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# PROPOSED WIND ENERGY FACILITY ON A SITE NORTH OF OYSTER BAY, EASTERN CAPE PROVINCE

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## CONSTRUCTION & OPERATION ENVIRONMENTAL MANAGEMENT PLAN (EMP)

Submitted as part of the Draft EIA Report  
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## PROJECT DETAILS

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## DEFINITIONS AND TERMINOLOGY

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

**Ambient sound level:** means the background noise level already present in the environment (in the absence of noise generated by any other proposed development)

**Cumulative impacts:** Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities (e.g. discharges of nutrients and heated water to a river that combine to cause algal bloom and subsequent loss of dissolved oxygen that is greater than the additive impacts of each pollutant). Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.

**Cut-in speed:** The minimum wind speed at which the wind turbine will generate usable power.

**Cut-out speed:** The wind speed at which shut down occurs.

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

**Disturbing noise:** A noise level that exceeds the ambient sound level measured continuously at the same measuring point by 7 dB or more. A disturbing noise would be a noise that increase the rating level with more than 7 dBA. Therefore, for this area the rating level is 35 dBA, and if the operation of the WEF results in a noise level higher than 42 dBA, and that change can be attributed to the wind energy facility that would be a disturbing noise. The noise specialist recommended a 5 dB increase as a guideline (40 dBA upper limit) for RES Southern Africa, giving them a 2 dB buffer before exceedance of the 42 dBA limit.

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

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

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

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

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

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

**Environmental impact assessment:** Environmental Impact Assessment (EIA), as defined in the NEMA EIA Regulations and in relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

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

**Environmental management plan/ programme:** An operational plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its ongoing maintenance after implementation.

**Generator:** The generator is what converts the turning motion of a wind turbine's blades into electricity

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

**Indirect impacts:** Indirect or induced changes that may occur as a result of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply

water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.

**Interested and Affected Party:** Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups and the general public.

**Nacelle:** The nacelle contains the generator, control equipment, gearbox and anemometer for monitoring the wind speed and direction.

**Natural properties of an ecosystem (*sensu* Convention on Wetlands):** Defined in Handbook 1 as the "...physical, biological or chemical components, such as soil, water, plants, animals and nutrients, and the interactions between them". (Ramsar Convention Secretariat. 2004. Ramsar handbooks for the wise use of wetlands. 2nd Edition. Handbook 1. Ramsar Convention Secretariat, Gland, Switzerland.) (see <http://www.ramsar.org/>).

**Ramsar Convention on Wetlands:** "The Convention on Wetlands (Ramsar, Iran, 1971) is an intergovernmental treaty whose mission is "the conservation and wise use of all wetlands through local, regional and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world". As of March 2004, 138 nations have joined the Convention as Contracting Parties, and more than 1300 wetlands around the world, covering almost 120 million hectares, have been designated for inclusion in the Ramsar List of Wetlands of International Importance." (Ramsar Convention Secretariat. 2004. Ramsar handbooks for the wise use of wetlands. 2nd Edition. Handbook 1. Ramsar Convention Secretariat, Gland, Switzerland.) (refer <http://www.ramsar.org/>). South Africa is a Contracting Party to the Convention.

**Rare species:** Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare".

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

**Rotor:** The portion of the wind turbine that collects energy from the wind is called the rotor. The rotor converts the energy in the wind into rotational energy to turn the generator. The rotor has three blades that rotate at about 15 to 28 revolutions per minute (rpm).

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

**Tower:** The tower, which supports the rotor, is constructed from tubular steel. It is approximately 80 – 120 m tall. The nacelle and the rotor are attached to the top of the tower. The tower on which a wind turbine is mounted is not just a support structure. It also raises the wind turbine so that its blades safely clear the ground and so it can reach the stronger winds at higher elevations. Larger wind turbines are usually mounted on towers ranging from 40 to 120 m tall. The tower must be strong enough to support the wind turbine and to sustain vibration, wind loading and the overall weather elements for the lifetime of the wind turbine.

**Wind power:** A measure of the energy available in the wind.

**Wind speed:** The rate at which air flows past a point above the earth's surface.

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## PURPOSE & OBJECTIVES OF THE EMP

## CHAPTER 1

An Environmental Management Plan (EMP) is defined as “an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented or mitigated, and that the positive benefits of the projects are enhanced”<sup>1</sup>. The objective of this Environmental Management Plan is to provide consistent information and guidance for implementing the management and monitoring measures established in the permitting process and help achieve environmental policy goals. The purpose of an EMP is to help ensure compliance with recommendations and conditions specified through an EIA process, as well as to ensure continuous improvement of environmental performance, reducing negative impacts and enhancing positive effects during the construction and operation of the facility. An effective EMP is concerned with both the immediate outcome as well as the long-term impacts of the project.

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

The EMP has been developed as a set of environmental specifications (i.e. principles of environmental management for the proposed wind energy facility), which are appropriately contextualised to provide clear guidance in terms of the on-site implementation of these specifications (i.e. on-site contextualisation is provided through the inclusion of various monitoring and implementation for use of the EMP by the project implementer as well as compliance monitors).

The EMP has the following objectives:

- » To outline mitigation measures and environmental specifications which are required to be implemented for the planning, construction, rehabilitation and operation phases of the project in order to minimise the extent of environmental impacts, and to manage environmental impacts associated with the wind energy facility.

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<sup>1</sup> Provincial Government Western Cape, Department of Environmental Affairs and Development Planning: *Guideline for Environmental Management Plans*, 2005

- » To ensure that the construction and operation phases do not result in undue or reasonably avoidable adverse environmental impacts, and ensure that any potential environmental benefits are enhanced.
- » To identify entities who will be responsible for the implementation of the measures and outline functions and responsibilities.
- » To propose mechanisms for monitoring compliance, and preventing long-term or permanent environmental degradation.
- » To facilitate appropriate and proactive responses to unforeseen events or changes in project implementation that was not considered in the EIA process.

The mitigation measures identified within the Environmental Impact Assessment process are systematically addressed in the EMP, ensuring the minimisation of adverse environmental impacts to an acceptable level.

Renewable Energy Systems (RES) Southern Africa (Pty) Ltd must ensure that the implementation of the project complies with the requirements of any and all environmental authorisations and permits (once issued), as well as with obligations emanating from all relevant environmental legislation. This obligation is partly met through the development of the EMP, and the implementation of the EMP through its integration into the contract documentation for activities associated with both construction and operation. Since this EMP is part of the EIA process undertaken for the proposed wind energy facility, it is important that this guideline document be read in conjunction with the Final Scoping Report (January 2011) and draft EIA Report (September 2011). This will contextualise the EMP and enable a thorough understanding of its role and purpose in the integrated environmental process. This EMP for construction and operation activities has been compiled in accordance with Regulation 34 of the EIA Regulations of 2006 and will be further developed in terms of specific requirements listed in any authorisations issued for the proposed project. This EMP should be considered a dynamic document, requiring regular review and updating as new information becomes available in order for it to remain relevant to the requirements of the site and the environment.

To achieve effective environmental management, it is important that Contractors are aware of their responsibilities in terms of the relevant environmental legislation and the contents of this EMP. The Contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts. The Contractors obligations in this regard include the following:

- » Ensuring that employees have a basic understanding of the key environmental features of the construction site and the surrounding environment.

- » Ensuring that a copy of the EMP is readily available on-site, and that all site staff are aware of the location and have access to the document. Employees must be familiar with the requirements of the EMP and the environmental specifications as they apply to the construction of the facility.
- » Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an appropriate Environmental Awareness Training course. The course must provide the site staff with an appreciation of the project's environmental requirements, the EMP specifications, and how they are to be implemented.
- » Basic training in the identification of archaeological sites/objects, and protected or Red List flora and fauna that may be encountered on the site.
- » Awareness of any other environmental matters, which are deemed to be necessary by the Environmental Control Officer (ECO).

## PROJECT DETAILS

## CHAPTER 2

Renewable Energy Systems (RES) Southern Africa (Pty) Ltd is proposing to establish a commercial wind energy facility and associated infrastructure on a site located north approximately 6 km north of Oyster Bay in the Eastern Cape Province. The proposed development site is located within the Kouga Local Municipality. The larger site covers an area of approximately 23 km<sup>2</sup>. The facility, which will be appropriately placed on the larger site, will include the following infrastructure:

- » A **wind energy facility** including up to **62 wind turbines**, appropriately spaced to make use of the wind resource on the site. The facility is proposed to have a generating capacity of up to 160 MW, depending on the final turbine selected for implementation. The facility would be operated as a single facility with each turbine being between 1,8MW and 3MW in capacity.
- » Each wind turbine is expected to consist of a concrete foundation, a steel tower, a hub (between 80m and 120m above ground level, depending on the turbine size decided upon) and three blades between 40 to 55m long attached to the hub.
- » **Possibly a small transformer** outside each turbine tower, depending on the type of turbine deemed most suitable for the site. Such a transformer would have its own foundation and housing around it.
- » **Crane hardstandings** (approximately 60x 40m depending on turbine choice, crane choice and geotechnical considerations).
- » **Cablings** between the components, laid approximately 1 m underground where feasible. In as far as possible, cabling will follow the internal access roads.
- » Internal roads (approximately 5-6 m in width, although may be up to 13m if crawler crane used) linking the wind turbines and other infrastructure on the site. Existing farm roads will be used as far as possible. However, the dispersed distribution pattern of wind turbines will necessitate the construction of new access roads in some areas.
- » An **on-site substation** to facilitate the connection between the facility and the grid. Two options are being considered, namely:
  - o Option 1: the B04 and
  - o Option 2: KromRivier Intake/Switching SubstationThis proposed substation will have a high-voltage (HV) yard footprint of approximately 120m x 120m.
- » A new 132kV overhead power line to connect to Eskom's existing Melkhout (132kV) substation which is approximately 20km from the site. Three corridor options are under consideration for this power line. **The Eastern and Central alignments are preferred over the Western alignment.**
- » **Operations and service building area** for control, maintenance and storage (approximately 20 x 40m depending on turbine choice).

The facility is proposed on the following farm portions:

- » Portion 3 of Farm Klein Rivier 713
- » Portion 1, 2, 3, 4 and the Remainder of Farm Rebok Rant 715
- » Portion 1 and 3 of Farm Ou Werf 738
- » Portion 5 of Farm Klippedrift 732
- » Portion 10 and Portion 12 of Farm Kruis Fontein 681.

The facility will be fuelled by wind. No other fuels will be used as a generating fuel during the operational phase of the project.

Two layout alternatives were considered in the EIA process. The preferred preliminary layout of the facility, indicating 62 turbines and associated temporary and permanent infrastructure, is shown in Figure 2.1. The power line corridors are shown in Figure 2.2.

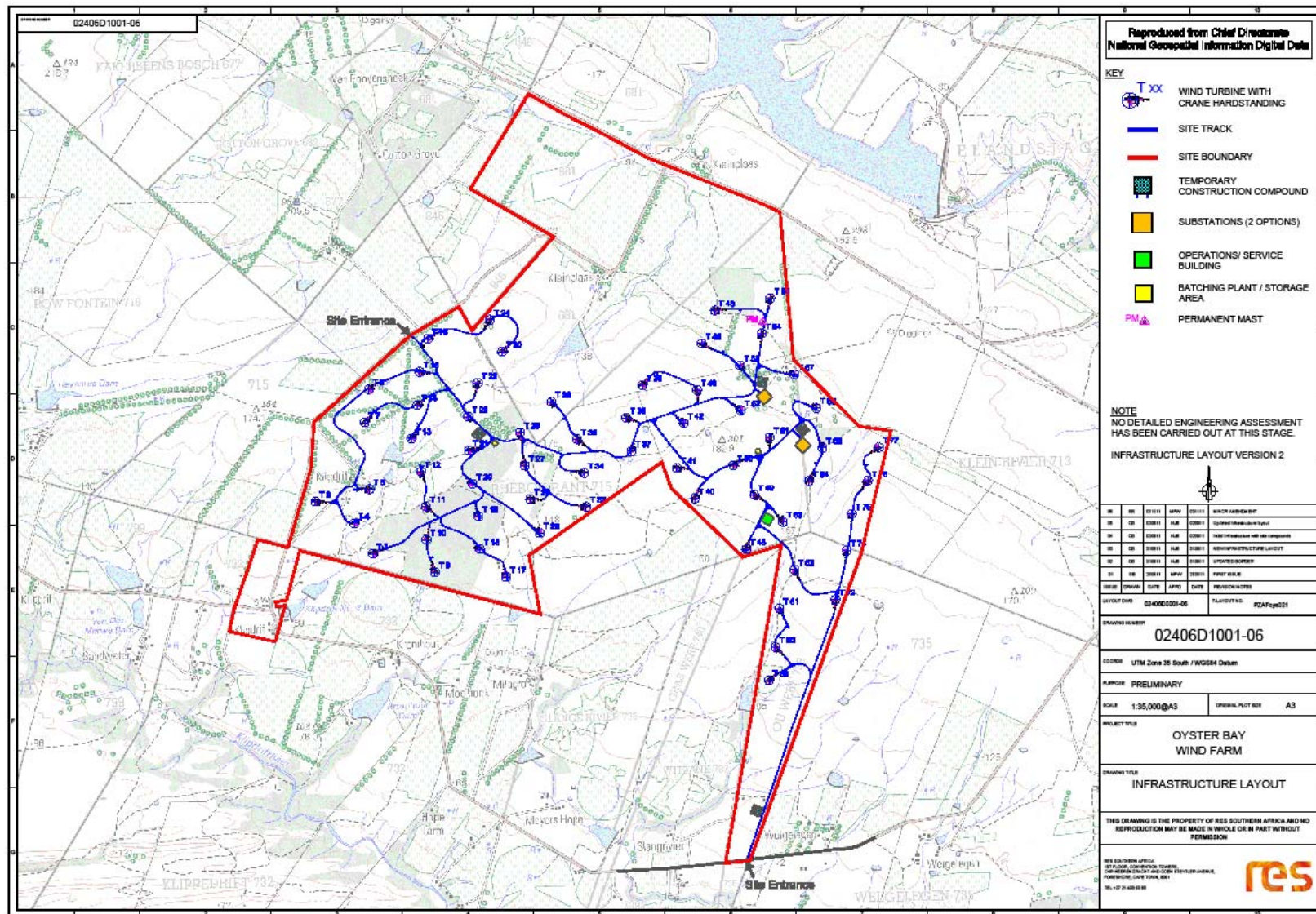


Figure 2.1: Layout for the Wind Energy Facility north of Oyster Bay

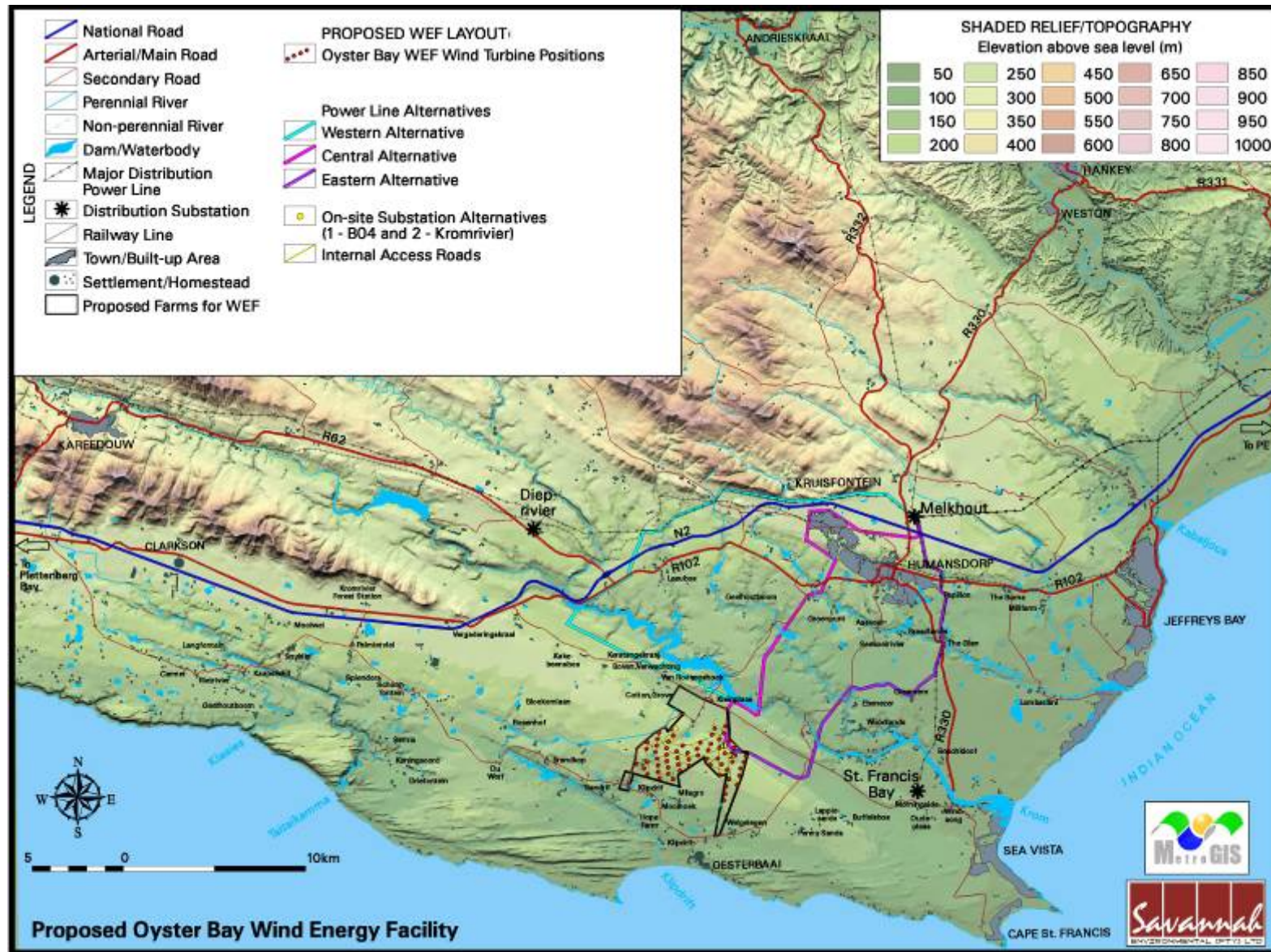


Figure 2.2: Three power line options considered in the EIA process

## 2.1 Activities and Components associated with the Wind Energy Facility

The main activities/components associated with the wind energy facility comprise the following:

Main Activity/Project Component	Components of Activity	Details
<b>Planning</b>		
Conduct surveys	<ul style="list-style-type: none"> <li>» Geotechnical survey by geotechnical engineer</li> <li>» Site survey and confirmation of the turbine micro-siting footprints</li> <li>» Survey of on-site substation (1) and chosen power line route</li> <li>» Survey of internal access routes</li> </ul>	<ul style="list-style-type: none"> <li>» Surveys to be undertaken prior to initiating construction.</li> </ul>
<b>Construction</b>		
Establishment of access roads to the site	<ul style="list-style-type: none"> <li>» Upgrade access/haul roads to the site</li> <li>» Establish internal access roads: 5-6 m wide permanent roadway within the site between the turbines for use during construction and operation phase.</li> <li>» If required, temporary track (adjacent to and utilising part of the permanent road) of up to 13m in width for use by the crane during construction phase only.</li> </ul>	<ul style="list-style-type: none"> <li>» Access roads will be constructed in advance of any components being delivered to site, and will remain in place after completion for future access and possibly access for replacement of parts if necessary.</li> <li>» Existing access roads to the site will be utilised, and upgraded where required. Special haul roads may need to be constructed to and within the site to accommodate abnormally loaded vehicle access and circulation.</li> <li>» The internal service road alignment is informed by the final micro-siting/positioning of the wind turbines (as well as by surveys undertaken by ecological and avifaunal specialists).</li> </ul>
Undertake site preparation	<ul style="list-style-type: none"> <li>» Site establishment of offices/workshop with ablutions and stores, contractors yards</li> <li>» Establishment of internal access roads (permanent and temporary roads)</li> </ul>	<ul style="list-style-type: none"> <li>» These activities will require the stripping of topsoil, which will need to be stockpiled, backfilled and/or spread on site.</li> </ul>



Main Activity/Project Component	Components of Activity	Details
	<ul style="list-style-type: none"> <li>» Clearance of vegetation at the footprint of each turbine</li> <li>» Excavations for foundations</li> </ul>	
Establishment of lay down areas on site	<ul style="list-style-type: none"> <li>» Lay down areas (temporary footprint 60 m x 40m) at each turbine position for the storage of wind turbine components and accommodation of construction and crane lifting equipment.</li> <li>» Construction site office</li> <li>» Establish concrete batching plants (up to two – See proposed locations on Locality map – Figure 2.1).</li> </ul>	<ul style="list-style-type: none"> <li>» The lay down area will need to accommodate the cranes required in tower/turbine assembly.</li> <li>» Lay down and storage areas will be required to be established for the normal civil engineering construction equipment which will be required on site.</li> <li>» A large lay down area will be required at each position where the main lifting crane may be required to be erected and/or disassembled. This area would be required to be compacted and levelled to accommodate the assembly crane, which would need to access the main crane from all sides.</li> </ul>
Construct wind turbine foundations	<ul style="list-style-type: none"> <li>» Turbine foundations will be up to 25m in diameter (octagonal shape). Foundation holes will be excavated to a depth of approximately 5m, depending on the underlying geotechnical conditions on site</li> </ul>	<ul style="list-style-type: none"> <li>» Foundation holes will be mechanically excavated.</li> <li>» The final re-instated foundation is the plinth with a diameter of up to 6.5m, onto which the turbine tower bolts.</li> <li>» Shoring and safety barriers will be erected around open excavations.</li> </ul>
Transport of components and equipment to site	<ul style="list-style-type: none"> <li>» Flatbed trucks will be used to transport all components to site:                             <ul style="list-style-type: none"> <li>* The normal civil engineering construction equipment for the civil works (e.g. excavators, trucks, graders, compaction equipment, cement mixers, etc.).</li> <li>* The components required for the establishment of the substation (including transformers)</li> <li>* Components required for the</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>» Turbine units consist of a tower comprised of typically 4 segments, a nacelle, and three rotor blades.</li> <li>» Components of various specialised construction, lifting equipment and counter weights etc. are required on site (e.g. mobile assembly crane and a main crane) to erect the wind turbines.</li> <li>» Other components include components required for the establishment of the substation (including transformers) and those required for the establishment of the power line (including towers and cabling).</li> <li>» The wind turbine, including tower, will be brought to site by the supplier in sections. The individual components are defined as</li> </ul>

Main Activity/Project Component	Components of Activity	Details
	establishment of the power line (including towers and cabling)	abnormal loads in terms of the Road Traffic Act (Act No 29 of 1989) by virtue of the dimensional limitations (abnormal length of the blades) and load limitations (i.e. the nacelle). The dimensional requirements of the load during the construction phase (length/height) may require alterations to the existing road infrastructure (widening on corners, removal of traffic islands), accommodation of street furniture (electricity, street lighting, traffic signals, telephone lines etc.) and protection of road-related structures (bridges, culverts, portal culverts, retaining walls etc.) as a result of abnormal loading. The equipment will be transported to the site using appropriate National and Provincial routes, and the dedicated access/haul road to the site itself. It is estimated that 10 trucks will be used for the transport of each turbine.
Erect turbines	<ul style="list-style-type: none"> <li>» Large lifting crane used for lifting of large, heavy components</li> <li>» A small crane for the assembly of the rotor.</li> </ul>	<ul style="list-style-type: none"> <li>» The large lifting crane will lift the tower sections into place, assisted by the smaller crane.</li> <li>» The nacelle, which contains the gearbox, generator and yawing mechanism, will then be placed onto the top of the assembled tower.</li> <li>» The rotor (i.e. the blades of the turbine) will then be assembled or partially assembled on the ground by the smaller crane. It will then be lifted to the nacelle by the large crane, and bolted in place. Alternatively the blades may be lifted into position on the nacelle individually by the main crane.</li> <li>» It will take approximately 2-4 days to erect each turbine, although this will depend on the climatic conditions as a relatively wind-free day will be required for the installation of the rotor.</li> </ul>
Construct substation and ancillary infrastructure.	<ul style="list-style-type: none"> <li>» Substation components</li> <li>» Security fencing around high-voltage (HV) Yard</li> <li>» Workshop</li> </ul>	<ul style="list-style-type: none"> <li>» Will require the clearing of vegetation and levelling of the development site and the excavation of foundations prior to construction.</li> <li>» A lay down area for building materials and equipment associated</li> </ul>

Main Activity/Project Component	Components of Activity	Details
		<p>with these buildings will also be required.</p> <ul style="list-style-type: none"> <li>» The substation will be constructed within a high-voltage (HV) yard footprint of up to 120m x 120m.</li> <li>» The substation would be constructed in the following simplified sequence:                             <ul style="list-style-type: none"> <li>* Step 1: Survey of the site</li> <li>* Step 2: Site clearing and levelling and construction of access road to substation sites</li> <li>* Step 3: Construction of terrace and foundations</li> <li>* Step 4: Assembly, erection and installation of equipment</li> <li>* Step 5: Connection of conductors to equipment</li> <li>* Step 6: Rehabilitation of any disturbed areas and protection of erosion sensitive areas.</li> </ul> </li> </ul>
Connection of wind turbines to the on-site substation	<ul style="list-style-type: none"> <li>» Wind turbines</li> <li>» 33 kV underground electrical cabling connecting each turbine to the substation</li> </ul>	<ul style="list-style-type: none"> <li>» The installation of these cables will require the excavation of trenches, approximately 1m in depth within which these cables can then be laid. The underground cables would follow the internal access roads as far as reasonably possible.</li> </ul>
Connect substation to power grid	<ul style="list-style-type: none"> <li>» A 132 kV distribution power line is proposed to connect the substation in the facility to the electricity distribution network/grid at Eskom's Melkhout Substation.</li> </ul>	<ul style="list-style-type: none"> <li>» The route for the power line will be assessed, surveyed and pegged prior to construction.</li> </ul>
Commissioning of the facility	<ul style="list-style-type: none"> <li>» Wind energy facility commissioning</li> </ul>	<ul style="list-style-type: none"> <li>» Prior to the start up of a wind turbine, a series of checks and tests will be carried out, including both static and dynamic tests to make sure the turbine is working within appropriate limits.</li> <li>» Grid interconnection and unit synchronisation will be undertaken to confirm the turbine and unit performance. Physical adjustments may be needed such as changing the pitch of the blades.</li> </ul>
Undertake site remediation	<ul style="list-style-type: none"> <li>» Remove all construction equipment from the site</li> </ul>	<ul style="list-style-type: none"> <li>» On full commissioning of the facility, any access points to the site which are not required during the operation phase will be closed</li> </ul>

Main Activity/Project Component	Components of Activity	Details
	<ul style="list-style-type: none"> <li>» Rehabilitation of temporarily disturbed areas where practical and reasonable</li> </ul>	<p>and prepared for rehabilitation.</p>
<b><i>Operation</i></b>		
Operation	<ul style="list-style-type: none"> <li>» Operation of turbines within the wind energy facility</li> </ul>	<ul style="list-style-type: none"> <li>» Once operational, the wind energy facility will be monitored remotely. Based on information provided by the proponent, the proposed project will employ approximately 45 full time and approximately 70 temporary employees over the 20-25 year operational phase of the project. It is anticipated that there will be full time security, maintenance and control room staff required on site.</li> <li>» Each turbine in the facility will be operational, except under circumstances of mechanical breakdown, extreme weather conditions or maintenance activities.</li> </ul>
Maintenance	<ul style="list-style-type: none"> <li>» Oil and grease – turbines</li> <li>» Transformer oil – substation</li> <li>» Waste product disposal</li> </ul>	<ul style="list-style-type: none"> <li>» The wind turbines will be subject to periodic maintenance and inspection. Periodic oil changes will be required and any waste products (e.g. oil) will be disposed of in accordance with relevant waste management legislation.</li> <li>» The turbine infrastructure is expected to have a lifespan of approximately 20 - 25 years, with maintenance.</li> </ul>
<b><i>Decommissioning</i></b>		
Site preparation	<ul style="list-style-type: none"> <li>» Confirming the integrity of the access to the site to accommodate required equipment and lifting cranes.</li> <li>» Preparation of the site (e.g. lay down areas, construction platform)</li> <li>» Mobilisation of construction equipment</li> </ul>	<ul style="list-style-type: none"> <li>» Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life. It is most likely that decommissioning activities of the infrastructure of the facility would comprise the disassembly and replacement of the turbines with more appropriate technology/infrastructure available at that time.</li> </ul>
Disassemble and remove existing turbines	<ul style="list-style-type: none"> <li>» A large crane will be used to disassemble the turbine and tower sections.</li> </ul>	<ul style="list-style-type: none"> <li>» Turbine components would be reused, recycled or disposed of in accordance with regulatory requirements.</li> <li>» The hours of operation for noisy construction activities are guided</li> </ul>

Main Activity/Project Component	Components of Activity	Details
		by the Environment Conservation Act (noise control regulations). If the project requires construction work outside of the designated hours, regulatory authorities and affected stakeholders will be consulted and subsequent negotiations will be made to ensure the suitability of the revised activities (if applicable).

## 2.2 Potential Environmental Impacts

In terms of the findings of the EIA Report, various planning, construction and operation-related environmental impacts were identified, including:

- » Disturbance of ecological environment
- » Impacts on wetlands and other sensitive habitats
- » Impacts on avifauna (birds)
- » Impacts on bats
- » Disturbance to sense of place, visual aesthetics
- » Noise during construction
- » Socio-economic impacts
- » Soil erosion and degradation
- » Impacts on heritage and/ fossil resources

From the specialist investigations undertaken for the proposed wind energy facility development site, a number of potentially sensitive areas were identified (refer to Figure 2.3). In order to avoid and minimise impacts on sensitive areas or receptors, it was recommended that:

- » Turbine positioning takes cognisance of sensitive areas (as indicated on **Figure 2.3**) by relocating the following turbine positions:
  - \* Turbines 4, 6, 13, 25, 29, 30, 36, 39, 42, 44, 47, 49, 58, 59, 60, 62, 63, 64, 70 and 74 should be moved in order to avoid / minimise impacts on wetlands. These turbines should be placed a minimum of 50 metres outside the outer edge of wetlands in terms of the National Water Act 107.
  - \* Turbine 1 should be removed from the agricultural land which has a pivoted irrigation system.
  - \* The following turbines are removed from the areas of high soil / land-use sensitivity (1, 6, 24, 29, 30, 36, 44, 49, 59, and 63).
  - \* Turbines 58-61 and 69-72 should be constructed further inland as recommended by the heritage specialist due to the Thyspunt cultural landscape / heritage site to reduce the visual impact.

**In response to the recommendations made through the specialist investigations undertaken, and based on the areas / sensitive environmental receptors identified, RES Southern Africa revised the layout, including the positioning of the turbines substation locations, and internal road routes (refer to Figure 2.4). This has been done in order to demonstrate the feasibility of implementing the recommended mitigation measures, resulting in the minimisation of predicted impacts as far as possible**

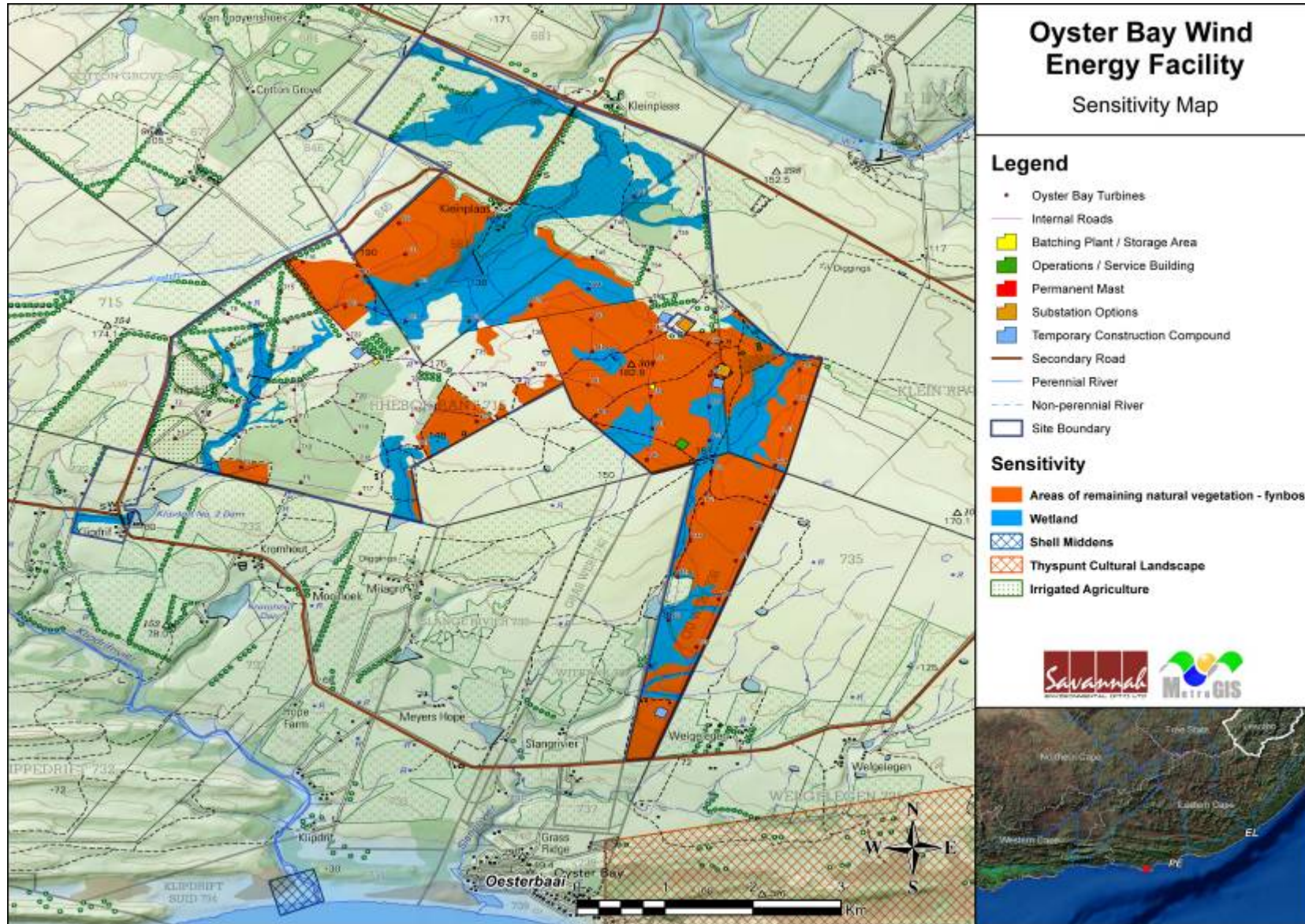
Relevant amendments to the layout for the proposed Oyster Bay wind energy facility include the following:

- » A reduction in the number of turbines from **77 to 62** (due to relocation / removal of turbines)
- » Turbines 6, 29, 36, 44, 47, 58, 59 and 70, have been removed from the layout, as they were previously located within wetlands.
- » Turbines 4, 25, 30, 13, 39, 42, 49, 60, 62, 63, 64 and 74 has been relocated at least 50 metres outside the outer edge of wetlands in terms of the National Water Act 107.
- » Turbine 1 has been removed from the agricultural land which has a pivoted irrigation system.
- » The following turbines were removed/ relocated from the areas of high soil / land-use sensitivity (6, 24, 29, 30, 36, 44, 49, 59 and 63).
- » Turbines 58, 69, 70 and 71 have been removed from the layout in line with the recommendations by the heritage specialist due to the Thyspunt cultural landscape / heritage site (to reduce the visual impact).

In this regard, the following impacts have been minimised through this revised layout:

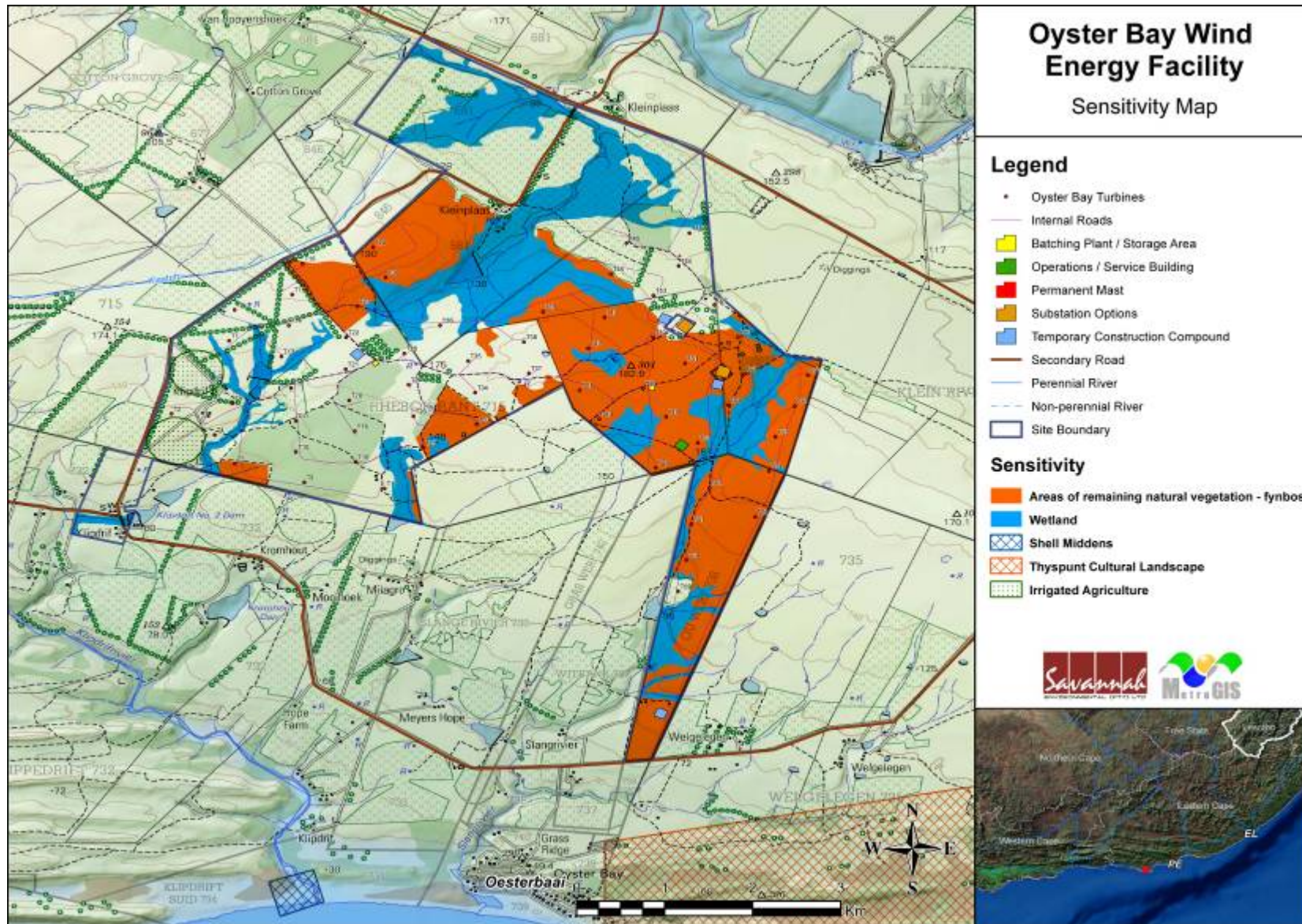
- » **Impacts on wetlands:** turbines have been relocated such that identified wetland areas are avoided. It may however still be necessary to cross some wetland areas with roads and/or cables. In these instances, the recommended mitigation measures will be required to be implemented. In addition, a water use license will be required to be obtained from the Department of Water Affairs.
- » **Impacts on agricultural potential:** turbines have been relocated such that they are outside of areas of high soil / land-use sensitivity, and outside of actively cultivated areas. In consultation with the landowner, it has been determined that the actively cultivated areas currently on site cannot be moved or expanded for the following reasons:
  1. The apparatus would not physically fit anywhere else on the land, and is also restricted by wind direction and strength, and distance from the dairy.
- » **Impacts on cultural landscape:** turbines within the culturally sensitive area have been reduced. Although not totally removed, this is considered acceptable from a visual perspective as the existing Red Cap viewshed as a result of the addition of the Oyster Bay facility remains largely unchanged. This therefore also mitigates the potential impact on the cultural landscape as a result of the Oyster Bay facility to some extent.

This has been done in order to demonstrate the feasibility of implementing the recommended mitigation measures, resulting in the minimisation of predicted impacts as far as possible. The EMP has thus been developed in line with these environmental sensitivities and must be implemented to protect sensitive on-site and off-site features through controlling construction and operation activities that could have a detrimental effect on the environment, and avoiding or minimising potential impacts.



**Figure 2.3:** Environmental Sensitivity map for the project study area illustrating sensitive areas in relation to the Oyster Bay wind energy facility layout





**Figure 2.4:** Environmental Sensitivity map for the project study area illustrating sensitive areas in relation to the **revised layout** for the Oyster Bay wind energy facility layout  
Project Details

## STRUCTURE OF THIS EMP

## CHAPTER 3

The first two chapters provide background to the EMP and the proposed project. The chapters which follow consider the:

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

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

**OBJECTIVE:** Description of the objective, which is necessary in order to meet the overall goals; these take into account the findings of the environmental impact assessment specialist studies

<b>Project component/s</b>	List of project components affecting the objective, i.e.: <ul style="list-style-type: none"> <li>» wind energy turbines</li> <li>» access roads</li> <li>» substation</li> <li>» power line</li> </ul>
<b>Potential Impact</b>	Brief description of potential environmental impact if objective is not met
<b>Activity/risk source</b>	Description of activities which could impact on achieving objective
<b>Mitigation: Target/Objective</b>	Description of the target; include quantitative measures and/or dates of completion

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

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

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

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

### 3.1. Project Team

This draft EMP was compiled by:

<b>EMP Compilers</b>	
Ravisha Ajodhapersadh	Savannah Environmental
Jo-Anne Thomas	Savannah Environmental
<b>Input from Specialists</b>	
Ecology	David Hoare Consulting cc
Avifauna	Chris Van Rooyen Consulting
Geology and erosion potential	Outeniqua Geotechnical Services cc
TerraSoil Science	Agricultural Potential and Wetlands
Visual	MetroGIS
Heritage	Eastern Cape Heritage Consultants
Palaeontology	John Almond of Natura Viva
Noise	MENCO (M2 Environmental Connections cc)
Social Impact	Tony Barbour (Environmental Consultant and Researcher)

The Savannah Environmental team have extensive knowledge and experience in environmental impact assessment and environmental management, having being involved in EIA processes over the past ten (10) years. They have managed and drafted environmental management plans / programmes for other wind energy facility projects throughout South Africa. In addition, they have been involved in compliance monitoring of major construction projects in South Africa.

**MANAGEMENT PLAN FOR THE WIND ENERGY FACILITY:  
PLANNING & DESIGN**

**CHAPTER 4**

**4.1. Planning and Design**

**OBJECTIVE:** To ensure that the design of the facility responds to the identified environmental constraints and opportunities

Subject to final turbine micro-siting resulting from on-site geotechnical investigation and subsequent acceptance from DEA (if necessary) the revised layout and preferred power line route/s must be implemented.

<b>Project component/s</b>	Project components affecting the objective: <ul style="list-style-type: none"> <li>» wind energy turbines</li> <li>» access roads and crane hard standings</li> <li>» substation</li> <li>» service building</li> <li>» power line</li> </ul>
<b>Potential Impact</b>	» Design fails to respond optimally to the environmental consideration
<b>Activities/risk sources</b>	» Positioning of turbines and access roads » Positioning of substation » Alignment of power line
<b>Mitigation: Target/Objective</b>	» To ensure that the design of the facility responds to the identified environmental constraints and opportunities

Mitigation: Action/control	Responsibility	Timeframe
Consider design level mitigation measures recommended by the specialists, especially with respect to ecology, visual aesthetics, drainage lines and avifauna as detailed within the EIA report and relevant appendices.	Engineering Design Consultant / turbine supplier RES Southern Africa	Tender Design & Design Review Stage
Access roads to be carefully planned to minimise the impacted area and prevent unnecessary over compaction of soil. Keep grazing, cultivated and natural units as intact as possible.	RES Southern Africa	Design phase
A comprehensive stormwater management to be compiled that details how storm-water off hard surfaces will be managed to reduce velocities and volumes of water that could lead to erosion of surfaces.	RES Southern Africa	Design phase

Mitigation: Action/control	Responsibility	Timeframe
<p>The draft EMP should form part of the contract with the Contractors appointed to construct and maintain the proposed wind energy facility, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMP for all life cycle phases of the proposed project is considered to be key in achieving the appropriate environmental management standards as detailed for this project.</p>	RES Southern Africa	Tender Design & Design Review Stage
<p>Developer to implement a long-term bird monitoring programme in order to understand the nature of impacts on avifauna due to wind energy facilities on the site and in South Africa. Pre-construction and post-construction monitoring is to be implemented in terms of any accepted or endorsed bird monitoring guidelines or standard.</p>	RES Southern Africa	Pre-construction
<p>The final location of the wind turbines and associated infrastructure (including the power line) must be informed by a survey undertaken by an ecological specialist to identify any of the three Red List plant species that have a geographic distribution in the areas, this includes:</p> <ul style="list-style-type: none"> <li>» <i>Disa lugens var. lugens</i>- Endangered</li> <li>» <i>Bobartia macrocarpa</i> - Vulnerable</li> <li>» <i>Pauridia minuta</i> - Near Threatened</li> </ul> <p>The findings of this survey must be included in the updated EMP to be compiled for the project. Prior to construction, the footprint of each turbine and power line tower must be searched for the three populations of plant species of concern. If any populations are found in these areas, infrastructure should be moved to avoid impacts. If not possible to avoid the impact, a permit is required in terms of Chapter 7 of the National Environmental Management: Biodiversity Act to carry out a restricted activity involving a specimen of a listed threatened or protected species.</p>	RES Southern Africa	Design phase
<p>A walk through survey by an ecologist and avifaunal specialist to be undertaken for the final power line route and sections of the line which cross sensitive habitats should be demarcated.</p>	RES Southern Africa, ecologist, avifaunal specialist	Design phase
<p>Should the eastern power line route be selected for implementation, realign the route to cross the identified wetlands at the narrowest possible point so as to avoid placement of towers within these sensitive areas.</p>	RES Southern Africa	Design phase
<p>Water use license to be obtained for any impacts on</p>	RES Southern Africa	Design phase

Mitigation: Action/control	Responsibility	Timeframe
wetlands		
Mining permit/license to be obtained for any borrow pits to be established for the project (if applicable)	RES Southern Africa	Design phase
Register water use for construction purposes for abstraction of water from on site borehole (if water use falls within the General Authorisation limits). If necessary, obtain a water use license for this purpose.	RES Southern Africa	Design phase.
Obtain required abnormal load permits for transportation of project components to site.	RES Southern Africa/contractor	Design phase
The noise emission specifications of wind turbine generators should be considered when selecting the equipment.	RES Southern Africa	Design phase
A detailed geotechnical investigation is required for the design phase.	RES Southern Africa	Design phase

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Design meets objectives and does not degrade the environment.</li> <li>» Design and layouts etc. respond to the mitigation measures and recommendations in the EIA report.</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» Ensure that the design implemented meets the objectives and mitigation measures in the EIA report through review of the design by the Project Manager and Environmental Control Officer (ECO) prior to the commencement of construction.</li> </ul>

#### OBJECTIVE: Commence Phase 1 Palaeontology Pre-construction Field Assessment

Given the uncertainties concerning the geological mapping of the poorly-exposed, potentially fossiliferous marine rock formations within the study area, as well as their actual palaeontological sensitivity on the ground, it is recommended that a Phase 1 pre-construction field assessment of the broader development area, including the final development footprint, by a professional palaeontologist be carried out to identify possible zones or areas of high palaeontological sensitivity and to recommend any further mitigation measures deemed necessary.

<b>Project component/s</b>	List of project components affecting the objective <ul style="list-style-type: none"> <li>» wind turbines</li> <li>» power lines</li> <li>» substation</li> <li>» crane hardstandings</li> <li>» track</li> <li>» service building</li> <li>» buried cables and so forth</li> </ul>
<b>Potential Impact</b>	» Disturbance, damage, destruction or sealing-in of scientifically valuable fossil material embedded within bedrock or weathered-out at ground surface
<b>Activity/risk source</b>	» Extensive bedrock excavations and surface disturbance (e.g. road construction, excavations for wind turbine foundations, cables etc)
<b>Mitigation: Target/Objective</b>	» Recording, judicious sampling and curation of important fossil heritage within development area, both before and during construction, to be achieved before completion of construction phase

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Phase 1 paleontological field assessment for the footprint of the facility	RES Southern Africa and Professional palaeontologist	Pre-construction
Short workshop to train ECOs in recognition, recording and safeguarding of relevant fossil heritage	RES Southern Africa and Professional palaeontologist	Following field assessment, before and during construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Identification of any paleontological hotspots within broader development footprint.</li> <li>» Training of ECO</li> <li>» Cumulative acquisition of geographically and stratigraphically well-localised fossil records, samples and relevant geological data from successive subsections of the development area.</li> <li>» Submission of interim and final technical reports to SAHRA</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» Monitoring during construction phase of fresh bedrock exposures within development footprint by ECO and, if necessary, by professional palaeontologist</li> <li>» Realistic frequency, scale and protocol of monitoring to be determined by professional palaeontologist in conjunction with SAHRA and developer</li> <li>» Assessment of interim and final reports by SAHRA</li> </ul>

## **MANAGEMENT PLAN FOR THE WIND ENERGY FACILITY:                    CHAPTER 5**

### **CONSTRUCTION**

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#### **5.1. Overall Goal for Construction**

The construction phase of the wind energy facility should be undertaken in such a way that ensures the construction activities are properly managed in respect of environmental aspects and impacts and enables the wind energy facility construction activities to be undertaken without significant disruption to other land uses in the area, in particular with regard to noise impacts, traffic and road use, and effects on local residents. The construction phase of the facility should also be undertaken in such a way as to minimise the impact on the vegetation, fauna and avifauna on the site as well as on any archaeological and historical value the site may have, as determined by the EIA.

#### **5.2. Institutional Arrangements: Roles and Responsibilities for the Construction Phase of the Wind Energy Facility**

As the Proponent, RES Southern Africa must ensure that the construction and operation of the wind energy facility complies with the requirements of any and all environmental authorisations and permits, and obligations emanating from other relevant environmental legislation. This obligation is partly met through the development of the EMP, and the implementation of the EMP through its integration into the contract documentation. RES Southern Africa will retain various key roles and responsibilities during the construction of the wind energy facility. These are outlined below.

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Project Manager; Site Manager; Safety, Health and Environmental Representative; Environmental Control Officer and Contractor for the construction phase of this project are as detailed below.

The **Project Manager** will:

- » Ensure of all specifications and legal constraints specifically with regards to the environment are highlighted to the Contractor(s) so that they are aware of these.
- » Ensure that RES Southern Africa and its Contractor(s) are made aware of all stipulations within the EMP.
- » Ensure that the EMP is correctly implemented throughout the project by means of site inspections and meetings. This will be documented as part of the site meeting minutes.



- » Be fully conversant with the Environmental Impact Assessment for the project, the EMP, the conditions of the Environmental Authorisation (once issued), and all relevant environmental legislation.

The **Site Manager** (RES Southern Africa On-site Representative) will:

- » Be fully knowledgeable with the contents of the Environmental Impact Assessment.
- » Be fully knowledgeable with the contents and conditions of the Environmental Authorisation (once issued).
- » Be fully knowledgeable with the contents of the Environmental Management Plan.
- » Be fully knowledgeable with the contents of all relevant environmental legislation, and ensure compliance with these.
- » Have overall responsibility of the EMP and its implementation.
- » Conduct audits to ensure compliance to the EMP.
- » Ensure there is communication with the Project Manager, the Environmental Control Officer and relevant discipline Engineers on matters concerning the environment.
- » Ensure that no actions are taken which will harm or may indirectly cause harm to the environment, and take steps to prevent pollution on the site.

The **Safety, Health and Environmental Representative** (ER) will:

- » Develop and compile environmental policies and procedures.
- » Direct and liaise with the Environmental Control Officer (ECO) regarding monitoring and reporting on the environmental performance of the construction phase.
- » Conduct internal environmental audits and co-ordinate external environmental audits.
- » Liaise with statutory bodies on environmental performance and other issues as required.

The **Environmental Control Officer** (ECO) will be responsible for monitoring, reviewing and verifying compliance by the Contractor with the environmental specification. Accordingly, the ECO will:

- » Be fully knowledgeable with the contents with the Environmental Impact Assessment.
- » Be fully knowledgeable with the contents with the conditions of the Environmental Authorisation (once issued).
- » Be fully knowledgeable with the contents with the Environmental Management Plan.
- » Be fully knowledgeable with the contents with all relevant environmental legislation, and ensure compliance with them.
- » Ensure that the contents of this EMP are communicated to the Contractor site staff and that the Site Manager and Contractor are constantly made aware of the contents through discussion.
- » Ensure that the compliance of the EMP is monitored through regular and comprehensive inspection of the site and surrounding areas.

- » Ensure that if the EMP conditions or specifications are not followed then appropriate measures are undertaken to address this.
- » Monitoring and verification must be implemented to ensure that environmental impacts are kept to a minimum, as far as possible.
- » Ensure that the Site Manager has input into the review and acceptance of construction methods and method statements.
- » Ensure that activities on site comply with all relevant environmental legislation.
- » Remedial action will be required by the responsible party in the event of contravention of the specifications of the EMP.
- » Ensure that the compilation of progress reports for submission to the Project Manager, with input from the Site Manager, takes place on a regular basis, including a final post-construction audit.
- » Ensure that there is communication with the Site Manager regarding the monitoring of the site.
- » Ensure that any non-compliance or remedial measures that need to be applied are reported.
- » Independently report to DEA in terms of compliance with the specifications of the EMP and conditions of the Environmental Authorisation (once issued).

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

- » Ensuring adherence to all environmental management specifications contained within this EMP (and the Environmental Authorisation, once issued), as well as any specific specifications detailed by RES Southern Africa.
- » Ensuring that Method Statements are submitted to the Site Manager (and ECO) for approval before any work is undertaken. Any lack of adherence to this will be considered as non-compliance to the specifications of the EMP.
- » Ensuring that any instructions issued by the Site Manager on the advice of the ECO are adhered to.
- » Ensuring that a report is tabled at each site meeting, which will document all incidents that have occurred during the period before the site meeting.
- » Ensuring that a register is kept in the site office, which lists all transgressions issued by the ECO.
- » Ensuring that a register of all public complaints is maintained.
- » Ensuring that all employees, including those of sub-contractors receive training before the commencement of construction in order that they can constructively contribute towards the successful implementation of the EMP (i.e. ensure their staff are appropriately trained as to the environmental obligations).

### 5.3. Objectives for the Construction EMP

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

#### OBJECTIVE: Securing the site and site establishment

The Contractor must take all reasonable measures to ensure the safety of the public in the surrounding area. Where the public could be exposed to danger by any of the works or site activities, the Contractor must, as appropriate, provide suitable flagmen, barriers and/or warning signs in English and any other relevant indigenous languages, all to the approval of the Site Manager. All unattended open excavations shall be adequately demarcated and/or fenced (fencing shall consist of a minimum of three strands of wire wrapped with danger tape). Adequate protective measures must be implemented to prevent unauthorised access to the working area and the internal access/haul routes.

<b>Project component/s</b>	Project components affecting the objective: <ul style="list-style-type: none"> <li>» wind energy turbines</li> <li>» access roads</li> <li>» substation</li> <li>» power line</li> <li>» service building</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Hazards to landowners and public</li> <li>» Security of materials</li> <li>» Substantially increased damage to adjacent sensitive vegetation</li> </ul>
<b>Activities/risk sources</b>	<ul style="list-style-type: none"> <li>» Open excavations (foundations and cable trenches)</li> <li>» Movement of construction vehicles in the area and on-site</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To secure the site against unauthorised entry</li> <li>» To protect members of the public/landowners/residents</li> </ul>

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Secure site, working areas and excavations in an appropriate manner	Contractor	During site establishment Maintenance: for duration of Contract
Where necessary to control access, fence and secure access to the site and entrances to the site.	Contractor	During site establishment Maintenance: for duration of Contract
Fence and secure Contractor's equipment camp.	Contractor	Erection: during site

Mitigation: Action/control	Responsibility	Timeframe
		establishment Maintenance: for duration of Contract
Location of concrete batching plant/s to be approved by ECO, prior to its development.	ECO	During site establishment

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Site is secure and there is no unauthorised entry</li> <li>» No members of the public/ landowners injured</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» Regular visual inspection of fence for signs of deterioration/forced access</li> <li>» An incident reporting system must be used to record non-conformances to the EMP.</li> <li>» Public complaints register must be developed and maintained on site.</li> <li>» ECO to monitor all construction areas on a continuous basis until all construction is completed; immediate report backs to site manager.</li> <li>» ECO to address any infringements with responsible contractors as soon as these are recorded.</li> </ul>

**OBJECTIVE: Maximise local employment and business opportunities associated with the construction phase**

It is acknowledged that skilled personnel are required for the construction of the wind turbines and associated infrastructure. However, where semi-skilled and unskilled labour is required, opportunities for local employment should be maximised as far as possible.

<b>Project component/s</b>	<p>Project components affecting the objective:</p> <ul style="list-style-type: none"> <li>» Construction activities associated with the establishment of the wind energy facility, including all infrastructure.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» The opportunities and benefits associated with the creation of local employment and business should be maximised. However, due to the relatively small size of the facility the number of employment and business opportunities for locals will be limited.</li> </ul>
<b>Activities/risk sources</b>	<ul style="list-style-type: none"> <li>» The employment of outside contractors to undertake the work and who make use of their own labour will reduce the employment and business opportunities for locals. Employment of local labour will maximise local employment opportunities.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» RES Southern Africa, in discussions with the Kouga Municipality, should aim to employ as many workers (skilled, semi-skilled / low-skilled) from the local area as possible.</li> </ul>

	» RES Southern Africa should develop a database of local BEE service providers
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Mitigation: Action/control	Responsibility	Timeframe
Employ as many workers (skilled, semi-skilled / low-skilled) from the local area as possible.	RES Southern Africa and contractors	Construction
Where required, implement appropriate training and skills development programmes prior to the initiation of the construction phase to ensure that local employment target is met.	RES Southern Africa	Where required, training and skills development programmes to be initiated prior to the initiation of the construction phase.
Develop a database of local BEE service providers and ensure that they are informed of relevant tenders and job opportunities.	RES Southern Africa	Database of potential local BEE services providers to be completed before construction phase commences.
Identify potential opportunities for local businesses.	RES Southern Africa	Tender Design and Review stage

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Source as many local labourers as possible.</li> <li>» Database of potential local BEE services providers in place before construction phase commences.</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» RES Southern Africa and appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.</li> <li>» An incident reporting system must be used to record non-conformances to the EMP.</li> <li>» Public complaints register must be developed and maintained on site.</li> </ul>

**OBJECTIVE: Avoid the negative social impacts on family structures and social networks due to the presence of construction workers**

While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on the local community. In this regard the most significant negative impact is associated with the disruption of existing family structures and social networks. This risk is linked to the potential behaviour of male construction workers, including an increase in alcohol and drug use, an increase in crime levels, the loss of girlfriends and or wives to construction

workers, an increase in teenage and unwanted pregnancies, an increase in prostitution and an increase in sexually transmitted diseases.

The potential risk to local family structures and social networks is, however, likely to be low. The low and semi-skilled workers are likely to be local residents and will therefore form part of the local family and social network.

<b>Project component/s</b>	Project components affecting the objective: » Construction and establishment activities associated with the establishment of the wind energy facility, including all infrastructure.
<b>Potential Impact</b>	» The presence of construction workers who live outside the area and who are housed in local towns can impact on family structures and social networks. » Presence of construction workers on site may result in loss of livestock due to stock theft and damage to farm infrastructure, such as gates and fences. Poaching of wild animals may also occur. » Due the relatively small number of workers associated with the construction of the proposed facility, the risk of impacts is likely to be low.
<b>Activities/risk sources</b>	» The presence of construction workers can impact negatively on family structures and social networks, especially in small, rural communities. » The presence of construction workers on the site can result in stock thefts and damage to farm infrastructure.
<b>Mitigation: Target/Objective</b>	» Avoid and or minimise the potential impact of construction workers on the local community and livelihoods.

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Employ as many workers (skilled, semi-skilled / low-skilled) from the local area as possible. This should be included in the tender documents. Construction workers should be recruited from the local area in and around the towns such as Oyster Bay and Humansdorp.	RES Africa Southern	Identify suitable local contractors prior to the tender process for the construction phase.
Establish contact with the adjacent farmers and develop a Code of Conduct for construction workers.  Ensure that construction workers attend a brief session before they commence activities. The aim of the briefing session is to inform them of the rules and regulations governing activities on the site as set out in the Code of Conduct.  Ensure that all workers are informed at the outset of the construction phase of the conditions contained on	RES Africa Southern	Briefing session for construction workers held before they commence work on site.

Mitigation: Action/control	Responsibility	Timeframe
the Code of Conduct.		
Ensure that construction workers who are found guilty of breaching the Code of Conduct are dealt with appropriately. Dismissals must be in accordance with South African labour legislation.	RES Southern Africa and contractors	Construction
No housing of construction workers on the site to be permitted, apart from security personnel.	RES Southern Africa and contractors	Construction
Compensate farmers / community members for cost for any losses, such as livestock, damage to infrastructure etc.	Contractors	Compensate Farmers / community after a claim has been verified by RES Southern Africa or Contractors.

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Employment policy and tender documents that set out requirement for local employment and targets completed before construction phase commences.</li> <li>» Code of Conduct developed and approved prior to commencement of construction phase.</li> <li>» Labour locally sourced, where possible.</li> <li>» Tender documents for contractors include recommendations for construction camp.</li> <li>» All construction workers made aware of Code of Conduct within first week of being employed.</li> <li>» Briefing session with construction workers held at outset of construction phase.</li> <li>»</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» RES Southern Africa and appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.</li> <li>» An incident reporting system must be used to record non-conformances to the EMP.</li> <li>» Public complaints register must be developed and maintained on site.</li> </ul>

## OBJECTIVE: Noise control

Various construction activities would be taking place during the development of the facility and may pose a noise risk to sensitive receptors. While the study undertaken in the EIA investigated likely and significant noisy activities, it did not evaluate all potential activities that could result in a noise impact, as these were not defined at the time of

the study. Other construction activities not evaluated could include temporary or short-term activities where small equipment is used (such as the digging of trenches to lay underground power-cables).

<b>Project component/s</b>	List of project components affecting the objective: <ul style="list-style-type: none"> <li>» Construction of turbine system (foundation, tower, nacelle and rotor)</li> <li>» Substation</li> <li>» access roads</li> <li>» electrical power cabling.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Nuisance noise from construction activities affecting the surrounding community</li> </ul>
<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» Any construction activities taking place within 500 m from potentially sensitive receptors (PSR)</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Ensure equivalent A-weighted noise levels below 45 dBA at potentially sensitive receptors.</li> <li>» Ensure that maximum noise levels at potentially sensitive receptors be less than 65 dBA.</li> <li>» Prevent the generation of a disturbing or nuisance noises</li> <li>» Ensure acceptable noise levels at surrounding stakeholders and potentially sensitive receptors.</li> <li>» Ensuring compliance with the Noise Control Regulations</li> </ul>

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Where possible, construction work should be undertaken during normal working hours (06H00 – 18H00), from Monday to Friday. If work is required on the weekend / public holiday, agreements can be reached (in writing) with the landowners adjacent to the work, these working hours can be extended.	Contractor	Construction
The construction crew must abide by the national standards and local by-laws regarding noise.	Contractor	Construction
All construction equipment, including vehicles, must be properly and appropriately maintained in order to minimise noise generation.	Contractor	Construction
Establish a line of communication and notify all stakeholders and sensitive receptors of the means of registering any issues, complaints or comments.	Environmental Control Officer	All phases of project
Notify potentially sensitive receptors about work to take place at least 2 days before the activity in the vicinity (within 500 m) of the PSR is to start. The following information to be presented in writing: <ul style="list-style-type: none"> <li>» Description of Activity to take place</li> <li>» Estimated duration of activity</li> <li>» Working hours</li> <li>» Contact details of responsible party</li> </ul>	Contractor, Environmental Control Officer	At least 2 days, but not more than 5 days before activity is to commence



<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No complaints received concerning noise.</li> <li>» Equivalent A-weighted noise levels below 45 dBA at potentially sensitive receptors.</li> <li>» Ensure that maximum noise levels at potentially sensitive receptors are less than 65 dBA.</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» Should a complaint about noise be reported, RES to look into the matter and determine steps to deal with the complaint. An incident reporting system must be used to record non-conformances to the EMP.</li> <li>» Public complaints register must be developed and maintained on site.</li> </ul>

### OBJECTIVE: Management of dust and emissions and damage to roads

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

<b>Project component/s</b>	<p>Project components affecting the objective:</p> <ul style="list-style-type: none"> <li>» wind energy turbines</li> <li>» access roads</li> <li>» substation</li> <li>» power line</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Heavy vehicles can generate noise and dust impacts. Movement of heavy vehicles can also damage roads.</li> </ul>
<b>Activities/risk sources</b>	<ul style="list-style-type: none"> <li>» The movement of heavy vehicles and their activities on the site can result in noise and dust impacts and damage roads.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To avoid and or minimise the potential noise and dust impacts associated with heavy vehicles, and also minimise damage to roads.</li> </ul>

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Implement appropriate dust suppression measures on site such as wetting roads on a regular basis.	Contractor	Construction
Haul vehicles moving outside the construction site carrying material that can be wind-blown should be covered with tarpaulins.	Contractor	Duration of contract
Ensure vehicles adhere to speed limits on public roads and speed limits set within the site by the ECO. Vehicles should be fitted with recorders to record when vehicles exceed the speed limit.	Contractor/ transportation contractor	Duration of contract
Disturbed areas must be re-vegetated as soon as practicable after construction is complete in an area.	Contractor	At completion of the construction

Mitigation: Action/control	Responsibility	Timeframe
		phase
Vehicles and equipment must be maintained in a road-worthy condition at all times.	Contractor	Prior to construction phase
Ensure that damage to gravel public roads and access roads attributable to construction vehicles is repaired before completion of construction phase.	Contractor	Before completion of construction phase
Regular dust control of materials (sand, soil, cement) must be used at concrete batching plants on site	Contractor	Construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Appropriate dust suppression measures implemented on site during the construction phase.</li> <li>» Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed.</li> <li>» All heavy vehicles equipped with speed monitors before they are used in the construction phase.</li> <li>» Road worthy certificates in place for all heavy vehicles at outset of construction phase and up-dated on a monthly basis.</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» RES Southern Africa and appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.</li> <li>» Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager.</li> <li>» An incident reporting system must be used to record non-conformances to the EMP.</li> <li>» Public complaints register must be developed and maintained on site.</li> </ul>

## OBJECTIVE: Soil and rock degradation and erosion control

The natural soil on the site needs to be preserved as far as possible to minimise impacts on the environment. Soil degradation including erosion (by wind and water) and subsequent deposition elsewhere is of a concern in areas underlain by fine grained soil which can be mobilised when disturbed, even on relatively low slope gradients (accelerated erosion). Uncontrolled run-off relating to construction activity (excessive wetting, etc.) will also lead to accelerated erosion. Degradation of the natural soil profile due to excavation, stockpiling, compaction, pollution and other construction activities will affect soil forming processes and associated ecosystems.

A set of strictly adhered to mitigation measures are required to be implemented in order to effectively limit the impact on the environment. The disturbance areas where human impact is likely are the focus of the mitigation measures laid out below.

<b>Project component/s</b>	<p>Project components affecting the objective:</p> <ul style="list-style-type: none"> <li>» wind energy turbines</li> <li>» access roads</li> <li>» substation</li> <li>» power line</li> <li>» Sealed surfaces (e.g. roofs, concrete surfaces, compacted road surfaces, paved roads / areas).</li> <li>» All other infrastructure</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Erosion and soil loss</li> <li>» Negative impacts on wetlands</li> <li>» Disturbance to or loss of wetland/pan habitat</li> <li>» Sedimentation of watercourses/wetland areas</li> <li>» A loss of indigenous vegetation cover</li> <li>» Increased runoff into drainage lines can potentially be associated with accelerated erosion</li> </ul>
<b>Activities/risk sources</b>	<ul style="list-style-type: none"> <li>» Rainfall and wind erosion of disturbed areas</li> <li>» Excavation, stockpiling and compaction of soil</li> <li>» Concentrated discharge of water from construction activity</li> <li>» Stormwater run-off from sealed surfaces</li> <li>» Mobile construction equipment movement on site</li> <li>» Power line construction activities</li> <li>» River/stream/drainage line road crossings</li> <li>» Roadside drainage ditches</li> <li>» Project related infrastructure, such as buildings, turbines and fences</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To minimise erosion of soil from site during construction</li> <li>» To minimise deposition of soil into drainage lines</li> <li>» To minimise damage to vegetation by erosion or deposition</li> <li>» To minimise damage to rock, soil and vegetation by construction activity</li> <li>» No accelerated overland flow related surface erosion as a result of a loss of vegetation cover</li> <li>» No reduction in the surface area of wetlands (drainage lines and other wetland areas) as a result of the establishment of infrastructure</li> <li>» Minimal loss of vegetation cover due to construction related activities</li> <li>» No or insignificant loss of wetland area in the specialist study area</li> <li>» No increase in runoff into drainage lines as a result of construction of project related infrastructure</li> <li>» No increase in runoff into drainage lines as a result of road construction</li> </ul>

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Stockpile topsoil for re-use in rehabilitation phase.	Contractor	During site

Mitigation: Action/control	Responsibility	Timeframe
Maintain stockpile shape and protect from erosion. All stockpiles must be positioned at least 50 m away from drainage lines and wetlands. Limit the height of stockpiles as far as possible to reduce compaction.		establishment and any activity related to earthworks as well as the duration of construction
New access roads to be carefully planned and constructed to minimise the impacted area and prevent unnecessary excavation, placement and compaction of soil.	Engineer / ECO / Contractor	Before and during construction
Identify and demarcate construction areas for general construction work and restrict construction activity to these areas.	Contractor	Construction
Rehabilitate disturbance areas as soon as construction in an area is completed.	Contractor	During and after construction
Stockpiles not used in three (3) months after stripping must be seeded or appropriately covered to prevent dust and erosion - only if natural seeding does not occur.	Contractor	During and after construction
Erosion control measures: Implement run-off attenuation on slopes (sand bags, logs), silt fences, stormwater catch-pits, shade nets or temporary mulching over denuded areas.	Contractor	Erection: Before construction Maintenance: Duration of contract
Particular care should be taken in the design of road drainage line and wetland crossings in order to ensure there is no step in the channel bed, substrate continuity is maintained and no undue constriction of flow takes place.	Contractor	Erection: during site establishment Maintenance: for duration of contract
Where access roads cross natural drainage lines or wetlands, culverts (or other appropriate measures) must be designed to allow free flow. Regular maintenance of the culverts must be carried out.	Engineer / ECO / Contractor	Before and during construction
Control depth of all excavations and stability of cut faces/sidewalls.	Engineer / ECO / Contractor	Maintenance over duration of contract
Compile a comprehensive stormwater management plan as part of the final design of the project and implement during construction and operation.	Construction team, management, environmental control officer	Compile during design; implement during construction & operation
Cement batching to take place in designated areas	Contractor	Construction

Mitigation: Action/control	Responsibility	Timeframe
only, as approved by the ECO.		
Spillages of cement to be cleaned up immediately and disposed or re-used in the construction process.	Contractor	Construction
Spill kits to be kept on active parts of the construction site & at site offices.	Contractor	Construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Acceptable level of activity within disturbance areas, as determined by ECO</li> <li>» Acceptable level of soil erosion around site, as determined by ECO</li> <li>» Acceptable level of increased siltation in drainage lines, as determined by ECO</li> <li>» Acceptable level of soil degradation, as determined by ECO</li> <li>» Acceptable state of excavations, as determined by ER &amp; ECO</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» Continual inspections of the site by ECO</li> <li>» Fortnightly inspections of sediment control devices by ECO</li> <li>» On-going inspections of surroundings, including drainage lines and wetlands by ECO</li> <li>» Reporting of ineffective sediment control systems and rectification as soon as possible.</li> <li>» An incident reporting system must record non-conformances to the EMP.</li> <li>» Public complaints register must be developed and maintained on site.</li> </ul>

**OBJECTIVE: Limit disturbance and avoid damage to wetland areas and drainage lines**

The preferred preliminary layout for the wind energy facility avoids the placement of turbines and other infrastructure (such as the substation and workshop area) within wetland areas. However, there are still some instances where roads and cables cross the identified wetland areas. Mitigation measures are required to minimise impacts on those systems affected in this regard.

In addition, a number of wetlands have been identified along the preferred power line routes (i.e. central and eastern routes). The design of the power line route is required to be done in order to minimise potential impacts on these systems.

<b>Project component/s</b>	List of project components affecting the objective: » access roads » cabling » power line
<b>Potential Impact</b>	» Damage to wetland areas by any means that will result in hydrological changes (includes erosion, siltation, dust, direct removal of soil of vegetation, dumping of material within wetlands). The focus should be on the functioning of the wetland as a natural system.
<b>Activity/risk source</b>	» Construction of access roads, cabling & power line
<b>Mitigation: Target/Objective</b>	» No damage to wetlands and drainage lines within project area

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Align underground cables and internal access roads as far as possible along existing infrastructure & disturbances.	RES Southern Africa, Construction team, ECO	Construction
Rehabilitate any disturbed areas as soon as possible once construction is completed in an area.	RES Southern Africa, Construction team, ECO	Construction
Obtain required water use license for impacting on wetlands	RES Southern Africa	Pre-construction
For any new construction where direct impacts on wetlands are unavoidable cross watercourses perpendicularly to minimise disturbance footprints.	RES Southern Africa, Construction team, ECO	Construction
Construction must not result in the width of the watercourse being narrowed.	RES Southern Africa, Construction team, ECO	Construction
Control stormwater and runoff water.	RES Southern Africa, Construction team, ECO	Construction
Where identified by the ECO, utilise erosion control measures on access roads, wetland areas and drainage lines.	RES Southern Africa, Construction team, ECO	Construction
Concrete batching plants and stockpiles to be located more than 50m away from wetlands.	Contractor	Construction

<b>Performance</b>	» No impacts on water quality, water quantity, wetland vegetation,
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<b>Indicator</b>	natural status of wetland
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» Habitat loss in watercourses should be monitored before and after construction.</li> <li>» The ECO should be responsible for driving this process and reporting.</li> <li>» An incident reporting system must be used to record non-conformances to the EMP.</li> <li>» Public complaints register must be developed and maintained on site.</li> </ul>

**OBJECTIVE: Protection of indigenous vegetation and control of alien invasive plants**

Impacts on vegetation at the construction stage are expected to be mainly as a result of direct permanent loss of vegetation in development footprint areas. Due to disturbance of vegetation, there is a higher risk of alien species dominating disturbed areas. Therefore, control of alien invasive plants is required.

<b>Project component/s</b>	<p>List of project components affecting the objective:</p> <ul style="list-style-type: none"> <li>» wind energy turbines and associated laydown areas</li> <li>» access roads and cabling</li> <li>» substation</li> <li>» workshop area</li> <li>» batching plants</li> <li>» temporary laydown areas</li> <li>» power line and associated access road</li> </ul>
<b>Potential Impact</b>	» Proliferation of alien plants
<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» Site preparation and earthworks</li> <li>» Construction-related traffic</li> <li>» Foundations</li> <li>» Mobile construction equipment</li> <li>» Power line construction activities</li> <li>» Dumping or damage by construction equipment outside of demarcated construction areas</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To retain natural vegetation in the highly sensitive areas of the site</li> <li>» To minimise footprints of disturbance of vegetation/habitats on-site</li> <li>» No alien plants within project control area</li> <li>» No loss of species of conservation concern</li> </ul>

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Unnecessary impacts on surrounding natural vegetation must be avoided, e.g. driving around in the veld. The construction impacts must be contained to the footprint of the infrastructure.	Construction team, management (ECO)	Construction
Internal access roads and underground cables should	Construction team,	Construction /

Mitigation: Action/control	Responsibility	Timeframe
be aligned as far as possible along existing linear disturbances, e.g. roads on site and away from steep slopes and drainage lines as much as possible. Where new roads are to be constructed, these should follow existing tracks or disturbed areas or the edges of disturbed areas.	management (ECO)	design
Identify and demarcate areas within which activities are to be undertaken. Ensure that activities are restricted to these areas to ensure unnecessary impacts on surrounding natural vegetation are avoided.	Construction team, management (ECO)	Construction
A site rehabilitation programme should be compiled and implemented.	Contractor in consultation with Specialist	Duration of contract
Avoid creating conditions in which alien plants may become established: <ul style="list-style-type: none"> <li>» Keep disturbance of indigenous vegetation to a minimum</li> <li>» Rehabilitate disturbed areas as quickly as possible once construction is complete in an area</li> <li>» Do not import soil from areas with alien plants</li> </ul>	Construction team, management (environmental officer)	Construction & Operation
Establish an on-going monitoring programme to detect and quantify any alien species that may become established and identify the problem species (as per Conservation of Agricultural Resources Act, Act 43 of 1983 and NEM: Biodiversity)	Construction team, management (environmental officer)	Construction & Operation
Immediately control any alien plants that become established using registered control methods.	Construction team, management (environmental officer)	Construction & Operation

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Zero disturbance outside of designated work areas.</li> <li>» Minimised clearing of existing/natural vegetation.</li> <li>» No loss of natural vegetation within "no-go" areas. Loss of other natural vegetation only within designated footprint of infrastructure.</li> <li>» No significant fragmentation of untransformed areas of natural vegetation.</li> <li>» No alien infestation within project control area.</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» Observation of vegetation clearing activities by ECO throughout construction phase.</li> <li>» Supervision of all clearing and earthworks.</li> <li>» Monitoring of alien plant establishment within the project control area on an on-going basis.</li> <li>» An incident reporting system must be used to record non-conformances to the EMP.</li> <li>» Public complaints register must be developed and maintained on site.</li> </ul>





**OBJECTIVE: Protection of fauna & avifauna**

Infrastructure associated with the facility often impacts on birds and animals. Furthermore, the construction and maintenance of the power line linking the facility to the electricity grid will result in some disturbance and habitat destruction. New roads constructed will also have a disturbance and habitat destruction impact.

<b>Project component/s</b>	List of project components affecting the objective: <ul style="list-style-type: none"> <li>» wind energy turbines and associated laydown areas</li> <li>» access roads and cabling</li> <li>» substation</li> <li>» workshop area</li> <li>» batching plants</li> <li>» temporary laydown areas</li> <li>» power line and associated access road</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Vegetation clearance and associated impacts on faunal habitats</li> <li>» Disturbance of birds</li> </ul>
<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» Site preparation and earthworks</li> <li>» Construction-related traffic</li> <li>» Foundations or plant equipment installation</li> <li>» Mobile construction equipment</li> <li>» Power line construction activities</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To minimise footprints of habitat destruction</li> <li>» To minimise disturbance to resident and visitor faunal and avifaunal species</li> </ul>

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
The power line should be marked with Double Loop Bird Flight Diverters on the earth wire of the line, five metres apart, alternating black and white to mitigate against impacts on birds in identified high sensitivity areas.	RES Southern Africa	During construction
Clearly mark areas to be cleared in order to eliminate unnecessary clearing/disturbance.	Contractor in consultation with Specialist	Pre-construction
The extent of clearing and disturbance to the native vegetation must be kept to a minimum so that impact on fauna and their habitats is restricted.	Contractor	Site establishment & duration of contract
A site rehabilitation programme should be compiled and implemented.	Contractor in consultation with Specialist	Duration of contract

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Minimum disturbance outside of designated work areas</li> <li>» Minimised clearing of existing/natural vegetation and habitats for fauna and avifauna</li> <li>» Limited impacts on faunal species (i.e. noted/recorded fatalities), especially those of conservation concern.</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» Observation of vegetation clearing activities by ECO throughout construction phase</li> <li>» Supervision of all clearing and earthworks by ECO</li> <li>» An incident reporting system must be used to record non-conformances to the EMP.</li> <li>» Public complaints register must be developed and maintained on site.</li> </ul>

**OBJECTIVE: Protection of fossils and sites of heritage and archaeological value**

The construction phase of the wind energy facility will entail excavations into the superficial sediment cover (soils etc.) and perhaps also into the underlying bedrock. Areas of potentially fossiliferous bedrock may be sealed-in or sterilized by infrastructure such as hard standing areas for each wind turbine, lay down areas and internal access roads. These activities may adversely affect potential fossil heritage within the study area by damaging, destroying, disturbing or permanently sealing-in fossils that are then no longer available for scientific research or other public good.

The proposed Oyster Bay Wind Energy Facility is located in an area of the southern Cape coastal plain that is underlain by a number of geological formations of Palaeozoic to Late Caenozoic age, three of which are known to contain important fossil heritage resources, viz. the Cedarberg, Baviaanskloof and Gydo Formations. Only small sectors in the south-western and north-eastern portions of the study area for the power line are considered to be potentially palaeontologically sensitive (areas outlined with dashed orange rectangles in Figure 7.22) because the Cedarberg Formation may crop out here. However, the outcrop area of the Cedarberg Formation is likely to be narrow, covered with a mantle of superficial deposits, deeply-weathered and possibly highly cleaved, so its effective palaeontological sensitivity is now low.

Both location options for the on-site electricity substation are situated within the outcrop area of the Peninsula Formation (low palaeontological sensitivity). Likewise, neither of the two alternative entrances to the wind energy facility site, one on the south side and the other on the north-western side, will have a material effect on the local fossil heritage resource.

The main cause of impacts to archaeological sites is physical disturbance of the material itself and its context. The heritage and scientific potential of an archaeological site is

highly dependent on its geological and spatial context. This means that even though, for example a deep excavation may expose archaeological artefacts, the artefacts are relatively meaningless once removed from the area in which they were found. Large-scale excavations for foundations will damage archaeological sites, as will road construction activities.

<b>Project component/s</b>	List of project components affecting the objective: <ul style="list-style-type: none"> <li>» wind energy turbines</li> <li>» access roads and cabling</li> <li>» Operations and service building area</li> <li>» substation</li> <li>» power line and associated access roads</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Heritage objects or artefacts found on site are inappropriately managed or destroyed</li> <li>» Loss of fossil resources</li> </ul>
<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» Site preparation and earthworks</li> <li>» Foundations or plant equipment installation</li> <li>» Mobile construction equipment movement on site</li> <li>» Power line construction activities</li> <li>» Access road construction activities</li> <li>» Substation construction facilities</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To ensure that any heritage objects found on site are treated appropriately and in accordance with the relevant legislation</li> </ul>

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Construction managers/foremen should be informed before construction starts on the possible types of heritage sites and cultural material they may encounter and the procedures to follow when they find sites.	RES Southern Africa	Pre-construction
If a heritage object is found, work in that area must be stopped immediately, and appropriate specialists brought in to assess to site, notify the administering authority of the item/site, and undertake due/required processes.	RES Southern Africa / Contractor in consultation with Specialist	Duration of contract
If at any stage during the construction phase any semblance of a fossil were to be observed, it would be vital to recover the fossil and report the occurrence to the geological staff at the closest repository in the Eastern Cape (e.g. the Albany Museum).	RES Southern Africa	Duration of contract
If concentrations of archaeological materials are exposed during construction then all work must stop for an archaeologist to investigate.	RES Southern Africa	Construction
If any human remains (or any other concentrations of archaeological heritage material) are exposed during construction, all work must cease and it must be	RES Southern Africa	Construction

Mitigation: Action/control	Responsibility	Timeframe
reported immediately to the nearest museum/archaeologist or to the South African Heritage Resources Agency, so that a systematic and professional investigation can be undertaken. Sufficient time should be allowed to investigate and to remove/collect such material.		
Monitoring of all substantial bedrock excavations for fossil remains by ECO, with reporting of new finds to SAHRA and / or a professional palaeontologist for possible specialist mitigation (i.e. recording, judicious sampling of fossil material).	ECO / ECO/ RES Southern Africa	Construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Minimum disturbance outside of designated work areas</li> <li>» All heritage items located are dealt with as per the legislative guidelines</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» Observation of excavation activities by ECO throughout construction phase.</li> <li>» Supervision of all clearing and earthworks.</li> <li>» An incident reporting system will be used to record non-conformances to the EMP.</li> <li>» Public complaints register must be developed and maintained on site.</li> </ul>

### OBJECTIVE: Minimisation of visual impacts associated with construction

During construction heavy vehicles, components, cranes, equipment and construction crews will frequent the area and may cause, at the very least, a visual nuisance to landowners and residents in the area as well as road users.

<b>Project component/s</b>	List of project components affecting the objective: <ul style="list-style-type: none"> <li>» Construction site</li> <li>» access roads</li> <li>» turbines</li> <li>» etc</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» The potential scarring of the landscape due to the creation of new access roads/tracks or the unnecessary removal of vegetation.</li> <li>» Construction traffic.</li> </ul>
<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» The viewing of visual scarring by observers in the vicinity of the facility or from the roads traversing the site.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Minimal disturbance to vegetation cover in close vicinity to the proposed facility and its related infrastructure.</li> <li>» Minimised construction traffic, where possible.</li> </ul>

Mitigation: Action/control	Responsibility	Timeframe
The general appearance of construction activities, construction equipment camps and lay-down areas must be maintained and kept neat and tidy by means of the timely removal of rubble and disused construction materials.	Contractor	Construction
The turbines must be painted a pale, matt, non-reflective colour (i.e. off white, as specified by CAA) before erection of the turbines.	Contractor	Erection of turbines
Limit access to the construction sites (during both construction and operational phases) along existing access roads as far as possible.	Contractor	Duration of contract
Ensure all disturbed areas are appropriately rehabilitated once construction in an area is complete.	Contractor	Duration of construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Construction site maintained in a neat and tidy condition.</li> <li>» Vegetation cover that remains intact with no erosion scarring in close proximity of the facility.</li> <li>» Site appropriately rehabilitated after construction is complete.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Monitoring of vegetation clearing during the construction phase.</li> <li>» Monitoring of rehabilitation activities to ensure appropriate rehabilitation of the site.</li> <li>» An incident reporting system will be used to record non-conformances to the EMP.</li> <li>» Public complaints register must be developed and maintained on site.</li> </ul>

### OBJECTIVE: Appropriate handling and storage of chemicals, hazardous substances and waste

The construction phase of the wind energy facility will involve the storage and handling of a variety of chemicals including adhesives, abrasives, oils and lubricants, paints and solvents. The main wastes expected to be generated by the construction of the facility will include general solid waste, hazardous waste and liquid waste.

<b>Project component/s</b>	<p>List of project components affecting the objective:</p> <ul style="list-style-type: none"> <li>» wind energy turbines</li> <li>» substation</li> <li>» power line</li> <li>» concrete batching plant</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Release of contaminated water from contact with spilled chemicals</li> <li>» Generation of contaminated wastes from used chemical containers</li> <li>» Inefficient use of resources resulting in excessive waste generation</li> </ul>

	<ul style="list-style-type: none"> <li>» Litter or contamination of the site or water through poor waste management practices</li> </ul>
<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» Vehicles associated with site preparation and earthworks</li> <li>» Power line construction activities</li> <li>» Substation construction activities</li> <li>» Packaging and other construction wastes</li> <li>» Hydrocarbon use and storage</li> <li>» Spoil material from excavation, earthworks and site preparation</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To ensure that the storage and handling of chemicals and hydrocarbons on-site does not cause pollution to the environment or harm to persons</li> <li>» To ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons</li> <li>» To comply with waste management legislation</li> <li>» To minimise production of waste</li> <li>» To ensure appropriate waste storage and disposal</li> <li>» To avoid environmental harm from waste disposal</li> </ul>

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
The storage of flammable and combustible liquids such as oils must be in designated areas which are appropriately bunded, and stored in compliance with Material Safety Data Sheets (MSDS) files, as defined by the ECO.	Contractor	Duration of contract
Any spills will receive the necessary clean-up action. Bioremediation kits are to be kept on-site and used to remediate any spills that may occur. Appropriate arrangements to be made for appropriate collection and disposal of all cleaning materials, absorbents and contaminated soils (in accordance with a waste management plan).	Contractor	Duration of contract
Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals will be complied with.	Contractor	Duration of contract
Routine servicing and maintenance of vehicles is not to take place on-site (except for emergency situations or large cranes which cannot be moved off-site). If repairs of vehicles must take place on site, an appropriate drip tray must be used to contain any fuel or oils.	Contractor	Duration of contract
Transport of all hazardous substances must be in accordance with the relevant legislation and regulations.	Contractor	Duration of contract
Waste disposal records must be available for review at any time.	Contractor	Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
Construction contractors must provide specific detailed waste management plans to deal with all waste streams.	Contractor	Duration of contract
Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap) and contaminated waste. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage and vermin control.	Contractor	Duration of contract
Where possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation and storage of waste streams (such as wood, metals, general refuse etc.).	Contractor	Duration of contract
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors and licensed waste disposal sites.	Contractor	Duration of contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area.	Contractor	Duration of contract
Waste and surplus dangerous goods must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal.	Contractor	Duration of contract
Documentation (waste manifest) must be maintained detailing the quantity, nature and fate of any hazardous waste.	Contractor	Duration of contract
An incident/complaints register must be established and maintained on-site.	Contractor	Duration of contract
Hazardous and non-hazardous waste must be separated at source. Separate waste collection bins must be provided for this purpose. These bins must be clearly marked and appropriately covered.	Contractors	Erection: during site establishment Maintenance: for duration of Contract within a particular area
All solid waste collected must be disposed of at a registered waste disposal site. A certificate of disposal must be obtained and kept on file. The disposal of waste must be in accordance with all relevant legislation. Under no circumstances may solid waste be burnt or buried on site.	Contractors	Erection: during site establishment Maintenance: for duration of Contract within a particular area
Supply waste collection bins at construction equipment	Contractors	Erection:



Mitigation: Action/control	Responsibility	Timeframe
and construction crew camps.		during site establishment Maintenance: for duration of Contract within a particular area
Construction equipment must be refuelled within designated refuelling locations, or where remote refuelling is required, appropriate drip trays must be utilised.	Contractor	Duration of contract
All stored fuels to be maintained within a bund and on a sealed surface.	Contractor	Duration of contract
Fuel storage areas must be inspected regularly to ensure bund stability, integrity and function.	Contractor	Duration of contract
Construction machinery must be stored in an appropriately sealed area.	Contractor	Duration of contract
Oily water from bunds at the substation must be removed from site by licensed contractors.	Contractor	Duration of contract
Spilled cement and concrete must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site.	Contractor	Duration of contract
Corrective action must be undertaken immediately if a complaint is made, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures.	Contractor	Duration of contract
In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents. Spill kits to be kept on-site	Contractor	Duration of contract
Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility.	Contractor	Duration of contract
Upon the completion of construction, the area will be cleared of potentially polluting materials.	Contractor	Completion of construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No chemical spills outside of designated storage areas</li> <li>» No water or soil contamination by chemical spills</li> <li>» No complaints received regarding waste on site or indiscriminate dumping</li> <li>» Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately</li> </ul>
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	» Provision of all appropriate waste manifests for all waste streams
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase.</li> <li>» A complaints register must be maintained, in which any complaints from the community will be logged. Complaints must be investigated and, if appropriate, acted upon.</li> <li>» Observation and supervision of waste management practices throughout construction phase.</li> <li>» Waste collection to be monitored on a regular basis.</li> <li>» Waste documentation completed.</li> <li>» An incident reporting system must be used to record non-conformances to the EMP.</li> <li>» RES Southern Africa and appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase</li> </ul>

**OBJECTIVE: Ensure disciplined conduct of on-site contractors and workers**

In order to minimise impacts on the surrounding environment, Contractors must be required to adopt a certain Code of Conduct and commit to restricting construction activities to areas within the development footprint. Contractors and their sub-contractors must be familiar with the conditions of the Environmental Authorisation (once issued), the EIA Report and this EMP, as well as the requirements of all relevant environmental legislation.

<b>Project component/s</b>	List of project components affecting the objective: <ul style="list-style-type: none"> <li>» Wind energy facility and associated infrastructure</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Pollution/contamination of the environment</li> <li>» Disturbance to the environment and surrounding communities</li> </ul>
<b>Activity/risk source</b>	» Contractors are not aware of the requirements of the EMP, leading to unnecessary impacts on the surrounding environment
<b>Mitigation: Target/Objective</b>	» To ensure appropriate management of actions by on-site personnel in order to minimise impacts to the surrounding environment

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
This EMP and the Environmental Authorisation must be included in all tender documentation and Contractors contracts.	RES Southern Africa	Tender process
Establishment of a Monitoring Forum (MF) for the construction phase. The Forum should be established before the construction phase commences and include representatives from the local farmers union, local rate payers association, local municipality and	RES Southern Africa, Contractor, ECO	Construction

Mitigation: Action/control	Responsibility	Timeframe
the contractor. The role of the Forum would be to monitor the construction phase and the implementation of the recommended mitigation measures. The MF should also be briefed on the potential risks to the local community associated with construction workers. The Eco to chair the monitoring forum.		
Contractors must use chemical toilets/ablution facilities situated at designated areas of the site; no abluting must be permitted outside the designated area. These facilities must be regularly serviced by appropriate contractors. Ablution facilities must not be placed within 50m from any river, wetland or drainage line.	Contractor (and sub-contractor/s)	Duration of contract
Cooking must take place in a designated area. No firewood or kindling may be gathered from the site or surrounds.	Contractor (and sub-contractor/s)	Duration of contract
All litter must be deposited in a clearly marked, closed, animal-proof disposal bin in the construction area; particular attention needs to be paid to food waste.	Contractor (and sub-contractor/s)	Duration of contract
No one other than the ECO or personnel authorised by the ECO, will disturb flora or fauna outside of the demarcated construction area/s.	Contractor (and sub-contractor/s)	Duration of contract

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Compliance with specified conditions of Environmental Authorisation, EIA report and EMP</li> <li>» No complaints regarding contractor behaviour or habits</li> <li>» Code of Conduct drafted before commencement of construction phase &amp; briefing session with construction workers held at outset of construction phase</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» Observation and supervision of Contractor practices throughout construction phase.</li> <li>» A complaints register must be maintained, in which any complaints from the community are to be logged. Complaints must be investigated and, if appropriate, acted upon</li> <li>» An incident reporting system must be used to record non-conformances to the EMP</li> </ul>

**OBJECTIVE: To avoid and or minimise the potential risk of increased veld fires during the construction phase.**

<b>Project component/s</b>	List of project components affecting the objective: » Wind energy facility and associated infrastructure
<b>Potential Impact</b>	» Fires can pose a personal safety risk to local farmers and communities, and their homes, crops, livestock and farm infrastructure, such as gates and fences.
<b>Activity/risk source</b>	» Contractors are not aware of the requirements of the EMP, leading to unnecessary impacts on the surrounding environment
<b>Mitigation: Target/Objective</b>	» To ensure appropriate management of actions by on-site personnel in order to minimise impacts to the surrounding environment

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Ensure that open fires on the site for cooking or heating are not allowed except in designated areas.	Contractor	Construction
Provide adequate fire fighting equipment onsite.	Contractor	Construction
Provide fire-fighting training to selected construction staff.	Contractor	Construction
Compensate farmers / community members at full market related replacement cost for any losses due to the wind energy facility project, such as livestock, damage to infrastructure etc.	Contractor	Construction

<b>Performance Indicator</b>	» Designated areas for fires identified on site at the outset of the construction phase. » Fire fighting equipment and training provided before the construction phase commences. » Compensation claims settled after claim verified by Community MF.
<b>Monitoring</b>	» A complaints register must be maintained, in which any complaints from the community are to be logged. Complaints must be investigated and, if appropriate, acted upon » An incident reporting system must be used to record non-conformances to the EMP

### 5.3. Detailing Method Statements

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

The environmental specifications are required to be underpinned by a series of Method Statements, within which the Contractors and Service Providers are required to outline how any identified environmental risks will practically be mitigated and managed for the duration of the contract, and how specifications within this EMP will be met. That is, the

Contractor will be required to describe how specified requirements will be achieved through the submission of written Method Statements to the Site Manager and ECO.

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

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

The Contractor may not commence the activity covered by the Method Statement until it has been approved, except in the case of emergency activities and then only with the consent of the Site Manager. Approval of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract.

#### 5.4. Awareness and Competence: Construction Phase of the Wind Energy Facility

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

To achieve effective environmental management, it is important that Contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMP. The Contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts. The Contractors obligations in this regard include the following:

- » Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment.
- » Ensuring that a copy of the EMP is readily available on-site, and that all site staff are aware of the location and have access to the document.
- » Employees will be familiar with the requirements of the EMP and the environmental specifications as they apply to the construction of the facility.
- » Employees must undergo training for the operation and maintenance activities associated with a wind energy facility and have a basic knowledge of the potential environmental impacts that could occur and how they can be minimised and mitigated.
- » Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an Environmental Awareness Training course which can be done by the contractors environmental representative or the ECO.
- » The course should be sufficient to provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
- » Awareness of any other environmental matters, which are deemed to be necessary by the ECO.
- » Ensuring that employee information posters, outlining the environmental "do's" and "don'ts" (as per the environmental awareness training course) are erected at prominent locations throughout the site.
- » Ensure that construction workers have received basic training in environmental management, including the storage and handling of hazardous substances, minimisation of disturbance to sensitive areas, management of waste, and prevention of water pollution.
- » Records must be kept of those that have completed the relevant training.
- » Training should be done either in a written or verbal format but must be in an appropriate format for the receiving audience.

- » Refresher sessions must be held to ensure the contractor staff are aware of their environmental obligations as practically possible.

## 5.5. Monitoring Programme: Construction Phase of the Wind Energy Facility

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

An environmental monitoring programme should be developed and implemented not only to ensure conformance with the EMP, but also to monitor any environmental issues and impacts which have not been accounted for in the EMP that are, or could result in significant environmental impacts for which corrective action is required. The period and frequency of environmental monitoring will most likely be stipulated by the Environmental Authorisation. Bird monitoring should take place in line with guidelines or endorsed standards in South Africa, at the time of implementing the wind energy facility (See **Appendix A** for methodology as taken from the EIA). Where this is not clearly dictated, RES Southern Africa will determine and stipulate the period and frequency of monitoring required in consultation with relevant stakeholders and authorities. The Project Manager will ensure that the monitoring is conducted and reported.

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

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

The Environmental Control Officer (ECO) will ensure compliance with the EMP during construction, and will conduct monitoring activities on a regular basis. An independent ECO must be appointed, and have the appropriate experience and qualifications to undertake the necessary tasks. The ECO will report any non-compliance or where corrective action is necessary to the Site Manager, DEA and/or any other monitoring body stipulated by the regulating authorities.

**MANAGEMENT PLAN FOR THE WIND ENERGY FACILITY: CHAPTER 6**  
**REHABILITATION OF DISTURBED AREAS**

**6.1. Overall Goal for the Rehabilitation of Disturbed Areas**

**Overall Goal for the Rehabilitation of Disturbed Areas:** Undertake the rehabilitation measures in a way that:

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

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

**OBJECTIVE: To ensure rehabilitation of disturbed areas**

Areas requiring rehabilitation will include all areas disturbed during the construction phase and that are not required for regular maintenance operations.

<b>Project component/s</b>	List of project components affecting the objective: <ul style="list-style-type: none"> <li>» wind energy facility (including temporary access roads and laydown areas)</li> <li>» power line servitude and service road for power line servitude</li> <li>» substation</li> <li>» temporary laydown areas</li> </ul>
<b>Potential Impact</b>	» Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention
<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» Temporary laydown areas</li> <li>» Temporary access roads/tracks</li> <li>» Other disturbed areas/footprints</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To ensure and encourage site rehabilitation of disturbed areas</li> <li>» To ensure that the site is appropriately rehabilitated following the execution of the works, such that residual environmental impacts (including erosion) are remediated or curtailed</li> </ul>

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
A site rehabilitation programme should be compiled and implemented.	Contractor in consultation with Specialist	Duration of contract
All temporary facilities, equipment and waste	Contractor	Following



Mitigation: Action/control	Responsibility	Timeframe
materials must be removed from site and appropriately disposed of.		execution of the works
All temporary fencing and danger tape should be removed once the construction phase has been completed.	Contractor	Following completion of construction activities in an area
Necessary drainage works and anti-erosion measures must be installed, where required, to minimise loss of topsoil and control erosion.	Contractor	Following completion of construction activities in an area
Disturbed areas must be rehabilitated/re-vegetated with appropriate natural vegetation and/or local seed mix. Re-use native/indigenous plant species removed from disturbance areas in the rehabilitation phase.	Contractor in consultation with rehabilitation specialist	Following completion of construction activities in an area
Re-vegetated areas may have to be protected from wind erosion and maintained until an acceptable plant cover has been achieved.	RES Southern Africa in consultation with rehabilitation specialist	Post-rehabilitation
On-going alien plant monitoring and removal should be undertaken on all areas of natural vegetation on an annual basis.	RES Southern Africa in consultation with rehabilitation specialist	Post-rehabilitation

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» All portions of site, including construction camp and working areas, cleared of equipment and temporary facilities</li> <li>» Topsoil replaced on all areas and stabilised</li> <li>» Disturbed areas rehabilitated and at least 50% plant cover achieved on rehabilitated sites</li> <li>» Closed site free of erosion and alien invasive plants</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» On-going inspection of rehabilitated areas in order to determine effectiveness of rehabilitation measures implemented.</li> <li>» On-going alien plant monitoring and removal should be undertaken on an annual basis.</li> <li>» An incident reporting system must be used to record non-conformances to the EMP.</li> </ul>

## MANAGEMENT PLAN FOR THE WIND ENERGY FACILITY: CHAPTER 7 OPERATION

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An environmental manager should be appointed during operation whose duty it will be to minimise impacts on surrounding sensitive habitats, including wetlands. In addition, it is important to monitor the incidence of bird collisions with the wind turbines. Should any significant impacts of the facility on priority bird populations be detected by the monitoring programme, mitigation could be required to be investigated for those selected problem turbines. "Significant impacts" and 'priority' bird species could be defined in consultation between RES Southern Africa and BAWESG/BLSA/EWT.

### 7.1. Overall Goal for Operation

**Overall Goal for Operation:** To ensure that the operation of the wind energy facility does not have unforeseen impacts on the environment and to ensure that all impacts are monitored and the necessary corrective action taken in all cases. In order to address this goal, it is necessary to operate the wind energy facility in a way that ensures that operation activities are properly managed in respect of environmental aspects and impacts and enables the wind energy facility operation activities to be undertaken without significant disruption to other land uses in the area, in particular with regard to noise impacts, farming practices, traffic and road use, and effects on local residents as well as minimising impacts on birds and other fauna using the site.

### 7.2. Objectives

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

#### OBJECTIVE: Securing the site

Safety issues may arise with public access to wind turbines (e.g. unauthorised entry to the site) or to the wind farm substation. Prevention and control measures to manage public access are therefore important.

Project component/s
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Project components affecting the objective:

- » wind energy turbines
- » access roads
- » substation
- » power line

	» Operations and service building
<b>Potential Impact</b>	» Hazards to landowners and public
<b>Activities/risk sources</b>	» Uncontrolled access to the wind energy facility and associated infrastructure.
<b>Mitigation:</b>	» To secure the site against unauthorised entry
<b>Target/Objective</b>	» To protect members of the public/landowners/residents

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Where necessary to control access, fence and secure access to the site and entrances to the site.	RES Southern Africa	Operation
Post information boards about public safety hazards and emergency contact information	RES Southern Africa	Operation

<b>Performance Indicator</b>	» Site is secure and there is no unauthorised entry » No members of the public/ landowners injured
<b>Monitoring and Reporting</b>	» Regular visual inspection of fence for signs of deterioration/forced access » An incident reporting system must be used to record non-conformances to the EMP. » Public complaints register must be developed and maintained on site.

**OBJECTIVE: Protection of indigenous natural vegetation, fauna and maintenance of rehabilitation**

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

<b>Project component/s</b>	» Areas requiring regular maintenance. » Route of the security team. » Areas disturbed during the construction phase and subsequently rehabilitated at its completion
<b>Potential Impact</b>	» Disturbance to or loss of vegetation and/or habitat. » Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention.
<b>Activity/Risk Source</b>	» Movement of employee vehicles within and around site.

<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Maintain minimised footprints of disturbance of vegetation/habitats on-site.</li> <li>» Ensure and encourage plant regrowth in non-operational areas of post-construction rehabilitation.</li> </ul>
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Mitigation: Action/Control	Responsibility	Timeframe
Vehicle movements must be restricted to designated roadways.	RES Southern Africa	Operation
Existing roads must be maintained to ensure limited erosion and impact on areas adjacent to roadways.	RES Southern Africa	Operation
An on-going alien plant monitoring and eradication programme must be implemented, where necessary.	Ilanga CSP 1	Operation
A botanist familiar with the vegetation of the area should monitor the rehabilitation success and alien plant removal on an annual basis.	RES Southern Africa/Specialist	Annual monitoring until successful re-establishment of vegetation in an area

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No further disturbance to vegetation or terrestrial faunal habitats.</li> <li>» Continued improvement of rehabilitation efforts.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Observation of vegetation on-site by environmental manager.</li> <li>» Regular inspections to monitor plant regrowth/performance of rehabilitation efforts and weed infestation compared to natural/undisturbed areas.</li> </ul>

### OBJECTIVE: Protection of avifauna, priority bird species and bat species

During operation of the facility, the threat of collision of birds and bats with the turbine blades is a concerning issue. However, the real extent of this threat is not currently well understood within the South African context due to the limited numbers of wind turbines in South Africa with which bird and bat interactions have been monitored. Lighting of turbines and other infrastructure has the potential to attract birds, thereby increasing the risk of collisions with turbines. Bird monitoring has been commissioned by RES Southern Africa in 2011 which will serve a pre-construction bird monitoring. Bird monitoring will continue during the operation of the facility.

A pre-construction survey for bats should be undertaken to determine whether bat species of concern occur on site or not and whether roosting habitats or known important maternity roosts occur within close proximity to the site. If this

preconstruction survey finds that the presence of bats or roosting habitats of concern occur, then a monitoring programme must be implemented to document the effect on bats of the turbines. The detail of this monitoring programme must be informed by the outcomes of the preconstruction survey.

<b>Project component/s</b>	List of project components affecting the objective: » wind energy facility (turbines) » power line » substation
<b>Potential Impact</b>	» Disturbance to or loss of birds and bats as a result of collision with the turbine blades » Disturbance to or loss of birds and bats as a result of collision with turbines » Electrocutation and collision with the power line
<b>Activity/risk source</b>	» Spinning turbine blades » Power line » Substation
<b>Mitigation: Target/Objective</b>	» More accurately determine the impact of the operating wind energy facility on priority bird species » Minimise impacts associated with the power line and substation

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Pre-construction survey for bats should be undertaken to determine whether bat species of concern occur on site or not and whether roosting habitats or known important maternity roosts occur within close proximity to the site.	Advising scientist, monitoring agency in negotiation with RES Southern Africa	Pre-construction
A site monitoring programme must be implemented for surveying bird movements in relation to the wind energy facility and fully documenting all collision and electrocution casualties with the turbines and associated power line.	RES Southern Africa / environmental manager	Operation
Start post-construction bird monitoring as soon as possible for turbines and the power line (for birds).	Monitoring agency	Once facility is operational
Periodically collate and analyse post-construction monitoring data for bird monitoring.	Advising scientist	Every 3 months of monitoring
Review bird monitoring report on the full year of post-construction monitoring, and integrate findings into operational EMP and broader mitigation scheme.	Advising scientist, monitoring agency in negotiation with RES Southern Africa	1 year post-construction

<b>Performance Indicator</b>	» No additional disturbance to bird or bat populations on the wind energy facility site.
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	<ul style="list-style-type: none"> <li>» Continued improvement of bird and bat protection devices, if any.</li> <li>» Regular provision of clearly worded, logical and objective information on the interface between the local avifauna and the proposed/operating wind energy facility.</li> <li>» Clear and logical recommendations on why, how and when to institute mitigation measures to reduce avian impacts of the development, from pre-construction to operational phase.</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» Observation of avifaunal populations and incidence of injuries/death from collisions from turbine blades</li> <li>» Environmental manager to monitor turbine field for fatalities.</li> <li>» Review of bird monitoring report on the full year of post-construction monitoring</li> </ul>

**OBJECTIVE: Minimisation of visual impact - lighting**

The primary visual impact, namely the appearance and dimensions of the wind energy facility (mainly the wind turbines) is not possible to mitigate to any significant extent within this landscape. The functional design of the structures and the dimensions of the facility cannot be changed in order to reduce visual impacts. Alternative colour schemes (i.e. painting the turbines sky-blue, grey or darker shades of white) are not permissible as the CAA's Marking of Obstacles expressly states, "Wind turbines shall be painted white to provide the maximum daytime conspicuousness". Failure to adhere to the prescribed colour specifications will result in the fitting of supplementary daytime lighting to the wind turbines, once again aggravating the visual impact. The potential for mitigation is therefore low or non-existent.

Another source of glare light, albeit not as intense as flood lighting, is the aircraft warning lights mounted on top of the hub of the wind turbines. These lights are less aggravating due to the toned-down red colour, but have the potential to be visible from a great distance. The Civil Aviation Authority (CAA) prescribes these warning lights and the potential to mitigate their visual impacts is low. Indications are that the facility may not be required to fit a light to each turbine, but rather place synchronous flashing lights on the turbines representing the outer perimeter of the facility. In this manner less warning lights can be utilised to delineate the facility as one large obstruction, thereby lessening the potential visual impact. The regulations for the CAA's *Marking of Obstacles* should be strictly adhered too, as the failure of complying with these guidelines may result in the developer being required to fit additional light fixtures at closer intervals thereby aggravating the visual impact.

The mitigation of secondary visual impacts, such as security and functional lighting, construction activities, etc. may be possible and should be implemented and maintained on an on-going basis.

<b>Project component/s</b>	List of project components affecting the objective: <ul style="list-style-type: none"> <li>» Wind energy facility (including access roads)</li> <li>» Power line</li> <li>» Substation</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Risk to aircraft in terms of the potential for collision</li> <li>» Enhanced visual intrusion</li> </ul>
<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» Substation and associated lighting</li> <li>» Wind turbines and other infrastructure</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To minimise potential for visual impact</li> <li>» To ensure that the facility complies with Civil Aviation Authority requirements for turbine visibility to aircraft</li> <li>» Minimise contrast with surrounding environment and visibility of the turbines to humans</li> <li>» The containment of light emitted from the substation in order to eliminate the risk of additional night-time visual impacts</li> </ul>

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Aviation warning lights must be mounted on turbine hub or such measures required by the Civil Aviation Authority. Indications are that the facility may not be required to fit a light to each turbine, but rather place synchronous flashing lights on the turbines representing the outer perimeter of the facility.	RES Africa	Southern Duration of contract
Maintain the general appearance of the facility in an aesthetically pleasing way.	RES Africa	Southern Operation and maintenance
Ensure that proper planning is undertaken regarding the placement of lighting structures for the substation and that light fixtures only illuminate areas inside the substation sites.	RES Africa	Southern Operation and maintenance
Undertake regular maintenance of light fixtures.	RES Africa	Southern Operation and maintenance

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Appropriate visibility of infrastructure to aircraft</li> <li>» The effective containment of the light to the substation sites.</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» Ensure that aviation warning lights or other measures are installed before construction is completed and are fully functional at all times.</li> <li>» The monitoring of the condition and functioning of the light fixtures during the operational phase of the project.</li> </ul>



**OBJECTIVE: Minimisation of noise impacts from turbines**

From the results of the EIA studies undertaken, noise impacts associated with the wind energy facility are expected to be of low significance. However, mitigation measures are proposed in order to further reduce any potential for noise impact. The rating level in the area for Oyster Bay wind energy facility is likely to be 35 dBA at night. That would also be the "lower limit".

<b>Project component/s</b>	List of project components affecting the objective: » Wind energy facility (including access roads)
<b>Potential Impact</b>	» Increased noise levels at potentially sensitive receptors » Changing ambient sound levels could change the acceptable land use capability » Disturbing character of sound
<b>Activity/risk source</b>	» Wind turbines
<b>Mitigation: Target/Objective</b>	» Ensure that the change in ambient sound levels (measured in $L_{Aeq}$ ) as experienced by Potentially Sensitive Receptors is less than 5 dBA; (change from the measured and calculated ambient sound levels for the corresponding wind speed); » Prevent the generation of disturbing noise from the wind turbines; » Ensure acceptable noise levels at surrounding stakeholders and potentially sensitive receptors

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Design and implement a noise monitoring programme. Define the ambient sound levels in 10 minute bins over a period of at least 7 days before the operational phase starts inside (if practically feasible and if the NSD will allow it) and outside of the dwelling at NSD32. 10 minute sampling bins should be co-ordinated with 10 m wind speed.	RES Southern Africa / Acoustical Consultant / Approved Noise Inspection Authority	To be determined by RES Southern Africa
If required, additional noise monitoring points at a complainant that registered a valid and reasonable noise complaint relating to the operation of the facility	RES Southern Africa / Acoustical Consultant / Approved Noise Inspection Authority	To be determined on a case-by-case basis
A Noise Monitoring Programme should be designed by an acoustic consultant after discussions with the project developer and considering the comments from surrounding stakeholders. This may involve routine or	Acoustical Consultant / Approved Noise Inspection	To be determined by RES Southern Africa

Mitigation: Action/control	Responsibility	Timeframe
response measurements. Measurements is to take place over a period of 24 hours in 10 minute bins, with the resulting data co-ordinated with wind speeds as measured at a 10 meter height. These samples should be collected when the Wind Turbines are operational. Monitoring is recommended at NSD32 and in the vicinity of NSD31 for the first year, as well as any other NSDs that have complained to the developer regarding noise originating from the facility during it operation.	Authority	

<b>Performance Indicator</b>	» Ensure that the change in ambient sound levels ( $L_{Aeq}$ ) as experienced by Potentially Sensitive Receptors is less than 7 dBA
<b>Monitoring and Reporting</b>	» Noise monitoring programme to be developed and implemented at the start of operation.

#### NOTE 1

- a) Values of the  $L_{A90,10min}$  noise statistic shall be measured at the complainant's property using a sound level meter of EN 60651/BS EN 60804 Type 1, or EN 61672 Class 1 quality (or the replacement thereof) set to measure using a fast time weighted response as specified in BS EN 60651/BS EN 60804 or BS EN 61672-1 (or the equivalent UK adopted standard in force at the time of the measurements). This shall be calibrated in accordance with the procedure specified in BS 4142: 1997 (or the replacement thereof).
- b) The microphone should be mounted at 1.2 - 1.5 m above ground level, fitted with a two layer windshield (or suitable alternative approved in writing from the Local Planning Authority), and placed outside the complainant's dwelling. Measurements should be made in "free-field" conditions. To achieve this, the microphone should be placed at least 3.5m away from the building facade or any reflecting surface except the ground at a location agreed with the Local Planning Authority.
- c) The  $L_{A90,10min}$  measurements shall be synchronised with measurements of the 10-minute arithmetic mean wind speed and with operational data, including power generation information for each wind turbine, from the turbine control systems of the wind farm.
- d) The wind farm operator shall continuously log arithmetic mean wind speed and arithmetic mean wind direction data in 10 minute periods from the hub height anemometer located on the site meteorological mast unless otherwise agreed with the Local Planning Authority, to enable compliance with the conditions to be evaluated. The mean wind speed data shall be 'standardised' to a reference height of 10 metres as described in ETSU-R-97 at page 120 using a reference roughness length of 0.05 metres. It is this standardised 10m height wind speed data which is correlated with the noise measurements of Note 2(a) in the manner described in Note 2(c)

#### NOTE 2

- a) The noise measurements shall be made so as to provide not less than 20 valid data points as defined in Note 2 paragraph (b). Such measurements shall provide valid data points for the range of wind speeds, wind directions, times of day and power generation requested by the Local Planning Authority. In specifying such conditions the Local Planning Authority shall have regard to those conditions which were most likely to have prevailed during times when the complainant alleges there was disturbance due to noise. At its request the wind farm operator shall provide within 28 days of the completion of the measurements all of the data collected under condition 2 to the local planning authority

- b) Valid data points are those that remain after all periods during rainfall have been excluded. Rainfall shall be assessed by use of a rain gauge that shall log the occurrence of rainfall in each 10minute period concurrent with the measurement periods set out in Note 1(c) and is situated in the vicinity of the sound level meter.
- c) A least squares, "best fit" curve of a maximum 2<sup>nd</sup> order polynomial or otherwise as may be agreed with the local planning authority shall be fitted between the standardised mean wind speed (as defined in Note 1 paragraph (d)) plotted against the measured L<sub>A90,10min</sub> noise levels. The noise level at each integer speed shall be derived from this best-fit curve.

**NOTE 3**

If the wind farm noise level is above the limit set out in the conditions, measurements of the influence of background noise shall be made to determine whether or not there is a breach of condition. This may be achieved by repeating the steps in Notes 1 & 2 with the wind farm switched off in order to determine the background noise, L<sub>3</sub>, at the assessed wind speed. The wind farm noise at this wind speed, L<sub>1</sub>, is then calculated as follows, where L<sub>2</sub> is the measured wind farm noise level at the assessed wind speed with turbines running but without the addition of any tonal penalty:

$$L_1 = 10 \log \left[ 10^{L_2/10} + 10^{L_3/10} \right]$$

**OBJECTIVE: Appropriate handling and management of hazardous substances and waste**

The operation of the wind energy facility will involve the generation of limited waste products. The main wastes expected to be generated by the operation activities includes general solid waste and hazardous waste.

<b>Project component/s</b>	List of project components affecting the objective: <ul style="list-style-type: none"> <li>» wind energy turbines</li> <li>» power line</li> <li>» substation</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Inefficient use of resources resulting in excessive waste generation</li> <li>» Litter or contamination of the site or water through poor waste management practices</li> </ul>
<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» Generators and gearbox - turbines</li> <li>» Transformers and switchgear - substation</li> <li>» Fuel and oil storage</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To comply with waste management legislation</li> <li>» To minimise production of waste</li> <li>» To ensure appropriate waste disposal</li> <li>» To avoid environmental harm from waste disposal</li> </ul>



<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Hazardous substances must be stored in sealed containers within a clearly demarcated designated area.	RES Southern Africa	Operation
Storage areas for hazardous substances must be appropriately sealed and banded.	RES Southern Africa	Operation
All structures and/or components replaced during maintenance activities must be appropriately disposed of at an appropriately licensed waste disposal site or sold to a recycling merchant for recycling.	RES Southern Africa	Operation
Care must be taken to ensure that spillage of oils and other hazardous substances are limited during maintenance. Handling of these materials should take place within an appropriately sealed and banded area. Should any accidental spillage take place, it must be cleaned up according to specified standards regarding bioremediation.	RES Southern Africa	Operation and maintenance
Waste handling, collection and disposal operations must be managed and controlled by a waste management contractor.	RES Southern Africa / waste management contractor	Operation
Used oils and chemicals: » Where these cannot be recycled, appropriate disposal must be arranged with a licensed facility in consultation with the administering authority. » Waste must be stored and handled according to the relevant legislation and regulations.	RES Southern Africa	Operation
General waste must be recycled where possible or disposed of at an appropriately licensed landfill.	RES Southern Africa	Operation
Hazardous waste (including hydrocarbons) and general waste must be stored and disposed of separately.	RES Southern Africa	Operation
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	RES Southern Africa	Operation
No waste may be burned or buried on site.	RES Southern Africa	Operation

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No complaints received regarding waste on site or dumping</li> <li>» Internal site audits identifying that waste segregation, recycling and reuse is occurring appropriately</li> <li>» Provision of all appropriate waste manifests</li> <li>» No contamination of soil or water</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>» Waste collection must be monitored on a regular basis.</li> <li>» Waste documentation must be completed and available for inspection</li> </ul>

on request

- » An incidents/complaints register must be maintained, in which any complaints from the community must be logged. Complaints must be investigated and, if appropriate, acted upon
- » Regular reports on exact quantities of all waste streams exiting the site must be compiled by the waste management contractor and monitored by the environmental manager. All appropriate waste disposal certificates must accompany the monthly reports.

**OBJECTIVE: Maximise local employment and business opportunities during operation**

Based on information provided by RES Southern Africa approximately 45 permanent and 70 occasional and temporary employment opportunities will be created during the operational phase of the project. The operational phase is expected to last 20-25 years.

<b>Project component/s</b>	List of project components affecting the objective: <ul style="list-style-type: none"> <li>» Wind energy facility</li> <li>» Day to day operational activities associated with the wind energy facility including maintenance etc.</li> </ul>
<b>Potential Impact</b>	» The opportunities and benefits associated with the creation of local employment and business should be maximised.
<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» The operational phase of the wind energy facility will create approximately 45 permanent and 70 occasional and temporary employment opportunities.</li> <li>» The establishment of a wind energy facility has the potential to create and attraction for visitors to the area. The development also has the potential to promote the benefits of renewable energy projects.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Benefit to local tourism by providing the area with a potential additional tourist attraction.</li> <li>» In the medium- to long-term employ as many locals as possible to fill the approximate 45 full time employment opportunities.</li> </ul>

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Identify local members of the community who are suitably qualified or who have the potential to be employed full time.	RES Southern Africa	Identify members during construction
Develop training and skills transfer programme during construction phase for local personnel.	RES Southern Africa	Identify members during construction
Liaise with representatives from the Kouga Municipality and tourism organisations to raise awareness of the proposed wind energy facility	RES Southern Africa	Set up meeting with municipality and local tourism organisations during the construction phase.

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Public exposure to the project.</li> <li>» Meeting with Local Municipality and local tourism organisations during the construction phase.</li> </ul>
<b>Monitoring and</b>	» Indicators listed above must be met for the operational phase.

**Reporting**

**OBJECTIVE:** Ensure the implementation of an appropriate fire management plan during the operation phase

The vegetation in the study area may be at risk of fire. The increased presence of people on the site could increase the risk of veld fires, particularly in the dry season.

<b>Project Component/s</b>	» Operation and maintenance of the wind energy facility and associated infrastructure.
<b>Potential Impact</b>	» Veld fires can pose a personal safety risk to local farmers and communities, and their homes, crops, livestock and farm infrastructure, such as gates and fences. In addition, fire can pose a very minor risk to the wind energy facility infrastructure.
<b>Activities/Risk Sources</b>	» The presence of operation and maintenance personnel and their activities on the site can increase the risk of veld fires.
<b>Mitigation: Target/Objective</b>	» To avoid and or minimise the potential risk of veld fires on local communities and their livelihoods.

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>		<b>Timeframe</b>
Provide adequate fire fighting equipment on site.	RES Africa	Southern	Operation
Provide fire-fighting training to selected operation and maintenance staff.	RES Africa	Southern	
Ensure that appropriate communication channels are established to be implemented in the event of a fire.	RES Africa	Southern	Operation
Fire breaks should be established where and when required. Cognisance must be taken of the relevant legislation when planning and burning firebreaks (in terms of timing, etc.). Access roads may also act as fire breaks.	RES Africa	Southern	Operation
Upon completion of the construction phase, an emergency evacuation plan must be drawn up to ensure the safety of the staff and surrounding land users in the case of an emergency.	RES Africa	Southern	Operation
Contact details of emergency services should be prominently displayed on site.	RES Africa	Southern	Operation

<b>Performance Indicator</b>	» Fire fighting equipment and training provided before the construction phase commences. » Appropriate fire breaks in place.
<b>Monitoring and Reporting</b>	» RES Southern Africa must monitor indicators listed above to ensure that they have been met.



**OBJECTIVE: Minimise the potential negative impact on farming activities and on the surrounding landowners**

Once operational, the negative impact on the daily living and movement patterns of neighbouring residents is expected to be minimal and intermittent (i.e. the increase in traffic to and from site, possible dust creation of vehicle movement on gravel roads on site and possible increase in criminal activities). The number of workers on site on a daily basis is anticipated to have minimal negative social impacts in this regard.

Some positive impacts will be experienced with farmers gaining more access to land through the high quality site roads. Farmers involved with the project will also receive income which can be invested into farming activities.

Once construction is completed, negative impacts on farming activities on the site must be limited as far as possible.

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» Possible negative impacts of activities undertaken on site on the activities of surrounding property owners.</li> <li>» Impact on farming activities on site.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Limited intrusion impact on surrounding land owners.</li> <li>» Interference with farming activities on site.</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Increase in traffic to and from site could affect daily living and movement patterns of surrounding residents.</li> <li>» Operational activities on site could interfere with farming activities of landowner.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Effective management of the facility.</li> <li>» Mitigation of intrusion impacts on property owners.</li> <li>» Mitigation of impact on farming activities.</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Effective management of the facility and accommodation facility to avoid any environmental pollution focusing on water, waste and sanitation infrastructure and services.	RES Southern Africa	Operation
Vehicle movement to and from the site should be minimised as far as possible.	RES Southern Africa & Employees	Operation
Local roads should be maintained to keep the road surface up to a reasonable standard.	RES Southern Africa	Operation
Limit the development of new access roads on site.	RES Southern Africa	Operation
Ensure on-going communication with the landowners of the site in order to ensure minimal impact on farming	RES Southern Africa	Operation

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
activities		
<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No environmental pollution occurs (i.e. waste, water and sanitation).</li> <li>» No intrusion on private properties and on the activities undertaken on the surrounding properties.</li> <li>» Continuation of farming activities on site.</li> </ul>	
<b>Monitoring and reporting</b>	<ul style="list-style-type: none"> <li>» RES Southern Africa should be able to demonstrate that facility is well managed without environmental pollution and that the above requirements have been met.</li> </ul>	

## MANAGEMENT PLAN FOR THE WIND ENERGY FACILITY: DECOMMISSIONING

## CHAPTER 8

The turbine infrastructure which will be utilised for the proposed wind energy facility is expected to have a lifespan of 20 to 25 years (with maintenance). Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life. Decommissioning activities would need to comply with the environmental legislation relevant at the time.

### 8.1. Site Preparation

Site preparation activities will include confirming the integrity of the access to the site to accommodate required abnormal load equipment and lifting cranes, preparation of the site (e.g. lay down areas, construction platform) and the mobilisation of construction equipment.

### 8.2 Disassemble Turbines

A large crane will be brought on site. It will be used to disassemble the turbine and tower sections. These components will be reused, recycled or disposed of in accordance with regulatory requirements (NEMA / NEM:WA). All parts of the turbine would be considered reusable or recyclable except for the blades.

**OBJECTIVE: To avoid and or minimise the potential social impacts associated with the decommissioning phase**

<b>Project component/s</b>	» Decommissioning phase of the wind energy facility and associated infrastructure.
<b>Potential Impact</b>	» Decommissioning will result in job losses, which in turn can result in a number of social impacts, such as reduced quality of life, stress, depression, etc. » Decommissioning is also similar to the construction phase in that it will also create temporary employment opportunities.
<b>Activity/risk source</b>	» Decommissioning of the wind energy facility.
<b>Mitigation: Target/Objective</b>	» To avoid and or minimise the potential social & environmental impacts associated with decommissioning phase of the wind energy facility.

Mitigation: Action/control	Responsibility	Timeframe
Retrenchments should comply with South African Labour legislation of the day.	RES Southern Africa	At decommissioning.
Mitigation measures as detailed in the construction phase EMP regarding impacts on flora, fauna, habitats and wetlands would be applicable to this phase – See Chapter 5 of this document	RES Southern Africa	At decommissioning.

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Compliance with South African Labour legislation at the relevant time.</li> <li>» Compliance with NEMA</li> </ul>
<b>Monitoring</b>	No occurrences of dismissals not in-line with South African Labour Legislation.

**FINALISATION OF THE  
ENVIRONMENTAL MANAGEMENT PLAN**

**CHAPTER 9**

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The EMP is a dynamic document, which must be updated when required. It is considered critical that this draft EMP be updated to include site-specific information and specifications following the final walk-through survey by specialists of the power line, and development site. This will ensure that the construction and operation activities are planned and implemented taking sensitive environmental features into account.

# APPENDIX A: PROPOSED BIRD MONITORING PROGRAMME

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## Proposed Bird Monitoring Programme:

### 1. Proposed monitoring protocols

This methodology is extracted from the Avifauna Report (C Van Rooyen, September 2011) which is contained in Appendix G of the Draft EIA report (Savannah Environmental, September 2011). It should be noted that the methodology for bird monitoring should be updated in accordance with any endorsed guidelines at the time of implementation of the programme.

The methodology for gathering of data on the Oyster Bay wind energy facility during the EIA, including the manner and frequency of sampling, was guided by the recently released *"Best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa"* Version 1 (Jenkins *et al* 2011), which is the current protocol endorsed by the Endangered Wildlife Trust (EWT) and Birdlife South Africa (BLSA). The methodology will be discussed on an ongoing basis with relevant NGO stakeholders as the project progresses, specifically the EWT and BirdLife SA, at the regular meetings of the Birds and Wind Energy Specialist Group (BAWESG). The priority species will be identified through the use of the following data sources:

- » The BLSA list of priority species for wind farms (Retief 2011)
- » Existing avifaunal data sources, e.g. the South African Bird Atlas 2 (SABAP2) and the Co-ordinated Avifaunal Road Count (CAR)
- » The results of monitoring at several wind farm sites in the Jeffreys Bay area which commenced in 2011 and is currently ongoing.

### 2. Deliverables of the bird monitoring programme

A report will be produced at the end of the pre-construction programme which will contain an analysis of the results of the pre-construction monitoring. These outcomes will inform the final micro-siting of the turbines. Results will be presented in terms of the estimated density of priority (and non-priority) species (birds/km or if possible and/or required, birds/km<sup>2</sup>), which will serve as the baseline for comparing potential displacement of birds during and after construction, and habitat associations. In addition, a Collision Risk Model (CMR), popularly known as the Band model, which is widely applied in the UK, will be used to predict collision rates of priority species if and when possible. If the Band model proves not to be suitable for these purposes, an alternative method of presenting the collision risk data will be found, in consultation with the client. The predominant flight patterns will be mapped and, where/if possible, coordinates of flight corridors will be provided. In addition, focal point monitoring will be conducted where necessary, i.e. any priority species nest sites that are discovered in the course of the monitoring, as well as wetlands that could serve as roost sites for priority species.

Interim reports will be provided to the client at the conclusion of each seasonal monitoring period. The interim report will contain a preliminary analysis of the data that has been gathered to date, and any potential issues that could influence the lay-out of the turbines will be flagged and discussed with the client.

### **3. Responsibilities and progress reports**

The monitoring and data capturing will be conducted by Karoo Birding Safaris (Japie and Ralie Claassen) and supervised by Chris van Rooyen. The data analysis will be conducted by Chris van Rooyen, Albert Froneman (who will also do the GIS analysis) and Dr. Marietjie Froneman. Progress reports will be compiled at the end of each season's monitoring.

### **4. Bird Monitoring**

The primary aims of bird monitoring are to:

- Estimate the numbers/densities of birds regularly present or resident within the broader impact area of the operational wind facility;
- Compare this data with baseline figures and hence quantify the impacts of displacement and/or collision mortality; and
- Mitigate impacts of the development by informing ongoing management of the wind facility.

The collision monitoring will have two components: (i) experimental assessment of search efficiency and scavenging rates of bird carcasses on the site, (ii) regular searches of the vicinity of the wind farm for collision casualties.

All methods used to estimate bird numbers and movements during baseline monitoring should be applied in exactly the same way to post-construction work in order to ensure the comparability of these two data sets. Further detail on any differences in field techniques and data requirements (e.g. the timing of commencement of post-construction monitoring, the duration over which data collection should be carried out, the need to record bird reactions to the presence of operational turbines) will be done according to the best practices which are valid at that point in time. For now, it is important to note that post-construction monitoring should be started as soon as possible after the first turbines become operational to ensure that the immediate effects of the facility on resident and passing birds are recorded, before they have time to adjust or habituate to the development, and should run over a period of at least 12 months.



#### 4.1.1 Pre-construction monitoring

The table below provides a summary of the **pre-construction monitoring** which is required.

Mitigation: Action/control	Responsibility	Timeframe
Pre-construction monitoring must be implemented for a 12-month period, consisting of line transects counts and vantage point observations. The objective is to establish a baseline to use for comparison purposes once the wind energy facility has become operational.	RES Southern Africa Ornithological consultant	12 months (4 x per year), starting in May 2011
<b>Performance Indicator</b>	» Quarterly report presenting the results of the seasonal monitoring	
<b>Monitoring</b>	» Four replicates per year (one replicate per season)	

#### 4.1.2 Construction mitigation and monitoring

The table below provides a summary of the **construction mitigation and monitoring** requirements.

Mitigation: Action/control	Responsibility	Timeframe
<ul style="list-style-type: none"> <li>During the construction period, activity should be restricted to the construction footprint itself. Access to the rest of the properties must be strictly controlled to prevent unnecessary disturbance of birds.</li> <li>The infrastructure footprint must be restricted to the minimum in accordance with the recommendations of the ecological specialist study.</li> </ul>	RES Southern Africa Environmental Control Officer	Duration of the construction period
<b>Performance Indicator</b>	» N/A	
<b>Monitoring</b>	» Regular spot-checks by the Environmental Control Officer to ensure compliance	

### 4.1.3 Operational mitigation and monitoring

The table below provides a summary of the **operational mitigation and monitoring requirements**.

Mitigation: Action/control	Responsibility	Timeframe
<ul style="list-style-type: none"> <li>» Once the turbines have been constructed, post-construction monitoring as per the latest version of the <i>Best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa</i> (Jenkins <i>et al</i> 2011) should be implemented to compare actual collision rates with predicted collision rates. If actual collision rates indicate unsustainable mortality levels, the following mitigation measures will have to be considered Negotiating appropriate off-set compensation for turbine related collision mortality</li> <li>» Post-construction monitoring should be implemented to assess the impact of displacement, particularly on priority species. Initially, a 12 month period of post-construction monitoring should be implemented, using the same protocol as is currently implemented. Thereafter, the need for further monitoring will be informed by the results of the initial 12-month period</li> <li>» Should the results of the post-construction monitoring indicate significant displacement of priority species, appropriate off-set compensation should be negotiated with the developer to compensate for the loss of priority species habitat;</li> <li>» For affected bird flight paths and areas of significant potential bird impact, the power line should be marked with Double Loop Bird Flight Diverters on the earth wire of the line, five metres apart, alternating black and white.</li> </ul>	<p>RES Southern Africa                      Ornithological                      consultant</p>	<p>12 months (4                      x per year),                      starting as                      soon as                      possible after                      the wind                      energy                      facility                      becomes                      operational.</p>

<b>Performance Indicator</b>	» Quarterly report presenting the results of the monitoring.
<b>Monitoring</b>	» The required monitoring replicates and intervals should be established at the beginning of the post-construction monitoring period.

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