PROPOSED RHEBOKSFONTEIN WIND ENERGY FACILITY NEAR DARLING, WESTERN CAPE PROVINCE

CONSTRUCTION & OPERATION ENVIRONMENTAL MANAGEMENT PLAN (EMP) FOR THE RHEBOKSFONTEIN WIND ENERGY FACILITY PROJECT:

Submitted as part of the Final EIA Report
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Prepared for

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PROJECT DETAILS

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DEFINITIONS AND TERMINOLOGY

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: The reading on an integrating impulse sound level meter taken at a measuring point in the absence of any alleged disturbing noise at the end of a total period of at least 10 minutes after such meter was put into operation.

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.

'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: An operational plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its on-going 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).

Regional Methodology: The Western Cape Department of Environmental Affairs and Development Planning (DEA&DP) have developed a guideline document entitled *Strategic Initiative to Introduce Commercial Land Based Wind Energy Development to the Western Cape - Towards a Regional Methodology for Wind Energy Site Selection* (Western Cape Provincial Government, May 2006). The methodology proposed within

this guideline document is intended to be a regional level planning tool to guide planners and decision-makers with regards to appropriate areas for wind energy development (on the basis of planning, environmental, infrastructural and landscape parameters).

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 a constant speed of 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 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 80 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"[1]. The objective of this EMP 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 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 remediation (soil stabilisation, re-vegetation) and operation.

The EMP has been developed as a set of environmental specifications (i.e. principles of environmental management for the Rheboksfontein 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 tools for use of the EMP by the project implementer as well as compliance monitors). During its lifecycle, projects journey through four distinctive phases, as presented in Figure 1.1. The EMP is accordingly separated into measures dealing with the various project phases.

[1] Provincial Government Western Cape, Department of Environmental Affairs and Development Planning: *Guideline for Environmental Management Plans*. 2005

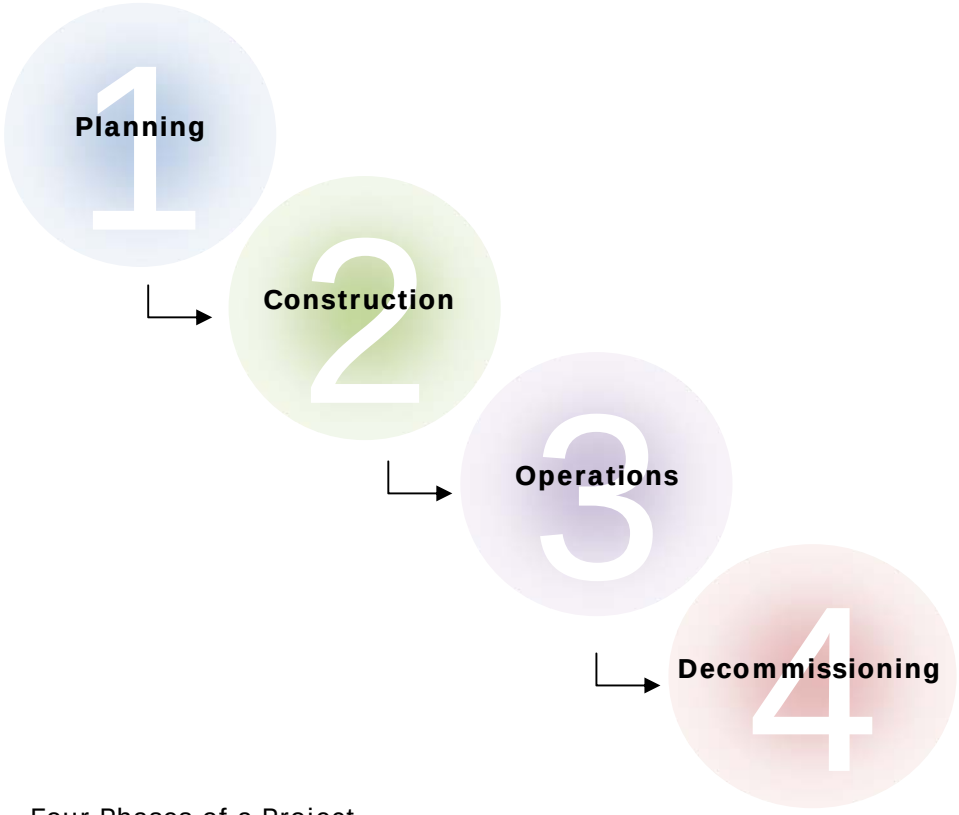

Figure 1.1: Four Phases of a Project

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.
- 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 and frequency 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.

Moyeng Energy must ensure that the implementation of the project 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 and the implementation of the EMP through its integration into the contract documentation. Since this EMP is part of the EIA process undertaken for the proposed Rheboksfontein Wind Energy Facility, it is important that this guideline document be read in conjunction with the Scoping Report (July 2010) and EIA Report (September 2011). This will contextualise the EMP and enable a thorough understanding of its role and purpose in the integrated environmental management process. This EMP for construction and operation activities has been compiled in accordance with Section 34 of the EIA Regulations and will be further developed in terms of specific requirements listed in any authorisations issued for the proposed project.

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 Contractor's 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.
» Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an Environmental Awareness Training course. The course must provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
» Basic training in the identification of archaeological sites/objects, and protected flora and fauna that may be encountered on the site.
» Awareness of any other environmental matters, which are deemed to be necessary by the ECO.

PROJECT DETAILS *CHAPTER 2*

An area of ~39 km^2 in extent falling within the Swartland Municipality was identified by Moyeng Energy as being potentially suitable for wind energy development (Refer to Figure 2.1). This area comprises the following farm portions:

» Remaining extent of Farm 568 (Rheboksfontein)
» Farm 567 (Nieuwe Plaats)
» Remaining extent of Farm 571 (Bonteberg)
» Portion 1 of Farm 574 (Doornfontein)
» Portion 1 of Farm 551 (Plat Klip)
» Farm 1199 (Groot Berg)
» Portion 2 of Farm 552 (Slang Kop)

The facility is proposed to have a generating capacity of up to 240 MW, depending on the final turbine selected. A preliminary design for the wind turbines was provided for assessment within the EIA (refer to Figure 2.2). Moyeng Energy has not selected the turbine model or models that will be installed on the site at this time. The capacity of the actual turbines to be used for the project is therefore not certain at this point, but is expected to be up to 3 MW per turbine. All analyses of potential project impacts presented in the draft EIA Report are therefore based on a preliminary layout of 3 MW turbines, as provided by Moyeng Energy. The exact positioning or detailed layout of the components of this proposed wind energy facility will be developed by taking cognisance of the wind resource on the site as well as the environmental sensitivities and mitigation measures identified through the EIA process. A final layout of the turbines within the facility would be prepared prior to construction. Based on the layout, the EIA made recommendations of sensitive areas / features, which resulted in a revised layout being developed – Alternative 2 which contains 48 wind turbines (See Figure 2.3). Alternative 2 is the environmentally preferred option.

The infrastructure associated with the wind energy facility would include:

» Up to **80 wind turbine units** of between 1.8MW and 3MW in capacity each (up to 80m to 100 m high steel tower and nacelle; rotor diameter up to 90m - consisting of 3 blades up to 45m in length).
» Concrete **foundations** to support the turbine towers.
» **Internal roads** (approximately 6 m in width) 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.

- **Underground (~ 1m deep) 33 kV cabling**, linking the wind turbines to three 33/132 kV substations. In as far as possible, cabling will follow the internal access roads.
- **Three 33/132 kV internal substations** within the development site. Each substation will have a high-voltage (HV) yard footprint of approximately 80m x 90m.
- An overhead **power line** (132 kV monopole distribution lines) linking the substation at the wind energy facility to Dassenburg substation in Atlantis.
- An operations and maintenance facility, including a storage building (40 m x 20 m), security office (10 m x 5 m) and a car park area (15 m x 7 m).

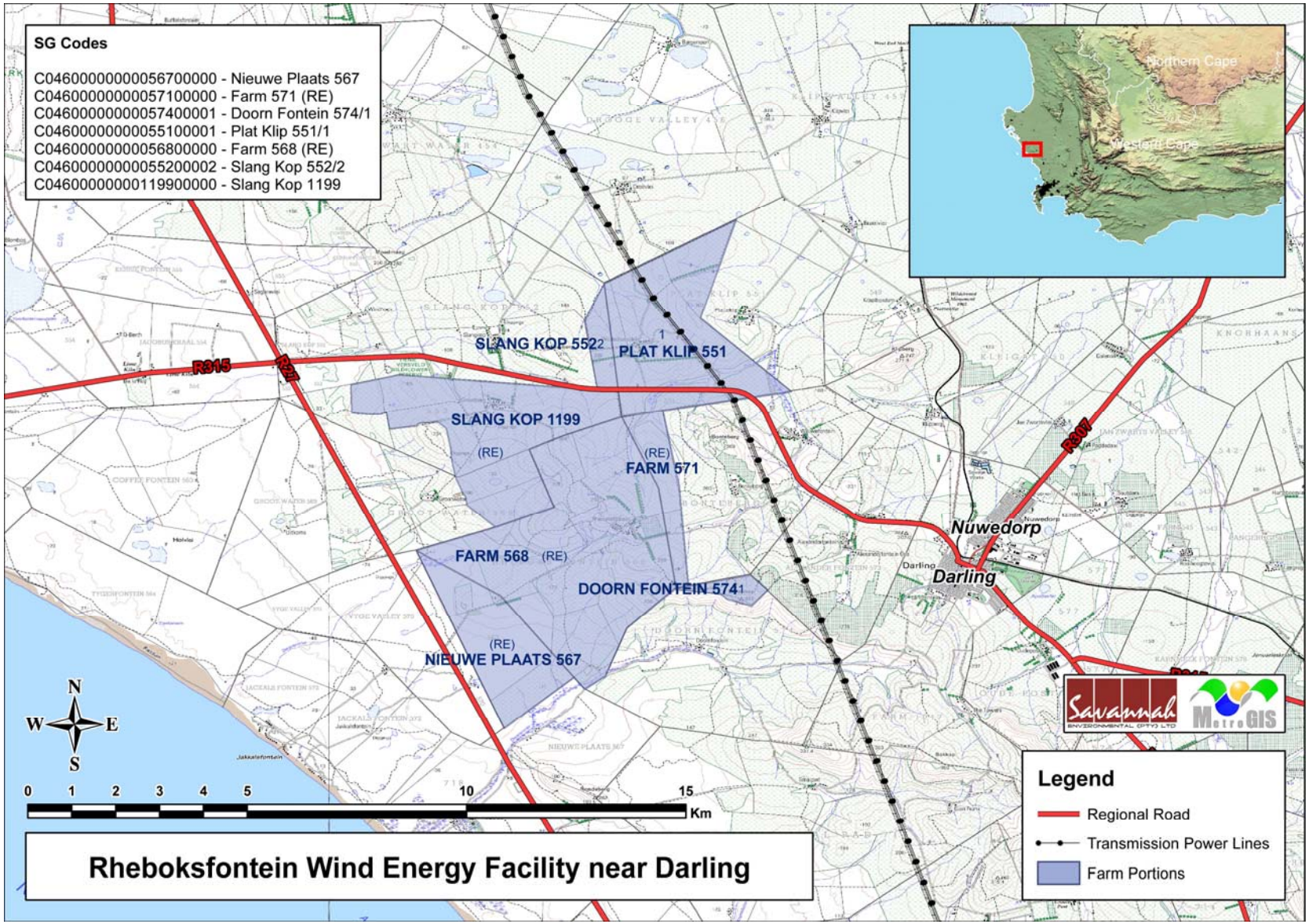

Figure 2.1: Locality map showing the farm portions which form part of the study area for the Rheboksfontein Wind Energy Facility

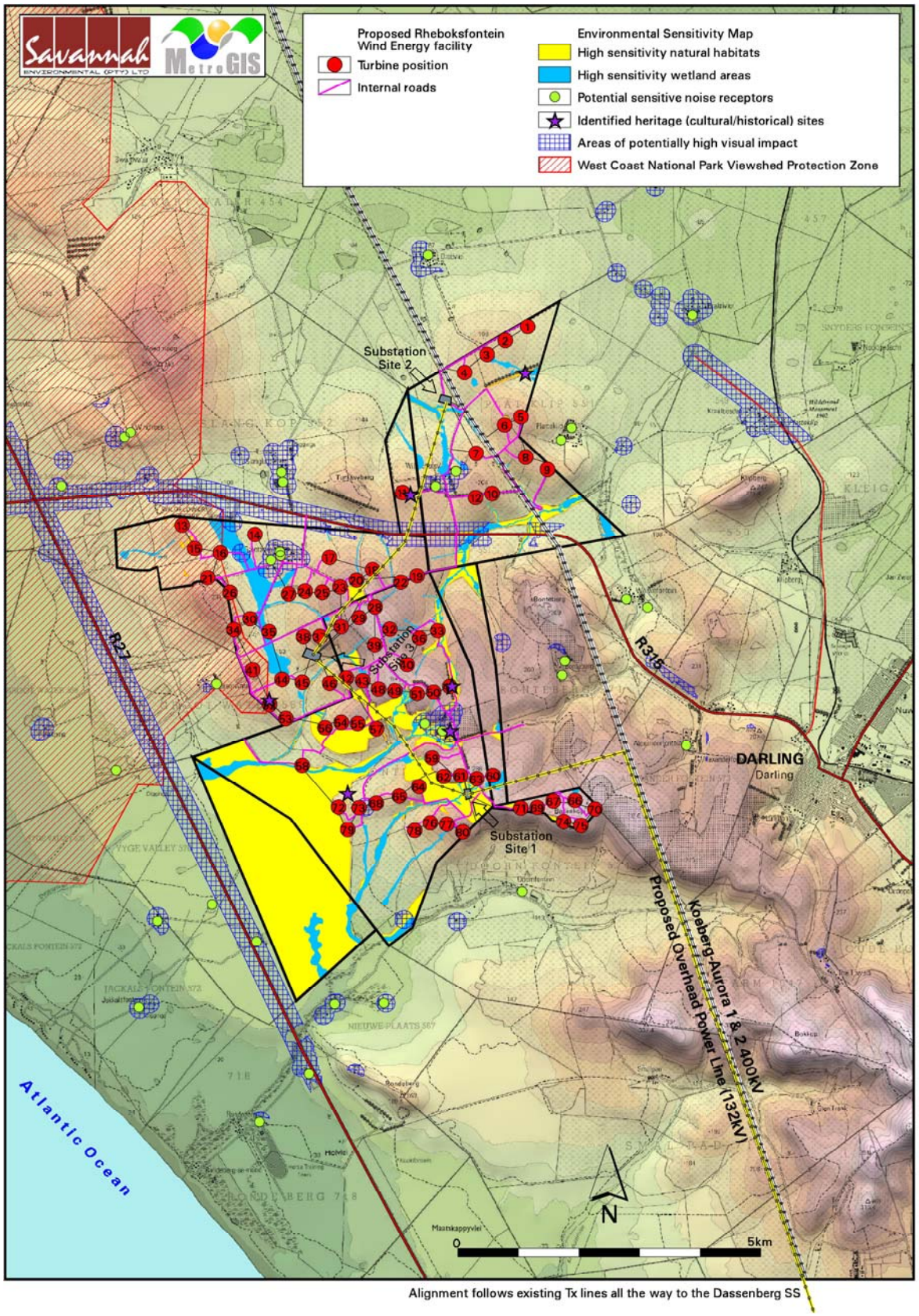

Figure 2.2: Layout Alternative 1: Up to 80 wind turbines, 3 substation sites, workshop area and proposed power line routes linking to the electricity grid at Dassenburg substation

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

» Disturbance of ecological environment (flora fauna, and habitats (including wetlands and watercourses))
» Impacts on avifauna (birds)
» Disturbance to sense of place, visual aesthetics
» Noise
» Soil disturbance and erosion
» Impacts on heritage and fossil resources
» Social impacts

No absolute no go areas have been identified to be associated with the proposed wind energy facility. Potentially sensitive areas in the project area identified through the EIA include:

» Potential visual and noise sensitive receptors
» Areas of medium - high ecological sensitivity
» All natural wetlands, rivers and drainage lines and associated buffer zones.
» Areas of high avifaunal sensitivity
» Heritage sites

These areas of sensitivity are indicated on the project sensitivity map included within Figure 2.3.

In terms of the layout, a number of turbines are located in potentially sensitive areas, characterised by ridgelines, wetlands, drainage lines, or heritage sites. A shift in the location of these turbines to areas outside of these sensitive areas is recommended to minimise impacts to the environment. The following turbines (as shown in **Figure 2.4 – revised layout**) have been shifted in order to avoid these areas of high sensitivity (i.e. best practice is impact avoidance):

» **Turbine 58** moved to the south-eastern side of the watercourse next to which it stands in order to avoid impacts from underground cables and access roads.
» Only one archaeological site was located at **Turbine 52.** Either avoiding the site be relocating turbine 52 or conduct archaeological excavations (which requires a permit from Heritage Western Cape). Relocating turbine 52 is highly recommended.

In terms of the proposed power line, the following is recommended:

» From a social perspective, the initial ~2 km section of the proposed power line alignment is an area of concern. This short linking section between the Rheboksfontein wind energy facility and the existing transmission line corridor

traverses high potential land on Bonteberg and Alexanderfontein Farms. Vineyard and olive groves are established in the relevant area. Impacts would include loss of high potential land to pylon footprints, and more significantly, restricted movement of farming implements. It is recommended that the possibility of siting the alignment along the Alexanderfontein-Doornfontein boundary should be investigated as an alternative for this segment. However, care should be taken to site the alignment towards the east of the relevant ridgeline in order to avoid visual impacts on Doornfontein.

» The proposed power line traverses numerous areas of High ecological sensitivity as defined in the vegetation study), and these are estimated to cover at least 26km of the proposed route. It is recommended that the proposed power line that traverses 26 km of sensitive vegetation is moved east by about 300 m.

In addition to the above, the following general recommendations have been made in order to reduce/avoid impacts on sensitive areas:

» Turbine positioning takes cognisance of “high sensitivity” areas (as indicated on Figure 2.3).
» Moyeng Energy to implement a long-term bird monitoring programme, particularly in identified sensitive areas.
» No agriculture should be allowed to take place within 50m of the southern boundary of the Tienie Versfeld Wildflower Reserve.
» Disturbed areas should be rehabilitated as quickly as possible and an on-going monitoring programme should be established to detect and quantify any alien species.
» During construction, unnecessary disturbance to habitats should be strictly controlled and the footprint of the impact should be kept to a minimum.
» A comprehensive stormwater management plan should be compiled for the substation footprints prior to construction.
» Results from the noise modelling should play a role in the ultimate layout/positioning of the turbines in order to minimise long-term impacts on receptors within the facility footprint.
» A walk-through survey of the final surveyed power line corridor must be undertaken by an ecological, heritage and avifauna specialist in order to inform site-specific mitigation to be implemented during construction and operation.

The EMP has been developed on the basis of the findings of the EIA, 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.

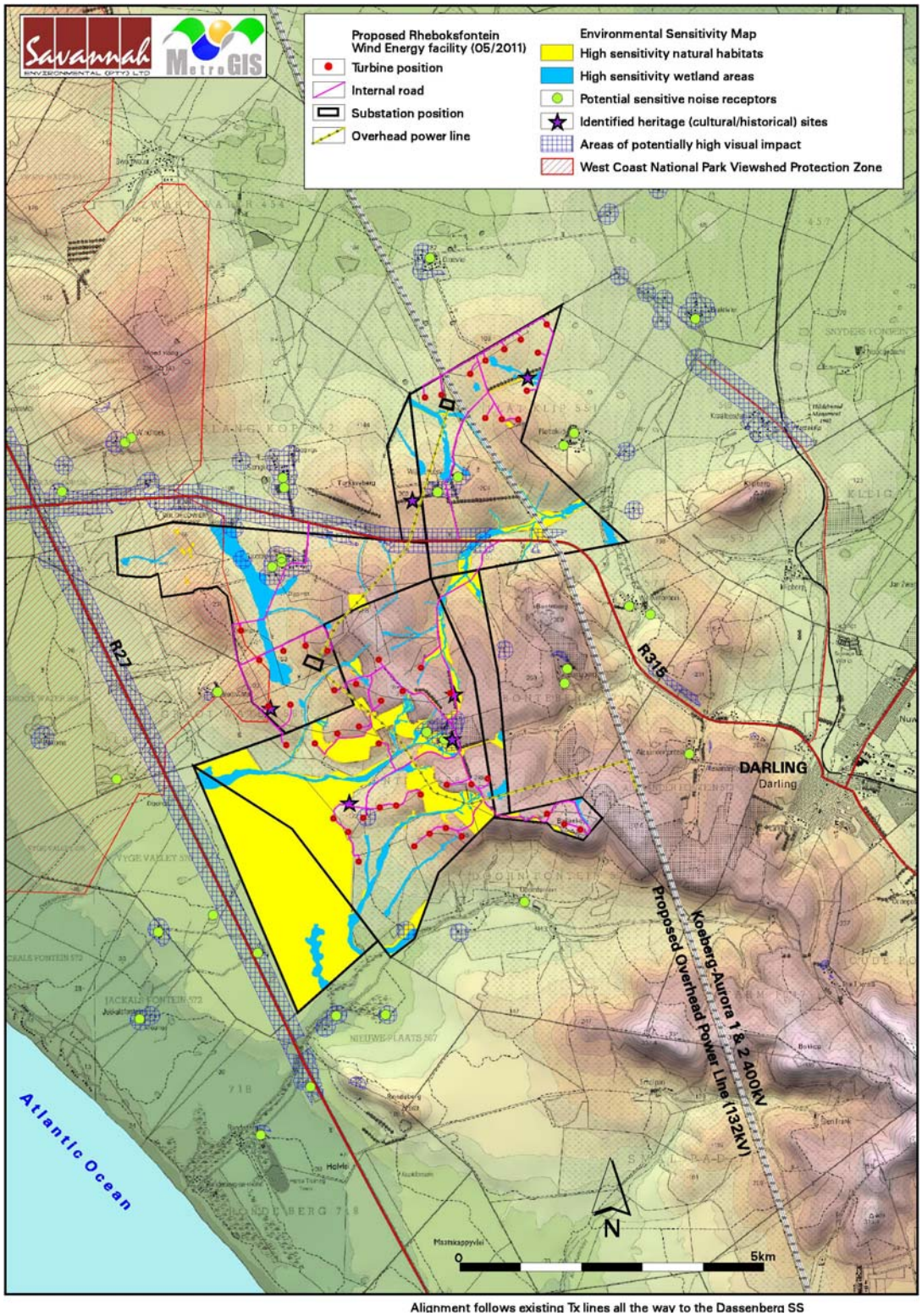

Figure 2.3: Revised layout Alternative 2 taking into account specialist recommendations

2.1 Activities and Components associated with the Wind Energy Facility

The main activities/components associated with the Rheboksfontein Wind Energy Facility are detailed in Table 2.1.

Table 2.1: Activities Associated with Planning, Construction, Operation and Decommissioning of the Facility

Main Activity / Project Component	Components of Activity	Details
	Planning	
Conduct technical surveys	» Geotechnical survey by geotechnical engineer: » Site survey and confirmation of the turbine micro-siting footprint » Survey of substation sites » Survey of power line servitude to determine tower locations	» All surveys are to be undertaken prior to initiating construction.
Conduct environmental surveys (environmental specialists)	» Ecological surveys » Avifauna surveys » Heritage surveys	» All surveys are to be undertaken during the final design phase of the facility, prior to initiating construction. » Surveys should include all project components in identified sensitive areas
	Construction	
Establishment of access roads to the site	» Upgrade access/haul roads to the site, as required » Establish internal access roads: 6 m wide permanent roadway within the site between the turbines for use during construction and operation phase. » Temporary track (adjacent to and utilising part of the permanent road) of ~13m in width for use by the crawler crane during construction phase only.	» Access roads will be constructed/upgraded 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. » 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. » The internal service road alignment is informed by the final micro-siting/positioning of the wind turbines (as well as specialist surveys). To accommodate the large crawler crane required for turbine assembly, a track of approximately 13m in width is required to be established on the site. * Internal roads (same for construction and operational phase)

Main Activity / Project Component	Components of Activity	Details
		* Maximum vehicle length, including the load is 55 meters. * Maximum vehicle weight is 150 tons, with a maximum axle load of 15 tons. * The outside radius for up to 120 degree turns is 15 metres for a truck with rear axle steering. * The outside radius for more than 120 degree turns is 35 metres for a truck with rear axle steering. * Turning radius for trucks without rear axle steering is 60 m. * Maximum gradient is 5%. * Maximum road camber is 2%. * Maximum break-over angle is 0,2 m over 50 m. * Road width is 6 m.
Undertake site preparation	» Site establishment of offices / workshop with ablutions and stores, contractors yards » Establishment of internal access roads (permanent and temporary roads) » Clearance of vegetation at the footprint of each turbine » Excavations for foundations	» These activities will require the stripping of topsoil, which will need to be appropriately stockpiled for use in rehabilitation.
Establishment of lay down areas on site	» Lay down areas (temporary footprint 40m x 40m) at each turbine position for the storage of wind turbine components and accommodation of construction and crane lifting equipment. » Temporary lay down area for crane assembly.	» Each turbine needs a flat and hardened lay down area of 40 m x 40 m during the construction process. » This area can be rehabilitated after construction. » The lay down area will need to accommodate the cranes required in tower/turbine assembly. Lay down and storage areas will be required to be established for the normal civil engineering construction equipment which will be required on site. A large lay down area will be required at each position where the main lifting crawler crane may be required to be erected and/or disassembled. This area would be required to be compacted and levelled to

Main Activity / Project Component	Components of Activity	Details
		accommodate the assembly crane, which would need to access the crawler crane from all sides. » Such areas to make use of already compacted areas as far as possible, such as roadways or other laydown areas.
Construct wind turbine foundations	» Concrete foundations of approximately of up to 15 x 15m x 2m depth at each turbine location (final dimensions to be defined by geotechnical survey of the site)	» Foundation holes will be mechanically excavated. » Shoring and safety barriers will be erected. » Aggregate and cement to be transported from the closest centre to the development, with the establishment of a small concrete batching plant close to the activities. This would most likely be a movable plant.
Transport of components and equipment to site	» Flatbed trucks will be used to transport all components to site: * Turbine units consist of a tower comprised of 4 segments, a nacelle, and three rotor blades (each of up to 50 m in length). * Components of various specialised construction, lifting equipment and counter weights etc. are required on site (e.g. mobile assembly crane and main lift crawler crane) to erect the wind turbines. * The normal civil engineering construction equipment for the civil works (e.g. excavators, trucks, graders, compaction equipment, cement mixers, etc.). * The components required for the establishment of the substations (including transformers)	» The Saldanha Port has been identified as the as most suitable port for ease of access and storage facilities for wind turbine components. » Turbine units consist of a tower comprised of 4 segments, a nacelle, and three rotor blades. Components of various specialised construction, lifting equipment and counter weights etc. are required on site (e.g. 200 ton mobile assembly crane and a 750 ton main lift crawler crane) to erect the wind turbines. Other components include components required for the establishment of the substations (including transformers) and those required for the establishment of the power line (including towers and cabling). » The wind turbine, including tower, will be brought to site by the supplier in sections. The individual components are defined as 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

Main Activity/Project Component	Components of Activity	Details
	* Components required for the establishment of the power line (including towers and cabling) * Ready-mix cement trucks for turbine, substation and visitors centre foundations	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. An estimated 10 trucks will be used for the shipment of each turbine. » <u>Bridges:</u> o Maximum vehicle weight is 150 tons, with a maximum axle load of 15 tons. o Maximum gradient is 5%. o Maximum road camber is 2%. o Maximum break-over angle is 0,2 m over 50 m. o Road width is 6 metres.
Erect turbines	» Large lifting crane used for lifting of large, heavy components » A small crane for the assembly of the rotor.	» The large lifting crane will lift the tower sections into place. » The nacelle, which contains the gearbox, generator and yawing mechanism, will then be placed onto the top of the assembled tower. » The rotor (i.e. the blades of the turbine) will then be assembled or partially assembled on the ground. It will then be lifted to the nacelle and bolted in place. » It will take approximately 2 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.
Construct substations and ancillary infrastructure.	» Substations » Other substation components » Security fencing around high-voltage (HV) Yard » Workshop	» A temporary construction area is needed for containers, toilets and equipment. » Permanent operational buildings are as follows: o Operations and maintenance facility, including storage building » Will require the clearing of vegetation and levelling of the development site and the excavation of foundations prior to construction.

Main Activity/Project Component	Components of Activity	Details
		» A lay down area for building materials and equipment associated with these buildings will also be required. » The 132kV on site substations will be constructed with a high-voltage (HV) yard footprint of up to 80m x 90m. » The substations would be constructed in the following simplified sequence: * Step 1: Survey of the site * Step 2: Site clearing and levelling and construction of access road to substation site * Step 3: Construction of terrace and foundations * Step 4: Assembly, erection and installation of equipment (including transformers) * Step 5: Connection of conductors to equipment * Step 6: Rehabilitation of any disturbed areas and protection of erosion sensitive areas.
Connection of wind turbines to the on-site substations (up to13)	» Wind Turbines » 33 kV underground electrical cabling connecting each turbine to the substations	» 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.
Connect substations to power grid	» One 132 kV power line connecting the substations to the Dassenburg substation at Atlantis.	» The power line route will be assessed, surveyed and pegged prior to construction. » A servitude of approximately 32 m will be required for the 132kV power line.
Commissioning of the facility	» Wind energy facility commissioning	» 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. » 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.

Main Activity / Project Component	Components of Activity	Details
Undertake site remediation	» Remove all construction equipment from the site » Rehabilitation of temporarily disturbed areas where practical and reasonable	» On full commissioning of the facility (or a phase thereof), any access points to the site which are not required during the operation phase will be closed and prepared for rehabilitation.
Operation		
Operation	» Operation of turbines within the wind energy facility	» Once operational, the wind energy facility will be monitored remotely. It is estimated that the operational phase of the complete project (i.e. all three phases) will provide employment for approximately 35 administrative, management, monitoring and maintenance staff members, who will be responsible for monitoring and maintenance when required. » No permanent staff will be required on site for any extended period of time. It is anticipated that there will be full time security, maintenance and control room staff required on site. » Each turbine in the facility will be operational, except under circumstances of mechanical breakdown, extreme weather conditions or maintenance activities.
Maintenance	» Oil and grease – turbines » Transformer oil – substations » Waste product disposal	» 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. » The turbine infrastructure is expected to have a lifespan of approximately 20-30 years, with maintenance.
Decommissioning		
Site preparation	» Confirming the integrity of the access to the site to accommodate required equipment and lifting cranes. » Preparation of the site (e.g. lay down areas, construction platform)	» 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

Main Activity/Project Component	Components of Activity	Details
	» Mobilisation of construction equipment	technology/infrastructure available at that time.
Disassemble and replace existing turbines	» A large crane will be used to disassemble the turbine and tower sections.	» Turbine components would be reused, recycled or disposed of in accordance with regulatory requirements. » The hours of operation for noisy construction activities are guided 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.

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 Moyeng Energy to achieve environmental compliance. For each of the phases of implementation 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 programme 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 programme 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

Project component/s	List of project components affecting the objective, i.e.: » wind energy turbines » access roads » substations » power lines
Potential Impact	Brief description of potential environmental impact if objective is not met
Activity/risk source	Description of activities which could impact on achieving objective
Mitigation: Target/Objective	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

Performance Indicator	Description of key indicator(s) that track progress/indicate the effectiveness of the management plan.
Monitoring	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 and/or layout of the facility).
» Modification to or addition to environmental objectives and targets.
» 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:

	Name	**Company**
EMP Compilers:	Ravisha Ajodhapersadh	Savannah Environmental
	Jo-Anne Thomas	Savannah Environmental
Specialists:	David Hoare - ecologist	David Hoare Consulting cc
	Tim Hart & Jason Orton- archaeology and heritage	Archaeology Contracts Office (ACO) Department of Archaeology: University of Cape Town
	John Pether - Palaeontologist	Private consultant
	Andrew Jenkins - ornithologist	AVISENSE
	Iain Paton - soils and erosion potential	Outeniqua Geotechnical Services cc
	Lourens du Plessis - visual	MetroGIS
	Morne de Jager – noise	MENCO (M2 Environmental Connections cc)
	Tony Barbour - social	Tony Barbour Consultants

The Savannah Environmental team have extensive knowledge and experience in environmental impact assessment and environmental management, having been involved in EIA processes over the past ten (10) years. They have managed and drafted Environmental Management Plans for other power generation projects throughout South Africa, including numerous wind energy facilities.

MANAGEMENT PLAN FOR WIND ENERGY FACILITY: PLANNING & DESIGN — CHAPTER 4

4.1. Goal for Planning and Design

Overall Goal for Planning and Design: Undertake the planning and design phase of the wind energy facility in a way that:

» Ensures that the design of the facility responds to the identified environmental constraints and opportunities.
» Ensures that adequate regard has been taken of any landowner concerns and that these are appropriately addressed through design and planning (where appropriate).
» Ensures that the best environmental options are selected for the project, including the power line alignment and substation site.
» Enables the wind energy facility construction activities to be undertaken without significant disruption to other land uses in the area.

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

4.2. Objectives

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

From the specialist investigations undertaken for the proposed wind energy facility development site, no absolute *'no go'* areas were identified. However, a number of potentially sensitive areas were identified to be associated with the proposed project. These areas are illustrated in Figure 2.3.

Project component/s	Project components affecting the objective: » wind turbines » access roads » substations » power line
Potential Impact	» Design fails to respond optimally to the environmental consideration
Activities/risk sources	» Positioning of turbines and access roads » Positioning of substations » Alignment of power line

Mitigation: Target / Objective	» To ensure that the design of the facility responds to the identified environmental constraints and opportunities

Mitigation: Action / control	**Responsibility**	**Timeframe**
In order to minimise impacts associated with the construction and operation of the wind energy facility and associated infrastructure, the following surveys are required to be undertaken during the final design phase of the facility: » Ecological survey. The most sensitive landscape features for planning purposes in the study area will be the presence of natural vegetation (renosterveld), wetlands and drainage lines. These features and an associated 30 m buffer should be excluded from any development footprint wherever possible. » Avifaunal survey. Additional observations to confirm if high-lying areas should be excluded from the development footprint. Turbines of concern noted at this stage include turbines 20, 23, 28-29, 32, 39, 48-51, 55, 59-62, 69-71, 74, 75 and 80. The final input on turbine exclusion areas (if any) for the sites would be determined by pre-construction monitoring. Moyeng Energy to implement a long-term bird monitoring programme, particularly in identified sensitive areas. » Heritage survey. A walk-through survey of the wind energy facility site during the final design phase in order to determine the need for realignment of the infrastructure (if possible) to avoid impacts, or the need to implement mitigation measures.	Specialists	Design stage
Consider design level mitigation measures recommended by the specialists, especially with respect to visual aesthetics, noise, flora, aquatic ecology (i.e. wetlands and watercourses), avifauna, and heritage, as detailed within the EIA report and relevant appendices. These recommendations are to be supplemented by information collected during the pre-construction surveys.	Engineering Design Consultant / turbine supplier Moyeng Energy	Tender Design & Design Review Stage
Access roads to be carefully planned to minimise the impacted area and prevent unnecessary over compaction of soil.	Moyeng Energy	Design phase
No turbines in areas surveyed to be of high environmental sensitivity areas during the pre-	Moyeng Energy & avifauna specialist	Design phase

Mitigation: Action/control	Responsibility	Timeframe
construction survey.		
The noise emission specifications of wind turbine generators should be considered when selecting the equipment.	Moyeng Energy	Design phase
Noise modelling should play a role in the design of the layout of the facility. If turbines occur within 1000m from noise sensitive receptors (which is not the case in the revised layout Alternative 2), noise modelling would need to be redone to determine if the impact is acceptable or not.	Moyeng Energy	Design phase
Turbine shifting may be necessary to relocate turbines which are proposed to be positioned close to noise sensitive receptors.	Engineering Design Consultant Moyeng Energy	Design phase
A monitoring programme should be implemented to document the effect of the wind turbines on birds and bats. This should take place before construction (to provide a benchmark), during construction and during operation.	Moyeng Energy in consultation with specialist	Pre-construction, Construction and Operation
A detailed geotechnical investigation is required for the design phase.	Moyeng Energy	Design phase
Compile a comprehensive stormwater management plan for hard surfaces (e.g. substation footprints) as part of the final design of the project.	Moyeng Energy	Design phase
Balance technical and financial considerations against environmental constraints and opportunities in finalising the design of key elements.	Moyeng Energy	Tender Design & Design Review Stage

Performance Indicator	» Design meets objectives and does not degrade the environment » Design and layouts etc respond to the mitigation measures and recommendations in the EIA report.
Monitoring	» Ensure that the design implemented meets the objectives and mitigation measures in the EIA report through review of the design by the Project Manager, SHE representative and Environmental Control Officer (ECO) prior to the commencement of construction.

OBJECTIVE: To ensure selection of best environmental option for alignment/design of the power lines and associated access roads

One 132 kV power lines is proposed to connect the 2 substations at the wind energy facility to the electricity network/grid at Dassenburg substation in Atlantis, a distance of

approximately 43km. Only one alignment was assessed in the EIA process. In terms of this alignment, the following is recommended:

» From a social perspective, the initial ~2 km section of the proposed power line alignment is an area of concern. This short linking section between the Rheboksfontein wind energy facility and the existing transmission line corridor traverses high potential land on Bonteberg and Alexanderfontein Farms. Vineyard and olive groves are established in the relevant area. Impacts would include loss of high potential land to pylon footprints, and more significantly, restricted movement of farming implements. It is recommended that the possibility of siting the alignment along the Alexanderfontein-Doornfontein boundary should be investigated as an alternative for this segment. However, care should be taken to site the alignment towards the east of the relevant ridgeline in order to avoid visual impacts on Doornfontein.
» The proposed power line traverses numerous areas of High ecological sensitivity as defined in the vegetation study), and these are estimated to cover at least 26km of the proposed route. It is recommended that the proposed power line that traverses 26 km of sensitive vegetation is moved east by about 300 m.

Project component/s	» Power line » Access roads
Potential Impact	» Route that degrades environment unnecessarily, particularly with respect to visual aesthetics, loss of indigenous flora, erosion, and impacts on local communities/residents
Activities/risk sources	» Alignment of power line within corridor » Construction of access roads
Mitigation: Target/Objective	» To ensure selection of best environmental option for alignment for the power line

Mitigation: Action/control	Responsibility	Timeframe
In order to minimise impacts associated with the power line, the following surveys are required to be undertaken during the final design phase of the facility: » Ecological survey. A walk-through survey of the final power line routes is required once tower positions have been finalised in order to minimise any impacts as far as possible. » Avifaunal survey. A walk-through survey of the final power line routes is required once tower positions have been finalised in order to minimise any impacts as far as possible and to identify areas where bird diverters are required to be installed. » Heritage survey. A walk-through survey of the power line routes and substation site during the final	Specialists	Design phase

Mitigation: Action/control	Responsibility	Timeframe
design phase in order to determine the need for realignment of the infrastructure (if possible) to avoid impacts, or the need to implement mitigation.		
Select an alignment that curtail environmental impacts and enhances environmental benefits.	Moyeng Energy	Design phase
Consider design level mitigation measures recommended by the specialists, especially with respect to visual aesthetics, noise, flora, ecology (i.e. wetlands and pans), avifauna, and heritage, as detailed within the EIA report and relevant appendices.	Moyeng Energy	Design phase
Plan new access roads according to contour lines to minimise cutting and filling operations.	Moyeng Energy	Design phase
Use bird-friendly power line tower and conductor designs.	Moyeng Energy	Design phase
The most sensitive landscape features for planning purposes in the study area will be the presence of dams, wetlands and drainage lines. These features and an associated 30 m buffer should be excluded from any development footprint wherever possible.	Moyeng Energy	Design phase
Route new lines as close as possible to existing lines.	Moyeng Energy	Design phase

Performance Indicator	» Power line alignments meet environmental objectives. » Selected power line alignments and substation site minimises any negative environmental impacts and maximises any benefits.
Monitoring	» Ensure that the design implemented meets the objectives and mitigation measures in the EIA report through review of the design by the Project Manager, SHE representative and the ECO prior to the commencement of construction.

MANAGEMENT PLAN FOR WIND ENERGY FACILITY: CONSTRUCTION CHAPTER 5

5.1. Overall Goal for Construction

Overall Goal for Construction: Undertake the construction phase of the wind energy facility in a way that:

» Ensures that construction activities are properly managed in respect of environmental aspects and impacts.
» Enables the wind energy facility construction activities to be undertaken without significant disruption to other land uses in the area, in particular with regards to noise impacts, farming practices, traffic and road use, and effects on local residents, tourism industry and settlements.
» Minimises the impact on the vegetation and habitats value of the site and where possible adds to the botanical record of this area.
» Minimises the impact on the archaeological and historical value of the site and where possible adds to the archaeological record of this area.
» Minimises impacts on birds and other fauna using the site.
» Establishes an environmental baseline during construction activities on the site, where possible, particularly with regard to priority bird species using the site.

5.2. Objectives

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

OBJECTIVE: Environmentally sensitive location of construction equipment camps on site

It is expected that all construction workers will be accommodated within the existing accommodation within the study area as far as possible. No construction workers will be accommodated on site. In addition, construction equipment may need to be stored at an appropriate location on the wind energy facility site, along the power line routes and at the substation site for the duration of the construction period.

Project component/s	Project components affecting the objective: » Wind turbines » substations

	» power line » access roads
Potential Impact	» Damage to protected / endangered vegetation » Damage to and/or loss of topsoil » Compacting of ground » Impacts on the surrounding environment due to inadequate sanitation and waste removal facilities
Activities/risk sources	» Bush clearing and levelling of equipment storage area/s » Access to and from the equipment storage area/s
Mitigation: Target/Objective	» To minimise impacts on the social and biophysical environment. » To limit equipment storage to within the demarcated site

Mitigation: Action/control	**Responsibility**	**Timeframe**
Before construction commences, representatives from the local authority and community-based organisations (e.g. residents associations), as well as neighbouring residents should be informed of the details of the construction company, size of the workforce and construction schedules	Moyeng Energy	Pre-construction
The exact siting of the construction equipment camp shall be negotiated with the relevant landowner, and must take cognisance of any sensitive areas identified by the EIA studies. The location of this construction equipment camp shall be approved by the project Environmental Control Officer (ECO)	Contractor	Pre-construction
Minimise vegetation clearing and levelling for equipment storage areas.	Contractor	Erection: during site establishment Maintenance: for duration of Contract
Rehabilitate all disturbed areas at the construction equipment camp as soon as construction is complete within an area.	Contractor	Duration of Contract

Performance Indicator	» No visible erosion scars once construction in an area is completed. » No claims regarding damage leading to litigation due to unauthorised removal of vegetation. » All damaged areas successfully rehabilitated one year after completion » No damage to natural vegetation patches, wetlands or watercourses. » Appropriate waste management.
Monitoring	» Regular audits of the construction camps and areas of construction on site. » An incident reporting system should be used to record non-conformances to the EMP.

OBJECTIVE: Site Establishment and Securing The Site

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, Afrikaans and any other relevant local languages, all to the approval of the project manager.

Project component/s	Project components affecting the objective: » wind turbines » access roads » substations » power line
Potential Impact	» Hazards to landowners and public » Security of materials » Substantially increased damage to adjacent sensitive vegetation.
Activities/risk sources	» Open excavations (foundations and cable trenches) » Movement of construction vehicles in the area and on-site
Mitigation: Target/Objective	» To secure the site against unauthorised entry » To protect members of the public/landowners/residents

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

Mitigation: Action/control	Responsibility	Timeframe
All development footprints for roads, buildings, underground cables, laydown areas and turbine footings should be appropriately fenced and clearly indicated with flags and/or danger tape strips. There is to be no disturbance outside these demarcated areas.	Contractor	Erection: during site establishment Maintenance: for duration of Contract
Establish the necessary ablution facilities with chemical toilets. Provide adequate sanitary facilities and ablutions for construction workers (1 toilet per every 15 workers) at appropriate locations on site.	Contractor	Erection: during site establishment Maintenance: for duration of Contract
Ablution or sanitary facilities should not be located within 100 m from a 1:100 year flood line including water courses, wetlands or within a horizontal distance of less than 100 m, whichever is applicable	Contractor	During site establishment, construction and maintenance
Supply adequate waste collection bins at site where construction is being undertaken.	Contractor	Erection: during site establishment Maintenance: for duration of Contract within a particular area
Dispose of all solid waste collected at an appropriately registered waste disposal site. The disposal of waste shall be in accordance with all relevant legislation. Under no circumstances may waste be burnt on site.	Contractor	Erection: during site establishment Maintenance: for duration of Contract within a particular area

Performance Indicator	» Site is secure and there is no unauthorised entry » No members of the public/ landowners injured
Monitoring	» An incident reporting system will be used to record non-conformances to the EMP » ECO to monitor all construction areas on a continuous basis until all construction is completed; immediate report backs to site manager.

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

It is expected that the project will create approximately 120 direct construction employment opportunities for the relevant 36 month period. Contractors typically make use of their own skilled and semi-skilled staff. Direct employment opportunities to members of local communities are therefore likely to be limited to low skilled opportunities.

Project component/s	Construction and establishment activities associated with the establishment of the wind energy facility, including infrastructure etc.
Potential Impact	The opportunities and benefits associated with the creation of local employment and business should be maximised.
Activities/risk sources	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.
Mitigation: Target/Objective	Moyeng Energy, in discussions with the LM, should aim to employ a minimum of 80% of the low-skilled workers from the local area. This should also be made a requirement for all contractors. Moyeng Energy should also develop a database of local BEE service providers

Mitigation: Action/control	Responsibility	Timeframe
A minimum of 80% of the low-skilled workers are sourced from the local area as far as possible.	Moyeng Energy and contractors	Before construction phase commences.
Where required, implement appropriate training and skills development programmes prior to the initiation of the construction phase to ensure that 80% target is met.	Moyeng Energy	Prior to the initiation of the construction phase.
Skills audit to be undertaken to determine training and skills development requirements	Moyeng Energy	Undertaken within 1 month of commencement of construction phase commencing.
Develop a database of local BEE service providers and ensure that they are informed of tenders and job opportunities;	Moyeng Energy	Before construction phase commences.
Identify potential opportunities for local businesses	Moyeng Energy	Tender Design and Review stage

Performance Indicator	» Employment and business policy document that sets out local employment and targets completed before construction phase commences; » 80% of semi and unskilled labour locally sourced. » Database of potential local BEE services providers in place before construction phase commences. » Skills audit to determine need for training and skills development programme undertaken within 1 month of commencement of construction phase.
Monitoring	» Moyeng Energy and or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

OBJECTIVE: Avoid and/ minimise the potential impacts on family structures and social networks associated with presence of construction workers from outside the area

The presence of construction workers poses a potential risk to family structures and social networks. 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 local communities. The most significant negative impact is associated with the disruption of existing family structures and social networks. This risk is linked to potentially risky 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
» An increase in sexually transmitted diseases (STDs)

Project component/s	Construction and establishment activities associated with the establishment of the wind energy facility, including infrastructure etc.
Potential Impact	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.
Activities/risk sources	The presence of construction workers can impact negatively on family structures and social networks, especially in small, rural communities.
Mitigation: Target/Objective	To avoid and or minimise the potential impact of construction workers on the local community. This can be achieved by maximising the number of locals employed during the construction phase and minimising the number of workers housed on the site.

Mitigation: Action/control	Responsibility	Timeframe
Tender documents for contractors include conditions set out in SIA, including transport of workers home over weekends, transportation of workers home on completion of construction phase, establishment of MF etc.	Moyeng Energy	Tender stage Pre-construction
Identify local contractors who are qualified to undertake the required work	Moyeng Energy	Tender stage Pre-construction
Ensure that a minimum of 80% of the low-skilled workers are sourced from the local area. This should be included in the tender documents. Construction workers should be able to provide proof of having lived in the area for five years or longer.	Moyeng Energy and contractors	Pre-construction
Establish a Monitoring Forum (MF) consisting of representatives from the local community, local police, local farming community and the contractor prior to the commencement of the construction phase	Moyeng Energy	Prior to commencement of construction
Develop a Code of Conduct to cover the activities of the construction workers housed on the site. Ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct. Construction workers should 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.	Moyeng Energy / contractors	Prior to commencement of construction
Ensure that construction workers who are found guilty of breaching the Code of Conduct are dismissed. All dismissals must be in accordance with South African labour legislation.	Contractors	Construction phase
On completion of the construction phase all construction workers must be transported back to their place of origin within two days of their contract ending. The costs of transportation must be borne by the contractor.	Contractor	Conclusion of construction

Performance Indicator	» Employment policy and tender documents that sets out local employment and targets completed before construction phase commences » 80% of semi and unskilled labour locally sourced » Construction workers employed have proof that they have lived in the area for five years or longer » Tender documents for contractors include recommendations for construction camp » Monitoring Forum set up prior to implementation of construction

	phase » Code of Conduct drafted before commencement of construction phase » Briefing session with construction workers held at outset of construction phase;
Monitoring	» Independent monitoring and indicators listed above to ensure that they have been met for the construction phase.

OBJECTIVE: To avoid and or minimise the potential impact of the activities during the construction on the safety of local communities and the potential loss of stock and damage to farm infrastructure

Project component/s	Construction and establishment activities associated with the establishment of the wind energy facility, including infrastructure etc.
Potential Impact	Impact on safety of farmers and communities (increased crime etc) and potential loss of livestock due to stock theft by construction workers and also damage to farm infrastructure, such as gates and fences.
Activities/risk sources	The presence of construction workers on the site can pose a potential safety risk to local farmers and communities and may also result in stock thefts. The activities of construction workers may also result in damage to farm infrastructure.
Mitigation: Target/Objective	To avoid and or minimise the potential impact on local communities and their livelihoods.

Mitigation: Action/control	Responsibility	Timeframe
The housing of construction workers on the site should be limited to security personnel	Moyeng Energy and contractor	Duration of construction
Compensate farmers / community members at full market related replacement cost for any losses, such as livestock, damage to infrastructure etc.	Contractors	Duration of construction

Performance Indicator	» Community Monitoring Forum in place before construction phase commences. » Code of Conduct developed and approved prior to commencement of construction phase. » All construction workers made aware of Code of Conduct within first week of being employed. » Compensation claims settled within 1 month of claim being verified by Community Monitoring Forum.
Monitoring	» Moyeng Energy and/or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

OBJECTIVE: To avoid and or minimise the potential impact on current and future farming activities during the construction phase

Project component/s	Construction phase activities associated with the establishment of the wind energy facility and associated infrastructure.
Potential Impact	The footprint of the wind energy facility and associated infrastructure will result in a loss of land that will impact on farming activities on the site.
Activities/risk sources	The footprint taken up by the wind energy facility and associated infrastructure.
Mitigation: Target/Objective	To minimise the loss of land taken up by the wind energy facility and associated infrastructure and to enable farming activities to continue where possible, specifically grazing.

Mitigation: Action/control	Responsibility	Timeframe
Minimise the footprint of the wind energy facility and the associated infrastructure.	Moyeng Energy and contractor	Duration of construction
Allow farmers in the area to continue to use the site for grazing.	Moyeng Energy	Duration of construction
Compile and implement a rehabilitation plan to ensure rehabilitation of disturbed areas on completion of the construction phase.	Moyeng Energy and specialist	Construction and post-construction

Performance Indicator	» No complaints regarding impacts on farming activities
Monitoring	» ECO to monitor indicators listed above to ensure that they have been met for the construction phase.

OBJECTIVE: Noise control

Projected noise levels during construction of the Wind Energy Facility were modelled using the methodology as proposed by SANS 10357:2004. The resulting future noise projections indicated that the construction activities as modelled for the worst case scenario would not comply with both the Noise Control Regulations (GN R154) as well as the SANS 10103:2004 guidelines (projected noise levels higher than the acceptable night rating level).

Various other construction activities would be taking place during the development of the facility and there exists a risk that some of these activities could have a noise impact on surrounding residents. The significance of this noise impact was defined to be of a medium significance. However, mitigation measures were proposed that would reduce the significance to a more acceptable low level.

Project component/s	Construction of infrastructure, including but not limited to: turbine system (foundation, tower, nacelle and rotor), substation(s), access roads and electrical power cabling.
Potential Impact	» Increased noise levels at potentially sensitive receptors » Potentially changing the acceptable land use capability
Activity/risk source	» Any construction activities taking place within 500 meters from potentially sensitive receptors (PSR)
Mitigation: Target/Objective	» Ensure equivalent A-weighted noise levels below 45 dBA at potentially sensitive receptors. » Ensure that maximum noise levels at potentially sensitive receptors be less than 65 dBA. » Ensure acceptable noise levels at surrounding stakeholders and potentially sensitive receptors. » Ensuring compliance with the Noise Control Regulations

Mitigation: Action/control	Responsibility	Timeframe
Establish a line of communication and notify all stakeholders and potentially 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 1000m) of the potentially sensitive receptors is to start. The following information to be presented in writing: » Description of Activity to take place » Estimated duration of activity	Community Liaison Officer	Duration of construction At least 2 days, but not more than 5 days before activity is to commences

Mitigation: Action/control	Responsibility	Timeframe
» Working hours » Contact details of responsible party		
Ensure that all equipment are maintained and fitted with the required noise abatement equipment.	Environmental Control Officer	Weekly inspection
Where possible construction work should be undertaken during normal working hours (06H00 – 18H00), from Monday to Saturday. If agreements can be reached (in writing) with the surrounding (within a 500m distance) potentially sensitive receptors, these working hours can be extended.	Contractor	As required

Performance Indicator	» Equivalent A-weighted noise levels below 45 dBA at potentially sensitive receptors (8 hours). » Ensure that maximum noise levels at potentially sensitive receptors are less than 65 dBA. » No noise complaints are registered
Monitoring	» Keep a record of community complaints using a complaints register to determine if mitigation is needed.

OBJECTIVE: Management of dust and emissions to air

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 main and internal access roads.

Project component/s	Construction and establishment activities associated with the establishment of the wind energy facility and associated infrastructure
Potential Impact	» Dust and particulates from vehicle movement to and on-site, foundation excavation, road construction activities, road maintenance activities, temporary stockpiles, and vegetation clearing affecting the surrounding residents and visibility » Release of minor amounts of air pollutants (for example NO_2, CO and SO_2) from vehicles and construction equipment
Activities/risk sources	» Clearing of vegetation and topsoil » Excavation, grading, scraping » Transport of materials, equipment and components on internal access roads » Re-entrainment of deposited dust by vehicle movements » Wind erosion from topsoil and spoil stockpiles and unsealed roads and surfaces » Fuel burning vehicle engines

Mitigation: Target/Objective	» To ensure emissions from all vehicles are minimised, where possible, for the duration of the construction phase » To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements for the duration of the construction phase

Mitigation: Action/control	Responsibility	Timeframe
Roads must be maintained to a manner that will ensure that dust from road or vehicle sources is not visibly excessive. Ensure that damage to roads is repaired before completion of construction phase.	Contractor	Site establishment; Duration of construction
Appropriate dust suppressant must be applied on all exposed areas and stockpiles as required to minimise/control airborne dust.	Contractor	Duration of contract
Haul vehicles moving outside the construction site carrying material that can be wind-blown must be covered with tarpaulins.	Contractor	Duration of contract
Speed of construction vehicles must be restricted, as defined by the SHE Representative and/or ECO.	Contractor	Duration of contract
Dust-generating activities or earthworks may need to be rescheduled or the frequency of application of dust control/suppressant increased during periods of high winds if visible dust is blowing toward nearby residences.	Contractor	Duration of contract
Strictly control vibration pollution from compaction plant or excavation plant.	Contractor	Duration of contract
Disturbed areas must be re-vegetated as soon as practicable.	Contractor	At completion of the construction phase
Construction vehicles and equipment must be maintained in a road-worthy condition at all times.	Contractor	Duration of contract
If monitoring results or complaints indicate inadequate performance against the criteria indicated, then the source of the problem must be identified, and existing procedures or equipment modified to ensure the problem is rectified.	Contractor	Duration of contract

Performance Indicator	» No complaints from affected residents or community regarding dust or vehicle emissions » Dust suppression measures for roads are used. » Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed. » Road worthy certificates in place for all heavy vehicles at outset of construction phase and up-dated on a monthly basis.
Monitoring	Monitoring must be undertaken to ensure emissions are not exceeding the

	prescribed levels via the following methods: » Visual daily inspections of dust generation by construction activities throughout the construction phase. If considered necessary by the ECO Representative, dust gauges to be used. » Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Project Manager and ECO. » A complaints register must be maintained, in which any complaints from residents/the community will be logged. Complaints will be investigated and, where appropriate, acted upon. » An incident reporting system must be used to record non-conformances to the EMP.

OBJECTIVE: Minimisation of development footprint and protection of vegetation, fauna, habitats and soil

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. Impacts on fauna during construction are expected to be as a result of disturbance and habitat destruction. Although some areas of high ecological sensitivity have been identified on site, the development footprints will not impact on any ecological "no go" habitats or areas.

Project component/s	» wind turbines » access roads » substations » power line
Potential Impact	» Impacts on or loss of indigenous natural vegetation due to construction activities » Impacts on soil » Loss of topsoil
Activity/risk source	» Site preparation and earthworks » Construction-related traffic » Foundations or plant equipment installation » Mobile construction equipment » Power line construction activities » Dumping or damage by construction equipment outside of demarcated construction areas.
Mitigation: Target/Objective	» To retain natural vegetation in the highly sensitive areas the site » To minimise footprints of disturbance of vegetation/habitats on-site » To minimise loss of indigenous vegetation » No alien plants within project control area » No loss of species of conservation concern

Mitigation: Action/control	Responsibility	Timeframe
Areas to be cleared must be clearly marked on-site to eliminate the potential for unnecessary clearing.	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 flora and fauna is restricted.	Contractor	Site establishment & duration of contract
Construction activities must be restricted to demarcated areas so that impact on flora and fauna is restricted.	Contractor	Site establishment & duration of contract
Fencing of development footprints in sensitive areas is in order to minimise disturbance to adjacent sensitive areas and to make it clear to contractors where they should and should not go. Two strand wire fencing with droppers every 10m, around all development footprints in areas of natural vegetation; wire to be inter-threaded with danger tape, and signage saying "Sensitive Area – Keep Out" placed on fences every 50m.	Contractor	Site establishment & duration of contract
Search and Rescue of all translocatable indigenous plants from development footprints prior to any development, and maintenance of these in a nursery (on site) for use in rehabilitation in disturbed areas on completion of all construction. Genera that can be considered for rescue are all bulbs and tuberous species (*Haemanthus, Brunsvigia, Babiana, Trachyandra, Albuca, Veltheimia, Arctopus*, *etc*.), plus selected specimens of succulents such as *Ruschia* and *Lampranthus* species, and shrubs and restios such as *Phylica harveyi* and *Thamnochortus* species. Material to be bagged up or stored in suitable conditions in an on-site greenhouse (with irrigation where needed); to be replanted in areas requiring rehabilitation in May/June following cessation of all construction related disturbance in particular area.	Contractor	Site establishment & duration of contract
Undertake controlled fires in identified blocks of natural vegetation to reduce the risk of wildfires and to allow for vital ecological processes such as regeneration and flowering of fire dependant plant species.	Contractor	Pre-construction
Unnecessary impacts on surrounding natural vegetation must be avoided, e.g. driving around in the veld, use access roads only	Contractor	Site establishment & duration of contract
Roads must be aligned away from steep slopes and	Contractor	Design;

Mitigation: Action/control	Responsibility	Timeframe
drainage lines as much as possible.		Duration of construction
Avoid creating conditions in which alien plants may become established: » Keep disturbance of indigenous vegetation to a minimum » Rehabilitate disturbed areas as quickly as possible » Do not import soil from areas with alien plants	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)	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
Avoid the unnecessary removal of vegetation for the distribution power line servitudes and limit access to the servitudes (during both construction and operational phases) along existing access roads as far as possible.	Contractor	Duration of contract
A site rehabilitation programme must be developed and implemented.	Contractor in consultation with Specialist	Duration of contract

Performance Indicator	» Zero disturbance outside of designated work areas » Minimised clearing of existing/natural vegetation » Loss of natural vegetation equivalent to the exact footprint of the proposed project » Number of plants and aerial cover of plants within project area and immediate surroundings
Monitoring	» Observation of vegetation clearing and soil management activities by ECO throughout construction phase » Before construction, determine required number of hectares to accommodate footprint of proposed infrastructure. » Supervision of all clearing and earthworks by ECO » An incident reporting system will be used to record non-conformances to the EMP.

OBJECTIVE: Limit Damage to Watercourses

A number of watercourses have been identified on the site. These areas provide habitat to many of the identified sensitive plant and animal species identified to be associated with the site. Therefore, avoidance of these areas as far as possible is recommended.

Project component/s	» wind energy turbines » access roads » substation » power lines
Potential Impact	» 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.
Activity/risk source	» Construction & operation of facility
Mitigation: Target/Objective	» No damage to watercourse areas within project area

Mitigation: Action/control	**Responsibility**	**Timeframe**
Align underground cables and internal access roads as much as possible along existing infrastructure	Moyeng Energy Contractor	Design; Construction
For any new construction, cross watercourses perpendicularly to minimise disturbance footprints	Moyeng Energy Contractor	Design; Construction
Rehabilitate any disturbed areas as quickly as possible once construction is completed in an area	Contractor	Construction
Compile a stormwater management plan to control stormwater and runoff water for areas such as the workshop area.	Moyeng Energy, ECO	Construction
Water quality monitoring to take place on a regular basis where infrastructure is to be located close to watercourses.	Contractor ECO	Construction
Obtain a permit from DWA to impact on any wetland or water resource.	Moyeng Energy	Pre-construction

Performance Indicator	» No impacts on water quality, water quantity, wetland vegetation, natural status of wetland
Monitoring	» Water quality monitoring to take place on a regular basis. This should include the water quality and quantity leaving the project area through the watercourses (should be monitored within main drainage systems that exit site). » Habitat loss in watercourses should be monitored before and after construction. » The environmental manager should be responsible for driving this process. » Reporting frequency depends on legal compliance framework.

OBJECTIVE: Control runoff and soil erosion

The soil resource on the site needs to be conserved as far as possible to minimise the cumulative impact on the local environment. Erosion and soil loss will be associated with both wind and water. Impacts of wind-blown erosion will increase with increased disturbance to the vegetation cover. Intense rainfall periods will also result in significant soil loss. The provision of erosion/sediment control measures and water quality management is paramount.

A set of strictly adhered to mitigation measures are required 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.

Project component/s	» wind turbines » access roads » substations » power line » Sealed surfaces (e.g. roofs, concrete surfaces, compacted road surfaces, paved roads / areas). » All other infrastructure
Potential Impact	» Increased soil erosion, silt loads or sedimentation that may cause damage to sensitive habitats » Erosion and soil loss associated with both wind and water » Negative impacts on wetlands » Disturbance to or loss of wetland/pan habitat » Sedimentation of watercourses/wetland areas » Increased runoff » A loss of indigenous vegetation cover.
Activities/risk sources	» Water and wind erosion of cleared and excavated areas » Stormwater run-off from sealed surfaces » Accidental spills of petrochemical products (e.g. transformer oils associated with the operation of the substations and wind turbines) or cement on-site, or during transport of these products to the site » Site preparation and earthworks » Foundations or plant equipment installation » Mobile construction equipment movement on site » Power line construction activities » River/stream/drainage line road crossings. » Roadside drainage ditches. » Project related infrastructure, such as buildings, turbines and fences.
Mitigation: Target/Objective	» To minimise degradation of rock and soil by construction activity » To conserve topsoil by stockpiling and re-using in disturbance areas

	» To minimise erosion of soil from site during construction » To minimise deposition of soil into drainage lines

Mitigation: Action / control	Responsibility	Timeframe
Identify disturbance areas and restrict construction activity to these areas	Contractor	Pre-construction and Construction
Access roads to be carefully planned and constructed to minimise the impacted area and prevent unnecessary excavation, placement and compaction of soil.	Contractor	Pre-construction and Construction
Compile a comprehensive stormwater management plan as part of the final design of the project. Ensure that water velocity from precipitation and runoff must be reduced and diffused before water is returned to natural systems	Moyeng Specialist	Pre-construction
Erosion features must be immediately stabilised with erosion control measures, if they develop	Contractor	Construction
Where access roads cross natural drainage lines, culverts must be designed to allow free flow. Regular maintenance must be carried out	Moyeng Contractor	Design Pre-construction and Construction
Stockpile topsoil for re-use in rehabilitation phase. Maintain stockpile shape and protect from erosion. All stockpiles will be positioned away from drainage lines. Limit the height of stockpiles to reduce compaction.	Contractor	During site establishment and any activity related to earthworks as well as the duration of construction
Rehabilitate any disturbed areas immediately after construction in that area is complete in order to stabilise landscapes	Contractor	Post-construction
Any stockpiles must be protected against wind erosion (e.g. surrounded by shadecloth fences or damped down on a regular basis).	Contractor	Duration of contract
Use silt traps / bunds to trap sediment wherever possible and revegetate affected areas as soon as is practical.	Contractor	Erection: Before construction Maintenance: Duration of contract
Vehicular traffic must be controlled during construction, confining access and roadways, where possible, to proposed or existing road alignments.	Contractor	Duration of contract
As far as possible, access to the wind energy facility construction site should be restricted to a single access point.	Contractor	Duration of contract
Internal access roads should be kept to a minimum.	Contractor	During site

Mitigation: Action/control	Responsibility	Timeframe
Use existing roads wherever possible.		establishment
Movement of vehicles on-site is to be on approved and formalised access roads only, which shall be adequately maintained throughout construction. Where temporary tracks are required (e.g. for use by crawler crane) these are to be ripped and rehabilitated as soon use of the track is no longer required.	Contractor	Duration of contract
Control depth of excavations and stability of cut faces/sidewalls	Engineer/ECO/ Contractor	Before construction and maintenance over duration of contract

Performance Indicator	» Acceptable level of soil erosion around site, as approved by ECO » Acceptable level of increased siltation in drainage lines, as approved by ECO » Acceptable level of soil degradation, as approved by ECO » Acceptable state of excavations, as approved by ECO » No activity in restricted areas
Monitoring	» On-going monitoring of area by environmental control officer during construction » Weekly inspections of the site » Fortnightly inspections of sediment control devices » Fortnightly inspections of surroundings, including drainage lines » Immediate reporting of ineffective sediment control systems » An incident reporting system will record non-conformances » Reporting frequency depends on legal compliance framework.

OBJECTIVE: Protection of Fossil Resources

The potential for fossil resources to occur on the site has been identified. Construction work is likely to expose, disturb, destroy or seal-in valuable fossil heritage. Although the direct impact will be local, these fossils are of importance to national as well as international research projects.

Project component/s	Construction of wind turbine emplacements, buried cables, access roads, transmission towers, substations
Potential Impact	Disturbance, destruction or sealing-in of scientifically valuable fossil material embedded within bedrock or weathered out at ground surface
Activity/risk source	Extensive bedrock excavations and surface disturbance (*e.g.* road construction)
Mitigation: Target/Objective	Recording, sampling and curation of important fossil heritage within development area, both before and during construction, to be achieved before completion of construction phase.

Mitigation: Action/control	Responsibility	Timeframe
Paleontological field survey of broader development area (i.e. all land parcels), leading to interim fossil heritage report	Professional palaeontologist	Pre-Construction
Short workshop to train ECOs in recognition, recording and safeguarding of relevant fossil heritage	Professional palaeontologist	Following paleontological field survey, before development commences
Recording and judicious sampling of representative as well as any exceptional fossil material from the development footprint	Professional palaeontologist assisted by ECOs	Before and during construction phase
Curation of fossil specimens at an approved repository (e.g. museum) & final technical report on paleontological heritage within study area.	Professional palaeontologist	Following mitigation

Performance Indicator	» No impacts on valuable fossil heritage. » Identification of palaeontological hotspots within broader development footprint. » Training of ECOs » Cumulative acquisition of geographically and stratigraphically well-localised fossil records and samples from successive subsections of the development area.

	» Submission of interim and final technical reports to HWC , SAHRA
Monitoring	» Monitoring of compliance by professional palaeontologist in collaboration with ECOs » Realistic frequency, scale and protocol of monitoring to be determined by professional palaeontologist in conjunction with Heritage Western Cape, SAHRA and developer » Assessment of interim and final reports by Heritage Western Cape & SAHRA

OBJECTIVE: Protection of sites of heritage value

The main cause of impacts to archaeological sites during construction activities 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.

Project component/s	» wind turbines » access roads » substations » power line
Potential Impact	» Heritage objects or artefacts found on site are inappropriately managed or destroyed
Activity/risk source	» Site preparation and earthworks » Foundations or plant equipment installation » Mobile construction equipment movement on site » Power line construction activities
Mitigation: Target/Objective	» To ensure that any heritage objects found on site are treated appropriately and in accordance with the relevant legislation

Mitigation: Action/control	Responsibility	Timeframe
Areas required to be cleared during construction must be clearly marked in the field to avoid unnecessary disturbance of adjacent areas (which will not be surveyed in detail by a heritage specialist).	Contractor in consultation with Specialist	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	Moyeng Energy /Contractor in consultation with Specialist	Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
processes.		
Apply for sampling permits from Heritage Western Cape for work on any archaeological sites identified as needing intervention – in other words any archaeological site that will be affected by the access road, crane track, laydown areas, turbine bases and cable trenches.	Moyeng Energy	Duration of contract

Performance Indicator	» Zero disturbance outside of designated work areas » All heritage items located are dealt with as per the legislative guidelines » A record is kept of all instances of accidental disturbance of heritage material, as well as post construction review of impacts on landscape context.
Monitoring	» Observation of excavation activities by ECO throughout construction phase » Supervision of all clearing and earthworks » A log of monitoring and observations be kept by the responsible archaeologist for submission to HWC for review by relevant committees. Compliance authority to check as per their discretion.

OBJECTIVE: Minimisation of visual impacts associated with construction

The construction phase of a wind energy facility and all associated infrastructure is approximated at approximately 3 years. This is dependent on a number of external factors that may not always be controlled by the developer. During this time 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.

Project component/s	» wind turbines » substations » power line » access roads
Potential Impact	» Temporary visual intrusion
Activity/risk source	» Transportation of wind energy facility, substation and power line components to the site » Construction activities on-site, along power line corridor and at substation site » The potential scarring of the landscape due to the creation of new

	access roads/tracks or the unnecessary removal of vegetation.
Mitigation: Target/Objective	» Minimise contrast with surrounding environment and visibility of the construction activities to people in the area

Mitigation: Action/control	Responsibility	Timeframe
Adopt responsible construction practices aimed at containing the construction activities to specifically demarcated areas thereby limiting the removal of natural vegetation to the minimum.	Contractor	Duration of contract
The activities and movement of construction workers and construction site vehicles will be restricted to the immediate construction site.	Contractor	Duration of contract
Limit access to the construction sites along existing access roads.	Contractor	Duration of contract
The general appearance of construction activities, construction equipment camps and lay-down areas will be maintained by means of the timely removal of rubble and disused construction materials.	Contractor	Duration of contract
Construction activities must be restricted to daylight hours (as far as possible) in order to negate or reduce the visual impacts associated with lighting. In the event that night-time construction activities are required to be undertaken, lighting will be placed in such a manner as to limit impacts on the surrounding areas.	Contractor	Duration of contract
Implement an environmentally responsive planning approach to roads and infrastructure to limit cut and fill requirements.	Moyeng Contractor	Pre-construction Construction
Rehabilitate all disturbed areas, including cut and fill slopes to acceptable visual standards.	Contractor	Post-construction

Performance Indicator	» No complaints regarding visual intrusion associated with construction activities
Monitoring	» Ensure that mitigation measures are implemented during construction to minimise visual impacts on surrounding communities » An incident reporting system will be used to record non-conformances to the EMP

OBJECTIVE: Traffic management and transportation of equipment and materials to site

The construction phase of the project will be the most significant in terms of generating traffic impacts; resulting from the transport of equipment (including turbine components) and materials and construction crews to the site and the return of the vehicles after delivery of materials. Potential impacts associated with transportation and access relate to works within the site boundary (i.e. the wind energy facility and ancillary infrastructure) and external works outside the site boundary.

Project component/s	» wind turbines » substations » power line
Potential Impact	» Traffic congestion » Risk of accidents » Deterioration of road pavement conditions (both surfaced and gravel road) due to abnormal loads
Activity/risk source	» Transportation of project components to the site.
Mitigation: Target/Objective	» To minimise impact of traffic associated with the construction of the facility on local traffic » To minimise potential for negative interaction between pedestrians or sensitive users and traffic associated with the facility construction

Mitigation: Action/control	Responsibility	Timeframe
All relevant permits for abnormal loads must be applied for from the relevant authority.	Contractor (or appointed transportation contractor)	Pre-construction
A designated access to the proposed site must be created to ensure safe entry and exit.	Contractor	Pre-construction
No deviation from approved access routes within the site must be allowed.	Contractor	Duration of contract
Appropriate road management strategies must be implemented on external and internal roads with all employees and contractors required to abide by standard road and safety procedures.	Contractor (or appointed transportation contractor)	Pre-construction
Times for arrival and departure of heavy vehicles must be co-ordinated to minimise congestion.	Contractor	Duration of contract
Any traffic delays as a result of construction traffic must be co-ordinated with the appropriate authorities.	Contractor	Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
Signage must be established at appropriate points warning of turning traffic and the construction site.	Contractor	Duration of contract
Appropriate maintenance of all vehicles must be ensured.	Contractor	Duration of contract
Keep hard road surfaces as narrow as possible.	Contractor	Duration of contract

Performance Indicator	» No traffic incidents involving Moyeng Energy personnel or appointed contractors » Appropriate signage in place » No complaints resulting from traffic congestion, delays or driver negligence associated with construction of the wind energy facility
Monitoring	» Visual monitoring of dust produced by traffic movement » Visual monitoring of traffic control measures to ensure they are effective » A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon » An incident reporting system will be used to record non-conformances to the EMP

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.

Project component/s	Storage and handling of chemicals, hazardous substances and waste
Potential Impact	» Release of contaminated water from contact with spilled chemicals » Generation of contaminated wastes from used chemical containers » Inefficient use of resources resulting in excessive waste generation » Litter or contamination of the site or water through poor waste management practices » Pollution of water and soil resources.
Activity/risk source	» Vehicles associated with site preparation and earthworks » Power line construction activities » Substation construction activities » Packaging and other construction wastes » Hydrocarbon use and storage » Spoil material from excavation, earthworks and site preparation

Mitigation: Target/Objective	» To ensure that the storage and handling of chemicals and hydrocarbons on-site does not cause pollution to the environment or harm to persons » To ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons » To comply with waste management guidelines development by the authorities. » To minimise production of waste » To ensure appropriate waste handling, storage and disposal » To avoid environmental harm from waste disposal

Mitigation: Action/control	Responsibility	Timeframe
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	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.	Contractor	Duration of contract
Spilled cement must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site.	Contractor	Duration of contract
Soil contaminated/ polluted as a result of a major spill must be removed from the site and disposed of at a licensed hazardous waste disposal facility. Soils contaminated/ polluted through minor spills can be treated on site provided they are contained and have not penetrated the soil surface.	Contractor	Duration of contract
Routine servicing and maintenance of vehicles must 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, an appropriate drip tray must be used to contain any fuel or oils.	Contractor	Duration of contract
All stored fuels to be maintained within a bund and on a sealed surface.	Contractor / ECO	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 substations must be	Contractor	Duration of

Mitigation: Action/control	Responsibility	Timeframe
removed from site by licensed contractors.		contract
The storage of flammable and combustible liquids such as oils will be in designated areas which are appropriately bunded, and stored in compliance with MSDS files.	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 compiled with.	Contractor	Duration of contract
Transport of all hazardous substances must be in accordance with the relevant legislation and regulations.	Contractor	Duration of contract
Construction contractors must provide specific detailed waste management plans to deal with all waste streams.	Contractor	Pre-construction
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.	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 regulated waste. Waste disposal records must be available for review at any time.	Contractor	Duration of contract
Upon the completion of construction, the area must be cleared of potentially polluting materials.	Contractor	Completion of construction

Performance Indicator	» No chemical spills outside of designated storage areas » No water or soil contamination by spills

	» No complaints received regarding waste on site or indiscriminate dumping » Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately » Provision of all appropriate waste manifests for all waste streams
Monitoring	» Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase » A complaints register must be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon » Observation and supervision of waste management practices throughout construction phase » Waste collection to be monitored on a regular basis » Waste documentation completed » A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon » An incident reporting system will be used to record non-conformances to the EMP

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.

Project component/s	» wind turbines » access roads » substations » power line
Potential Impact	» Pollution/contamination of the environment » Disturbance to the environment
Activity/risk source	» Contractors are not aware of the requirements of the EMP, leading to unnecessary impacts on the surrounding environment
Mitigation: Target/Objective	» To ensure appropriate management of actions by on-site personnel in order to minimise impacts to the surrounding environment

Mitigation: Action/control	Responsibility	Timeframe
The terms of this EMP and the Environmental Authorisation (once issued) will be included in all tender documentation and Contractors contracts and environmental awareness training to be done for staff.	Moyeng Energy and ECO	Tender process
An ECO must be permanently on site throughout the road construction, cable laying, and turbine foundation excavation periods, and at other times should visit the site at least once a week.	Moyeng Energy	Duration of construction
Contractors must use chemical toilets/ablution facilities situated at designated areas of the site; no abluting will be permitted outside the designated area. These facilities must be regularly serviced by appropriate contractors.	Contractor (and sub-contractor/s)	Duration of contract
Cooking/meals 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 must disturb flora or fauna outside of the demarcated construction area/s.	Contractor (and sub-contractor/s)	Duration of contract
Contractors appointed by Moyeng Energy must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.	Contractor (and sub-contractor/s)	Construction
Provide opportunities for workers to go home over weekends. The cost of transporting workers home over weekends and back to the site should be borne by the contractors.	Contractor (and sub-contractor/s)	Construction
On completion of the construction phase all construction workers must be transported back to their place of origin within two days of their contract ending. The costs of transportation must be borne by the contractor	Contractor (and sub-contractor/s)	Construction

Performance Indicator	» Compliance with specified conditions of Environmental Authorisation, EIA report and EMP » No complaints regarding contractor behaviour or habits » Code of Conduct drafted before commencement of construction phase.

	» Briefing session with construction workers held at outset of construction phase
Monitoring	» Observation and supervision of Contractor practices throughout construction phase. » A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon » An incident reporting system will be used to record non-conformances to the EMP

5.3. Institutional Arrangements: Roles and Responsibilities for the Construction Phase of the Wind Energy Facility

As the Proponent, Moyeng Energy must ensure that the implementation 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. Moyeng Energy will retain various key roles and responsibilities during the construction of the wind energy facility. These are outlined below.

OBJECTIVE: To establish clear reporting, communication and responsibilities in relation to environmental incident

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Project Manager; Site Manager; Safety, Health and Environment 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 Moyeng Energy 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** (Moyeng Energy's 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.
» Confine activities to the demarcated construction site.

The **Safety, Health and Environment Representative** (SHE officer) 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 document 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.
» Ensure that a removal is ordered of any person(s) and/or equipment responsible for any 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.

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

» Ensuring adherence to the environmental management specifications.
» 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).

5.4. Detailing Method Statements

OBJECTIVE: To ensure all construction activities/practices/procedures are undertaken with the appropriate level of environmental awareness to minimise environmental risk, in line with the specifications of the EMP.

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 by the ECO, 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.

5.5. 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.

» Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an Environmental Awareness Training course. The course must provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
» Basic training in the identification of archaeological sites/objects, paleontological sites, and protected flora and fauna that may be encountered on the site.
» Awareness of any other environmental matters, which are deemed to be necessary by the ECO.
» Ensuring that appropriate communication tools are used to outline the environmental "do's" and "don'ts" (as per the environmental awareness training course) to employees.
» Records must be kept of those that have completed the relevant training.
» Refresher sessions must be held to ensure the contractor staff are aware of their environmental obligations.

5.6. Monitoring Programme: Construction Phase of the Wind Energy Facility

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

A monitoring programme must be in place 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 monitoring will be stipulated by the Environmental Authorisation (once issued). Where this is not clearly dictated, Moyeng Energy 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 will ensure compliance with the EMP, and to conduct monitoring activities. The Environmental Control Officer must have the appropriate experience and qualifications to undertake the necessary tasks. The Environmental Control Officer will report any non-compliance or where corrective action is necessary to the Site Manager and/or any other monitoring body stipulated by the regulating authorities.

MANAGEMENT PLAN FOR WIND ENERGY FACILITY: REHABILITATION OF DISTURBED AREAS

CHAPTER 6

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

6.2. Objectives

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

OBJECTIVE: To ensure appropriate rehabilitation of disturbed areas following the execution of the works, such that residual environmental impacts are remediated or curtailed

Areas requiring rehabilitation will include all areas disturbed during the construction phase and that are not required for regular maintenance operations. Rehabilitation should be undertaken in an area as soon as possible after the completion of construction activities within that area.

The main areas requiring rehabilitation will be the laydown areas adjacent to the turbines, the crane tracks alongside the permanent 6 m wide roads, any cable routings where these fall outside the above-mentioned areas, and disturbed areas around the substation and maintenance building, and disturbed areas associated with the power line tower foundations, substation site and access roads.

Project component/s	» wind energy facility (including temporary access roads and laydown areas) » power line servitude and associated service road
Potential Impact	» Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention
Activity/risk source	» Temporary laydown areas » Temporary access roads/tracks » Other disturbed areas/footprints

Mitigation: Target/Objective	» To ensure and encourage site rehabilitation of disturbed areas » 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

Mitigation: Action/control	Responsibility	Timeframe
Compacted areas that are no longer needed after construction (e.g. parts of the laydown areas, and the crane tracks) may need to be ripped or scarified to break up the compacted surface (at the discretion of the horticultural / rehabilitation contractor). The areas should then be sown with seed mix collected on site. ECO should liaise with botanist and horticulturist after completion of main construction phase to identify main areas of compaction in need of ripping and discuss best methodology. Ripping may need to be done by tractor, followed by immediate mulching and sowing of previously stockpiled local mulch containing indigenous seed, and possibly hydroseeding with selected local seed.	ECO Botanist	Completion of construction in an area
Any plants from search and rescue prior to construction must be replanted in May.	Contractor	Following execution of the works
All temporary facilities, equipment and waste materials must be removed from site.	Contractor	Following execution of the works
All temporary fencing and danger tape must 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 of 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
Ongoing alien plant monitoring and removal must be undertaken on all areas of natural vegetation on an annual basis.	Moyeng Energy in consultation with rehabilitation specialist	Post-rehabilitation

Performance Indicator	» All portions of site, including construction equipment camp and working areas, cleared of equipment and temporary facilities » Topsoil replaced on all areas and stabilised » Disturbed areas rehabilitated and acceptable plant cover achieved on rehabilitated sites » Completed site free of erosion and alien invasive plants
Monitoring	» On-going inspection of rehabilitated areas in order to determine effectiveness of rehabilitation measures implemented » On-going alien plant monitoring and removal should be undertaken on an annual basis

MANAGEMENT PLAN FOR WIND ENERGY FACILITY: OPERATION CHAPTER 7

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.
» 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.
» Minimises impacts on birds and other fauna using the site.
» Monitors and evaluates the impacts of the wind energy facility on birds that frequent the area, in particular monitoring of bird strikes, bird nesting activities and water bird uses of the wetlands/ephemeral pans on the site.
» Monitors the actual noise impacts of the wind energy facility.
» Establishes an environmental baseline for wind energy facility sites in South Africa, particularly with regard to priority bird species 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: Protection of vegetation

Indirect impacts on vegetation during operation could result from maintenance activities and the movement of people and vehicles on site.

Project component/s	» Wind Energy Facility (including access roads) » power line and service road for power line servitude
Potential Impact	» Disturbance to or loss of vegetation and/or habitat
Activity/risk source	» Movement of employee vehicles within and around site

Mitigation: Target/Objective	» To maintain minimised footprints of disturbance of vegetation/habitats on-site » To ensure and encourage plant regrowth in areas of post-construction rehabilitation

Mitigation: Action/control	Responsibility	Timeframe
Vehicle movements must be restricted to designated roadways	Moyeng Energy	Operation
Bushcutting within servitude must be limited to cutting of taller vegetation as required to ensure optimal operation of the power line	Moyeng Energy	Operation
Existing roads must be maintained to ensure limited erosion and impact on areas adjacent to roadways.	Moyeng Energy	Operation
An on-going weed monitoring and eradication programme must be implemented, where necessary.	Moyeng Energy	Operation
An independent environmental manager must be appointed during operation whose duty it will be to minimise impacts on surrounding sensitive habitats	Moyeng Energy	Operation

Performance Indicator	» No further disturbance to vegetation » Continued improvement of rehabilitation efforts
Monitoring	» Observation of vegetation on-site by Site Manager and environmental manager » Regular inspections to monitor plant regrowth/performance of rehabilitation efforts and weed infestation compared to natural/undisturbed areas

OBJECTIVE: Maintenance of rehabilitated areas

In order to ensure the long-term environmental integrity of the site following construction, maintenance the areas rehabilitated post-construction must be undertaken until these areas have successfully re-established. Fire breaks should be established, where appropriate, to limit both incoming and outgoing veld fires.

Project component/s	» Wind energy facility (including access roads and laydown areas) » power line servitude and associated service road » substation site and associated access road
Potential Impact	» Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention
Activity/risk	» Laydown areas

source	» Access roads » Other disturbed areas
Mitigation: Target/Objective	» To ensure and encourage site rehabilitation of disturbed areas

Mitigation: Action/control	Responsibility	Timeframe
A botanist familiar with the vegetation of the area should monitor the rehabilitation success and alien plant removal on an annual basis.	Moyeng Energy / Specialist	Annual monitoring until successful re-establishment of vegetation in an area
Fire breaks should be established, where appropriate.	Moyeng Energy	Duration of contract
Appoint an independent environmental manager during operation whose duty it will be to minimise impacts on surrounding sensitive habitats.	Moyeng Energy	Operation

Performance Indicator	» Successful rehabilitation of disturbed areas
Monitoring	» On-going alien plant monitoring and removal should be undertaken on an annual basis

OBJECTIVE: Protection of avifauna and determine the impact of the operating Wind Energy Facility on priority bird species

During operation of the facility, the threat of collision of avifauna with the turbine blades is the most 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 turbines in South Africa with which bird interactions have been monitored. Infrastructure associated with the facility often also impacts on birds. Overhead power lines also pose a collision and possibly an electrocution threat to certain bird species.

A monitoring program must be set up on site pre and post construction to monitor for the impact the facility will potentially have on birds.

Project component/s	» wind energy facility (turbines) » power line » substations

Potential Impact	» Loss of birds as a result of collision with the turbine blades » Loss of birds as a result of collision with the overhead power lines » Electrocution as a result of power line
Activity/risk source	» Spinning turbine blades » Overhead power line
Mitigation: Target/Objective	» More accurately determine the impact of the operating wind energy facility on priority bird species

Mitigation: Action/control	Responsibility	Timeframe
A site monitoring programme must be implemented for surveying bird movements in relation to the wind energy facility and fully documenting all collision casualties.	Moyeng Energy	Operation
An ornithologist must be designated to provide input on monitoring and mitigation of bird collisions with the turbine blades. All bird collisions to be recorded and reported to a designated ornithologist. If bird collisions are detected, consideration will need to be given to shutting down turbines in high risk periods in order to mitigate for this impact.	Moyeng Energy Plant Environmental Manager	Operation
Bird-flappers must be fitted to aerial power line cabling, where required (as identified by a suitably qualified ornithologist).	Moyeng Energy	Operation/ maintenance

Performance Indicator	» Continued improvement of avifaunal protection efforts » No additional disturbance to avifaunal populations on the wind energy facility site » No additional disturbance to avifaunal populations along the length of the power line route » No fatalities due to electrocutions
Monitoring	» Observation of avifaunal populations and incidence of injuries/death from collisions from turbine blades or power line » Environmental manager to monitor turbine field for fatalities.

OBJECTIVE: Protection of fauna and habitats

Indirect impacts on terrestrial fauna during operation could include disturbance and further habitat destruction as a result of maintenance activities and the movement of people and vehicles on site, and direct fatalities from vehicle movements on-site.

Bat mortality at wind energy plants has been reported world-wide. Bats occurring in the area may potentially suffer mortality from the rotor blades of the turbines when these

animals forage at night. Excessive lighting at the facility may attract flying insects and therefore also bats, which may lead to increased mortality from collision with turbine blades.

Project component/s	» wind energy facility (including access roads) » power line and service road for power line servitude
Potential Impact	» Disturbance to or loss of fauna and/or habitat » Direct mortalities
Activity/risk source	» Movement of vehicles within and around site » Turbines » Power line
Mitigation: Target/Objective	» To keep number of vehicle movements to a minimum » To maintain minimised footprints of disturbance of vegetation/habitats on-site » To minimise impacts on bats » To ensure and encourage site rehabilitation

Mitigation: Action/control	Responsibility	Timeframe
Vehicle movements restricted to designated roadways.	Moyeng Energy	Operation
Appoint an independent environmental manager during operation whose duty it will be to minimise impacts on surrounding sensitive habitats	Moyeng Energy	Operation
Adherence to reduced vehicle speeds (as prescribed by the environmental manager) by any vehicles moving on the site to reduce potential for direct mortalities.	Moyeng Energy	Operation

Performance Indicator	» No further disturbance to faunal populations on the site » Continued improvement of faunal protection efforts
Monitoring	» Observation and recording of bird and bat mortality associated with the wind energy facility

OBJECTIVE: Minimisation of visual impacts

The placement of the Rheboksfontein Wind Energy Facility and its associated infrastructure will have a visual impact on the natural scenic resources and rural character of this region. The rural and relatively unspoilt wide-open vistas surrounding the WEF will be transformed for the entire operational lifespan (approximately 25 years) of the plant.

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 bright 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. Due to the nature of the area within which the facility is planned, there are only a few potentially sensitive receptors.

Other impacts include impacts associated with lighting of substations, and the aircraft warning lights mounted on top of the hub of the wind turbines. The regulations for the CAA's *Marking of Obstacles* should be strictly adhered to, 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.

Project component/s	» wind energy facility (including access roads) » power line and service road for power line servitude
Potential Impact	» Risk to aircraft in terms of the potential for collision » Enhanced visual intrusion » Impact on ambient lighting conditions
Activity/risk source	» Size/scale of turbines » Substations and associated lighting » Aviation lighting » Access roads » Power line » Other associated infrastructure
Mitigation: Target/Objective	» To minimise potential for visual impact » To ensure that the facility complies with Civil Aviation Authority requirements for turbine visibility to aircraft » Minimise contrast with surrounding environment and visibility of the turbines to humans » The containment of light emitted from the substation in order to eliminate the risk of additional night-time visual impacts.

Mitigation: Action/control	Responsibility	Timeframe
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.	Moyeng Energy	Erection and maintenance

Mitigation: Action/control	Responsibility	Timeframe
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 site.	Moyeng Energy	Construction, Operation and maintenance
A lighting engineer must be consulted to assist in the planning and placement of light fixtures in order to reduce visual impacts associated with glare and light trespass. In addition, the possibility of motion activated security lighting should be investigated. This will allow for a predominantly dark site to be lit only as required.	Moyeng Energy	Erection and maintenance
Maintain the general appearance of the facility in an aesthetically pleasing way.	Moyeng Energy	Operation and maintenance
Undertake regular maintenance of light fixtures.	Moyeng Energy	Operation and maintenance
Limit access to the wind energy facility site, power lines and substation along existing access roads	Moyeng Energy	Operation and maintenance
Avoid the unnecessary removal of vegetation for the distribution power line servitudes and limit access to the servitudes (during both construction and operational phases) along existing access roads.	Moyeng Energy	Operation and maintenance

Performance Indicator	» Minimised visual intrusion on surrounding areas » Appropriate visibility of infrastructure to aircraft » The effective containment of the light to the substation site.
Monitoring	» Ensure that aviation warning lights or other measures are installed before construction is completed » Ensure that Aviation warning lights or other measures are functional at all times » The monitoring of the condition and functioning of the light fixtures during the operational phase of the project.

OBJECTIVE: To ensure the implementation of an appropriate fire management plan during the operation phase

Vegetation in the study area requires fire for maintenance of biodiversity. Controlled burns with the natural areas on the site are required every 12-25 years. Areas that need fire include most High Sensitivity areas of natural vegetation identified in scoping report of Helme 2010.

Project component/s	Operation and maintenance of the wind energy facility and associated infrastructure
Potential Impact	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 risk to the wind energy facility infrastructure.
Activities/risk sources	The presence of operation and maintenance personnel and their activities on the site can increase the risk of veld fires.
Mitigation: Target/Objective	To avoid and or minimise the potential risk of veld fires on local communities and their livelihoods.

Mitigation: Action/control	Responsibility	Timeframe
All areas due to be burnt must be properly cleared of all invasive alien vegetation at least one year prior to fire	Moyeng Energy	Duration of operation
Extensive inputs needed from fire specialist. Local authority fire services should assist, as should local landowners and CapeNature. A windless day in March or April is recommended, with no wind predicted for following two days. Minimum areas burnt at any one time should be 10ha, in order to reduce edge effects. Site can be burnt sequentially in blocks, over a period of 5 years.	Moyeng Energy	Duration of operation
Provide adequate fire fighting equipment onsite.	Moyeng Energy	Duration of operation
Provide fire-fighting training to selected operation and maintenance staff.	Moyeng Energy	Duration of operation
Compensate farmers / community members at full market related replacement cost for any losses, such as livestock, damage to infrastructure etc.	Moyeng Energy	Duration of operation
Ensure landowner is part of the local Fire Protection Agency and that appropriate communication channels are established to be implemented in the event of a fire.	Moyeng	Pre-construction

Performance Indicator	» Fire fighting equipment and training provided before the construction phase commences.
Monitoring	» Moyeng Energy must monitor indicators listed above to ensure that they have been met for the construction phase.

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, hazardous waste and liquid waste.

Project component/s	» wind turbines » substations
Potential Impact	» Inefficient use of resources resulting in excessive waste generation » Litter or contamination of the site or water through poor waste management practices
Activity/risk source	» Generators and gearbox - turbines » Transformers and switchgear - substation » Water storage tank » Fuel and oil storage » Maintenance building
Mitigation: Target/Objective	» To comply with waste management guidelines » To minimise production of waste » To ensure appropriate waste disposal » To avoid environmental harm from waste disposal

Mitigation: Action/control	Responsibility	Timeframe
Hazardous substances must be stored in sealed containers within a clearly demarcated designated area.	Moyeng Energy	Operation
Storage areas for hazardous substances must be appropriately sealed and bunded.	Moyeng Energy	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.	Moyeng Energy	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 bunded area. Should any accidental spillage take place, it will be cleaned up according to specified standards regarding bioremediation.	Moyeng Energy	Operation and maintenance
Waste handling, collection and disposal operations must be managed and controlled by a waste management contractor.	Moyeng Energy /waste management contractor	Operation
Used oils and chemicals:	Moyeng Energy	Operation

Mitigation: Action/control	Responsibility	Timeframe
» 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.		
General waste must be recycled where possible or disposed of at an appropriately licensed landfill.	Moyeng Energy	Operation
Hazardous waste (including hydrocarbons) and general waste must be stored and disposed of separately.	Moyeng Energy	Operation
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Moyeng Energy	Operation
It must be ensured that volumes of any hazardous waste stored on site do not exceed 30m^3. Should this volume be exceeded, a waste license will be required to be obtained.	Moyeng Energy	Operation

Performance Indicator	» No complaints received regarding waste on site or indiscriminate dumping » Internal site audits identifying that waste segregation recycling and reuse is occurring appropriately » Provision of all appropriate waste manifests » No contamination of soil or water
Monitoring	» Waste collection must be monitored on a regular basis· » Waste documentation must be completed and available for inspection 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 SHE Representative. All appropriate waste disposal certificates accompany the monthly reports.

OBJECTIVE: Noise control

Projected noise levels during operation of the Wind Energy Facility were modelled using the methodology as proposed by SANS 10357:2004. The resulting future noise projections indicated that the operation of the facility would comply with the Noise Control Regulations (GN R154), yet would not comply with the guidelines as proposed by SANS 10103:2004. The significance of this noise impact was determined to be

medium. Mitigation measures were proposed that would reduce the significance to a more acceptable low.

The following measures are recommended to define the performance of the developer in mitigating the projected impacts and reducing the significance of the noise impact.

Project component/s	» Wind energy facility
Potential Impact	» Increased noise levels at potentially sensitive receptors » Changing ambient sound levels could change the acceptable land use capability » Disturbing character of sound
Activity/risk source	» Simultaneous operation of a number of wind turbines close to a sensitive receptor
Mitigation: Target/Objective	» Ensure that the change in ambient sound levels as experienced by Potentially Sensitive Receptors is less than 5 dBA. » Prevent the generation of a nuisance noises » Ensure acceptable noise levels at surrounding stakeholders and potentially sensitive receptors.

Mitigation: Action/control	Responsibility	Timeframe
Define the ambient sound levels over a 24 hour period before the operational phase starts inside and outside of the dwellings of at least 3 Potentially Sensitive Receptors	Moyeng Energy	Before operational phase commences
Design and implement a noise monitoring programme	Moyeng Energy Specialist	Before operational phase commences
Add additional noise monitoring points at any complainants that registered a noise complaint relating to the operation of the wind energy facility.	Acoustical Consultant / Approved Noise Inspection Authority	With quarterly monitoring

Performance Indicator	Ensure that the change in ambient sound levels as experienced by Potentially Sensitive Receptors is less than 7 dBA
Monitoring	Quarterly noise monitoring by an Acoustic Consultant or Approved Noise Inspection Authority. Noise monitoring programme to be developed and implemented at the start of operation.

MANAGEMENT PLAN FOR 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 30 years (with maintenance). 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.

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 and Replace Existing Turbine

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. All parts of the turbine would be considered reusable or recyclable except for the blades.

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

Project component/s	» Decommissioning phase of the wind energy facility.
Potential Impact	» 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. However, the number of people affected (30) is relatively small. Decommissioning is also similar to the construction phase in that it will also create temporary employment opportunities.
Activity/risk source	» Decommissioning of the wind energy facility.
Mitigation: Target/Objective	» To avoid and or minimise the potential social 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.	Moyeng Energy	At decommissioning.

Performance Indicator	South African Labour legislation at the relevant time.
Monitoring	Retrenchments should comply with South African Labour legislation of the day.