
TSITSIKAMMA COMMUNITY WIND ENERGY FACILITY, EASTERN CAPE PROVINCE

INTEGRATED OPERATION ENVIRONMENTAL MANAGEMENT PROGRAMME (OEMPr) FOR THE TSITSIKAMMA COMMUNITY WIND ENERGY FACILITY

REVISION 5

Revised in terms of the requirements of the Environmental Authorisation

January 2018

Prepared for:

Tsitsikamma Community Wind Farm (RF) (Pty) Ltd owned by:

Cennerg
PO Box 11052
Die Hoewes 1
0163



Prepared by

Savannah Environmental (Pty) Ltd

First Floor, Block 2, 5 Woodlands Drive Office Park
Woodmead
Johannesburg, 2191
Tel: +27 (0)11 656 3237
Fax: +27 (0)86 684 0547
E-mail: info@savannahsa.com
www.savannahsa.com



PROJECT DETAILS

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Revision 4 Author	:	Savannah Environmental (Pty) Ltd Jo-Anne Thomas
Revision 5 Authors	:	Savannah Environmental (Pty) Ltd <u>Lisa Opperman</u> <u>Tebogo Mapinga</u> <u>Jo-Anne Thomas</u>
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DEFINITIONS AND TERMINOLOGY

Alien species: A species that is not indigenous to the area or out of its natural distribution range.

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.

Assessment: The process of collecting, organising, analysing, interpreting and communicating information which is relevant.

Biological diversity: The variables among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes they belong to.

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

Cumulative impacts: Impacts that result from the incremental impact of the 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.

Ecosystem: A dynamic system of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

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

Environmental Assessment Practitioner: An individual responsible for the planning, management and coordinating of Environmental Management Programme or any other appropriate environmental instruments introduced by legislation.

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

Habitat: The place in which a species or ecological community occurs naturally.

Hazardous waste: Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment (Van der Linde and Feris, 2010;pg 185).

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/>).

Pollution: A change in the environment caused by substances (radio-active or other waves, noise, odours, dust or heat emitted from any activity, including the storage or treatment or waste or substances.

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

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

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

Rotor: The portion of the wind turbine that collects energy from the wind is called the rotor. The rotor converts the energy in the wind into rotational energy to turn the generator. The rotor has three blades that rotate at 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 up to 100m 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 100 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.

Waste: Any substance, whether or not that substance can be reduced re-used, recycled and recovered; that is surplus, unwanted, rejected, discarded, abandoned or disposed of which the generator has no further use for the purposes of production. Any product which must be treated and disposed of, that is identified as waste by the minister of Environmental affairs (by notice in the Gazette) and includes waste generated by the mining, medical or other sectors, but: A by-product is not considered waste, and portion of waste, once re-used, recycled and recovered, ceases to be waste.

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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INTRODUCTION

CHAPTER 1

This Environmental Management Programme has been compiled for the Tsitsikamma Community Wind Energy Facility, being operated by Tsitsikamma Community Wind Energy Farm (RF) (Pty) Ltd. The facility comprises of 31 wind turbines with a generating capacity of up to 100MW. This project received Environmental Authorisation on 01 March 2012. Following a competitive bidding process under the Department of Energy's Independent Power Producer (IPP) Procurement Programme, the Tsitsikamma Community Wind Energy Facility was awarded preferred bidder status in May 2012. Construction of the facility has been completed and the project is now operational.

This Operation Environmental Management Programme (OEMPr) is an update of the Final Construction and Operational EMPr for the wind energy facility approved on 10 October 2014. The revisions made are in line with the recommendations of the External Audit Report dated June 2017 for the facility. Amendments made are non-substantive and do not alter the objectives or outcomes of the EMPr.

This EMPr is applicable to all the employees and contractors of Tsitsikamma Community Wind Energy Farm RF (Pty) Ltd working on the operation and maintenance phases of the facility. The document will be adhered to and updated as relevant throughout the project life cycle. Any changes to the EMPr must be undertaken in accordance with the requirements of the EIA Regulations and any other legislation relevant at the time.

PROJECT DETAILS

CHAPTER 2

Tsitsikamma Community Wind Farm (RF) (Pty) Ltd has established the Tsitsikamma Community Wind Energy Facility and associated infrastructure on Portions 3, 4, 5 and 6 of Wittekleibosch 787 located within the Koukamma Local Municipality in the Eastern Cape Province. The wind energy facility is known as the **Tsitsikamma Community Wind Farm** and has been constructed on land partly owned by the Tsitsikamma Development Trust (TDT). The site is situated approximately 30 km west of Humansdorp, south of the N2 National Road in the Tsitsikamma area. Wind turbines with a total generating capacity of **100 MW**, collectively referred to as a **wind energy facility**, have been constructed over an area of approximately 54 km² in extent.

Infrastructure associated with the facility includes:

- » 31 wind turbines (with a hub height of 100m and blade length of 54.64m (blade diameter of 112m)) with a total generating capacity of ~100 MW.
- » Foundations (of 25 x 25 x 4 m) to support the turbine towers.
- » Underground cables between turbines.
- » On-site Substation (covering an area of 115m x 38m) connecting to Eskom Switching station which in turn connects to Eskom's Diep River Substation Extension.
- » Admin/control and other buildings associated with the substation.
- » Internal access roads (of 6m wide) to each wind turbine.
- » Permanent hardstand areas adjacent to turbine foundations. The permanent areas have been constructed from gravel in the same manner as the roads.
- » Main access road to the site.
- » Workshop / administration building within or adjacent to the footprint of the on-site substation (up to 100m²).

The facility will be fueled by wind. No other fuels will be used as a generating fuel during the operation phase.

The final approved layout overlaid on the sensitivity map (wetlands, drainage lines, rivers, stream and water crossing of roads, no-go areas, and the location of heritage sites), as per Condition 14 of the Environmental Authorisation, is displayed in Figure 2.1. Figure 2.1 includes:

- » Turbine positions and associated infrastructure.
- » Foundation footprint.
- » Permanent laydown area footprint.
- » Internal roads including their width (the operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible).
- » Substations and or transformer sites including their entire footprint.
- » Cable routes and trench dimensions (where they are not along national roads).
- » Cut and fill areas at turbine sites along roads and at sub-station/transformer sites.
- » All existing infrastructure, especially roads.
- » Buildings including accommodation.

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

- » Disturbance of ecological environment (flora and fauna);
- » Impacts on avifauna (birds) and bats;
- » Impacts on soils and agricultural potential;
- » Disturbance to sense of place, visual aesthetics;
- » Noise pollution;
- » Socio-economic impacts;
- » Soil erosion and degradation;
- » Storage and utilisation of hazardous substances on-site; and
- » Impacts on wetlands and drainage lines.

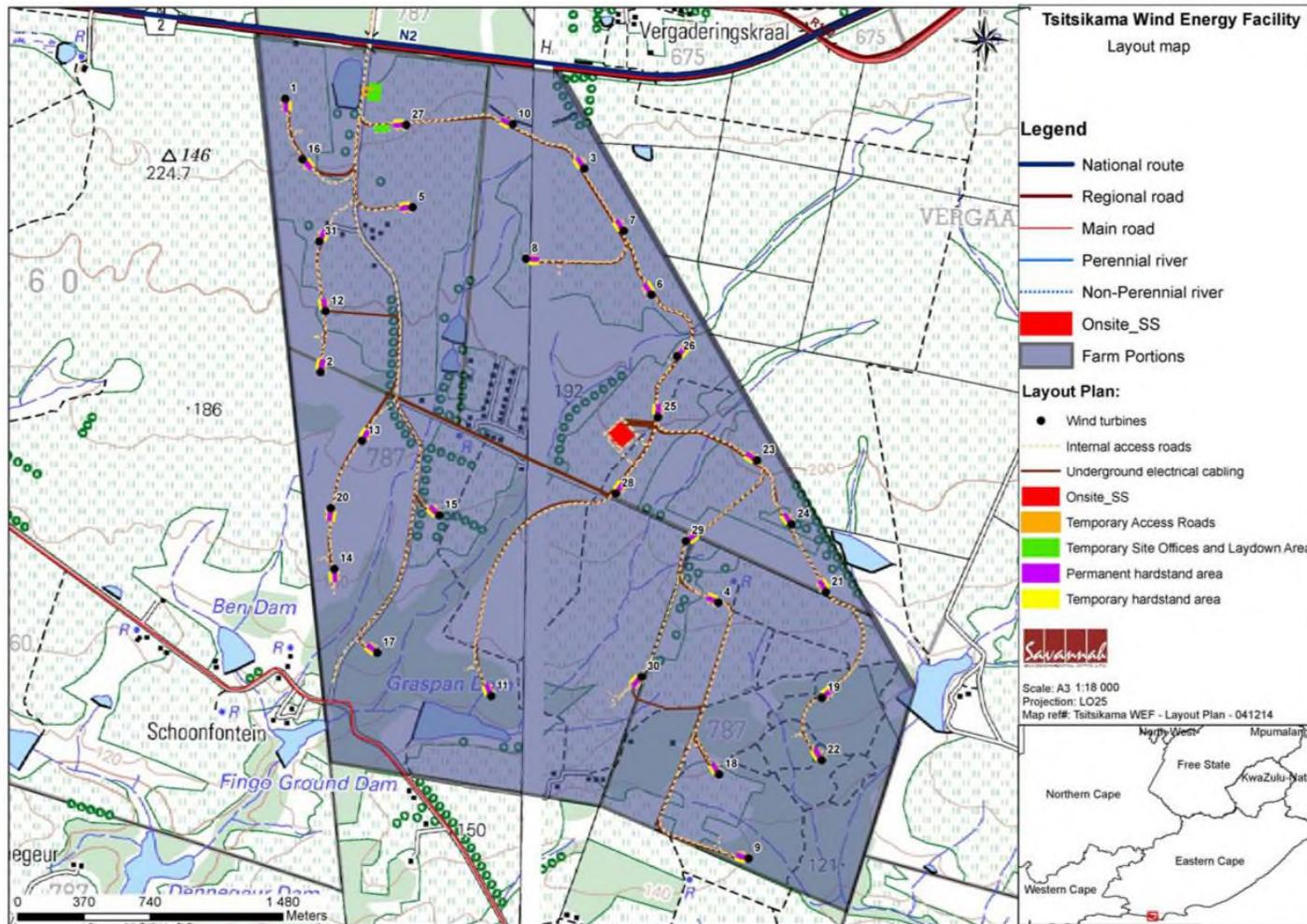


Figure 2.1: Locality map displaying the final approved layout in relation to the site sensitivity as identified through the EIA process

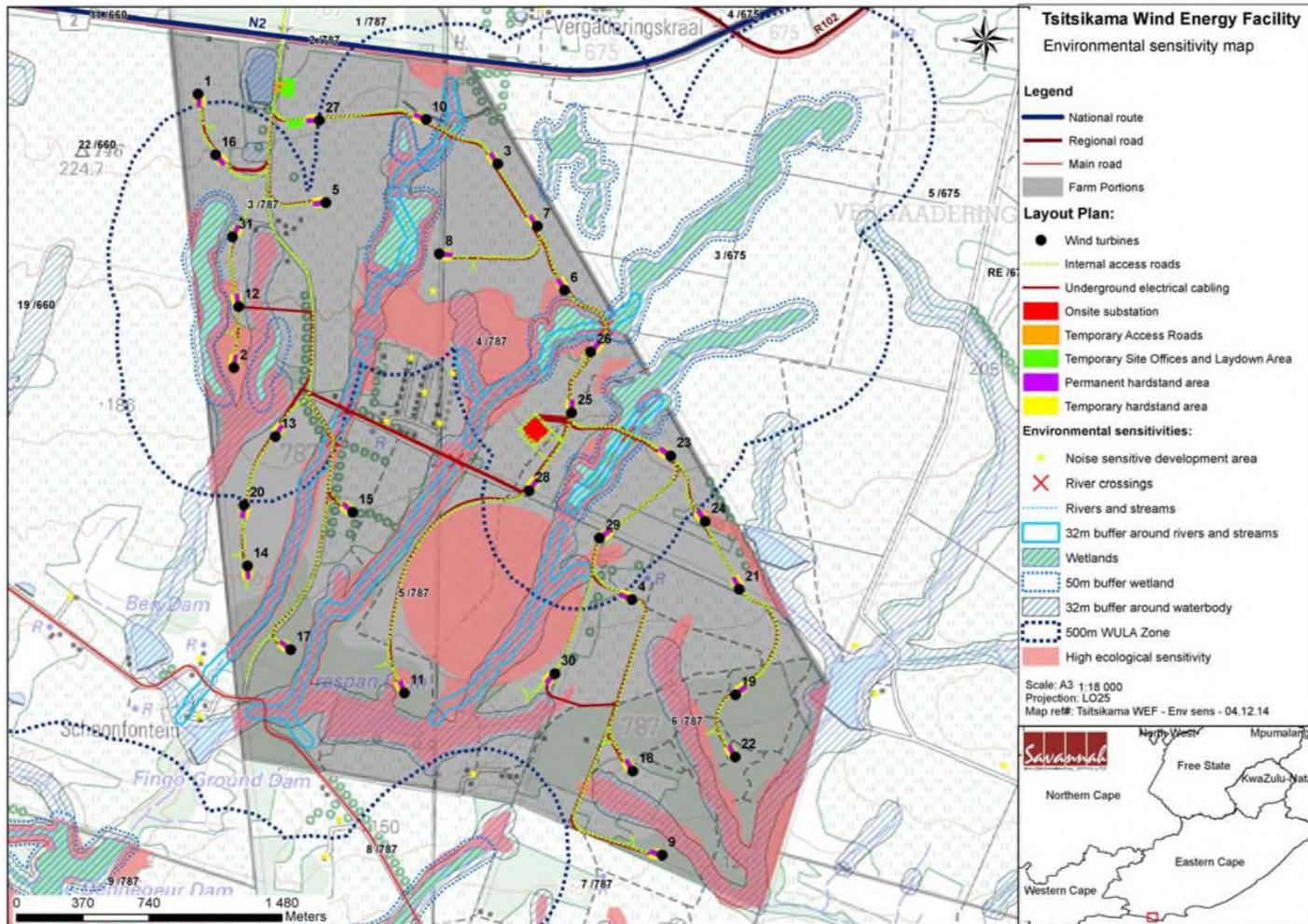


Figure 2.2: Zoomed in locality map displaying the final approved layout in relation to the site sensitivity as identified through the EIA process

2.1 Activities and Components associated with the Wind Energy Facility

The main activities/components associated with the Tsitsikamma Community Wind Energy Facility comprise the following:

2.1.1 Activities Associated with Operation and Decommissioning of the Facility

Main Activity/Project Component	Components of Activity	Details
Operation		
Operation	<ul style="list-style-type: none"> » Operation of turbines within the wind energy facility 	<ul style="list-style-type: none"> » Once operational, the wind energy facility will be monitored remotely. It is estimated that the operational phase of the project will provide employment for approximately 30 skilled 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. » Each turbine in the facility will be operational, except under circumstances of mechanical breakdown, extreme weather conditions or maintenance activities.
Maintenance	<ul style="list-style-type: none"> » Oil and grease – turbines » Transformer oil – substation » Waste product disposal 	<ul style="list-style-type: none"> » 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	<ul style="list-style-type: none"> » 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) » Mobilisation of construction equipment 	<ul style="list-style-type: none"> » 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.
Disassemble and remove existing turbines	<ul style="list-style-type: none"> » A large crane will be used to disassemble the turbine and tower sections. 	<ul style="list-style-type: none"> » 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

Main Activity/Project Component	Components of Activity	Details
		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.

PURPOSE & OBJECTIVES OF THE EMPr

CHAPTER 3

An Environmental Management Programme (EMPr) 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 EMPr 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 this EMPr is to help ensure compliance with recommendations and conditions specified through an EIA process, as well as to ensure continuous improvement of environmental performance, reducing negative impacts and enhancing positive effects during the operation of the facility. An effective EMPr is concerned with both the immediate outcome as well as the long-term impacts of the project.

This EMPr provides specific environmental guidance for the operation phase of the project, and is intended to manage and mitigate operation activities so that unnecessary or preventable environmental impacts do not result. The EMPr also defines monitoring requirements in order to ensure that the specified objectives are met.

The EMPr has been developed as a set of environmental specifications (i.e. principles of environmental management for the Tsitsikamma Community 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).

The EMPr has the following objectives:

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

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

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

Tsitsikamma Community Wind Energy Farm (RF) (Pty) Ltd must ensure that the implementation of the project complies with the requirements of any and all environmental authorisations and any other permits (once issued), and obligations emanating from other relevant environmental legislation. This obligation is partly met through the development of the EMPr, and the implementation of the EMPr through its integration into the contract documentation for activities associated with the operation. Since this EMPr is part of the EIA process undertaken for the Tsitsikamma Community Wind Energy Facility, it is important that this guideline document be read in conjunction with the Final Scoping Report (May 2011) and draft EIA Report (August 2011). This will contextualise the EMPr and enable a thorough understanding of its role and purpose in the integrated environmental process. This EMPr for operation activities has been compiled in accordance with the EIA Regulations of December 2014, as amended in April 2017 and will be further developed in terms of specific requirements listed in any authorisations issued for the project. This EMPr should be considered as a dynamic document, requiring regular review and updating as new information becomes available in order for it to remain relevant to the requirements of the site and the environment.

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

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

STRUCTURE OF THIS EMPr

CHAPTER 4

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

- » Operation activities; and
- » Decommissioning activities.

These chapters set out the procedures necessary for the Tsitsikamma Community Wind Energy Facility to achieve environmental compliance. For each of the phases for the wind energy facility project, an over-arching environmental **goal** is stated. In order to meet this goal, a number of **objectives** are listed. The management 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 EMPr 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.: <ul style="list-style-type: none"> » wind energy turbines » access roads » substation
Potential Impact	Brief description of potential environmental impact if objective is not met
Activity/risk source	Description of activities which could impact on achieving the 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 EMPr tables are required to be reviewed and possibly modified whenever changes, such as the following, occur:

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

4.1 Project Team

This OEMPr was compiled by:

EMPr Compilers	
Lisa Opperman Tebogo Mapinga Jo-Anne Thomas	Savannah Environmental Pty) Ltd

The Savannah Environmental team has extensive knowledge and experience in environmental impact assessment and environmental management, having being involved in EIA processes over the past twelve (12) years. They have managed and drafted Environmental Management Programmes for other wind energy facility projects throughout South Africa. In addition, they have been involved in compliance monitoring of major construction projects in South Africa.

MANAGEMENT PLAN FOR WIND ENERGY FACILITY: OPERATION

CHAPTER 5

5.1 Overall Goal for Operation

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

5.2 Objectives

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

OBJECTIVE 1: 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 Head of Operations and Environmental Specialist for the operation phase of this project are detailed below.

The Head of Operation will:

- » Ensure that adequate resources (human, financial, technology) are made available and appropriately managed for the successful implementation of the operational EMPr.
- » Conduct annual basis reviews of the OEMPr to evaluate its effectiveness.
- » Take appropriate action as a result of findings and recommendations in management reviews and audits.
- » Provide forums to communicate matters regarding environmental management.

The **Environmental Specialist** will:

- » Develop and Implement an Environmental and Social Management System (EMS) for the wind energy facility and associated infrastructure.
- » Manage and report on the facility's environmental performance in accordance with the Equator Principles.
- » Maintain a register of all known environmental impacts and manage the monitoring thereof.

- » Conduct internal environmental audits and co-ordinate external environmental audits.
- » Liaise with statutory bodies such as the National and Provincial Department of Environmental Affairs (DEA) on environmental performance and other issues.
- » Conduct environmental training and awareness for the employees who operate and maintain the wind energy facility.
- » Compile environmental policies and procedures.
- » Liaise with interested and affected parties on environmental issues of common concern.
- » Track and control the lodging of any complaints regarding environmental matters.

OBJECTIVE 2: Securing the site

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

Project component/s	<ul style="list-style-type: none"> » Wind energy turbines » Access roads » Substation
Potential Impact	<ul style="list-style-type: none"> » Hazards to landowners and public
Activities/risk sources	<ul style="list-style-type: none"> » Uncontrolled access to the wind energy facility and associated infrastructure
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To secure the site against unauthorised entry » To protect members of the public/landowners/residents

Mitigation: Action/control	Responsibility	Timeframe
Where necessary to control access, fence and secure access to the site and entrances to the site.	Tsitsikamma Community Wind Farm (RF) (Pty) Ltd	Operation
Post information boards about public safety hazards and emergency contact information.	Tsitsikamma Community Wind Farm (RF) (Pty) Ltd	Operation

Performance Indicator	<ul style="list-style-type: none"> » Site is secure and there is no unauthorised entry » No members of the public/ landowners injured
Monitoring and Reporting	<ul style="list-style-type: none"> » Regular visual inspection of the fence for signs of deterioration/forced access » An incident reporting system must be used to record non-conformances to the EMPr » A public complaints register must be developed and maintained on site

OBJECTIVE 3: Protection of indigenous natural vegetation, fauna and maintenance of rehabilitation

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

Project component/s	<ul style="list-style-type: none"> » Areas requiring regular maintenance » Route of the security team » Areas disturbed during the construction phase and subsequently rehabilitated at its completion » <u>Watercourse crossings</u>
Potential Impact	<ul style="list-style-type: none"> » Disturbance to or loss of vegetation and/or habitat » Environmental integrity of the site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention
Activity/Risk Source	<ul style="list-style-type: none"> » Movement of employee vehicles within and around site » <u>Disturbed areas</u>
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Maintain minimised footprints on disturbed vegetation/habitats on-site » Ensure and encourage plant regrowth in non-operational areas of post-construction rehabilitation

Mitigation: Action/Control	Responsibility	Timeframe
Vehicle movements must be restricted to designated roadways.	Tsitsikamma Community Wind Farm (RF) (Pty) Ltd	Operation
Existing roads must be maintained to ensure limited erosion and impact on areas adjacent to roadways.	Tsitsikamma Community Wind Farm (RF) (Pty) Ltd	Operation
An on-going alien plant monitoring and eradication programme must be implemented, where necessary.	Tsitsikamma Community Wind Farm (RF) (Pty) Ltd	Operation
A botanist <u>or environmental specialist</u> familiar with the vegetation of the area should monitor the rehabilitation success and alien plant removal on an annual basis.	Tsitsikamma Community Wind Farm (RF) (Pty) Ltd / <u>Environmental Specialist</u>	Annual monitoring until successful re-establishment of vegetation in an area
<u>An Environmental Specialist manager must be appointed during operation whose duty it will be to minimise impacts on surrounding sensitive habitats.</u>	<u>Tsitsikamma Community Wind Farm (RF) (Pty) Ltd and contractors</u>	<u>Operation</u>

Performance Indicator	<ul style="list-style-type: none"> » No further disturbance to vegetation or terrestrial faunal habitats » Continued improvement of rehabilitation efforts » <u>No colonisation of the site by alien vegetation</u>
Monitoring	<ul style="list-style-type: none"> » Observation of vegetation on-site by the environmental manager » Regular inspections to monitor plant regrowth / performance of

	rehabilitation efforts and weed infestation compared to natural / undisturbed areas » <u>On-going alien plant monitoring and removal should be undertaken on an annual basis for the first 5 years of the operation phase, or until it is deemed unnecessary by a suitably qualified botanist or environmental specialist.</u>
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OBJECTIVE 4: Protection of birds and bats and determination of the impact of the operating facility on priority bat and bird species

During the 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 and bat interactions have been monitored. Lighting of the turbines and other infrastructure has the potential to attract birds, thereby increasing the risk of collisions with turbines. Infrastructure associated with the facility often also impacts on birds.

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

Mitigation: Action/control	Responsibility	Timeframe
<u>Appoint a suitably qualified specialist to prepare a bird and bats monitoring programme and to undertake bird and bats monitoring during the operation phase in accordance with the recommendations in the pre-construction Bat and Bird Monitoring Reports.</u>	Advising scientist	<u>Operation</u>
Periodically collate and analyse post-construction monitoring data.	Advising scientist	Every 3 months of monitoring
Review report on the full year of post-construction monitoring, and integrate findings into operational EMP and broader mitigation scheme.	Advising scientist, monitoring agency in negotiation with Tsitsikamma Community Wind Farm (RF) (Pty) Ltd	<u>2 years</u> post-construction

Performance	» No additional disturbance to avifaunal populations on the wind energy
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Indicator	facility site » Continued improvement of avifaunal protection efforts » Regular provision of clearly worded, logical and objective information on the interface between the local avifauna and the operating wind energy facility » Clear and logical recommendations on why, how and when to institute mitigation measures to reduce avian impacts of the development
Monitoring	» Observation of avifaunal populations and incidence of injuries/death from collisions from turbine blades » Environmental manager to monitor turbine field for fatalities. » Review of report on the full year of post-construction monitoring

OBJECTIVE 5: Minimisation of visual impacts

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.

Project component/s	» Wind energy facility (including access roads) » Substation
Potential Impact	» Risk to aircraft in terms of the potential for collision » Enhanced visual intrusion
Activity/risk source	» Substation and associated lighting » Wind turbines and other infrastructure
Mitigation: Target/Objective	» To minimise the potential for visual impact » To ensure that the facility complies with Civil Aviation Authority requirements for turbine visibility to aircrafts » Minimise contrast with the 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
Adhere to the project CAA consent issued for the project and its conditions.	<u>O&M</u> Contractor	Operation and maintenance
Maintain the general appearance of the facility in an aesthetically pleasing way.	Tsitsikamma Community Wind Farm (RF) (Pty) Ltd	Operation and maintenance
Ensure that proper planning is undertaken regarding the	Tsitsikamma	Operation and

Mitigation: Action/control	Responsibility	Timeframe
placement of lighting structures for the substation and that light fixtures only illuminate areas inside the substation sites.	Community Wind Farm (RF) (Pty) Ltd/ O&M Contractor	maintenance
Undertake regular maintenance of light fixtures.	O&M Contractor	Operation and maintenance
Limit access to the wind energy facility site and substation to routes along existing access roads.	Tsitsikamma Community Wind Farm (RF) (Pty) Ltd	Operation and maintenance

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

OBJECTIVE 6: Minimisation of noise impacts

Projected noise levels during operation of the Wind Energy Facility were modelled using the methodology as proposed by SANS 10357:2004 and ISO 9613-2.

Noise levels was previously calculated using noise propagation modelling that indicated that the projected noise levels from the wind turbines would be less than 45 dBA. From the data gathered during the operational measurement assessment, there is no evidence that noise emissions from the wind turbines are exceeding this 45dBA level.

As such, no additional routine noise measurements are required, but valid and reasonable noise complaints should still be investigated. Such an investigation should be undertaken by an independent acoustic consultant. Considering the limitations of these measurements (lack of higher wind speeds), future measurements should take place over a period of at least 5 days, although a longer period is recommended to ensure that sufficient high wind speed data is collected. Measurements are recommended in the Mfengu Community (CWEF01, CWEF02 and CWEF03). These measurements should be collected when the Wind Turbines are operational. Noise measurements should also be collected at the dwelling of any NSDs that may have complained to the developer or Municipality regarding noise originating from the facility.

Mitigation measures are, however, proposed to ensure that the potential noise impacts and risks are optimally minimised. 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

Activity/risk source	» Wind turbines and other infrastructure
Mitigation: Target/Objective	» Prevent the generation of a nuisance noises » Ensure acceptable noise levels at surrounding stakeholders and potentially sensitive receptors » Ensure that the change in ambient sound levels as experienced by Potentially Sensitive Receptors is less than 5 dBA

Mitigation: Action/control	Responsibility	Timeframe
Noise monitoring should take place if valid <u>and reasonable</u> noise complaints relating to the operation of the facility are registered. Noise measurements should be conducted by an acoustic consultant.	Tsitsikamma Community Wind Farm (RF) (Pty) Ltd and Acoustic Consultant	Operation and maintenance

Performance Indicator	» Ensure that the change in ambient sound levels as experienced by Potentially Sensitive Receptors is less than 7 dBA
Monitoring	» <u>No additional routine noise measurements are required, but valid and reasonable noise complaints should still be investigated.</u>

OBJECTIVE 7: Appropriate handling and management of hazardous substances and waste

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

Project component/s	» Wind energy turbines » Substation
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 » Fuel and oil storage
Mitigation: Target/Objective	» To comply with waste management legislation » 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.	Tsitsikamma Community Wind Farm (RF) (Pty) Ltd and O&M Contractor	Operation

Mitigation: Action/control	Responsibility	Timeframe
Storage areas for hazardous substances must be appropriately sealed and bunded.	Tsitsikamma Community Wind Farm (RF) (Pty) Ltd and O&M Contractor	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.	Tsitsikamma Community Wind Farm (RF) (Pty) Ltd and O&M Contractor	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 must be cleaned up according to specified standards regarding bioremediation and taken to a registered hazardous waste facility.	Tsitsikamma Community Wind Farm (RF) (Pty) Ltd and O&M Contractor	Operation and maintenance
Waste handling, collection and disposal operations must be managed and controlled by a waste management contractor.	Tsitsikamma Community Wind Farm (RF) (Pty) Ltd / waste management contractor	Operation
Used oils and chemicals: » Where these cannot be recycled, appropriate disposal must be arranged with a licensed facility in consultation with the administering authority. » Waste must be stored and handled according to the relevant legislation and regulations.	Tsitsikamma Community Wind Farm (RF) (Pty) Ltd and O&M Contractor	Operation
General waste must be recycled where possible or disposed of at an appropriately licensed landfill.	Tsitsikamma Community Wind Farm (RF) (Pty) Ltd and O&M Contractor	Operation
Hazardous waste (including hydrocarbons) and general waste must be stored and disposed of separately.	Tsitsikamma Community Wind Farm (RF) (Pty) Ltd and O&M Contractor	Operation

Performance Indicator	<ul style="list-style-type: none"> » 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 untreated contamination of soil or water
Monitoring	<ul style="list-style-type: none"> » Waste collection must be monitored on a regular basis » Waste documentation must be completed and be made available for inspection on request

	<ul style="list-style-type: none"> » An incidents / complaints register must be maintained, in which any complaints from the community must be logged. Complaints must be investigated and, if appropriate, acted upon » Regular reports on exact quantities of all waste streams exiting the site must be compiled by the waste management contractor and monitored by the Environmental Manager » All appropriate waste disposal certificates must accompany the monthly reports
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OBJECTIVE 8: Ensure the implementation of an appropriate fire management plan during the operation phase

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

Project Component/s	» Operation and maintenance of the wind energy facility and associated infrastructure.
Potential Impact	<ul style="list-style-type: none"> » 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
Provide adequate fire fighting equipment on site.	Tsitsikamma Community Wind Farm (RF) (Pty) Ltd and O&M Contractor	Operation
Provide fire-fighting training to selected operation and maintenance staff.	Tsitsikamma Community Wind Energy Facility (RF) (Pty) Ltd and O&M Contractor	<u>Operation</u>
Ensure that appropriate communication channels are established to be implemented in the event of a fire.	Tsitsikamma Community Wind Farm (RF) (Pty) Ltd and O&M Contractor	Operation
Fire breaks should be established where and when required. Cognisance must be taken of the relevant legislation when planning and burning firebreaks (in terms of timing, etc.).	Tsitsikamma Community Wind Farm (RF) (Pty) Ltd and O&M Contractor	Operation

Mitigation: Action/Control	Responsibility	Timeframe
Compile an emergency evacuation plan to ensure the safety of the staff and surrounding land users in the case of an emergency.	Tsitsikamma Community Wind Farm (RF) (Pty) Ltd and O&M Contractor	Operation
Contact details of emergency services should be prominently displayed on site.	Tsitsikamma Community Wind Farm (RF) (Pty) Ltd and O&M Contractor	Operation

Performance Indicator	<ul style="list-style-type: none"> » Fire fighting equipment and training must be provided before the operation phase commences » Appropriate fire breaks in place
Monitoring and Reporting	<ul style="list-style-type: none"> » Tsitsikamma Community Wind Energy Facility (RF) (Pty) Ltd must monitor indicators listed above to ensure that they have been met

OBJECTIVE 9: Minimise the potential impact on farming activities and on the surrounding landowners

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

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

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

Mitigation: Action/Control	Responsibility	Timeframe
Effective management of the <u>Operation and Maintenance (O&M) Building</u> to avoid any environmental pollution	Tsitsikamma Community Wind	Operation

Mitigation: Action/Control	Responsibility	Timeframe
focusing on water, waste and sanitation infrastructure and services.	Farm (RF) (Pty) Ltd and O&M Contractor	
Vehicle movement to and from the site should be minimised as far as possible.	Tsitsikamma Community Wind Farm (RF) (Pty) Ltd and O&M Contractor	Operation
<u>Internal access</u> roads should be maintained to keep the road surface up to a reasonable standard.	Tsitsikamma Community Wind Farm (RF) (Pty) Ltd and O&M Contractor	Operation
Limit the development of new access roads on site.	Tsitsikamma Community Wind Farm (RF) (Pty) Ltd and O&M Contractor	Operation
Limit any movement and driving on agricultural or cultivated land to avoid disturbance/destruction	Tsitsikamma Community Wind Farm (RF) (Pty) Ltd and O&M Contractor	Operation
Ensure on-going communication with the landowners of the site in order to ensure minimal impact on farming activities	Tsitsikamma Community Wind Farm (RF) (Pty) Ltd and O&M Contractor	Operation

Performance Indicator	<ul style="list-style-type: none"> » No environmental pollution occurs (i.e. waste, water and sanitation) » No intrusion on private properties and on the activities undertaken on the surrounding properties » Continuation of farming activities on site
Monitoring and reporting	<ul style="list-style-type: none"> » Tsitsikamma Community Wind Energy Facility (RF) (Pty) Ltd should be able to demonstrate that the facility is well managed without environmental pollution and that the above requirements have been met

OBJECTIVE 10: Minimise soil degradation and erosion

<u>Project Component/s</u>	<ul style="list-style-type: none"> » <u>Watercourse crossings</u>
<u>Potential Impact</u>	<ul style="list-style-type: none"> » <u>Soil degradation and erosion</u> » <u>Increased deposition of soil into drainage systems</u> » <u>Increased run-off over the site</u>
<u>Activities/Risk Sources</u>	<ul style="list-style-type: none"> » <u>Poor rehabilitation and/or revegetation of cleared areas</u> » <u>Rainfall may result in water erosion and disturbed areas</u> » <u>Wind erosion of disturbed areas</u>

	» <u>Concentrated discharge of water from operation activities</u>
Mitigation:	» <u>Ensure rehabilitation of disturbed areas is maintained</u>
Target/Objective	» <u>Minimise soil degradation (i.e. wetting)</u>
	» <u>Minimise soil erosion and deposition of soil into drainage lines</u>
	» <u>Ensure continued stability of embankments / excavations</u>

Mitigation: Action/Control	Responsibility	Timeframe
<u>Implement Stormwater Management and Erosion Control Plan, as well as a rehabilitation plan as approved by the Department of Water and Sanitation within the Water Use License Application documentation.</u>	<u>Tsitsikamma Community Wind Energy Facility (RF) (Pty) Ltd</u>	<u>Operation</u>
<u>The culvert crossings should not trap any run-off, thereby creating inundated areas, but allow for free flowing systems.</u>	<u>Tsitsikamma Community Wind Energy Facility (RF) (Pty) Ltd</u>	<u>Operation</u>

Performance Indicator	» <u>Minimal levels of soil erosion around the site</u>
	» <u>Minimal levels of increased siltation in drainage lines</u>
Monitoring and reporting	» <u>Inspection of the site on a bi-annual basis</u>

MANAGEMENT PLAN FOR WIND ENERGY FACILITY: DECOMMISSIONING

CHAPTER 6

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. The decommissioning activities would need to comply with the legislation relevant at the time.

Should the activity ever cease or become redundant, the applicant shall undertake the required actions as prescribed by legislation at the time and comply with all relevant legal requirements administered by any relevant and competent authority at that time.

6.1 Site Preparation

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

6.2 Disassemble Existing Turbines

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

OBJECTIVE 1: To avoid and or minimise the potential social impacts associated with the decommissioning phase

Project component/s	» Decommissioning phase of the wind energy facility and associated infrastructure
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 (10) is 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 and environmental impacts associated with the decommissioning phase of the wind energy facility

Mitigation: Action/control	Responsibility	Timeframe
Mitigation measures as detailed in the construction	Tsitsikamma	Decommissioning

Mitigation: Action/control	Responsibility	Timeframe
phase EMPr regarding impacts on flora, fauna, habitats and wetlands would be applicable to this phase.	Community Wind Farm (RF) (Pty) Ltd	
Rehabilitation to be undertaken in terms of Rehabilitation specifications implemented during the construction phase as well as in terms of any specific requirements applicable at the time.	Tsitsikamma Community Wind Farm (RF) (Pty) Ltd	Decommissioning

Performance Indicator	» Compliance with South African legislation at the relevant time
Monitoring	» An ECO will need to supervise decommissioning activities

**APPENDIX A:
ENVIRONMENTAL AUTHORISATION**

**APPENDIX B:
LEGAL REQUIREMENTS**

**APPENDIX C:
INTEGRATED WATER AND WASTE MANAGEMENT PLAN**

**APPENDIX D:
NOISE MONITORING REPORT**

**APPENDIX E:
GRIEVANCE MECHANISM**

**APPENDIX F:
SOIL EROSION MANAGEMENT PLAN**

**APPENDIX G:
ALIEN PLANT MANAGEMENT PROGRAMME**