Appendix B:

Environmental Management Programme

For

THE PROPOSED HIGHLANDS SOUTH WIND ENERGY FACILITY, EASTERN CAPE PROVINCE

On behalf of

HIGHLANDS SOUTH WIND ENERGY FACILITY (RF) (PTY) LTD

SEPTEMBER 2018

Prepared By:

Arcus Consultancy Services South Africa (Pty) Ltd
Registered in South Africa No. 2015/416206/07

Glossary of Terms

Construction Phase: The activities pertaining to the preparation for and the physical construction of the proposed development

Contractor: Persons/organisations contracted by the Developer to carry out parts of the work for the proposed project

Engineer / Project Director (PD): Person/organisation appointed by the Developer to oversee the work of all consultants, sub-developers, contractors, residents and visitors.

Environment: The environment is defined as the surroundings within which humans exist and that are made up of – the land, water and atmosphere of the earth; micro-organisms, plant and animal life; any part or combination of (i) and (ii) and the interrelationships among and between them; and the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental and Social Manager (ESM) also known as the Environmental Control Officer (ECO): Person/organisation appointed by the Developer who will provide direction to the Principal Agent concerning the activities within the Construction site. The ECO will also be responsible to liaise with the independent auditor who will conduct an environmental audit during the construction phase of the project according to the provisions of the Environmental Management Programme.

Independent Auditor: The person or entity who will conduct an environmental audit during the construction phase of the project according to the provisions of the Environmental Management Programme and Environmental Authorisation.

Environmental Management Programme (EMPR): The EMPR is a detailed plan for the implementation of the mitigation measures to minimise negative environmental impacts during the life-cycle of a project. The EMPR contributes to the preparation of the contract documentation by developing clauses to which the contractor must adhere for the protection of the environment. The EMPR specifies how the construction of the project is to be carried out and includes the actions required for the Post-Construction Phase to ensure that all the environmental impacts are managed for the duration of the project's life-cycle. Therefore the EMPR will be a working document, which will be reviewed when necessary, or if required by the authorities. A revision will be done once the detailed design of the proposed development has been completed.

Operational Phase (Post Construction): The period following the Construction Phase, during which the proposed development will be operational.

Pre-Construction Phase: The period prior to commencement of the Construction Phase, during which various activities associated with the preparation for the Construction Phase: detailed final designs, micro siting, etc. will be undertaken.

Rehabilitation: Rehabilitation is defined as the return of a disturbed area to a state which approximates the state (where possible) which it was before disruption. Rehabilitation for the purposes of this specification is aimed at post-reinstatement revegetation of a disturbed area and the insurance of a stable land surface. Revegetation should aim to accelerate the natural succession processes so that the plant community develops in the desired way, i.e. promote rapid vegetation establishment.

Site Manager: The person, representing the Contractor, responsible for all the Contractor's activities on the site including supervision of the construction staff and activities associated with the Construction Phase.

Project Area: This refers to the authorised area for the proposed development to take place. Farm portions numbers are outline in the EMPR.

Local Community: People residing or present in the region and near the construction activities, including the owners and/or managers of land affected by construction, workers on the land, and people in nearby towns and villages.

Public: Any individual or group concerned with or affected by the Project and its consequences, including the local community, local, regional, and national authorities, investors, workforce, customers, consumers, environmental interest groups, and the general public.

Construction Area / Site: The land on which the Project is to be located. It includes the site, construction campsite, access roads and tracks, as well as any other area affected or disturbed by construction activities. The EMPR (particularly the

specifications for rehabilitation) is relevant for all areas disturbed during construction.

Access Roads and Tracks: All newly established roads and tracks, and areas cleared or driven over to provide access to/from the construction areas, and for the transportation of the construction workforce, equipment and materials.

Environmental Impact: The effect of an activity on the environment, whether desirable or undesirable. Undesirable or negative environmental impacts will result in damage and/or pollution of, or detriment to the environment, or in danger to the public, whether immediate or delayed.

Environmental Incident: An unexpected or sudden occurrence related to the Project, including major emissions, spills, fires, explosions, floods or erosion leading to serious or potentially serious negative environmental impacts.

Fugitive Dust: Can be defined as natural and/or human-associated dust becoming airborne due to the forces of wind or human activity.

Fauna and Flora / Plants and Animals: Any individual or group of micro-organisms, plants or animals.

General Waste and Construction Rubble It includes waste paper, board, cardboard, benign organic and domestic waste and uncontaminated construction debris such as used bricks, wood, waste concrete, unused subsoil and rubble from excavations or demolished structures.

Heritage Sites and Artefacts: Heritage sites and artefacts can be defined as any object or site of cultural, historical, archaeological or palaeontological significance found in or on the land. Historical objects are objects older than 50 years with architectural, historical, scientific, cultural, social, spiritual, linguistic, technological or aesthetic value. For example: buildings or parts thereof, graves or burial sites, milestones, numismatic objects (i.e. coins and beads), and military objects.

Archaeological objects include material remains resulting from human activity which are older than 100 years and which are in a state of disuse, such as tools, artefacts, human and hominoid remains and artificial features and structures.

Palaeontological objects include any fossilised remains of animals or plants.

Hazardous Substances: Substances which are potentially dangerous and may affect human and/or environmental health. This would be because of the substances' inherent chemical and physical composition, which could be toxic, poisonous, flammable, explosive, carcinogenic or radioactive. Hazardous waste includes, but is not limited to: human excrement, the by-products and wastes associated will the use of hazardous substances (i.e. used fuel, oil, lubricants and solvents), as well as items such as spent batteries, old oil filters, light bulbs, tyres, circuit boards, etc. which requires special collection and handling. When left abandoned, even substances such as scrap metal, wire, tins, broken glass and plastic could be harmful to people, wild and domestic animals. For example: plastic could be ingested by animals; people and animals could be injured by broken glass or metal objects; and animals could get trapped in drums, tins and bottles or get entangled in plastic or metal wiring. Even if buried, such objects may become exposed over time due to wind erosion, scavengers or future human activities. Because of the sensitive nature of the area, these substances are all regarded as 'hazardous waste' for the purposes of this EMPR.

Hydrological Features: Hydrological features include, but are not limited to:

- wetlands;
- open water;
- vegetated drainage channels;
- subterranean water;
- marine environments;
- estuarine environments.

Life Support Systems: Life support systems include, but are not limited to: an ecological system in which its outputs are vital for sustaining specialised habitats; an ecological system in which its outputs are vital for sustaining human life (e.g. water purification).

Mitigation: Environmental management measures designed to avoid, limit or remedy undesirable environmental impacts.

Monitoring: Structured observation, measurement and evaluation of environmental data over a period of time to assess the efficiency of environmental mitigation and rehabilitation measures.

Rehabilitation: Measures implemented to restore a damaged Environment.

Sensitive Sites: Environmentally sensitive sites include, but are not limited to:

- Areas with high conservation value due to the presence of important plant specimens, pristine habitats, high

biodiversity, important water resources or heritage features and artefacts;
- Areas particularly prone to erosion once disturbed (i.e. steep slopes);
- Vulnerable areas with low potential for rehabilitation / slow rate of recovery (i.e. rock outcrops, steep slopes); and
- Areas in close proximity of sensitive receptors, such as farm homesteads, viewpoints or tourist stopovers.

Specialised habitats: Specialised habitats include, but are not limited to, areas which are:

- Priority breeding habitats;
- Refuge areas;
- Vital for species survival (important for, part, or all of its life cycle);
- Essential for species performance;
- Cryptic habitats, etc.

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1 INTRODUCTION

1.1 Background

WKN Windcurrent South Africa (Pty) Ltd ('the Developer') is proposing to develop the Highlands Wind Energy Facilities (WEFs), and associated infrastructure including Grid Connection Infrastructure near the town of Somerset East, in the Eastern Cape Province (Figure 1.1).

There are six components to the proposed development, representing three development phases under separate applications:

- Highlands North WEF;
- Electrical Grid Connection and Associated Infrastructure for Highlands North WEF;
- Highlands Central WEF;
- Electrical Grid Connection and Associated Infrastructure for Highlands Central WEF;
- **Highlands South WEF**; and
- Electrical Grid Connection and Associated Infrastructure for Highlands South WEF

In order to bid in the Renewable Energy Independent Power Producers Procurement Programme, the developer is require to bid the projects under a special purpose vehicle (SPV). For the purposes of the Highlands WEFs, each wind farm and grid connection per phase will share the SPV, which will be the applicant for the environmental application and environmental authorisation.

Highlands South WEF and Grid Connection will share Highlands South Wind Energy Facility RF (Pty) Ltd, as 'the Applicant'.

Arcus Consultancy Services Pty ('Arcus') have been appointed by WKN Windcurrent to compile and submit Environmental Management Programme (EMPr) to the Department of Environmental Affairs (DEA) as part of the Basic Assessment process for the Highlands WEFs and associated infrastructure including grid connection. The Highlands South WEF and the Highlands South Electrical Grid Connection have both separately applied for environmental authorisation from the DEA and therefore require separate EMPr's.

This document represents the Environmental Management Programme (EMPr) for the **Highlands South WEF**.

This document, the environmental management programme (EMPr) must be seen as dynamic, and be updated when and if required, throughout the lifecycle of the project.

The EMPr outlines measures to be implemented in order to minimise adverse environmental degradation associated with construction of the proposed development. It serves as a guide for the contractor and the construction workforce on their roles and responsibilities concerning environmental management on site, and it provides a framework for environmental monitoring throughout the construction and operational period of the proposed development.

1.2 Details of the Applicant and the Environmental Assessment Practitioner

Details of Applicant	
Project Applicant	Highlands South WEF RF Propriety Limited
Company Registration	2015/425520/07
Contact Person	Alan Wolfromm
Postal Address	PO Box 762, Wilderness 6560
Telephone	082 529 4909
Fax	None
Email	MrWolf@wkn-windcurrent.com

Environmental Assessment Practitioner	
EAP	Arcus Consultancy Services Ltd
Contact Person	Ashlin Bodasing
Qualifications	Bachelor of Social Science - Geography and Environmental Management
Postal Address	Office 220, Cube Work Space, 24 Hans Strijdom Avenue, Cape Town, 8001
Telephone	021 412 1529
Fax	None
Email	ashlinb@arcusconsulting.co.za

1.3 Purpose and Aims of this Document

According to the Western Cape's Department of Environmental Affairs and Development Planning, Guideline for Environmental Management Plan (2005), and Environmental Management Programme (EMPr) is defined as "an *environmental management tool used to ensure that undue or reasonably avoidable adverse impact of the construction, operation and decommissioning of a project are prevented or mitigated, and that the positive benefits of the project are enhanced."*

This EMPr outlines measures to be implemented in order to minimise adverse environmental degradation and enhance positive impacts associated with the wind energy facility. It serves as a guide for the contractor and the workforce on their roles and responsibilities concerning environmental management on site, and it provides a framework for environmental monitoring throughout the construction and operational periods. The purpose of the EMPr is to:

- Encourage good management practices through planning and commitment to environmental issues;
- Define how the management of the environment is reported and performance evaluated;
- Provide rational and practical environmental guidelines to:
  - Minimise disturbance of the natural environment;
  - Prevent pollution of land, air and water;
  - Protect indigenous flora and fauna;
  - Prevent soil erosion and facilitate re-vegetation;
- Comply with all applicable laws, regulations, standards and guidelines for the protection of the environment;
- Adopt the best practicable means available to prevent or minimise adverse environmental impacts;
- Identify and mitigate against any potential impact on ecology;
- Describe all monitoring procedures required to identify impacts on the environment; and
- Train employees and contractors with regard to environmental obligations.

1.4 The Proposed Project

The proposed Highlands South WEF will compromise of up to 18 turbines, each having a maximum installed capacity of up to 5 megawatts (MW). Turbines will have a maximum height to tip of blade of 200 m, with a hub height of 135 m and a rotor diameter of 150 m. The proposed Highlands South WEF will be located within the southern portion of the development site boundary within an area of approximately 3,500 ha. The actual development footprint will only cover 1-2% of this area (Figure 1.2).

The proposed location of turbines seeking approval from the DEA is presented in Figure 1.2. These locations have been identified based on specialist constraints and sensitivity mapping conducted through various phases, including feasibility, and impact assessment. This allowed placement of turbines in areas of medium to low sensitivity.

If awarded Preferred Bidder Status, the Highlands South Wind Energy Facility (RF) Pty Ltd would enter into an implementation agreement with the Department of Energy (DoE) and a Power Purchase Agreement (PPA) with the buyer of the energy, which is in the majority of cases Eskom. Once operational the electricity would be sold to Eskom under the PPA at the agreed bid price. Eskom then distribute the energy through the national grid to the energy users.

1.5 Proposed Project Infrastructure Components

The proposed project will comprise the following components as described below. It should be noted as the final design of the proposed project is not yet finalised, all dimensions are maximums as is required by the EIA process. The final design may include infrastructure which is of equal or less than dimensions to those stated below but not more than.

1.5.1 Turbines

The proposed Highlands South WEF will comprise of 18 turbines with a maximum generation capacity of 5 MW per turbine. Internal roads will connect the turbines. On-site cabling will largely follow the road infrastructure where possible, and will be either overhead, or underground. Two on-site substation locations (Substation C1 and C2) will form part of this application. Turbines will have a maximum height to blade tip of 200 m (a hub height of up to 135 m, and a rotor diameter of up to 150 m).

The exact turbine model has not been selected yet and will be subject to competitive tendering after further wind analysis has been completed. The turbine model will depend upon the technical, commercial and site specific requirements.

The turbine rotor speed will vary according to the energy available in the wind, the wind speed. The turbines will generate power in wind speeds between approximately 3 metres per second (m/s) and 28 m/s (depending on the model of turbine) with maximum power output usually achieved at wind speeds of around 10 – 12 m/s. At average wind speeds greater than approximately 28 m/s the turbines would will automatically turn the angle of the blade to reduce energy capture (this is known as 'pitching') and stop turning to prevent damage.

The turbines will be placed on steel and concrete foundations which will each occupy an area of up to 30 m by 30 m in total (which includes the maximum total area that may need to be disturbed during construction of the foundation), and be typically up to 3 m deep and may include concrete and steel plinths depending upon local ground conditions.

Once construction is complete, much of the foundation area can be rehabilitated.

1.5.2 Hardstanding Areas

A hardstanding area of up to 100 m by 50 m will be established adjacent to each turbine location. This will be used to provide a platform for cranes to operate during construction (and unscheduled maintenance), as well as a clear area to lay out turbine components prior to erection.

1.5.3 Laydown Areas

Up to three additional temporary laydown areas of up to one hectare in size will be required for equipment and component storage during construction. These areas will be levelled and compacted and used for component storage.

1.5.4 Electrical Cabling and Onsite Substations

The electricity from the turbines will be transferred via a 33 kV electrical network to a 33/ 132 kV onsite substation OR to a 33/66 kV on site substation. Where feasible and possible this will be underground. The two on-site substations will house electrical infrastructure such as transformers and switch gear to enable the energy to be transferred into the existing national grid.

1.5.5 Access

The turbine locations will be accessed through a network of unsealed tracks which will be established across the project site. These access tracks will be up to 9 m wide during construction, depending on local topography, but will be reduced to between 4 m and 6 m during operation. Such roads are required to facilitate access for the cranes and abnormal load deliveries of turbine components.

Existing farm access tracks will be upgraded and utilised where possible, as will existing watercourse crossings. No borrow pits will be established on site. All material required for the construction of the proposed project will be imported to site.

1.5.6 Compound

There will also be an on-site office compound, including site offices, parking and an operation and maintenance facility including a control room.

1.5.7 Ancillary Equipment

In addition to the key components outlined above, the WEF will also require:

- Anemometer masts;
- Security fencing; and
- CCTV monitoring towers.

2 LEGAL FRAMEWORK

An application for Environmental Authorisation, in term of the National Environmental Management Act, Act 107, 1998 (NEMA), Environmental Impact Assessment Regulations, 2014 (as amend 2017), has been submitted to the Department of Environmental Affairs. The environmental authorisation process that is being followed for the proposed development, is a basic assessment process (BA). This reason for this is the proposed development is situated within the Cookhouse Renewable Energy Development Zone (REDz).

The Department of Environmental Affairs (DEA) undertook Strategic Environmental Assessments (SEAs) to contribute to regulatory requirements which aim to facilitate the implementation of sustainable energy. These SEAs identified geographical areas best suited for the development of wind and solar PV energy projects.

The Renewable Energy Development Zones (REDZs) were defined through a two phase SEA process. Phase 1 was a positive and negative mapping exercise that firstly evaluated development potential based on wind and solar resources and other pull factors such as socio-economic considerations (positive mapping), and secondly assessed environmental and technical constraints such as bird and bat sensitivity and topography (negative mapping). Phase 2 was a prioritisation process that involved extensive consultation with the renewable energy industry, key stakeholders, national, provincial and local authorities, primarily aimed at identifying the areas that best serve both the strategic objectives of the country (which include economic, environmental and socio-political considerations) and the needs of the industry.

As a result of these SEAs eight REDZs were allocated and subsequently gazetted by the Minister of Environmental Affairs on the 16th February 2018. Wind and solar PV projects within these REDZs will now be subject to a Basic Assessment and not a full Environmental Impact Assessment (EIA) process, accelerating the application process.

This section of the draft EMPr will need to be updated to include the recommendations and requirements that are outlined in the Environmental Authorisation, should this project be authorised by the DEA. Table 2.1 below highlights the listed activities being applied for environmental authorisation.

Table 2.1: The NEMA EIA Regulations Listed Activities Applicable to the Proposed WEF

Listing Notices 1 - 3 07 April 2017	***Listed Activity***	***Description of project activity that triggers listed activity***
Listing Notice 1 GN R 327 Activity 11	*The development of facilities or infrastructure for the transmission and distribution of electricity—* *(i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.*	Medium voltage powerlines will be installed to transfer electricity from the turbines to an on-site substation. Cables will be installed underground where feasible.
Listing Notice 1 GN R 327 Activity 12	*The development of (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs (a) within a watercourse (c) if no development setback exists within 32 m of a watercourse, measured from the edge of a watercourse*	Infrastructure may be required at watercrossings that covers an area of more than 100 m^2.
Listing Notice 1 GN R 327 Activity 19	*The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;*	The construction of the WEF would likely include the excavation of soil in watercourses/drainage line areas, and infilling/deposition may exceed 5 cubic metres and in some instances may exceed 10 cubic metres. Borrow pits for the sourcing of aggregate material may be required. Figure 7.1 shows the location of water crossings. The construction of associated infrastructure, such as access tracks crossing watercourses may require excavation and/or infilling of watercourse areas.
Listing Notice 1 GN R 327 Activity 24	*The development of a road—* *(ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;*	Access roads of 6 - 12 m will be required between turbines.
Listing Notice 1 GN R 327 Activity 27	*The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation*	The infrastructure and building area of the proposed WEF may require clearing of at least 1 hectare of indigenous vegetation in total.
Listing Notice 1 GN R 327 Activity 48	*The expansion of—* *(i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more;* *where such expansion occurs—* *(a) within a watercourse;*	Existing bridges over watercourses may need to be expanded or widened.

Listing Notices 1 - 3 07 April 2017	***Listed Activity***	***Description of project activity that triggers listed activity***
	(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;	
Listing Notice 1 GN R 327 Activity 56	*The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre-* *(ii) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas.*	Existing farm access roads may need to be widened or lengthened. These roads would currently have no road reserve and may be wider than 8 m in some areas.
Listing Notice 2 GN R 325 Activity 1	*The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more.*	The WEF will consist of up to 17 turbines for electricity generation with a combined capacity of more than 20 MW.
Listing Notice 2 GN R 325 Activity 6	*The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent.*	The construction of the WEF will require a Water Use License in terms of the National Water Act, 1998 (Act No. 36 of 1998).
Listing Notice 3 GN R 324 Activity 4	*The development of a road wider than 4 metres with a reserve less than 13,5 metres* *a. Eastern Cape* *i. Outside urban areas:* *(bb) National Protected Area Expansion Strategy Focus areas;* *(ee) Critical Biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;*	Internal and external access roads will be constructed, which are wider than 4 m. The site falls outside of an urban area and parts of the site fall with a NPAESF and a Tier 2 CBA.
Listing Notice 3 GN R324	*The development and related operation of facilities or infrastructure for the storage, or*	Fuel storage during construction is likely to exceed 30 m^3. The proposed on-site substation is likely to require the use of transformer oils/other hazardous substances during the operational phase.

Listing Notices 1 - 3 **07 April 2017**	***Listed Activity***	***Description of project activity that triggers listed activity***
Activity 10	*storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres.* *a. Eastern Cape* *i. Outside urban areas:* *(bb) National Protected Area Expansion Strategy Focus areas;* *(ee) Critical Biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;*	
Listing Notice 3 **GN R324** **Activity 12**	*The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.* *a. Eastern Cape* *ii. Within critical biodiversity areas identified in bioregional plans;*	The proposed development will require the clearance of natural vegetation in excess of 300 m^2 in areas of natural vegetation. Parts of the site fall within a Tier 2 Critical Biodiversity Area.
Listing Notice 3 **GN R324** **Activity 14**	*The development of—* *(ii) infrastructure or structures with a physical footprint of 10 square metres or more;* *where such development occurs—* *(a) within a watercourse;* *(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;* *a. Eastern Cape* *i. Outside urban areas:*	Bridges and infrastructure may be constructed within 32 m of watercourse(s). The site lies outside of an urban area and a portion of the site falls with an NPAESF area and a Tier 2 Critical Biodiversity Area.

Listing Notices 1 - 3 **07 April 2017**	***Listed Activity***	***Description of project activity that triggers listed activity***
	(bb) National Protected Area Expansion Strategy Focus areas; *(ff) Critical biodiversity areas or ecosystem service areas as identified in* *systematic biodiversity plans adopted by the competent authority or in bioregional plans;*	
Listing Notice 3 **GN R324** **Activity 18**	*The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.* *a. Eastern Cape* *i. Outside urban areas:* *(bb) National Protected Area Expansion Strategy Focus areas;* *(ee) Critical biodiversity areas or ecosystem service areas as identified in* *systematic biodiversity plans adopted by the competent authority or in bioregional plans;*	Existing farm roads may need to be widened or lengthened. The site lies outside urban areas, and a portion of the site falls with an NPAESF area and a Tier 2 Critical Biodiversity Area.
Listing Notice 3 **GN R324** **Activity 23**	*The expansion of—* *(ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more;* *where such expansion occurs—* *(a) within a watercourse;* *(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;* *a. Eastern Cape* *i. Outside urban areas:* *(bb) National Protected Area Expansion Strategy Focus areas;*	The construction of the WEF may include the expansion of existing bridges over watercourses. The site lies outside of any urban area, and parts of the site fall within a Critical Biodiversity Area.

Listing Notices 1 - 3 **07 April 2017**	***Listed Activity***	***Description of project activity that triggers listed activity***
	(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;	

3 ENVIRONMENTAL IMPACT ASSESSMENT

The EMPr has been developed based on the findings and recommendations of the environmental assessment process (Arcus, 2018).

3.1 Summary of Findings

During the environmental assessment process, impacts on both the biophysical and socio-economic environments were assessed. The following specialist's studies were commissioned based on the sensitivities of the site and the potential impacts of the proposed development:

- Visual;
- Terrestrial Ecology (Flora and Fauna);
- Bats;
- Wetlands and Freshwater;
- Birds;
- Soils, Land Use and Agricultural Potential;
- Heritage and Palaeontology;
- Noise;
- Traffic and Transportation; and
- Socio-Economic.

The assessment has found that the proposed development will only impact agricultural land which is of low agricultural potential and only suitable for grazing.

The significance of all agricultural impacts is low due to two important factors. Firstly, the actual footprint of disturbance of the wind farm (including associated infrastructure and roads) is very small in relation to the available grazing land on the effected farm portions. All agricultural activities will be able to continue unaffectedly on all parts of the farm other than the small development footprint for the duration of and after the project. Secondly, the proposed site is on land of limited agricultural potential that is only viable for grazing. These two factors also mean that cumulative regional effects as a result of other surrounding developments, also have low significance.

It was further assessed that the proposed development would have a limited impact on the aquatic environment as all large structures will avoid the delineated natural systems, with a limited number of new water course crossings, i.e. the layout makes use of any of the existing roads, as far as practicable.

From an ecological perspective the development site is largely restricted to the lower-lying eastern slopes and gentle hills of the site and are considered generally suitable for development. The abundance of plant species of conservation concern in these areas is low and species of high conservation concern were not observed within the development footprint.

Although there are a variety of mammals of conservation concern known from the broader area it is not likely that the affected areas are of high significance for these species and long-term impacts on listed fauna are likely to be low.

The majority of the Highlands South WEF lies within a tier 2 CBA aimed at maintaining the broad-scale connectivity of the landscape. Although the proposed development would result in some habitat loss within the CBA, this is not likely to compromise the overall functioning of the CBA as it is very large and the development occupies a very small proportion of the CBA. The majority of the development footprint lies within a NPAES focus area. The development however lies on the margin of the NPAES focus area and the extent

of the development would not significantly impact ability to meet conservation targets elsewhere within the focus area which is large in comparison with the development site.

Although there are extensive areas of sensitive habitat within the Proposed Development Area, the development footprint is restricted to the medium and low sensitivity parts of the site. These areas are considered suitable for development and there are no ecological impacts associated with the Highlands South WEF that cannot be mitigated to a low level.

Activity and abundance of priority species and red data species were generally found to be moderate to high on the proposed Highlands development site after one year of pre-construction monitoring. Activity was particularly high in summer, coinciding with the arrival of migratory raptors. Activity of other resident Red Data species, e.g. Verreaux's Eagle, Blue Crane and Ludwig's Bustard was relatively constant across the year, at a moderate level. Activity of the non-Red Data raptors, Jackal Buzzard and Rock Kestrel was high to very high throughout the year, and these species are the ones most likely to suffer collision mortality.

Abundances of small passerines were also found to be moderate, with a relatively moderate to high diversity of species recorded, including a number of endemics or near-endemics. However, due to most of these species being relatively common, and the extensive available habitats for this birds on and around the development site, it was predicted that the impacts to these birds was likely to be low.

The bat monitoring data collected and analysed to date suggest that the development of the proposed Highlands South WEF can be achieved without unacceptable risks to bats.

The increased occupation of the Bloukrans cave by the Natal long-fingered bat in October (spring) appears not to have influenced bat activity at the site. This migratory species would be at risk of encountering and colliding with wind turbines as it moves across the landscape to and from winter hibernacula towards the cave in autumn and spring but increased activity during these periods was not observed. It is not known which direction these bats would travel across the landscape to the cave but it is possible that they might move through the proposed WEF especially if they fly from the east, westwards towards the cave. The finding that activity is higher near water, buildings and in the valley or lowland areas is important as an initial step to reduce the impact of the proposed WEF's to bats as the facilities must be designed to avoid these areas based on the sensitivity map. No parts of the turbines, including the blade tips, should enter these buffers.

The significance ratings for the majority of the impacts to bats posed by the development are predicted to be low or medium before mitigation and low after mitigation. Impacts related to bat mortality during migration are predicted to be of medium significance before mitigation and low significance with mitigation. However, cumulative impacts may remain medium after mitigation.

The level of impact of noise effects for the Highlands South WEF has been assessed as low during construction and decommissioning with mitigation; as low during day-time operation and medium during night-time operation, without requiring mitigation.

Cumulative impacts are expected to be low during construction and decommissioning with mitigation, low during day-time operation (no mitigation required) and medium during night-time operation with mitigation.

The fieldwork conducted shows that archaeological resources could be found almost anywhere in the Proposed Development Area but that the vast majority are likely to be of low cultural significance. Aside from impacts to the cultural landscape which are unavoidable but only of generally medium significance, no other aspects of heritage are expected to be impacted. Although a further survey will be required prior to the commencement of construction, it is considered highly unlikely that heritage resources that

would require avoidance will be found. Rather, it is likely that some archaeological mitigation may be needed for any resources that cannot be avoided. Such mitigation can be easily effected where required.

The potential visual impact significance of the proposed Highlands South WEF during construction would be medium, and could be medium during the operation phase. Required mitigation has already been implemented through siting of the wind turbines in response to the specialist studies.

The layout of the proposed turbines succeeds in avoiding practically all the major visual constraints for the study area, occupying the least sensitive parts of the site.

The development of the proposed Highlands South WEF will create employment and business opportunities for locals during both the construction and operational phase of the project. The establishment of a Community Trust will also benefit the local community. The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the negative environmental and socio-economic impacts associated with a coal based energy economy and the challenges created by climate change, represents a significant positive social benefit for society as a whole. The findings of the SIA also indicate that the Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) has resulted in significant socio-economic benefits, both at a national level and at a local, community level. These benefits are linked to foreign Direct Investment, local employment and procurement and investment in local community initiatives.

The Proposed Development Site is also located within a REDZ. The area has therefore been identified as suitable for the establishment of renewable energy facilities.

From the assessment, it is evident that the construction and the operation of the WEF will have negative impacts both socially and environmentally but when appropriate mitigation measures are applied the potential socio-economic positive impacts around local / regional economic stimulation and renewable energy into the national grid are generally seen to be outweighed by negative impacts.

Overall the project has a positive economic impact regionally and for South Africa as a whole as power generated from the WEF will feed into the National Eskom grid, create job opportunities, and contribute to the local and regional economy.

4 ENVIRONMENTAL MANAGEMENT PROGRAMME

This section forms the core of the EMPr and outlines the specific mitigation measures for those key impacts identified in the section above.

4.1 Environmental Awareness and Compliance

The philosophy that has been used for the compilation of this management programme is derived from the principles of the National Environmental Management Act (No. 107 of 1998) which states that development must be socially, economically and environmentally sustainable. Sustainable development requires that:

- The disturbance of ecosystems and loss of biodiversity are avoided (minimised or remedied);
- Pollution and degradation of the environment are avoided or minimised and remedied; Waste is avoided or minimised and re-used or re-cycled where possible and otherwise disposed of in a responsible manner;
- A risk averse and cautious approach is applied;
- Negative impacts on the environment and on people's environmental rights be anticipated; and, prevented and where they cannot altogether be prevented, are minimised and remedied.

The Act makes provision that anyone who causes pollution or degradation of the environment is responsible for preventing impacts occurring, continuing or recurring and for the costs of repair of the environment.

4.2 Roles and Responsibilities for Good Environmental Management

The developer, together with the each appointed contractor will be responsible for environmental management on site during the construction and operational phases of the proposed development. Specific roles and responsibilities are highlighted below.

Developer Representative – Environmental Manager

- Review and approve EMPr prior to authorisation by DEA.
- Review and approve any EMPr updates or amendments.
- Ensure environmental requirements are integrated into the project plans, method statements and tender processes.
- Support the site environmental control officer during the construction phase, to ensure implementation of the EMPr.
- Follow up and close out all environmental incidents and non-conformances.
- Appointment a suitably qualified independent environmental control officer during the construction phase.

Principal Contractor Representative - Environmental Control Officer

An independent environmental consultant will arrange for inspections of the construction activities and EMPr implementation throughout the construction phase. After each inspection, the ECO will produce a monitoring report that will be submitted to the client, DEA and Eastern Cape Environmental Department. Relevant sections of the minutes of customary (monthly) site meetings will be attached to the monitoring report.

The Environmental Control Officer (ECO) will be responsible for overseeing the implementation of the EMPR during the construction and operations phases, and for monitoring, reviewing and verifying compliance of the contractor with the EMPR, record-keeping and updating of the EMPR as and when necessary.

The ECO will:

- Be fully knowledgeable with the contents of the EMPR;
- Be fully knowledgeable with the contents of all relevant environmental legislation and ensure compliance with them;
- Ensure that the contents of the EMPR are communicated to the contractor, all site staff, and the the contractor and /or site manager are made aware of the contents of the EMPR, through presentations and discussions;
- Ensure that compliance to the EMPR is monitored by regular and comprehensive inspection of the site and surrounding areas;
- Report on any incidents of non-compliance and ensure mitigation measure are implemented as soon as practical.

During *construction*, the Environmental Control Officer will be responsible for the following:

- Meeting on site with the Construction Manager prior to the commencement of construction activities to confirm the construction procedure and designated activity zones;
- Daily / weekly (depending on the extent of construction activities, at any given time) monitoring of site activities during construction to ensure adherence to the specifications contained in the EMPR, using a monitoring checklist that is to be prepared by an independent environmental assessment practitioner at the start of the construction phase;
- Preparation of the monitoring report based on the site visit;
- Conducting an environmental inspection on completion of the construction period and signing off the construction process with the Construction Manager; and
- Maintain an Incidents Register and Complaints Register on site.

During *operation*, the Environmental Control Officer will be responsible for:

- Overseeing the implementation of the EMPR for the operation phase;
- Ensure that the necessary environmental monitoring takes place as specified in the EMPR;
- Update the EMPR and ensure that records are kept of all monitoring activities and results; and
- Maintain an Incidents Register and Complaints Register on site.

During *decommissioning*, the Environmental Control Officer will be responsible for:

- Overseeing the implementation of the EMPR for the decommissioning phase; and
- Conducting an environmental inspection on completion of decommissioning and "signing off" the site rehabilitation process.

4.3 Training and Induction of Employees

The contractor has a responsibility to ensure that all personnel involved in the project are aware of and are familiar with the environmental requirements for the project. The EMPR shall be part of the terms of reference (ToR) for all contractors, sub-contractors and suppliers. All Contractors have to give some assurance that they understand the EMPR and that they will undertake to comply with the conditions therein. All senior and supervisory staff members shall familiarise themselves with the full contents of the EMPR. They shall know and understand the specifications of the EMPR and be able to assist other staff members in matters relating to the EMPR.

The Contractor must ensure that all staff working on site has an environmental induction. The presentation can include the following topics;

- What is meant by "Environment"?
- Why the environment needs to be protected and conserved.

- How construction activities can impact on the environment.
- What can be done to militate against such impacts?
- Awareness of emergency and spills response provisions.
- Social responsibility during construction e.g. being considerate to local residents.

A detailed environmental management and training program must be developed. The purpose of this is to ensure that all staff and workers understand what is required of them. The main components of the program can incorporate the following:

- Concept of sustainability and the reasons for good environmental management and practice
- Potential environmental impacts
- Mitigation measures
- Establishing a chain of responsibility and decision making
- Specific training requirements of certain staff, and the potential hazardous associated with the job.
- Methodologies to be used for field sampling
- Training in the use of field equipment
- Training in identification of non-compliance situations and procedures to be followed in such instances
- Reporting requirements
- Fire management
- HIV/AIDS

4.4 Complaints Register and Environmental Incidents Book

The Contractor must record any complaints received from the community. The complaint must be brought to the attention of the site manager and Environmental Control Officer, who will respond accordingly.

The following information will be recorded:

- Time, date and nature of the complaint;
- Response and investigation undertaken; and,
- Actions taken and by whom.

All complaints received will be investigated and a response (even if pending further investigation) will be given to the complainant within 7 days.

All environmental incidents occurring on the site will be recorded. The following information will be provided:

- Time, date, location and nature of the incident, and
- Actions taken and by whom.

4.5 Construction Environmental Monitoring

Environmental audits must be undertaken by an independent environmental consultant who will act as the Environmental Control Officer twice monthly, and on a daily basis or what is deemed necessary by the ECO during times of heavy earth works and vegetation clearing, in order to ensure compliance of all aspects of the EMPR.

In order to facilitate communication between the ECO and the Resident Engineer and Contractor, it is vital that a suitable chain of command is structured that will ensure that the ECO's recommendations have the full backing of the project team before being conveyed to the Contractor. In this way, penalties as a result of non-compliances with the EMPR may be justified as failure to comply with instruction from the highest authority.

4.6 Dealing with Non Compliance with the EMPR

There may be difficulties encountered with carrying out the mitigation measures within the EMPr, this may result in non-compliance with the EMPR. It may be possible that the contractor and or the developer put in place procedures to motivate staff members to comply with the EMPr and to deal with non-compliance. The developer must make this known to the contractor at the earliest stage possible, even during the tender phase.

4.7 EMPR Amendments and Instructions

No EMPR amendments shall be allowed without the approval of the DEA. Amendments may be possible, following discussions with the relevant ECO or environmental consultant, who may propose EMPR amendments on behalf of the developer or issue EMPR instructions, corrective actions, remediation or rehabilitation. These correction actions must be completed within the specified timeframes.

5 DESIGN PHASE / PRE–CONSTRUCTION PHASE MITIGATION MEASURES

The objectives of the pre-construction phase are:

- To promote environmental awareness.
- To define roles and responsibilities for environmental management;
- To ensure suitable environmental training and induction to all contractors, sub-contractors and labourers; and
- To ensure that all legal obligations and contractual conditions have been met prior to commencing of construction.

Mitigation measures for Legal Compliance.

- Appoint an independent environmental control officer
- Appoint an internal environmental co-ordinator or environmental officer, to oversee day to day environmental activities.
- Staff should be educated as to the need to refrain from indiscriminate waste disposal and/or pollution of local soil and water resources and receive the necessary safety training.
- Before construction begins, all areas to be developed must be clearly demarcated with fencing, by a qualified surveyor.
- The contractor must ensure compliance with conditions described in the environmental authorisation.
- No construction camps are allowed on site. No workers are allowed to stay overnight in the construction area.
- Confirm with ECO, suitable sites for the construction camps (equipment and batching etc.) and storage areas for materials. All construction equipment must be stored within this construction camp and all associated oil changes etc. (no servicing) must take place within this camp.
- Unskilled labourers should be drawn from the local market.
- Training of site staff.
- Environmental awareness training for construction staff, concerning the prevention of accidental spillage of hazardous chemicals and oil; pollution of water resources (both surface and groundwater), air pollution and litter control and identification of archaeological artefacts.
- Project Manager shall ensure that the training and capabilities of the Contractor's site staff are adequate to carry out the designated tasks.
- Staff operating equipment (such as excavators, loaders, etc.) shall be adequately trained and sensitised to any potential hazards associated with their tasks.

- No operator shall be permitted to operate critical items of mechanical equipment without having been trained by the Contractor and certified competent by the Project Manager.

The developer must ensure that the following mitigation measures are applied to the proposed project prior to the construction phase. These measures must be included in an updated EMPr to be submitted to the DEA for approval.

Prior to the submission of the final layout plan to the DEA for approval, the following specialists must visit the site to assist with the micro-siting the layout and do a walkthrough of all power lines:

- Flora and fauna specialists;
- Bat specialist;
- Avifaunal specialist;
- Aquatic specialist;
- Palaeontologist.

Following the selection of turbine to be used for the project, the developer must update the layout plan / site development plan, this together with the following management plans, to be developed, must be submitted to the DEA for approval:

- Traffic Management Plan – this plan will include the necessary arrangements to transport all equipment and infrastructure to site, including the necessary road transport permits.
- Construction Site Traffic Management Plan – this will be in the form of a site layout, showing the flow of traffic during the construction phase taking into consideration existing land users.
- Storm water Management Plan – once the final layout plan has been produced the appointed responsible engineers must produce a storm water management plan for the site, during the construction and operational phases of the project.
- A health and safety plan must be drawn up to ensure worker safety.

The construction of the WEF will result in water crossings for the expansion of existing and / the construction of new bridges over water courses. The developer must ensure that Water Use Licences are applied for and approved, prior to the start of construction. All mitigation measures proposed in the water use licence must be adhered to and included in an updated EMPr and submitted to the DEA for approval.

Develop a Project Layout and Access Plan to show the intended use of the area. The plan shall clearly indicate and/or describe the location and details of:

- Servitudes.
- Areas and routes to be cleared – including the size / width of the cleared areas.
- The construction campsite and rest areas to be used during construction.
- Waste disposal sites to be used during construction.
- Sources of construction materials.
- Power supply during construction.
- Existing roads and tracks to be used as transportation routes, and routes to gain access to construction areas.
- New tracks deemed necessary to provide access to construction activities.
- Any informal residential structures found within the property.
- Affected land use, 1:50 year floodlines.
- Sensitive areas.

5.1 Method Statements

Prior to construction the developer must ensure that the contractor supply the following method statements:

- Vegetation clearing;
- Cement mixing;
- Hazardous waste management;
- Emergency preparedness and response;
- Hazardous spills clean up;
- Topsoil stockpiling management;
- Laydown area management;
- Hazardous materials management;

5.2 Site Establishment

The object of site establishment is to ensure that an appropriate site is selected for the construction camp/site office and that the site office is managed in an environmentally responsible manner with minimal impact on the environment.

Mitigation Measures

Before establishing the construction office areas, carefully plan the layout and develop a Construction Site Office Plan[1]. The Construction Site Office Plan shall provide a description of the site and shall show, on a reasonably scaled map, the intended use of the site. Indicate and/or describe the location, size / quantity / capacity and design of:

- Access routes;
- Ablution facilities (including details on the handling of sewage and wastewater);
- On-site waste management facilities (waste containers, etc.);
- Design of bunds and other structures for containment of hazardous substances;
- Fencing;
- Water storage and supply;
- Power supply (for cooking, space heating, lighting, etc.);
- Fire extinguishers, first aid kit and any other relevant safety equipment;
- Other structures and buildings (offices, storerooms, workshops, etc.);
- Other storage areas and stockpiles (i.e. topsoil, construction materials, equipment, etc.).
- Location of areas to be rehabilitated upon completion of the construction period, providing measures to be used for rehabilitation.
- An area within the site must be demarcated for a construction site office, which will include storage area. This area must be fenced off.
- Site establishment shall take place in an orderly manner and all required amenities shall be installed at the lay down area before the main workforce move onto site.
- The construction camp shall have the necessary ablution facilities with chemical toilets at commencement of construction.
- The Contractor shall inform all site staff to make use of supplied ablution facilities and under no circumstances shall indiscriminate sanitary activities be allowed other than in supplied facilities.
- The Contractor shall supply waste collection bins and all solid waste collected shall be disposed of at a registered landfill.
- Potable water for use by on site workers must be made available on a daily basis at the site office and the working areas on site.

[1] To form part of the Project Layout and Access Plan.

- A certificate of disposal shall be obtained by the Contractor and kept on file. Where a registered waste site is not available close to the construction site, the Contractor shall provide a method statement with regard to waste management.
- The disposal of waste shall be in accordance with all relevant legislation. Under no circumstances may solid waste be burnt or buried on site.

Siting, Establishing and Management of Storage Material and Facilities

- Choice of location for storage areas must take into account prevailing winds, distances to water bodies, general onsite topography and water erosion potential of the soil. Impervious surfaces must be provided where necessary.
- Storage areas must be designated, demarcated and fenced.
- Storage areas should be secure so as to minimize the risk of crime. They should also be safe from access by children / animals etc.
- Fire prevention facilities must be present at all storage facilities.
- Proper storage facilities for the storage of oils, paints, grease, fuels, chemicals and any hazardous materials to be used must be provided to prevent the migration of spillage into the ground and groundwater regime around the temporary storage area(s).
- These pollution prevention measures for storage should include a bund wall high enough to contain at least 110% of any stored volume, and this should be sited away from drainage lines on site with the approval of the Engineer.
- Any water that collects in the bund must not be allowed to stand and must be removed immediately and the hydrocarbon digestion agent within must be replenished.
- All legal compliance requirements with respect to Fuel storage and dispensing must be met.
- All fuel storage tanks (temporary or permanent) and associated facilities must be designed and installed in accordance with the relevant oil industry standards, SANS codes and other relevant requirements.
- Areas for storage of fuels and other flammable materials must comply with standard fire safety regulations.
- Flammable fuel and gas must be separated from all welding workshops, assembly plants and loading bays where ignition of gas by an accidental spark may cause an explosion or fire.
- The tank must be erected at a safe distance from buildings, boundaries, welding sites and workshops and any other combustible or flammable materials.
- Symbolic safety signs depicting "No Smoking", "No Naked Flames" and "Danger" are to be prominently displayed in and around the fuel storage area.
- The capacity of the tank must be clearly displayed and the product contained within the tank clearly identified.
- There must be adequate fire-fighting equipment at the fuel storage and dispensing area or areas.
- The storage tank must be removed on completion of the construction phase of the project.
- All such tanks to be designed and constructed in accordance with a recognised code (international standard).
- The rated capacity of tanks must provide sufficient capacity to permit expansion of the product contained therein by the rise in temperature during storage.
- Only empty and externally clean tanks may be stored on the bare ground. All empty and externally dirty tanks must be sealed and stored in an area where the ground has been protected.
- Any electrical or petrol-driven pump must be equipped and positioned so as not to cause any danger of ignition of the product.
- If fuel is dispensed from 200 litre drums, the proper dispensing equipment must be used.

- The drum must not be tipped in order to dispense fuel. The dispensing mechanism of the fuel storage tank must be stored in a waterproof container when not in use.
- All waste fuel and chemical impregnated rags must be stored in leak-proof containers and disposed of at an approved hazardous waste site.
- The amounts of fuel and chemicals stored on site must be minimised.
- Storage sites must be provided with bunds to contain any spilled liquids and materials.
- These storage facilities (including any tanks) must be on an impermeable surface that is protected from the ingress of storm water from surrounding areas in order to ensure that accidental spillage does not pollute local soil or water resources.
- Clear signage must be placed at all storage areas containing hazardous substances / materials.
- Material Safety Data Sheets (MSDSs) shall be readily available on site for all chemicals and hazardous substances to be used on site. Where possible the available, MSDSs should additionally include information on ecological impacts and measures to minimise negative environmental impacts during accidental releases or escapes.
- Storage areas containing hazardous substances / materials must be clearly signed.
- Staff dealing with these materials / substances must be aware of their potential impacts and follow the appropriate safety measures.
- A suitable Waste Disposal Contractor must be employed to remove waste oil. These wastes should only be disposed of at licensed landfill sites designed to handle hazardous wastes.
- The contractor must ensure that its staff is made aware of the health risks associated with any hazardous substances used and has been provided with the appropriate protective clothing/equipment in case of spillages or accidents and have received the necessary training.
- All excess cement and concrete mixes are to be contained on the construction site prior to disposal off site.
- Any spillage, which may occur, shall be investigated and immediate action must be taken.

6 CONSTRUCTION PHASE MITIGATION MEASURES

The following sections form the core of the EMPr during the construction phase of the proposed development. The developer is to ensure that the contractor complies with all mitigation measures during the construction period. The major sources of potential impacts include, the turbine footprint construction, the construction of buildings and infrastructure, the construction of roads and bridges, and vehicle operation, and spillages.

The following is not allowed on site:

- No poaching of any animals or harvesting of any flora;
- No construction camp, for workforce accommodation is allowed on site; contractors are to ensure suitable housing for staff outside of the proposed development footprint.
- No cooking or fires allowed on site;
- No alcohol or drugs are allowed on site;

6.1 Potential Construction Phase Impacts

The following impacts are likely to occur during the construction of the proposed WEF. Specific mitigation measures for each impact is presented below.

- The accidental, negligent, or deliberate spillage or inappropriate disposal of hazardous substances could result in air, soil and water pollution and may affect the health and well-being of people, plants and animals.
- Excessive noise could be made by the construction activity which would affect neighbouring communities.

- Potential damage to the soil structure, soil compaction and loss of soil fertility.
- Loss of the vegetation cover and increased erosion risks.
- Dust related problems.
- Safety hazards to the public, workers and animals in the area.
- Disturbance to local hydrology from construction activities.
- Pollution of surface water bodies
- Dust can be a nuisance to the construction workforce and to the public and can negatively affect the growth and recovery rate of plants. Potential sources of fugitive dust include, but are not limited to:
    - Demolition of concrete foundations and existing buildings;
    - Grading / movement of soil;
    - Transportation and unloading of construction materials;
    - Vehicular movement over unsurfaced roads and tracks; and,
    - Wind erosion of stockpiles.
- Construction activities will result in the exposure of the soil to erosive factors, i.e. wind and water, and the compaction of the soil in other areas;
- Illegal poaching and collection of animals and plant material.
- Loss of established indigenous and exotic habitat
- Unnecessary trampling of vegetation and harm to animals.
- Degradation of the scenic quality due to the major earthworks and any unsightly structures.
- Damage or loss of important cultural, historical or pre-historical sites and artefacts.
- Damage to existing roads and tracks, power lines, pipelines, etc.
- Dangerous conditions near road.
- Trespassing and illegal access onto land.

Table 6.1 below presents a summary of the potential impacts as assessed by specialists for the construction phase of the WEF.

Table 6.2 below provides the mitigation measures to be implemented for the potential impacts identified.

Table 6.1: Summary of Construction Phase Potential Impacts and Significance Rating

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Geology, Soils and Agricultural Potential Impact							
Loss of Agricultural land	L	M	L	Negative	L	L	H
With Mitigation	L	M	L	Negative	L	L	H
Soil degradation	L	M	M	Negative	M	M	H
With Mitigation	L	M	L	Negative	L	L	H
Wetlands and freshwater							
Loss of riparian systems and water courses during the construction phase	L	M	L	Negative	M	H	H
With Mitigation	L	L	L	Negative	L	L	H
Increase in sedimentation and erosion within the development footprint during the construction phase and to a lesser degree the operational phase	L	M	L	Negative	M	H	H
With Mitigation	L	L	L	Negative	L	L	H
Impact on localized surface water quality mainly during the construction phase	L	M	L	Negative	M	H	H
With Mitigation	L	L	L	Negative	L	L	H
Terrestrial Ecological Impacts							
Impact on vegetation and listed plant species due to transformation within the development footprint	L	H	M	Negative	M	H	H
With Mitigation	L	M	M	Negative	M	H	H
Faunal impacts due to construction-phase noise and physical disturbance	L	L	H	Negative	M	H	H
With Mitigation	L	L	M	Negative	L	L	M
Avifauna							

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Destruction of habitat used by birds	L	M	M	Negative	M	H	H
With Mitigation	L	M	L	Negative	L	L	M
Disturbance and Displacement of Birds	L	L	M	Negative	M	M	M
With Mitigation	L	L	L	Negative	L	L	M
Bats							
Roost disturbance	L	M	L	Negative	L	L	M
With Mitigation	L	M	L	Negative	L	L	M
Roost destruction	L	H	L	Negative	M	M	M
With Mitigation	L	L	L	Negative	L	L	M
Habitat modification	L	M	L	Negative	L	L	M
With Mitigation	L	M	L	Negative	L	L	M
Noise							
Excavation and Concreting of Turbine Foundations	L	L	H	Negative	M	M	H
With Mitigation	L	L	L	Negative	L	L	H
Construction of Tracks and Hard standing	L	L	H	Negative	M	M	H
With Mitigation	L	L	L	Negative	L	L	H
Turbine Erection	L	L	H	Negative	M	M	H
With Mitigation	L	L	L	Negative	L	L	H
Generator (Night-time Use)	L	L	L	Negative	L	L	H
With Mitigation	L	L	L	Negative	L	L	H
Heritage and Archaeology							
Impacts on archaeological resources	L	H	L	Negative	M	M	H
With Mitigation	L	H	L	Negative	L	L	H
Impacts on graves	L	H	H	Negative	M	L	H

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
With Mitigation	L	H	L	Negative	L	L	H
Impacts to the cultural landscape	M	M	M	Negative	M	H	H
With Mitigation	M	M	M	Negative	M	H	H
Palaeontology							
Impacts to palaeontological resources	L	H	L	Negative	M	M	M
With Mitigation	L	H	L	Negative	L	L	M
Visual							
Potential visual effect of construction activities, including cranes, construction traffic, dust and noise affecting the rural sense of place.	L	L	M	Negative	M	H	H
With Mitigation	L	L	M	Negative	M	M	M
Social							
Impact of employment and business creation opportunities	M	L	M	Positive	M	M	H
With Mitigation	H	L	H	Positive	M	H	H
Impact of the presence of construction workers in the area on local communities	M	L	M	Negative	M	M	H
With Mitigation	M	L	L	Negative	L	L	H
Impact of job seekers on local communities	M	L	L	Negative	L	L	M
With Mitigation	M	L	L	Negative	L	L	M
Risk to safety, livestock, farm infrastructure and farming operations	M	L	M	Negative	M	M	H
With Mitigation	M	L	L	Negative	L	L	H
Impact of increased risk of fires	M	L	M	Negative	M	M	H
With Mitigation	M	L	L	Negative	L	L	H
Impacts associated with construction vehicles	M	L	M	Negative	M	M	H

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
With Mitigation	M	L	L	Negative	L	L	H
Impact on farmland due to construction related activities	M	L	M	Negative	M	M	H
With Mitigation	M	L	L	Negative	L	L	H
Traffic							
Traffic Flow	M	L	M	Negative	M	M	M
With Mitigation	M	L	M	Negative	L	L	M
Route Constraints	M	L	H	Negative	M	H	H
With Mitigation	M	L	L	Negative	L	L	H
Minor Road Degradation	L	L	M	Negative	M	M	M
With Mitigation	L	L	L	Negative	L	L	M
Minor Road Dust	L	L	H	Negative	M	M	M
With Mitigation	L	L	L	Negative	L	L	M
Intersection Road Safety	L	L	H	Negative	M	M	M
With Mitigation	L	L	H	Negative	L	L	M

Table 6.2 Design and Construction Phase Mitigation Measures

Mitigation Measure	Responsibility	Timing / Frequency
Route Clearing		
Off-road driving and the creation of new tracks, other than those described during Project Layout and Access Plan, are prohibited and will be regarded as unwanted tracks or unwarranted disturbed areas. All unwanted tracks or unwarranted disturbed areas shall be properly rehabilitated	Contractors engineer will be responsible for the creation of new roads. The ECO will be responsible for monitoring this activity	During site establishment Monthly thereafter.
When a new path is created: Carefully plan the route and have it clearly marked out so that drivers exactly know where to drive.	Site engineer/site manager ECO to monitor	Monthly
Establish the track by simply driving over the ground if there are no obvious obstacles (i.e. large rocks, high plants or rough terrain).	ECO to monitor Site engineer/site manager	
Keep tracks as narrow as possible and only drive on marked out routes (as per the Layout and Access Plan).		
No bulldozers will be used in bush clearing outside of the construction footprint. Only inflatable tyre earthmoving equipment must be used to reduce damage to vegetation.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
If obstacles are far enough apart, divert the track around obstacles. Only obstacles that could interfere with the safe construction and operation of the development need to be removed.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Where possible, remove obstacles by hand. Shrubs are to be cut or crushed rather than being completely uprooted in areas where landscaping or rehabilitation will be undertaken on completion of the construction. Leave vegetation in place wherever possible, especially around the perimeter of the site to provide screening and habitat. Indigenous plants can be planted to replace alien vegetation.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Only undertake earthworks in an area if it is unavoidable, and keep the size of platforms as small as possible.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Sensitive sites within the construction area must be demarcated to avoid accidental destruction of sensitive areas. The workforce must be made aware of these areas, and why they are sensitive.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Impacts on vegetation and listed or protected plant species resulting from construction activities		

Mitigation Measure	Responsibility	Timing / Frequency
Preconstruction walk-through of the approved development footprint by a qualified specialist to ensure that sensitive habitats and species are avoided where possible.	Developer / Site Engineer ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Search and Rescue of species of conservation concern (SCCs) should be conducted prior to clearing activities.	ECO to monitor Site engineer/site manager	During site establishment
Vegetation clearing to commence only after walk through has been conducted and necessary permits obtained.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness as to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
ECO to provide supervision and oversight of vegetation clearing activities within sensitive areas such as near drainage areas.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the construction area.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Temporary lay-down areas should be located within previously transformed areas or areas that have been identified as being of low sensitivity. These areas should be rehabilitated after use.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Ensure that lay-down and other temporary infrastructure is within low- sensitivity areas.	ECO to monitor Site engineer/site manager	Design Phase During site establishment
Minimise the development footprint as far as possible and rehabilitate disturbed areas that are no longer required by the operational phase of the development.	Developer / Site Engineer ECO to monitor Site engineer/site manager	During site establishment and post construction
The exact routing of the roads should be adjusted where necessary to avoid features of higher sensitivity such as rocky outcrops, as informed by the preconstruction walk-through of the facility.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Design Phase Pre-Construction ECO to monitor throughout construction.

Mitigation Measure	Responsibility	Timing / Frequency
Demarcate sensitive areas in close proximity to the development footprint as no-go areas with construction tape or similar and clearly mark as no-go area	Developer / Site Engineer ECO to monitor Site engineer/site manager	Design Phase Pre-Construction ECO to monitor throughout construction.
Alien Plant Invasion Risk		
Wherever excavation is necessary, topsoil should be set aside and replaced after construction to encourage natural regeneration of the local indigenous species.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
The recovery of the indigenous grass layer should be encouraged through leaving some areas intact through the construction phase to create a seed source for adjacent cleared areas.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility as there are also likely to be prone to invasion problems.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
An alien plant management plan must be submitted as part of the EMPr to be approved by the DEA and implemented on site.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Increased Erosion Risk and Soil Degradation		
Dust suppression and erosion management should be an integrated component of the construction approach.	ECO to monitor Site engineer/site manager	Weekly
Regular monitoring for erosion problems along the access roads and other cleared areas.	ECO to monitor Site engineer/site manager	Weekly
Erosion problems should be rectified on a regular basis.	ECO to monitor Site engineer/site manager	Weekly
Sediment traps may be necessary to prevent erosion and soil movement if there are topsoil or other waste heaps present during the wet season.	ECO to monitor Site engineer/site manager	Monthly

Mitigation Measure	Responsibility	Timing / Frequency
A low cover of vegetation should be left wherever possible within the construction footprint to bind the soil, prevent erosion and promote post-disturbance recovery of an indigenous ground cover.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Disturbance near to drainage lines or the pan should be avoided and sensitive drainage areas near to the construction activities should demarcated as no-go areas.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Implement an effective system of storm water run-off control using bunds and ditches, where it is required - that is at all points of disturbance where water accumulation might occur. The system must effectively collect and safely disseminate any run-off water from all hardened surfaces and it must prevent any potential down slope erosion.	Developer / Site Engineer ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
If an activity will mechanically disturb the soil below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.	Developer / Site Engineer ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Direct Faunal Impacts		
All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes, tortoises and owls which are often persecuted out of superstition.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Preconstruction walk-through of the facility to identify areas of faunal sensitivity such as occupied burrows	Developer ECO to monitor Site manager	Pre- construction.
Any fauna threatened by the construction activities should be removed to safety by the ECO or appropriately qualified environmental officer.	ECO to monitor Site engineer/site manager	During site establishment Weekly.
All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises.	ECO to monitor Site engineer/site manager / safety officer	During site establishment. Weekly.
During construction any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person.	Developer / Site Engineer ECO to monitor Site engineer/site manager	During site establishment Weekly.
The illegal collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off the construction site.	Developer / Site Engineer ECO to monitor Site engineer/site manager	During site establishment Weekly.

Mitigation Measure	Responsibility	Timing / Frequency
No fires should be allowed on site as the vegetation is vulnerable to runaway fires.	Developer / Site Engineer ECO to monitor Site engineer/site manager	During site establishment Weekly.
No fuelwood collection should be allowed on-site.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Weekly.
No dogs or cats should be allowed on site at the construction camps apart from those of the landowners.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Weekly.
If any parts of site such as construction camps must be lit at night, this should be done with low-UV type lights (such as most LEDs) as far as practically possible, which do not attract insects and which should be directed downwards	Developer / Site Engineer ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
No unauthorized persons should be allowed onto the site and site access should be strictly controlled.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Weekly.
All construction vehicles should adhere to a low speed limit (40km/h for cars and 30km/h for trucks) to avoid collisions with susceptible species such as snakes and tortoises and rabbits or hares. Speed limits should apply within the facility as well as on the public gravel access roads to the site.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Weekly.
All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
If trenches need to be dug for water pipelines or electrical cabling, these should not be left open for extended periods of time as fauna may fall in and become trapped in them. Trenches which are standing open should have places where there are soil ramps allowing fauna to escape the trench.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Loss of rare, endemic or protected species		
All alien plant re-growth, which is currently high within the greater region must be monitored and should it occur, these plants should be eradicated within the project footprints and especially in areas near the proposed crossings.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Monthly.

Mitigation Measure	Responsibility	Timing / Frequency
A final pre-construction walkdown should be conducted, as part of a Plant Search and Rescue plan, with the appropriate permits in place.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Pre-construction / design phase.
» Where any roads and crossings will be upgraded, the following applies: 1. All pipe culverts must be removed and replaced with suitably sized box culverts, where road levels are raised. 2. River levels, regardless of the current state of the river / water course will be reinstated thus preventing any impoundments from being formed. The related designs must be assessed by an aquatic specialist during a post authorisation walkdown, prior to commencement of the construction phase. 3. Approach road embankments especially where large cut and fill areas will be required must be rehabilitated during the construction process, to minimise erosion. Suitable stormwater management systems must be installed and monitored during the first few months of use. Any erosion / sedimentation must be prevented.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Pre-construction / design phase. During site establishment. Monthly thereafter.
Loss of functional habitat within the site and near any of the required crossing upgrades		
A final walkdown should also be conducted post authorisation to assist with the development of the stormwater management plan and Riverine Rehabilitation and Monitoring plan.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Pre-construction / design phase.
All alien plant re-growth must be monitored and should it occur, these plants should be eradicated within the project footprints and especially in areas near the proposed crossings	Developer / Site Engineer ECO to monitor Site engineer/site manager	During site establishment. Monthly thereafter.
All pipe culverts must be removed and replaced with suitably sized box culverts, where road levels are raised.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Pre-construction / design phase.
River levels, regardless of the current state of the river / water course will be reinstated thus preventing any impoundments from being formed. The related designs must be assessed by an aquatic specialist during a post authorisation walkdown, prior to commencement of the construction phase	Developer / Site Engineer ECO to monitor Site engineer/site manager	Pre-construction / design phase. Monthly thereafter.
Approach road embankments especially where large cut and fill areas will be required must be rehabilitated during the construction process, to minimise erosion	Developer / Site Engineer ECO to monitor Site engineer/site manager	Weekly.

Mitigation Measure	Responsibility	Timing / Frequency
Suitable stormwater management systems must be installed and monitored during the first few months of use. Any erosion / sedimentation must be prevented.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Weekly.
Avifaunal Habitat Destruction		
No turbines should be constructed in no-go areas, while associated infrastructure should be avoided where possible in these areas The turbine blade should not protrude into these areas, and therefore the bases should be constructed suitably far from these areas to prevent this	Developer / Site Engineer ECO to monitor Site engineer/site manager	Pre-construction / design phase.
The minimum number of turbines should be constructed to achieve the required MW output. It is preferable to have smaller number of turbines with larger rotor, compared with more turbines with smaller rotor	Developer / Site Engineer ECO to monitor Site engineer/site manager	Pre-construction / design phase.
Prior to construction, an avifaunal specialist should conduct a site walkthrough, covering the final road and power line routes as well as the final turbine positions, to identify any nests/breeding activity of sensitive species, as well as any additional sensitive habitats within which construction activities may need to be excluded; Should priority species nests be located, a protective buffer may be applied, within which construction activities may need to be restricted during the breeding season for that species.	ECO to monitor Site engineer/site manager	Prior to construction
During construction laydown areas and temporary access roads should be kept to a minimum in order to limit direct vegetation loss and habitat fragmentation, while designated no-go areas must be enforced i.e. no off road driving.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Any clearing of large trees (>5m in height), especially stands of large alien trees (e.g. Blue Gum or Pine) on site should be approved first by an avifaunal specialist. Before, clearing, the location and description of the trees should be provided to the specialist, who may request the ECO to inspect the trees for any nests prior to clearing	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
The construction Phase ECO, the onsite Environmental Manager, and the client's representative on site (e.g. the resident engineer) are to be trained to identify Red Data and priority bird species, as well as their nests. If any nests or breeding locations for this species are located, an avifaunal specialist is to be contacted for further instruction	Developer / Site Engineer ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks and laydown areas) must be undertaken and to this end a habitat restoration plan is to be developed by and included within the EMPr.	ECO to monitor Site engineer/site manager	Post construction

Mitigation Measure	Responsibility	Timing / Frequency
All contractors are to adhere to the EMPr and should apply good environmental practice during construction.	ECO to monitor Site engineer/site manager	Throughout construction
Avifaunal Disturbance and Displacement		
Prior to construction, the avifaunal specialist should conduct a site walkthrough, covering the final infrastructure (e.g. road, substation, offices, turbine positions etc.) to identify any nests/breeding/roosting activity of sensitive species, as well as any additional sensitive habitats. The results of which may inform the final construction schedule, including abbreviating construction time, scheduling activities around avian breeding and/or movement schedules, and lowering levels of associated noise. Following the specialist site walkthrough, any additional sensitive zones and no-go areas (e.g. nesting sites of Red Data species) are to be designated by the specialist who should advise on an appropriate buffer, within which construction activities may not occur during key breeding times.	ECO to monitor Site engineer/site manager	Monthly and when required.
The construction Phase ECO, the onsite Environmental Manager, and the client's representative on site (e.g. the resident engineer) must be trained by an avifaunal specialist to identify the potential priority species and Red Data species as well as the signs that indicate possible breeding by these species. The ECO must then, during audits/site visits, make a concerted effort to look out for such breeding activities of Red Data species, and such efforts may include the training of construction staff (e.g. in Toolbox talks) to identify Red Data species, followed by regular questioning of staff as to the regular whereabouts on site of these species. If any of the Red Data species are confirmed to be breeding (e.g. if a nest site is found), construction activities within 500 m of the breeding site must cease, and an avifaunal specialist is to be contacted immediately for further assessment of the situation and instruction on how to proceed.	ECO to monitor Site engineer/site manager	Pre-construction, post final design
During the construction phase, an avifaunal specialist must conduct a nest survey/exploration of the WEF site. This should be done during and after, the breeding season (i.e. approximately in July and again in September) of large Eagles (e.g. Martial and Verreaux's Eagle). The aim will be to locate any nest sites not yet found, so that these may continue to be monitored during the construction and operation phases, along with the monitoring of already identified nest sites.	ECO to monitor Site engineer/site manager	As per specialist requirements.
Appoint a specialist to design and conduct monitoring of the breeding of raptors at the various nests identified to date as well as any additionally located nests (see point above). This monitoring can be combined with the exploration described above, and should be conducted on two occasions (i.e. approximately in July and again in September) across each calendar year, during construction. The aim will be to monitor any disturbance to or displacement of the breeding birds during construction.	Developer / Site Engineer ECO to monitor Site engineer/site manager	As per specialist requirements.
Bat Roost disturbance and/or destruction		

Mitigation Measure	Responsibility	Timing / Frequency
Designing the layout of the project to avoid areas that are more frequently used by bats may reduce the likelihood of mortality and should be the primary mitigation measure. Low lying areas, buildings, woodland/thicket and areas near water should be avoided.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Pre-construction / design phase.
Turbine placement should only be in areas of Low-Medium and Medium bat sensitivity. No part of any turbine, including the rotor swept zone should be constructed within areas of Medium-High or High bat sensitivity.	ECO to monitor Site engineer/site manager	Pre-construction / design phase.
It is recommended that a bat specialist survey the confirmed turbine locations and all other proposed site infrastructure for the presence of roosts within 200 m before any construction activities commence and once the preliminary design and layout of each WEF is complete	Developer / Site Engineer ECO to monitor Site engineer/site manager	Pre-construction / design phase.
It is recommended that a bat specialist surveys the confirmed turbine locations and the locations of all other site infrastructure, such as pylons, for the presence of occupied roosts among the potential roosts before any construction activities commence and once the preliminary design and layout of the site is complete.	Developer to appoint ECO to monitor Site engineer/site manager	Pre-construction / design phase.
If occupied roosts are confirmed these should be buffered based on best practise guidance, which includes a minimum buffer of 200 m	Developer ECO	Pre-construction / design phase.
Clearing of natural and agricultural areas be kept to a minimum.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Blasting activities not to occur within 2km of any known bat roosts.	ECO to monitor Site engineer/site manager	During blasting activities
Dust suppression measures to be used during the full construction phase	ECO to monitor Site engineer/site manager	Weekly
Any new roosts discovered, should be reported and incorporated into the adaptive management plan.	ECO to monitor Site engineer/site manager	Monthly and as required during construction
Roost searches to continue during construction and operational phases.	ECO to monitor Site engineer/site manager	As required by the specialist
No construction activities with the potential to physically affect any bat roosts will be permitted without the express permission of a suitably qualified bat specialist following appropriate investigation and mitigation.	Developer ECO to monitor Site engineer/site manager	Pre-construction / design phase.

Mitigation Measure	Responsibility	Timing / Frequency
Bat Habitat Modification		
Clearing of natural and agricultural areas be kept to a minimum	ECO to monitor Site engineer/site manager	Pre-construction / design phase. Monthly thereafter.
Before construction commences, a bat specialist should conduct a site walkthrough, covering the final road and power line routes as well as the final turbine positions, to identify any roosts/activity of sensitive species, as well as any additional sensitive habitats	Developer to appoint ECO to monitor Site engineer/site manager	Pre-construction / design phase.
During construction laydown areas and temporary access roads should be kept to a minimum in order to limit direct vegetation loss and habitat fragmentation, while designated no-go areas must be enforced i.e. no off-road driving	ECO to monitor Site engineer/site manager	Pre-construction / design phase.
Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks and laydown areas) must be undertaken and a habitat restoration plan must be developed by a specialist	ECO to monitor Site engineer/site manager	Post construction. Weekly.
Loss of riparian systems and water courses		
Where water course crossings are required, the engineering team must provide an effective means to minimise the potential upstream and downstream effects of sedimentation and erosion (erosion protection) as well minimise the loss of riparian vegetation (crossing should have a small footprint).	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
No vehicles to refuel within drainage lines/ riparian vegetation.	ECO to monitor Site engineer/site manager	Weekly
During the operational phase, monitor culverts to see if erosion issues arise and if any erosion control if required.	ECO to monitor Site engineer/site manager	monthly
Where possible culvert bases must be placed as close as possible with natural levels in mind so that these don't form additional steps / barriers.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Impact on riparian systems through the possible increase in surface water runoff from hard surfaces and or roads on riparian form and function		
Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Increase in sedimentation and erosion within the development footprint		

Mitigation Measure	Responsibility	Timing / Frequency
Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Impact on localized surface water quality		
Strict use and management of all hazardous materials used on site.	ECO to monitor Site engineer/site manager	Weekly
Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.).	ECO to monitor Site engineer/site manager	Weekly
Containment of all contaminated water by means of careful run-off management on the development site.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Strict control over the behaviour of construction workers.	ECO and safety to monitor Site engineer/site manager	Weekly
Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the EMPr for the project and strictly enforced.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility.	ECO to monitor Site engineer/site manager	Weekly
Potential visual effect of construction activities, including cranes, construction traffic, dust and noise affecting the rural sense of place		
1.Substation and O&M buildings to be located in visually unobtrusive positions, or alternatively screened with earth berms and planting	Site engineer/site manager	Design phase
Location of the construction camp, batching plant and related storage/stockpile areas in unobtrusive positions in the landscape, away from arterial or district roads, or alternatively screening measures utilized	ECO to monitor Site engineer/site manager	Design phase
Clear demarcation of construction camps, limited in size to only that which is essential.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Employment of dust suppression and litter control measures. Formulation and adherence to an Environmental Management Programme (EMPr), monitored by an Environmental Control Officer (ECO).	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Visual mitigation during construction		
Access and haul roads to use existing farm tracks as far as possible.	ECO to monitor	During site establishment

Mitigation Measure	Responsibility	Timing / Frequency
	Site engineer/site manager	Weekly
Construction camp, stockpiles and lay-down area to be located out of sight of district roads, possibly in the vicinity of the proposed substation and O&M buildings.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Disturbed areas rather than pristine or intact land to preferably be used for the construction camp. Construction camp and laydown areas to be limited in area to only that which is essential	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Measures to control wastes and litter to be included in the contract specification documents.	ECO to monitor Site engineer/site manager	During site establishment Weekly thereafter.
Provision to be made for rehabilitation/ re-vegetation of areas damaged by construction activities.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Damage or destruction of Archaeological resources during clearing of the ground or excavation of foundations		
A final walk-down survey of the authorised footprints for all six projects should be carried out at least 6 months before the start of construction in order for any archaeological mitigation requirements to be determined and carried out	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
The employment of a palaeontologist during the construction phase, establishment of on-site curation facilities and identification of a repository for specimens.	ECO to monitor Site engineer/site manager	During site establishment When required during construction.
During the construction phase a chance-finds procedure should be applied should substantial fossil remains such as vertebrate bones, teeth or trackways, plant-rich fossil lenses or dense fossil burrow assemblages be exposed by excavation or discovered within the development footprint.	Environmental Control Officer should safeguard the fossils, preferably *in situ*, and alert the responsible heritage management authority, so that appropriate action can be taken by a professional palaeontologist	When required during construction
The fence incorporating historical stone fence posts (waypoint 1720 lies on this fence line) should be avoided if possible	Developer ECO to monitor Site engineer/site manager	Pre-construction / design phase.

Mitigation Measure	Responsibility	Timing / Frequency
If any archaeological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Throughout construction. Weekly checks.
archaeological material and rock engravings		
Conduct a final walk down of roads and check turbines positions for archaeological material.	ECO to monitor Site engineer/site manager	During site establishment. Monthly thereafter.
Application of Chance Fossil Finds Procedure (See Appendix 2 of palaeontological specialist study): safeguarding new fossil finds and reporting to ECPHRA by ECO for possible recording and sampling by professional palaeontologist	ECO to monitor Site engineer/site manager	Throughout construction. Monthly.
Check dolerite clusters and flat dolerite rafts for rock engravings. Rock engravings must be assigned co-ordinates, photographed (so as to record detail) and moved out of harm's way, or the road adjusted to avoid them.	ECO to monitor Site engineer/site manager	Throughout construction. Monthly.
Graves		
In the event of human bones being found on site, an archaeologist must be informed immediately and the remains removed under an emergency permit. This process will incur some expense as removal of human remains is at the cost of the developer. Time delays may result while application is made to the authorities and an archaeologist is appointed to do the work.	ECO to monitor Site engineer/site manager	Throughout construction.
All identified grave yards must be mapped and co-ordinates given to the developer and the contractor. These areas must be avoided, as far a practical. The contractor is to ensure that the work force are aware of these areas, and buffers applied around them.	ECO to monitor Site engineer/site manager	Throughout construction.
A minimum 30 m buffer to be maintained around all graves, ruins and buildings	ECO to monitor Site engineer/site manager	Pre-construction and throughout construction
Creation of local employment, training, and business opportunities		
Where reasonable and practical the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. Due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area	Developer/ site manager	Pre-construction and throughout construction
Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria	Developer/ site manager	Pre-construction and throughout construction

Mitigation Measure	Responsibility	Timing / Frequency
Before the construction phase commences the proponent should meet with representatives from the BCRLM and BCRLM to establish the existence of a skills database for the area. If such as database exists it should be made available to the contractors appointed for the construction phase	Developer/ site manager	Pre-construction and throughout construction
The local authorities, relevant community representatives and local farmers should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase of the project	Developer/ site manager	Pre-construction and throughout construction
Where feasible a training and skills development programmes for local workers should be initiated prior to the initiation of the construction phase	Developer/ site manager	Pre-construction and throughout construction
The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.	Developer/ site manager	Pre-construction and throughout construction
The proponent should liaise with the SBDM and BCRLM with regards the establishment of a database of local companies, specifically BBBEE companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work	Developer/ site manager	Pre-construction and throughout construction
Where possible, the proponent should assist local BBBEE companies to complete and submit the required tender forms and associated information.	Developer/ site manager	Pre-construction and throughout construction
The SBDM and BCRLM, in conjunction with the local business sector and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project	Developer/ site manager	Pre-construction and throughout construction
impacts of Construction workers on Local Community		
Where possible the proponent should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically for semi and low-skilled job categories	Developer/ site manager	Pre-construction and throughout construction
The proponent should consider the need for establishing a Monitoring Forum (MF) in order to monitor the construction phase and the implementation of the recommended mitigation measures. The MF should be established before the construction phase commences, and should include key stakeholders, including representatives from the SBDM and BCRLM, farmers and the contractor(s). The MF should also be briefed on the potential risks to the local community and farm workers associated with construction workers	Developer/ site manager	Pre-construction and throughout construction
The proponent and the contractor(s) should, in consultation with representatives from the MF, develop a code of conduct for the construction phase. The code should identify which types of	Developer/ site manager	Pre-construction and throughout construction

Mitigation Measure	Responsibility	Timing / Frequency
behaviour and activities are not acceptable. Construction workers in breach of the code should be dismissed. All dismissals must comply with the South African labour legislation		
The proponent and contractor (s) should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase;	Developer/ site manager	Pre-construction and throughout construction
The contractor should provide transport to and from the site on a daily basis for low and semi-skilled construction workers. This will enable the contractor to effectively manage and monitor the movement of construction workers on and off the site;	Developer/ site manager	Pre-construction and throughout construction
Where necessary, the contractors should make the necessary arrangements to enable low and semi-skilled workers from outside the area to return home over weekends and/ or on a regular basis. This would reduce the risk posed to local family structures and social networks	Developer/ site manager	Pre-construction and throughout construction
No construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.	Developer/ site manager	Pre-construction and throughout construction
impacts on family structures, social networks and community services associated with the influx of job seekers		
The proponent should implement a "locals first" policy, specifically with regard to unskilled and low skilled opportunities;	Developer/ site manager	Pre-construction and throughout construction
risk to safety of farmers and farm workers, livestock and damage to farm infrastructure associated with the movement of construction workers on and to the site		
The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase proven to be associated with the construction activities for the WEF will be compensated for. The agreement should be signed before the construction phase commences;	Developer/ site manager	Pre-construction and throughout construction
The proponent should establish a MF (see above) that includes local farmers and develop a Code of Conduct for construction workers. This committee should be established prior to commencement of the construction phase. The Code of Conduct should be signed by the proponent and the contractors before the contractors move onto site.	Developer/ site manager	Pre-construction and throughout construction
The proponent should hold contractors liable for compensating farmers in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between the proponent, the contractors and neighbouring landowners. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities.	Developer/ site manager	Pre-construction and throughout construction
The Environmental Management Programme (EMP) should outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested;	Developer/ site manager	Pre-construction and throughout construction

Mitigation Measure	Responsibility	Timing / Frequency
	ECO to monitor	
The contractors appointed by the proponent 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.	Developer/ site manager Safety officer	Pre-construction and throughout construction
The contractors appointed by the proponent must ensure that construction workers who are found guilty of trespassing, stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation;	Developer/ site manager Safety officer	Pre-construction and throughout construction
The housing of construction workers on the site should be strictly limited to security personnel.	Developer/ site manager Safety officer	Pre-construction and throughout construction
The contractors appointed by the proponent should provide daily transport for low and semi-skilled workers to and from the site. This would reduce the potential risk of trespassing on the remainder of the farm and adjacent properties.	Developer/ site manager Safety officer	Pre-construction and throughout construction
Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of grass fires		
The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase proven to be associated with the construction activities for the WEF will be compensated for. The agreement should be signed before the construction phase commences;	Developer/ site manager	Pre-construction and throughout construction
The contractor should provide adequate firefighting equipment on-site;	Site engineer/ site manager Safety officer	Pre-construction and throughout construction
Contractor should ensure that open fires on the site for cooking or heating are not allowed except in designated areas;	Developer/ site manager ECO to monitor	Daily. Pre-construction and throughout construction
The contractor should ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy winter months;	Site engineer/ site manager Safety officer	Pre-construction and throughout construction
The contractor should provide fire-fighting training to selected construction staff;	Site engineer/ site manager Safety officer	Pre-construction and throughout construction

Mitigation Measure	Responsibility	Timing / Frequency
No construction staff, with the exception of security staff, to be accommodated on site over night;	Site engineer/ site manager Safety officer	Pre-construction and throughout construction
As per the conditions of the Code of Conduct, in the event of a fire proven to be caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the firefighting costs borne by farmers and local authorities.	Site engineer/ site manager Safety officer	Pre-construction and throughout construction
Potential dust and safety impacts and damage to road surfaces associated with movement of construction related traffic to and from the site		
The contractor should inform local farmers and representatives from the SBDM and BCRLM Tourism of dates and times when abnormal loads will be undertaken	Site engineer/ site manager Safety officer and ECO	Pre-construction and throughout construction
The contractor must ensure that damage caused by construction related traffic to the gravel public roads and local, internal farm roads is repaired on a regular basis throughout the construction phase. The costs associated with the repair must be borne by the contractor.	Developer/ site manager ECO to monitor	Daily. Pre-construction and throughout construction
Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis[2], adhering to speed limits and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.	Developer/ site manager ECO to monitor	Daily. Pre-construction and throughout construction
The contractor must ensure that all construction vehicles adhere to speed limits and vehicles used to transport sand and building materials must be fitted with tarpaulins or covers;	Site engineer/ site manager Safety officer and ECO	Pre-construction and throughout construction
All workers should receive training/ briefing on the reasons for and importance of closing farm gates and driving slowly; Speed limits must be applied. Construction vehicles limit of 40 km/hr on site.	Site engineer/ site manager Safety officer and ECO	Pre-construction and throughout construction. Monthly
All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits.	Site engineer/ site manager Safety officer and ECO	Pre-construction and throughout construction. Monthly
The Contractor should ensure that workers are informed that no waste can be thrown out of the windows while being transported to and from the site. Workers who throw waste out windows should be fined.	Site engineer/ site manager Safety officer and ECO	Daily. Pre-construction and throughout construction
The Contractor should be required to collect waste along the road reserve on a daily basis.	Site engineer/ site manager ECO	Daily. Pre-construction and throughout construction
Waste generated during the construction phase should be transported to the registered landfill.	Site engineer/ site manager	Weekly throughput construction

[2] Treated effluent (non-potable) water should be used for wetting of roads and construction areas

Mitigation Measure	Responsibility	Timing / Frequency
	ECO	
EMPR measures (and penalties) should be implemented to ensure farm gates are closed at all times.	Site engineer/ site manager Developer to implement ECO	Daily. Pre-construction and throughout construction
EMPR measures (and penalties) should be implemented to ensure speed limits are adhered to at all times.	Site engineer/ site manager Developer to implement ECO	Daily. Pre-construction and throughout construction
As far as possible, the transport of components to the site along the N10 should be planned to avoid weekends and holiday periods	Developer/ site manager ECO to monitor	Daily. Pre-construction and throughout construction
Impact on Farmland due to Construction Related Activities		
The location of wind turbines, access roads, laydown areas etc. should be informed by the findings of key specialist studies, including the soil and botanical study. In this regard areas of high potential agricultural soils should be avoided;	Site engineer/ site manager Developer to implement ECO	Weekly. Pre-construction and throughout construction
The location of wind turbines, access roads, laydown areas etc. should be discussed with the locally affected landowners in the finalisation process and inputs provided should be implemented in the layout as best as possible;	Site engineer/ site manager Developer to implement ECO	Weekly. Pre-construction and throughout construction
All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase. The rehabilitation plan should be informed by input from a botanist with experience in arid regions;	Site engineer/ site manager Developer to implement ECO	Weekly post construction
The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. The specifications for the rehabilitation programme should be drawn up the Environmental Consultants appointed to undertake the EIA;	Site engineer/ site manager Developer to implement ECO	Tender phase
The implementation of the Rehabilitation Programme should be monitored by the ECO;	Site engineer/ site manager Developer to implement ECO	Weekly
All workers should receive training/ briefing on the reasons for and importance of not driving in undesignated areas;	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Monthly

Mitigation Measure	Responsibility	Timing / Frequency
EMPR measures (and penalties) should be implemented to strictly limit all vehicle traffic to designated roads and construction areas. Under no circumstances should vehicles be allowed to drive into the veld;	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Daily
Disturbance footprints should be reduced to the minimum.	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Monthly
The footprint areas for the establishment of individual wind turbines should be clearly demarcated prior to commencement of construction activities. All construction related activities should be confined to the demarcated area and minimised where possible;	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Monthly
General Construction Mitigation Measures		
Potable toilets must be supplied to the workforce in areas of activity. One toilet per 14 workers must be implemented. Females must have separate toilets. A licenced contractor must be appointed by the contractor to provide this facility, and ensure that wastes are correctly disposed of. Servicing must take place on a weekly basis, proof of which must be retained on site by the contractor.	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Weekly
Waste skips must be provided in areas of construction activity as well as within the lay down areas, along with waste bins. Wastes must be separated into the following categories: • General waste, compactable and non-compactable • Waste paper recycling • Scrap metal • Globes and fluorescent tubes • Rubber waste • Medical waste • Chemical waste • Hazardous waste	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Weekly
Health and Safety		
Implementation of safety measures, work procedures and first aid must be implemented on site.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Weekly

Mitigation Measure	Responsibility	Timing / Frequency
Workers should be thoroughly trained in using potentially dangerous equipment	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Weekly
Contractors must ensure that all equipment is maintained in a safe operating condition.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Weekly
A safety officer must be appointed.	Developer to implement	Pre-construction
A record of health and safety incidents must be kept on site.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Weekly
Any health and safety incidents must be reported to the project manager immediately.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction.
First aid facilities must be available on site at all times.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Workers have the right to refuse work in unsafe conditions.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Daily
The contractor must ensure that all construction workers are well educated about HIV/ AIDS and the risks surrounding this disease. The location of the local clinic where more information and counselling is offered must be indicated to workers.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Material stockpiles or stacks, such as, pipes must be stable and well secured to avoid collapse and possible injury to site workers / local residents	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
An STI and HIV/AIDS awareness campaign should be launched, which is not only directed at construction workers but also at the community as a whole.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks

Mitigation Measure	Responsibility	Timing / Frequency
Condoms should be distributed by placing them at centrally located points and by ensuring that construction workers and community members are aware of the availability and location of condoms. The distribution of condoms should be approached with the necessary cultural sensitivity.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Access at the construction site should be controlled to prevent sex workers from either visiting and/or loitering at the construction camp.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Daily
Ensure that the local community communicate their expectations of construction workers' behaviour with them.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Personal Protective Equipment (PPE) must be made available to all construction staff and their usage must be compulsory. Hard hats and safety shoes must be worn at all times and other PPE worn were necessary i.e. dust masks, ear plugs etc.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
No person is to enter the site without the necessary PPE.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Daily
Pre-construction, construction and operation activities should be undertaken during daylight working hours between the hours of 07:00 – 17:00 on weekdays and 07:00 – 13:00 on Saturdays. No activity will be allowed on Sundays	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
The workforce is to be provided with sufficient potable water and under no circumstances are they to use untreated water from the local watercourses for drinking.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Noise		
Construction site yards and other noisy fixed facilities should be located well away from noise sensitive areas adjacent to the development sites.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
All construction vehicles and equipment are to be kept in good repair.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks

Mitigation Measure	Responsibility	Timing / Frequency
Portable acoustic shields should be used in the case where noisy equipment is not stationary (for example drills, angle grinders, chipping hammers, poker vibrators).	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Daily
Construction staff working in areas where the 8-hour ambient noise levels exceed 75dBA should wear ear protection equipment.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Daily
Blasting operations are to be strictly controlled with regard to the size of explosive charge in order to minimise noise and air blast, and timings of explosions. The number of blasts per day should be limited, blasting should be undertaken at the same times each day and no blasting should be allowed at night.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
With regard to unavoidable very noisy construction activities in the vicinity of noise sensitive areas, the contractor and ECO should liaise with local residents on how best to minimise impact, and the local population should be kept informed of the nature and duration of intended activities.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Noise suppression measures must be applied to all construction equipment. Construction equipment must be kept in good working order and where appropriate fitted with silencers which are kept in good working order.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Should the vehicles or equipment not be in good working order, the Contractor may be instructed to remove the offending vehicle or machinery from site.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Where possible labour shall be transported to and from the site by the contractor or his Sub-Contractors by the contractors own transport.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Daily
Construction activities are to be contained to reasonable hours during the day and early evening. Night-time activities near noise sensitive areas should not be allowed.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Construction activities should be undertaken during daylight working hours between the hours of 07:00 – 17:00 on weekdays and 07:00 – 13:00 on Saturdays. No activity will be allowed on Sundays.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Daily

Mitigation Measure	Responsibility	Timing / Frequency
Should any equipment, such as generators on-site, generating excessive noise, they should be fitted with appropriate noise abatement measures.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Traffic Congestion, Impedance to Traffic Flow due to Increase in Traffic Volumes		
Transport Management Plan to be produced to include: • Ensure safe transport of materials, equipment, etc. to site; • Optimise route selection and time of travel; • Co-ordinate traffic law-enforcement and transport to site; • Design on-site roads to facilitate access to laydown areas, substations and wind turbines; Conduct a dry-run priori to implementation of the Transport Management Plan.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Design Phase / Pre-construction
Minor Road Degradation due to Increased Traffic		
Document condition of gravel roads prior to construction.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Monthly checks.
Upgrade gravel roads to suitable condition for proposed construction vehicles.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Monthly checks.
Ensure that the minor road is left in a better condition post-construction.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Monthly checks.
Intersection Road Safety		
Place warning construction vehicle signage on the R63 on each approach to Minor Road M00412.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Monthly checks.
Ensure that all construction vehicles are roadworthy.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Monthly checks.

Mitigation Measure	Responsibility	Timing / Frequency
Ensure that all construction vehicles have appropriate drivers licence.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Monthly checks.

6.2 Post Construction

- Once construction has been completed on site and all excess material has been removed, the storage area shall be rehabilitated. If the area was badly damaged, re-seeding shall be done and fencing in of the area shall be considered if livestock/faunal species specific to the area may subsequently have access to such an area.
- Such areas shall be rehabilitated to their natural state. Any spilled concrete shall be removed and soil compacted during construction shall be ripped, levelled and re-vegetated.
- Only designated areas must be used for storage of construction materials, soil stockpiles, machinery and other equipment.
- Specific areas must be designated for cement/concrete mixing/ batching plants. Sufficient drainage for these plants must be in place to ensure that soils do not become contaminated.
- The construction camp must be kept clear of litter at all times.
- Spillages within the construction camp need to be cleaned up immediately and disposed of in the hazardous skip bin for correct disposal.
- All remaining material including building rubble and waste are to be removed from the site.
- All areas disturbed should be managed to ensure efficient drainage.
- The area designated for the deposition of spoil material is to be levelled and shaped to ensure the efficient drainage of the site. Under no circumstances is general or hazardous waste to be disposed of at this site.

6.2.1 Infrastructure

- Disassemble all temporary infrastructure units and remove components from the working areas and contractors camp. This will include storage structures and containers, water storage container, power supply, workers accommodation, sewage systems
- Drain all potable chemical toilets, being careful not to spill the contents. Transfer the waste to an appropriate disposal site.
- Drain all waste water and sewage associated with temporary ablution facilities and transfer the waste to an appropriate disposal site to be identified by the contractor.
- Disassemble all fencing around the camp and either sell, suction or donate to the local community or transfer the waste components to a disposal site or the contractor's base.
- Do not leave any components, waste or infrastructure units within the working area and camp unless specifically required for the operation and maintenance phases and as agreed by the ECO

6.2.2 Contaminated Substrate and Pollution Control Structures

- Excavate all areas of contaminated substrate, transfer the contaminated substrate to an appropriate disposal site and treat the affected areas.
- Remove all plastic linings used for pollution control and transfer to an appropriate disposal site.
- Break up all concrete structures that have been created and remove concrete waste to an appropriate disposal site.

6.2.3 Waste

- Remove all remaining construction materials from the camp and working areas and either sell, auction, donate to the local community or transfer the waste components to a disposal site or the contractor's base.

- Remove all construction debris, litter and domestic waste from the camp and working areas and transfer to an appropriate disposal site. Remove all waste receptacles from the camp and working areas and either sell, auction, donate to the local community or transfer the waste components to a disposal site or the contractor's base.

7 OPERATIONAL PHASE MITIGATION MEASURES

Once the construction and commissioning of the WEF is completed the project becomes operational. The operator of the WEF has the responsibility to ensure that the mitigation measures proposed for the operational phase of the WEF is implemented and conducted appropriately.

During the operation and maintenance of the WEF (including the normal operation of the turbines themselves) a certain amount of disturbance results. An operational WEF will normally have various day to day activities occurring on site, such as (but not limited to) security control, routine maintenance, road clearing/cleaning, grass/bush cutting and clearing.

These factors can all lead to birds avoiding the area for feeding or breeding, and effectively leading to habitat loss and a potential reduction in breeding success (Larsen & Madsen 2000; Percival 2005). Turbines can also be disruptive to bird flight paths, with some species altering their routes to avoid them (Dirksen *et al.* 1998, Tulp *et al.* 1999, Pettersson & Stalin 2003). While this reduces the chance of collisions it can also create a displacement or barrier effect, for example between roosting and feeding grounds and result in an increased energy expenditure and lower breeding success (Percival 2005).

Disturbance distances (the distance from wind farms up to which birds are absent or less abundant than expected) can vary between species and also within species with alternative habitat availability (Drewitt & Langston 2006). Some studies have recorded distances of 80 m, 100 m, 200 m and 300 m (Larsen & Madsen 2000, Shaffer & Buhl 2015) but distances of 600 m (Kruckenberg & Jaehne 2006) and up to 800 m have been recorded (Drewitt & Langston 2006).

Raptors are generally fairly tolerant of wind farms, and continue to use the area for foraging (Thelander *et al.* 2003, Madders & Whitfield 2006), so are not affected by displacement, which however increases their collision risk.

WEFs have the potential to impact bats directly through collisions and barotrauma resulting in mortality (Horn et al. 2008; Rollins et al. 2012), and indirectly through the modification of habitats (Kunz et al. 2007b). Direct impacts pose the greatest risk to bats and, in the context of the project, habitat loss and displacement should not pose a significant risk (unless a large roost in discovered on site and bats are reluctant to leave this roost if disturbed) because the project footprint (i.e. turbines, roads and infrastructure) is small relative to the area monitored.

The developer has the responsibility to ensure that all operational mitigation measures outlined in this document, and all revisions thereof, are complied with.

7.1 Potential Operation Phase Impacts

Table 7.1 below provides a summary of the potential impacts of the operation of the WEF, as assessed by specialists.

Table 7.2 presents the mitigation measure to be implemented for the potential impacts identified.

Table 7.1 Summary of Operation Phase Impacts

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Geology, Soils and Agricultural Potential Impact							
Loss of Agricultural land	L	M	L	Negative	L	L	H
With Mitigation	L	M	L	Negative	L	L	H
Soil degradation	L	M	M	Negative	M	M	H
With Mitigation	L	M	L	Negative	L	L	H
Generation of additional land use income	L	M	L	Positive	M	H	H
With Mitigation	L	M	L	Positive	M	H	H
Wetlands and freshwater							
Impact on riparian systems through the possible increase in surface water runoff from hard surfaces and or new road crossings on riparian form and function	L	L	L	Negative	M	H	H
With Mitigation	L	L	L	Negative	L	L	H
Increase in sedimentation and erosion within the development footprint during the construction phase and to a lesser degree the operational phase	L	M	L	Negative	M	H	H
With Mitigation	L	L	L	Negative	L	L	H
Impact on localized surface water quality mainly during the construction phase	L	M	L	Negative	M	H	H
With Mitigation	L	L	L	Negative	L	L	H
Terrestrial Ecological Impacts							
Faunal impacts due to operational phase activities	L	M	M	Negative	M	H	H
With Mitigation	L	M	L	Negative	L	L	H
Soil erosion	L	H	M	Negative	M	H	H
With Mitigation	L	L	L	Negative	L	L	H
Alien plant invasion	L	H	M	Negative	M	H	H

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
With Mitigation	L	L	L	Negative	L	L	H
Critical Biodiversity Areas and Broad-Scale Ecological Processes	L	H	M	Negative	M	H	H
With Mitigation	L	H	L	Negative	L	L	H
Avifauna							
Bird mortality caused by collision with wind turbine blades and/or towers	M	M	H	Negative	M	H	M
With Mitigation	M	M	H	Negative	M	M	M
Bird mortality caused by collision overhead powerlines on the WEF site	L	M	H	Negative	M	M	M
With Mitigation	L	M	M	Negative	L	L	M
Bird mortality caused by electrocution on the WEF site	L	M	M	Negative	M	M	M
With Mitigation	L	M	M	Negative	L	L	H
Disturbance to birds resulting in temporary/permanent displacement or disrupting breeding success	M	M	M	Negative	M	M	L
With Mitigation	L	M	M	Negative	L	L	L
Disruption of Local Bird Movement Patterns (e.g. barrier effects)	M	M	M	Negative	L	L	L
With Mitigation	M	M	M	Negative	L	L	L
Bats							
Bat mortality during commuting and/or foraging	M	M	M	Negative	M	M	M
With Mitigation	M	M	L	Negative	L	L	M
Bat mortality during migration	H	M	M	Negative	M	L	M
With Mitigation	M	M	M	Negative	L	L	M
Habitat creation in high risk locations	L	M	L	Negative	L	L	M
With Mitigation	L	M	L	Negative	L	L	H
Light pollution	L	M	L	Negative	L	L	M
With Mitigation	L	M	L	Negative	L	L	H

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Noise							
Operational Noise (Day)	L	H	L	Negative	L	L	H
With Mitigation	L	H	L	Negative	L	L	H
Operational Noise (Night)	L	H	H	Negative	H	M	H
With Mitigation	L	H	M	Negative	M	M	H
Heritage and Archaeology							
Impacts to the cultural landscape	M	M	M	Negative	M	H	H
With Mitigation	M	M	M	Negative	M	H	H
Visual							
Potential visual intrusion of remaining structures, platform earthworks and access roads on the rural landscape.	L	H	M	Negative	M	H	H
With Mitigation	L	H	M	Negative	M	M	M
Social							
Implementation of clean, renewable energy infrastructure	M	M	M	Positive	M	M	H
With Mitigation	M	H	M	Positive	H	H	H
Impact of employment and business creation opportunities	M	M	L	Positive	M	M	H
With Mitigation	M	M	M	Positive	H	H	H
Establishment of a community trust funded by revenue generated from the sale of energy	M	H	M	Positive	M	L	H
With Mitigation	M	H	H	Positive	H	H	H
Assessment of benefits associated with income generated for affected farmer(s)	M	M	L	Positive	L	L	H
With Mitigation	M	M	M	Positive	M	H	H
Impact on sense of place and rural character of the landscape	M	M	M	Negative	M	M	M
With Mitigation	M	M	M	Negative	M	M	M

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Impact on sense of place and rural character of the landscape (based on comments from stakeholders)	M	M	L	Negative	L	M	M
With Mitigation	M	M	L	Negative	L	M	M
Impact of potential impact on property values	M	M	M	Negative	M	M	M
With Mitigation	M	M	M	Negative	M	M	M
Impacts on tourism in the region	M	M	L	Negative	L	L	H
With Mitigation	M	M	L	Negative	L	L	H
Impacts on adjacent tourism operations associated with game farming and hunting	M	M	M	Negative	M	M	M
With Mitigation	M	M	M	Negative	M	M	M
Traffic							
Route Constraints	M	L	H	Negative	M	M	H
With Mitigation	M	L	L	Negative	L	L	H

Table 7.2 Operational Phase Mitigation Measures

Mitigation Measure	Responsibility	Timing / Frequency
Ecology		
Management of the site should take place within the context of an Open Space Management Plan.	Developer / Operator ECO	Throughout operation. Monthly checks
Erosion management at the site should take place according to the Erosion Management Plan and Rehabilitation Plan.	Developer / Operator ECO	Throughout operation. Monthly checks
Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance, as per the Erosion Management and Rehabilitation Plans for the project.	Developer / Operator ECO	Throughout operation. Monthly checks
Develop and implement an Invasive Alien Plant Management Plan.	Developer / Operator ECO	Throughout operation. Monthly checks
There should be an integrated management plan for the development area during operation, which is beneficial to fauna and flora.	Developer / Operator ECO	Throughout operation. Monthly checks
Wherever excavation is necessary, topsoil should be set aside and replaced after construction to encourage natural regeneration of the local indigenous species. The recovery of the indigenous shrub/grass layer should be encouraged through leaving some areas intact through the construction phase to create a seed source for adjacent cleared areas. Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented. Problem species such as *Opuntia* are already present in the area and are likely to increase if not controlled. Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility as there are also likely to be prone to invasion problems. Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Throughout operation. Monthly checks
All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance. All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Throughout operation. Monthly checks

Mitigation Measure	Responsibility	Timing / Frequency
All cleared areas should be revegetated with indigenous perennial grasses from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow.		
No unauthorized persons should be allowed onto the site. Any potentially dangerous fauna such snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location. The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. If the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs), which do not attract insects. All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. All vehicles accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises. If parts of the facility are to be fenced, then no electrified strands should be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution from electric fences as they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks. Alternatively, the electrified strands should be placed on the inside of the fence and not the outside.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Throughout operation. Monthly checks
Birds		
Develop and implement a carcass search programme for birds as a minimum during the first three years of operation followed by year 5, 10, 15, 20 and 25, in line with the applicable South African monitoring guidelines. This program must include monitoring of all internal overhead power lines.	Developer to implement. Specialists to be appointed.	Throughout operation. Monthly checks.
Operational phase bird monitoring, in line with applicable guidelines, must be implemented and must include monitoring of all raptor nest sites for breeding success	Developer / Operator to implement. Specialists to be appointed. ECO to Monitor.	Throughout operation. Monthly checks.
Develop and implement a minimum 12 month post-construction bird activity monitoring program that mirrors the pre-construction monitoring surveys completed by Arcus and is in line with the applicable South African post-construction monitoring guidelines. This program must include thorough and ongoing nest searches and nest monitoring. The results of this monitoring and the	Developer / Operator to implement. Specialists to be appointed.	Throughout operation. Monthly checks.

Mitigation Measure	Responsibility	Timing / Frequency
carcass searchers should advise the need for any additional ongoing activity monitoring or nest surveys beyond the 12 month period	ECO to Monitor.	
Conduct frequent and regular review of operational phase monitoring data (activity and carcass) and results by an avifaunal specialist. This review should also establish the requirement for continued monitoring studies (activity and carcass) throughout the operational and decommissioning phases of the development	Developer / Operator to implement. Specialists to be appointed. ECO to Monitor.	Throughout operation. Monthly checks.
The above reviews should strive to identify sensitive locations at the development including turbines and areas of increased collisions with power lines that may require additional mitigation. If unacceptable impacts are observed (in the opinion of the bird specialist after consultation with BLSA, relevant stakeholders and an independent review), the specialist should conduct a literature review specific to the impact (e.g. collision and/or electrocution) and provide updated and relevant mitigation options to be implemented. Mitigations that may need to be implemented (and should be considered in the project's financial planning) include: ○ Onsite and off-site habitat management. A habitat management plan which aims to prevent an influx/increase in preferred prey items in the turbine area due to the construction and operation activities, while improving raptor habitat and promoting prey availability away from the site. ○ Implementing a carcass management plan on the WEF site, to remove any dead livestock as soon as possible, to reduce the likelihood of attracting vultures to the WEF site. ○ Using deterrent devices (e.g. visual and noise deterrents) and/or shutdown systems e.g. Automatic bird detectors (e.g. automated camera based monitoring systems – McClure et. al. 2018) if commercially available; or Radar Assisted Shutdown on Demand (RASOD) to reduce collision risk. ○ Identify options to modify turbine operation (e.g. temporary curtailment or shut-down on demand) to reduce collision risk if absolutely necessary and other methods have not had the desired results. Possibly offset programmes if no suitable mitigation measures can be implemented to reduced impacts sufficiently.	Developer / Operator to implement. Specialists to be appointed. ECO to Monitor.	Throughout operation. Monthly checks.
All new internal power lines linking the wind turbine generators to each other on site must be placed underground where technically and environmentally feasible. Certain spans can only be above ground if it is impossible and completely unfeasible to bury them or if there is a reasonable other environmental aspect present which prevents them being buried (e.g. a sensitive wetland area);	Site engineer/ site manager Developer to implement ECO and Safety Officer	Throughout operation. monthly checks

Mitigation Measure	Responsibility	Timing / Frequency
If some spans are to be above ground, where possible place new overhead power lines adjacent to existing power line or linear infrastructure (e.g. roads and fence lines);	Site engineer/ site manager Developer to implement ECO and Safety Officer	Throughout operation. monthly checks
Attach appropriate marking devices (BFDs) on all new overhead power lines to increase visibility. The advice of a specialist should be sought regarding the type, placement and spacing of the BFDs to be used	Developer / Operator to implement. Specialists to be appointed. ECO to Monitor.	Pre-Construction Design Phase.
Any new overhead power lines must be of a design that minimizes electrocution risk by using adequately insulated 'bird friendly' monopole structures, with clearances between live components and possible bird perches (e.g. cross arms) of 1.8 m or greater. Each pylon should be fitted with a safe bird perch	Developer / Operator to implement. Specialists to be appointed. ECO to Monitor.	Pre-Construction Design Phase.
The on-site WEF manager (or a suitably appointed Environmental Manager) must be trained by an avifaunal specialist to identify the potential priority species and Red Data species as well as the signs that indicate possibly breeding by these species. If a priority species or Red Data species is found to be breeding (e.g. a nest site is located) on the operational Wind Farm, the nest/breeding site must not be disturbed and an avifaunal specialist must be contacted for further instruction.	Developer / Operator to implement. Specialists to be appointed. ECO to Monitor.	Pre-Construction Design Phase.
Lighting on turbines to be of an intermittent and coloured nature rather than constant white light to reduce the possible impact on the movement patterns of nocturnal migratory species.	Developer / Operator to implement. Specialists to be appointed. ECO to Monitor.	Pre-Construction Design Phase.
Bats		
Operational acoustic monitoring and carcass searches for bats must be performed, based on best practice, to monitor mortality and bat activity levels. Acoustic monitoring should include monitoring at height (from more than one location i.e. such as on turbines) and at ground level. In addition, surveys of the Bloukrans cave should be undertaken in spring and autumn to assess changes in the annual movement patterns of the Natal long-fingered bat.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Throughout operation. monthly checks

Mitigation Measure	Responsibility	Timing / Frequency
If mortality does occur, the level of mortality should be considered by a bat specialist to determine if this is at a level where further mitigation needs to be considered. Mitigation options may include using ultrasonic deterrents, raising the cut-in speeds of turbines and turbine blade feathering. Any operational minimization strategy (i.e. curtailment) should be targeted during specific seasons and time periods for specific turbines coincident with periods of increased bat activity.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Throughout operation. monthly checks
It is advised that both pre-construction and operational monitoring data are used to confirm the need for above mentioned mitigation measures such as curtailment and to determine at what stage of the development such mitigation needs to be implemented, if at all.	Developer / Operator to implement. Specialists to be appointed. ECO to Monitor.	Throughout operation. Monthly checks.
Operational monitoring according to Aronson *et al.* (2014) or any more recent revisions to this document, reporting and adaptive management will be key to keeping the residual impact of the facility as low as possible. This data should be fed into the SANBI database to assist with enhancing the scientific knowledge base for information decision making and mitigation recommendations	Site engineer/ site manager Developer to implement ECO	Throughout operation. Monthly checks.
Pre-construction and operational monitoring bat data to feed into the SANBI bird and bat toolkit. Monthly carcass searching reports to be submitted to the SABAAP.	Site engineer/ site manager Developer to implement ECO	Throughout operation. monthly checks
As new information becomes available with regard to successful mitigation strategies tested, this information should feed into the adaptive management plan.	Site engineer/ site manager Developer to implement ECO	Throughout operation. monthly checks
Bats should be prevented from entering any possible artificial roost structures (e.g. roofs of buildings, road culverts and wind turbines) by ensuring that they are sealed in such a way as to prevent bats from entering. If bats colonise WEF infrastructure, a suitably qualified bat specialist should be consulted before any work is undertaken on that infrastructure or attempting to remove bats. Ongoing maintenance and inspections of buildings must be carried out to ensure no access to bats or actively roosting bats	Site engineer/ site manager. Developer to implement. Specialist to be appointed. ECO to monitor.	Throughout operation. monthly checks
Where lights need to be used such as at the substation and switching station and elsewhere, these should have low attractiveness for insects such as low pressure sodium and warm white LED lights	Site engineer/ site manager Developer to implement	Throughout operation. monthly checks

Mitigation Measure	Responsibility	Timing / Frequency
(Rydell 1992; Stone 2012). High pressure sodium and white mercury lighting is attractive to insects (Blake et al. 1994; Rydell 1992; Svensson & Rydell 1998) and should not be used as far as possible.	ECO	
Social		
Implement a skills development and training programme aimed at maximizing the number of employment opportunities for local community members.	Developer to implement	Throughout operation. Monthly checks
Maximise opportunities for local content, procurement and community shareholding.	Developer to implement	Throughout operation. Monthly checks
Pre-Construction, conduct a local community needs assessment to establish whether or not a visitor centre would be an appropriate expenditure for the potential funds flowing to the community. As indicated in the literature review of the Basic Assessment Report (2018), visitor centers in Scotland have attracted large numbers of visitors to wind farms.	Developer to implement	Design Phase / Preconstruction Post Construction to implement if required.
The proponent should implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's and locals employed during the operational phase of the project.	Developer to implement	Throughout operation. Monthly checks
The proponent, in consultation with the SBDM and BCRLM, should investigate the options for the establishment of a Community Development Trust.	Developer to implement	Throughout operation. Monthly checks
The SBDM and BCRLM should be consulted as to the structure and identification of potential trustees to sit on the Trust. The key departments in the SBDM and BCRLM that should be consulted include the Municipal Managers Office, IDP Manager and LED Manager.	Developer to implement	Throughout operation. Monthly checks
Clear criteria for identifying and funding community projects and initiatives in the area should be identified. The criteria should be aimed at maximising the benefits for the community as a whole and not individuals within the community.	Developer to implement	Throughout operation. Monthly checks
Strict financial management controls, including annual audits, should be instituted to manage the funds generated for the Community Trust from the WEF.	Developer to implement	Throughout operation. Monthly checks
Noise		
The candidate turbine is available in a noise-mitigated configuration with blade trailing edge serrations and nacelle insulation, which would reduce noise emissions by 2.5 dBA. The following turbines would require to be installed in this configuration: • Highlands South WEF: Turbines WTG 41 to 48; and • Cumulatively: turbines 16, 17, 31 and 41 to 48.	Developer to implement	Throughout operation. Monthly checks

Mitigation Measure	Responsibility	Timing / Frequency
It should be noted that mitigation of turbines 16 and 17 are only required in respect of location 6. As stated above this is not permanently occupied, so subject to agreement with the appropriate landowner, mitigation of turbines 16 and 17 may not be necessary in practice. Mitigation of turbine 31 is required in respect of locations 8 and 9, and mitigation of turbines 41 to 48 in respect of locations 12, 13 and 14. It is understood that agreement may be possible with landowners that noise levels are acceptable and / or relocation of farmworkers at these locations, in which case the use of noise-mitigated turbines may not be necessary. Should a turbine model other than the candidate be installed, consideration should be given to the noise emission of that turbine model and appropriate mitigation included if necessary.		

8 ALIEN INVASIVE MANAGEMENT PLAN

8.1 Purpose of the Alien Invasive Management Plan

The purpose of the Alien Invasive Management Plan is to provide a framework for the management of alien and invasive plant species during the construction and operation of the Highlands South Wind Energy Facility. The broad objectives of the plan includes the following:

- Ensure alien plants do not become dominant in parts or the whole site through the control and management of alien and invasive species presence, dispersal & encroachment
- Initiate and implement a monitoring and eradication programme for alien and invasive species
- Promote the natural re-establishment and planting of indigenous species in order to retard erosion and alien plant invasion.

8.2 Problem Outline

Alien plants replace indigenous vegetation leading to severe loss of biodiversity and change in landscape function. Potential consequences include loss of biodiversity, loss of grazing resources, increased fire risk, increased erosion, loss of wetland function, impacts on drainage lines, increased water use etc.

In addition, the Conservation of Agricultural Resources Act (Act 43 of 1983), as amended in 2001, requires that land users clear *Declared Weeds* from their properties and prevent the spread of *Declared Invader Plants* on their properties.

Table 3 of CARA (the Conservation of Agricultural Resources Act) lists all declared weeds and invader plants. Alien plants are divided into 3 categories based on their risk as an invader.

- Category 1 - These plants must be removed and controlled by all land users. They may no longer be planted or propagated and all trade in these species is prohibited.
- Category 2 – These plants pose a threat to the environment but nevertheless have commercial value. These species are only allowed to occur in demarcated areas and a land user must obtain a water use licence as these plants consume large quantities of water.
- Category 3 – These plants have the potential of becoming invasive but are considered to have ornamental value. Existing plants do not have to be removed but no new plantings may occur and the plants may not be sold.

The following guide is a useful starting point for the identification of alien species: Bromilow, C. 2010. *Problem Plants and Alien Weeds of South Africa*. Briza, Pretoria.

8.2.1 Vulnerable Ecosystems and Habitats

Certain habitats and environments are more vulnerable to alien plant invasion and are likely to bear the brunt of alien plant invasion problems at the site. In addition, construction activities and changes in water distribution at the site following construction are also likely to increase and alter the vulnerability of the site to alien plant invasion.

Areas at the site which are likely to require specific attention include the following:

- Wetlands, drainage lines and other mesic areas
- Cleared and disturbed areas such as road verges, crane pads and construction footprints etc.

- Construction camps and lay-down areas which are cleared or are active for an extended period

8.2.1.1 Wetlands, drainage lines and other mesic areas

There are a relatively large number of drainage lines at the site as well as a number of artificial wetlands. Disturbance within these areas often results in alien plant invasion on account of the greater water and nutrient availability in this habitat. Although there are no turbines within such areas, numerous road crossings will be required. The disturbance footprint within such areas should be minimized and these areas should be checked for alien species more than the surrounding landscape.

8.2.1.2 Cleared and disturbed areas

Cleared and disturbed areas are clearly vulnerable to invasion on account of the lack of existing plant cover to resist invasion as well as the disturbance created during construction which promoted the germination and establishment of alien plant species.

8.2.1.3 Construction camps and laydown areas

Construction camps and lay down areas are either cleared of vegetation or prolonged activities in these areas result in negative impact on indigenous vegetation. In addition, repeated vehicle and human activity in these areas usually results in the import of alien plant seed on clothes, dirty vehicles or with construction machinery and materials

8.3 General Clearing and Guidance Principles

- Alien control programs are long-term management projects and should include a clearing plan which includes follow up actions for rehabilitation of the cleared area. Alien problems at the site should be identified during pre-construction surveys of the development footprint. This may occur simultaneously to other required reaches and surveys. The clearing plan should then form part of the pre-construction reporting requirements for the site.
- The plan should include a map showing the alien density & indicating dominant alien species in each area.
- Lighter infested areas should be cleared first to prevent the build-up of seed banks.
- Pre-existing dense mature stands ideally should be left for last, as they probably won't increase in density or pose a greater threat than they are currently.
- Collective management and planning with neighbours may be required in the case of large woody invaders as seeds of aliens are easily dispersed across boundaries by wind or water courses.
- All clearing actions should be monitored and documented to keep track of which areas are due for follow-up clearing.

8.4 Clearing Methods

- Different species require different clearing methods such as manual, chemical or biological methods or a combination of both.
- However care should be taken that the clearing methods used do not encourage further invasion. As such, regardless of the methods used, disturbance to the soil should be kept to a minimum. Fire is not a natural phenomenon in the area and fire should not be used for alien control or vegetation management at the site.
- The best-practice clearing method for each species identified should be used. The preferred clearing methods for most alien species can be obtained from the DWAF Working for Water Website. http://www.dwaf.gov.za/wfw/Control/

8.5 Use of Herbicide for Alien Control

Although it is usually preferable to use manual clearing methods where possible, such methods may create additional disturbance which stimulates alien invasion and may also be ineffective for many woody species which re-sprout. Where herbicides are to be used, the impact of the operation on the natural environment should be minimised by observing the following:

- Area contamination must be minimised by careful, accurate application with a minimum amount of herbicide to achieve good control.
- All care must be taken to prevent contamination of any water bodies. This includes due care in storage, application, cleaning equipment and disposal of containers, product and spray mixtures.
- Equipment should be washed where there is no danger of contaminating water sources and washings carefully disposed of in a suitable site.
- To avoid damage to indigenous or other desirable vegetation, products should be selected that will have the least effect on non-target vegetation.
- Coarse droplet nozzles should be fitted to avoid drift onto neighbouring vegetation.
- The appropriate health and safety procedures should also be followed regarding the storage, handling and disposal of herbicides.

For all herbicide applications, the following guidelines should be followed:

Working for Water: Policy on the Use of Herbicides for the Control of Alien Vegetation.

9 ALIEN PLANT MANAGEMENT PLAN

9.1 Construction Phase Activities

The following management actions are aimed at reducing soil disturbance during the construction phase of the development, as well as reducing the likelihood that alien species will be brought onto site or otherwise encouraged.

Construction Phase Action	Frequency
The ECO is to provide permission prior to any vegetation being cleared for development.	Daily
Clearing of vegetation should be undertaken as the work front progresses – mass clearing should not occur unless the cleared areas are to be surfaced or prepared immediately afterwards.	Weekly
Where cleared areas will be exposed for some time, these areas should be protected with packed brush, or appropriately battered with fascine work. Alternatively, jute (Soil Saver) may be pegged over the soil to stabilise it.	Weekly
Cleared areas that have become invaded can be sprayed with appropriate herbicides provided that these are such that break down on contact with the soil. Residual herbicides should not be used.	Weekly
Although organic matter is frequently used to encourage regrowth of vegetation on cleared areas, no foreign material for this purpose should be brought onto site. Brush from cleared areas should be used as much as possible. The use of manure or other soil amendments is likely to encourage invasion.	Weekly
Clearing of vegetation is not allowed within 32 m of any wetland, 80 m of any wooded area, within 1:100 year floodlines, in conservation servitude areas or on slopes steeper than 1:3, unless permission is granted by the ECO for specifically allowed construction activities in these areas	Weekly
Care must be taken to avoid the introduction of alien plant species to the site and surrounding areas. (Particular attention must be paid to imported material such as	Weekly

building sand or dirty earth-moving equipment.) Stockpiles should be checked regularly and any weeds emerging from material stockpiles should be removed.	
Alien vegetation regrowth on areas disturbed by construction must be controlled throughout the entire site during the construction period.	Monthly
The alien plant removal and control method guidelines should adhere to best-practice for the species involved. Such information can be obtained from the DWAF Working for Water website.	Monthly
Clearing activities must be contained within the affected zones and may not spill over into demarcated No Go areas.	Daily
Pesticides may not be used. Herbicides may be used to control listed alien weeds and invaders only	Monthly
Wetlands and other sensitive areas should remain demarcated with appropriate fencing or hazard tape. These areas are no-go areas (this must be explained to all workers) that must be excluded from all development activities.	Daily

9.1.1 Monitoring Actions - Construction Phase

The following monitoring actions should be implemented during the construction phase of the development.

Monitoring Action	Indicator	Timeframe
Document alien species present at the site	List of alien species	Pre-construction
Document alien plant distribution	Alien plant distribution map within priority areas	3 Monthly
Document & record alien control measures implemented	Record of clearing activities	3 Monthly
Review & evaluation of control success rate	Decline in documented alien abundance over time	Biannually

9.2 Operational Phase Activities

The following management actions are aimed at reducing the abundance of alien species within the site and maintaining non-invaded areas clear of aliens.

Operational Phase Action	Frequency
Surveys for alien species should be conducted regularly. Every 6 months for the first two years after construction and annually thereafter. All aliens identified should be cleared.	Every 6 months for 2 years and annually thereafter
Where areas of natural vegetation have been disturbed by construction activities, revegetation with indigenous, locally occurring species should take place where the natural vegetation is slow to recover or where repeated invasion has taken place following disturbance.	Biannually, but revegetation should take place at the start of the rainy season
Areas of natural vegetation that need to be maintained or managed to reduce plant height or biomass, should be controlled using methods that leave the soil protected, such as using a weed-eater to mow above the soil level.	When necessary
No alien species should be cultivated on-site. If vegetation is required for esthetic purposes, then non-invasive, water-wise locally-occurring species should be used.	When necessary

9.2.1 Monitoring Actions - Operational Phase

The following monitoring actions should be implemented during the construction phase of the development.

Monitoring Action	Indicator	Timeframe
Document alien species distribution and abundance over time at the site	Alien plant distribution map	Biannually
Document alien plant control measures implemented & success rate achieved	Records of control measures and their success rate. A decline in alien distribution and cover over time at the site	Quarterly
Document rehabilitation measures implemented and success achieved in problem areas	Decline in vulnerable bare areas over time	Biannually

9.3 Decommissioning Phase Activities

The following management actions are aimed at preventing the invasion, by alien plant species, of the re-vegetated areas created during the decommissioning phase. Re-vegetation of the disturbed site is aimed at approximating as near as possible the natural vegetative conditions prevailing prior to operation.

Decommissioning Phase Action	Frequency
All damaged areas shall be rehabilitated if the infrastructure is removed and the facility is decommissioned	Once off
All natural areas must be rehabilitated with species indigenous to the area. Re-seed with locally-sourced seed of indigenous grass species that were recorded on site pre-construction.	Once off, with annual follow up re-vegetation where required
Maintain alien plant monitoring and removal programme for 3 years after rehabilitation.	Biannually

9.3.1 Monitoring Actions - Decommissioning Phase

The following monitoring and evaluation actions should take place during the decommissioning phase of the development

Monitoring Action	Indicator	Timeframe
Monitor newly disturbed areas where infrastructure has been removed to detect and quantify any aliens that may become established for 3 years after decommissioning and rehabilitation	Alien plant surveys and distribution map	Biannually until such time as the natural vegetation has recovered sufficiently to resist invasion.
Monitor re-vegetated areas to detect and quantify any aliens that may become established for 3 years after decommissioning and rehabilitation	Alien plant surveys and distribution map	Biannually for 3 years

Document alien plant control measures implemented & success rate achieved	Records of control measures and their success rate. A decline in alien distribution and cover over time at the site	Annually for 3 years

10 PLANT RESCUE AND PROTECTION PLAN

10.1 Purpose

The purpose of the plant rescue and protection plan is to implement avoidance and mitigation measures to reduce the impact of the development on listed and protected plant species and their habitats. Although this report identifies those species suitable for search and rescue at the site, it is important to note that a preconstruction walk-through of the site would also be important to refine the list of species identified for search and rescue, as well as locate such species prior to construction.

The objective of reusing plants on the project area is to prevent the loss of species either directly or through future extinction and minimising impacts of development on population dynamics of species of conservation concern.

Preserving the natural configuration of habitats as part of ecosystems, thus ensuring a diverse but stable hydrology, substrate and general environment for species to be able to become established and persist.

10.2 Effect of removing individual species of conservation concern

Species of conservation concern are declining either due to overexploitation or because their range of occupancy is limited and further infringed on by development. Most plant populations require a certain minimum number of individuals within a population or metapopulation to allow for sufficient genetic transfer between individuals. This prevents genetic erosion and hence weakening of the ability of individuals to persist in their environments. Similarly, where the distance between metapopulations is significantly increased due to fragmentation and the resultant loss of some populations, populations may suffer genetic decline due to restricted movement of pollen. Pollinators or other species that depend on a particular plant species for a specific microhabitat or food source may be equally affected because of the reduction of available resources. Therefore the aim of plant rescue actions are always to maintain as many individuals of a plant population in as close proximity to the original habitat as possible to minimise loss of individuals and fragmentation of populations to prevent the creation of future extinction debts of the development.

10.3 Plant Rescue and Protection

Successful plant rescue can only be achieved if:

- Species can be removed from their original habitat with minimal damage to the plant, especially the roots.
- All plants removed are safely stored and treated according to their specific requirements prior to being transplanted again.
- They are relocated into a suitable habitat and protected from further damage and all disturbances to aid their re-establishment.
- Timing of planting activities is planned with the onset of the growing season.
- Steps are taken where necessary to aid the initial establishment of vegetation, including occasional watering.

10.4 Time of Planting

- All planting shall be carried out as far as is practicable during the period most likely to produce beneficial results (i.e. during the peak growing season), but as soon as possible after completion of a section of earthworks.
- Drainage line rehabilitation preparation must be done during autumn, and planting of appropriate species in these areas should commence during early spring after the first rains.

10.5 Plant Search and Rescue

Prior to construction, once all the areas where topsoil will be removed or areas will be transformed have been demarcated, the ECO and contractor will be responsible to remove all bulbous species from the topsoil, as well as succulents and small indigenous shrubs that can be transplanted. These are to be kept in a raised, protected position in a designated area until they can be replanted again as part of the rehabilitation process. Further details are listed in the Re-vegetation and Habitat rehabilitation Plan.

11 RE-VEGETATION AND HABITAT REHABILITATION PLAN

The Revegetation and Habitat Rehabilitation Plan addresses the need to mitigate all impacts leading to disturbed vegetation, loss of species and/or agricultural potential, disturbed soil surfaces, and generally bare soils prone to erosion and further degradation on the proposed development site. The plan overlaps to some degree with the Erosion Management Plan, and for successful rehabilitation, it is imperative that this plan is at all times used in conjunction with other EMPRs mentioned.

The objective of the plan is therefore to provide:

- Protocols for the removal, temporary storage and replanting of plant species of conservation concern Protocols for the rehabilitation of vegetative cover across the project area
- Tools for planning the rehabilitation work and responding to unforeseen events Guidelines on implementation and post-implementation tasks Criteria for evaluating rehabilitation success
- A summary of items to be included in the rehabilitation budget to ensure that there is sufficient allocation of resources on the project budget so that the scale of EMPR-related activities is consistent with the significance of project impacts

The objective of rehabilitation and revegetation of the development area is:

- Preventing the loss of species either directly or through future extinction and minimising impacts of development on population dynamics of species of conservation concern.
- Preserving the natural configuration of habitats as part of ecosystems, thus ensuring a diverse but stable hydrology, substrate and general environment for species to be able to become established and persist.
- Preserving or re-creating the structural integrity of natural plant communities. Actively aid the improvement of indigenous biodiversity according to a desirable end state according to a previously recorded reference state. This reference state, if healthy, will be dynamic and able to recover after occasional disturbances without returning to a degraded state.
- Improving the ecosystem function of natural landscapes and their associated vegetation.
- Successful rehabilitation can only be achieved with: »A long-term commitment »Practical, adaptive management »Viable goals of desired outcomes

Prior to vegetation rehabilitation, all stakeholders involved should be consulted to determine:

- What the rehabilitation is ultimately aiming for– rehabilitation of cropping/grazing lands or rehabilitation of indigenous vegetation, after soil erosion and storm water management is in place and IAPs have been cleared?
- A clear definition of incompatible and compatible vegetation on and in the immediate surroundings of the development must be defined and maintained as such. No tree or shrubs shall be allowed to grow to a height in excess of the horizontal distance of that tree or shrub from the nearest newly developed structure or to grow in such a manner as to endanger the development or its operation
- Who will take long-term ownership and hence responsibility for the rehabilitation and its subsequent monitoring and management? Continued monitoring of vegetation establishment and composition, as well as erosion detection will have to be coupled with continued follow-up maintenance of rehabilitation and erosion control from commencement of activity up to the decommissioning phase.
- The ultimate objective for rehabilitation should focus on the stabilisation of soil erosion, retaining agricultural potential of transformed areas and /or the establishment of a dense and protective plant cover and the maintenance of habitats to enable vegetation to persist and flourish on rehabilitated areas indefinitely, ultimately relying only on environmental resources.

11.1 Map and create management areas

The entire project area must be mapped and divided into management areas indicating:

- Current land cover
    - Roads and residential
    - Areas with IAPs, subdivided further in sparse or dense infestations where applicable
    - Transformed areas
    - Untransformed indigenous vegetation

For every one of the management areas, the project proponent, in consultation with the land users, will have to decide what intervention will be necessary, desirable, and feasible to enable the development of the project and long-term sustainable maintenance of infrastructure. Thus for every management area there must be an operational outline on:

- what will happen there
- what needs to be mitigated – including storm water- and erosion management
- which management units need priority intervention/mitigation
- how will this mitigation / intervention be done (method statements) including schedule of work
- realistic and desirable end states including list of species that should be established to initiate rehabilitation after initial revegetation
- approximate timeframes
- monitoring protocol to evaluate success or failures of interventions
    - establish permanently marked transects and monitor with fixed-point photography who will be responsible for doing what how will different actions be integrated to achieve and maintain or improve the desirable end state of the environment of that management unit

Special attention will have to be given to drainage zones, as these not only have very active morphodynamics, but are also distributers of seeds – both indigenous and of IAPs. Thus clearing a downstream invasion of aliens to enable maintenance of the development will be futile if the upstream IAPs are not cleared or at least aggressively controlled.

11.2 Setting realistic rehabilitation goals

Rehabilitation efforts typically aim at improving ecosystem function that consists of a series of processes, which can in the end be evaluated against a desired outcome or reference state of the vegetation and environment.

Attainable goals of rehabilitation on the project area should be possible and viable for at least the following:

- Stabilisation of soils
- Stabilisation of riparian areas
- Storm water reduction through management and wetland integrity
- Clearing of IAPs
    - The degree to which IAPs can be cleared from the project area needs to be determined according to desirability, available project funding, personnel and project requirements
- Restoring and/or rehabilitating vegetative cover on non-transformed areas to obtain an acceptable vegetation cover that can be maintained or persists on its own indefinitely.

11.3 Remove or ameliorate the cause of degradation

This will include:

- Physical rehabilitation of topsoil where it has been removed.
- Topsoil on areas that have not been cultivated are considered as the upper 20 - 30 cm only. These contain the most important nutrients, micro flora and –fauna essential for nutrient cycling processes. Topsoils are also an important source of seeds.
- Subsoils and overburden substrata lack the above elements and will first have to be used for physical rehabilitation of landscapes as and where necessary, and then overlain with topsoils.
- Stabilisation of topsoils and prevention of erosion – refer to the Erosion management plan.
- Removal of all invasive vegetation – refer to the Alien Invasive Management Plan
    - Where it is desirable to use brush or logs of the cleared vegetation for soil stabilisation, such material must be free of regenerative material – e.g. seeds or root suckers.

11.4 Initial Revegetation

Immediately after clearing of vegetation, the soil surface must be inspected for signs of erosion and stabilised as soon as possible. After completion of construction, such erosion stabilisation should preferably be with a cover of vegetation. A dense initial grass or other perennial cover will be desirable. The appropriate seed mix should be determined in consultation with an ecologist familiar with the area. The aim of the first vegetation cover is to form a protective, relatively dense indigenous layer to slow runoff, increase moisture infiltration into the soil, and gradually change the soil nutrient status in order for it to be more favourable for other desirable indigenous vegetation to become established.

11.5 Natural seed banks and improvement of plant structural and compositional diversity

It is expected that soil seed banks of indigenous vegetation will be present to initiate initial vegetation cover, but may not be sufficient to establish an acceptable cover of desirable species. After deciding which indigenous species should be re-introduced, seed should be ideally collected from site or an environmentally-matched site nearby.

Seed collection may be done throughout the year as seed ripens, but can also be restricted to summer, when a large amount of the perennial seed should have ripened. Seeds should be stored in paper or canvas bags dusted with insecticide, and sown at the onset of the rainy season.

Alternatively, slower-growing perennials may be raised from seed or cuttings in a nursery and then transplanted once established. It will be beneficial to investigate if community members would be able to create and maintain such a nursery, or if there are nurseries in the area, that raise indigenous flora from the area.

The final vegetation cover should resemble the original (non-encroached) vegetation composition and structure as far as practicable possible or permissible within each management unit.

For drainage areas:

- First restore drainage line morphology following the guidelines of the Erosion Management Plan – without that ecological recovery cannot be initiated
- Determine if natural seed sources may be present further upstream
- If such upstream seed sources are still present, rehabilitation of riparian vegetation after soil erosion management will most likely occur naturally, PROVIDED that follow-up monitoring of the establishment of vegetation is carried out, and all invasive species eradicated as they emerge. This can only be achieved with a long-term commitment (> 5 years minimum)
- Should no upstream seed resources be available, suitable species (as determined in consultation with an ecologist) should be sown or planted.

11.6 Monitoring and follow-up action

Throughout the lifecycle of the development, regular monitoring and adaptive management must be in place to detect any new degradation of ecosystems affected by the development, and remedy these as soon as detected.

During the construction phase, the ECO and contractor will be responsible for initiating and maintaining a suitable monitoring system. Once the development is operational, the project proponent will have to identify a suitable entity that will be able to take over and maintain the monitoring cycle and initiate adaptive management as soon as it is required. Monitoring personnel must be adequately trained.

The following are the minimum criteria that should be monitored:

- Composition and density of replanted vegetation, distinguishing between species introduced for initial revegetation only and species that are part of the pre-determined desirable end state
- Associated nature and stability of surface soils
    - It is recommended that permanent transects are marked and surveyed annually according to the LFA technique (Tongway and Hindley 2004), adapted to integrate both surface soil characteristics and the vegetation to be monitored
- Re-emergence of IAPs
    - If noted, remedial action must be taken immediately according to Working for Water specifications
- Nature and dynamics of riparian zones
    - Stability of riparian vegetation
    - Any form of bank erosion, slumping or undercutting

- Stability of channel form and width of streams – if this increases, it shows that vegetation on plains and/or riparian areas and upper drainage lines are not yet in a stable enough state to be fully functional in reducing excess runoff and the ecosystem overall is losing valuable resources

11.7 Timeframes and duration

- Rehabilitation will occur during construction, as areas for the re-application of topsoil and revegetation become available or where revegetation can be initiated after clearing of invasives or to stabilise erosion.
- The initial revegetation period post construction is estimated to be over a period of 6 (minimum) to 12 months (maximum), or a time period specified by the Horticultural Landscape Contractor, particularly if planting of trees and shrubs occurs.
- The rehabilitation phase (including post seeding maintenance) should be at least 12 months (depending on time of seeding and rainfall) to ensure establishment of an acceptable plant cover is achieved (excluding invasive plant species or weeds).
- If the plants have not established and the acceptable plant cover is not achieved within the specified maintenance period, maintenance of these areas shall continue until at acceptable plant cover is achieved (excluding alien plant species or weeds).
- Additional seeding or planting may be necessary to achieve acceptable plant cover. Hydroseeding may have to be considered as an option in this case.
- Any plants that die, during the maintenance period, shall be replaced by the Horticultural Landscape Contractor (at the Horticultural Landscape Contractor's cost if it was due to insufficient maintenance).
- Succession of natural plant species should be encouraged
- Monitoring of rehabilitation success and follow-up adaptive management, together with clearing of emerging invasives shall be carried on until the decommissioning phase has been completed.

12 OPEN SPACE MANAGEMENT PLAN

The objective of open space management is to restore, enhance and rehabilitate open spaces, improve climate change adaptations through the minimisation of biodiversity loss, and mitigate against environmental degradation. Management actions consider open spaces and natural areas as well as community perceptions of these.

In the context of the proposed grid connections and substations the primary purpose of the open plan management plan is therefore to:

- Minimise visual impact on the character of the area; and
- Maintain biodiversity within the area to ensure that no long-term negative impacts occur on the local environment.

The proposed grid connection connections and associated infrastructure have the potential to impact negatively on the character of the area, as identified in the Visual Impact Assessment conducted during the EIA phase. The following actions must be implemented to minimise this visual impact:

- Grid connection route to avoid visually sensitive peaks, major ridgelines, scarp edges and slopes steeper than 1:5 gradient
- Substation to be sited in unobtrusive low-lying areas, away from roads and habitations, and screened by berms and/or tree-planting where feasible.
- Operations and maintenance buildings and parking areas to be located in an unobtrusive area and consolidated to avoid sprawl of buildings in the open landscape.
- Access roads to be in sympathy with the contours, avoid steep 1:5 slopes and drainage courses, and kept as narrow as possible.
- Access and haul roads to use existing farm tracks as far as possible.

- Construction camp, stockpiles and lay-down area to be located out of sight of district roads, possibly in the vicinity of the proposed substation and O&M buildings.
- Disturbed areas rather than pristine or intact land to preferably be used for the construction camp. Construction camp and laydown areas to be limited in area to only that which is essential.
- Measures to control wastes and litter to be included in the contract specification documents.
- Provision to be made for rehabilitation/ re-vegetation of areas damaged by construction activities.

In order to maintain biodiversity the Alien Invasive, Plant Rescue and Protection and Re-vegetation and Habitat Management Plans must be adhered to.

In addition the following actions should implemented by the Contractor and Project Company:

- Promote environmental awareness in all employees and sub-contractors and create an understanding of the environmental sensitivities of the project site;
- No waste, including organic matter may be disposed of anywhere on site, except in provided bins placed at convenient locations, especially during the construction period. Disciplinary actions should be taken against littering.
- Open spaces are to be kept free of alien plants and weeds;
- Indigenous plants may not be collected or removed from the site;
- Access to the facility should be strictly controlled
- All visitors and contractors should be required to sign-in
- Signage at the entrance should indicate that disturbance to fauna and flora is strictly prohibited.

The following activities should not be permitted by anyone except the landowner or his representatives:

- No fires within the site
- No hunting, collecting or disturbance of fauna and flora, except where required for the safe operation of the facility and only by the Environmental Officer on duty and with the appropriate permits and landowner permission.
- No driving off of demarcated roads
- No interfering with livestock.

12.1 Grazing Management

The development of the wind energy facility will not prevent the site from being used for its current landuse of extensive livestock production. Extensive livestock grazing is compatible with biodiversity maintenance provided that it is implemented according to the basic principles of sustainable grazing management. While the majority of these are beyond the scope of the current plan, the following basic principles should be adhered to:

- A grazing management plan for the site should be developed in cooperation with Agricultural Extension services.
- The stocking rate applied should be within the recommended limits as identified by the Department of Agriculture.
- Livestock should be rotated through the different paddocks at the site in a manner which allows for the growth and recovery of the vegetation between grazing events.
- Precautions should be taken to ensure that the development of the site does not increase the risk of stock theft within the facility. These include access control as previously described, as well as security patrols.

13 TRAFFIC MANAGEMENT PLAN

The objective of the traffic management plan is the prevention of incidents from the use of vehicles and disturbance of local traffic on public roads during the construction, operation and decommissioning phases of the proposed projects. Traffic volumes are most likely to increase during the construction phase. However, due to the remote location of the site, and the low volume of traffic on public roads in the area the impact is expected to be low.

Actions to be implemented by the Contractor and Project Company:

- Site-specific traffic plan to be developed and implemented during the detailed design phase prior to construction;
- Limit use of private cars by arranging mini bus transport service for workers;
- Monitor for overloading of vehicles;
- Use only well trained, suitably qualified and experienced drivers in possession of an appropriate and valid driver's license;
- All vehicles must be roadworthy and serviced regularly;
- Clear and visible signage must be placed on and around site, clearly demarcating safe entry and exit points;
- Require all drivers to abide by standard road and safety procedures on site;
- When travelling on public roads all speed limits and rules of the road must be adhered to; and
- Limit dust generation by applying dust suppressants and postponing dust generating activities during period of strong winds and enforcing a strict speed limit of 40 km/h on unpaved roads.

Monitoring actions to be conducted by the ECO

- Maintain incidents/complaints register for community complaints;
- Monitor dust generation and implementation of management actions detailed above.

14 TRANSPORTATION MANAGEMENT PLAN

The Transportation Management Plan aims to ensure the safe transportation of all components required for the construction of the proposed projects to the construction site. This includes the, turbines, substation transformers, electrical cables and pylon structures.

The following actions should be implemented by the developer and Contractor:

- Apply for all relevant permits for abnormal loads and route clearances with the relevant authorities prior to construction;
- Appoint a qualified specialist to conduct a detailed site-specific Transport Risk Assessment during the detailed design phase and prior to construction;
- Determine the pre-construction condition of the road immediately prior to construction by carrying out a condition assessment or from recent pavement management system condition assessments if available from the Provincial Authorities;
- Public notices regarding any planned abnormal load transports must be placed at the construction site to inform affected parties;
- Abnormal loads must conform with legal maximum dimensions, and vehicles carrying abnormal loads must display sufficient signage;
- Any roads damaged during the transportation of components, or from other construction vehicles must be rehabilitated and returned to pre-construction conditions.

The following monitoring activities should be carried out by the ECO:

- Conduct site audits and report non-compliance with the above-mentioned conditions

15 STORMWATER MANAGEMENT PLAN

The objective of the storm water management plan (SWMP) is to prevent increased soil erosion, to contain any contaminated run-off and to avoid water logging and pollution. The Erosion Management Plan (see below) must therefore be seen in conjunction with the SWMP. Actions are listed that will ensure that storm water is channelled in a controlled manner from roads and substations towards natural drainage lines, without impeded natural surface flows.

- Develop and implement a site-specific storm water management plan during the detailed design phase of the projects and prior to construction;
- In the detailed design phase of the project minimise any water crossings and utilise existing roads wherever possible;
- Enforce 32 m construction buffers of all rivers, streams and waterbodies;
- Should new roads be required to cross any banks or channels these must be secured with erosion protection (ie. gabions etc);
- Monitor for erosion during the clearing of vegetation;
- Avoid hard-engineered surfaces (ie. construct gravel roads and not asphalt roads wherever possible);
- Roads in steep areas must be equipped with side drainages and culverts that channel the run-off to natural drainage lines without gaining velocity and causing erosion;
- Construction camps and temporary ablution facilities must be located beyond the 1:100 year floodline;
- Stockpiles must be located on flat areas and protected from erosion;
- The substation site design must include side water outlets and an adequate slope to allow storm water run-off from the paved areas; and
- Prevent surface run-off from areas of potential contamination.

16 EROSION MANAGEMENT PLAN

16.1 Purpose

The purpose of the erosion management plan is to implement avoidance and mitigation measures to reduce the erosion potential and the likely impact of erosion associated with the construction and operational phases of the proposed facility. As part of the management plan, measures to protect hydrological features from erosion damage are included.

16.2 Scope and Limitations

This plan is intended at introducing measures aimed at reducing the negative impacts of erosion on biodiversity as well as reducing the vulnerability of the site to erosion problems during the construction and operational phases of the development. The focus is on managing runoff and reducing the construction phase impact on ecologically sensitive areas. The plan does not cover engineering-side issues which are of relevance to soil management and erosion. Therefore issues such as the potential presence of heaving clays, compressible soils, perched water tables, dispersive soils and corrosive groundwater at the site are beyond the general scope of this study and are not directly dealt with. These issues would need to be addressed and their relevance assessed during detailed geotechnical investigation of the site.

16.3 Background

16.3.1 Types of Erosion

Erosion comes in several forms, some of which are not immediately obvious. The major types of erosion are briefly described below:

Raindrop impact

This is the erosion that occurs due to the "bomb blast" effect of raindrop impact. Soil particles can be blasted more than a meter into the air. Apart from loosening soil particles, the effect can also break soil aggregates apart and form a clay seal on the surface which resists infiltration and results in increased levels of runoff. This effect is most important when large areas of exposed soils are present. If the site is cleared, then this effect will play an important role as it results in the soil surface becoming sealed which reduces infiltration and increases runoff, leading to erosion.

Sheet Erosion

This is the removal of a shallow and uniform layer of soil from the surface. It is caused initially by raindrop splash and then by runoff. Sheet erosion is often difficult to see as no perceptible channels are formed. Accumulated sediment at the bottom of the slope is often the only indicator. This is likely to be an important erosion type at the site given the gently sloping nature of the site and the susceptible soils.

Rill Erosion

This is the removal of soil from the surface whereby small channels or rills up to 300 mm are formed. It is caused by runoff concentrating into depressions, wheel tracks etc.

Gully Erosion

This is the removal of soil from the surface and sub-surface caused by concentrated runoff eroding channels greater than 300mm deep. Gully erosion often begins as rill erosion.

Wind Erosion

Wind erosion results from soil particles being picked up, bounced or moved by the wind. Wind erosion is primarily a problem in arid areas and may affect sands soils as well as fine-textured soils. Vegetation cover is usually an effective barrier to wind erosion, but large soils losses or degradation can occur in disturbed areas or on croplands.

16.3.2 Promoting Factors

Rainfall characteristics

High-intensity, short-duration storm events have much greater erosion potential than low intensity, longer duration storm events with the same runoff volume. Intense storms produce larger raindrops, and are more likely to break up the soil and dislodge particles.

Soil erodibility

Soil erodibility is determined by the soils ability to resist detachment and transport due to rainfall, runoff and infiltration capacity. Well-structured soils with a high clay content are generally least erodible. Some clays are dispersible meaning that they break down when wet and become highly erodible. Silts and fine sands are highly erodible.

Length and Steepness of Slope

Steeper slopes cause runoff velocities to increase, resulting in increased erosion. As the slope length increases the opportunity for runoff to concentrate and achieve an erosive velocity increases.

Soil Surface Cover

Soil surface cover such as vegetation and mulch protect the soil surface from raindrop impact, reduce flow velocity, disperse flow, and promote infiltration and the deposition of sediment. This is a basic principle underlying many erosion control approaches which aim to modify the surface characteristics in order to reduce the flow velocity and reduce the potential for erosion. In this regard it is important to note that many of the practices which are used to enhance rehabilitation potential are also useful in reducing erosion potential.

16.3.3Erosion and Sediment Control Principles

The goals of erosion and sediment control during and after construction at the site should be to:

- Protect the land surface from erosion;
- Intercept and safely direct run-on water from undisturbed upslope areas through the site without allowing it to cause erosion within the site or become contaminated with sediment.
- Progressively revegetate or stabilise disturbed areas.
- Prevent damage to hydrological features such as drainage lines or wetlands, either within or adjacent to the site.

These goals can be achieved by applying the following principles:

1. Integrate project design with site constraints.
2. Plan and integrate erosion and sediment control with construction activities.
3. Minimise the extent and duration of disturbance.
4. Control stormwater flows onto, through and from the site in stable drainage structures.
5. Use erosion controls to prevent on-site damage.
6. Use sediment controls to prevent off-site damage.
7. Control erosion and sediment at the source.
8. Stabilise disturbed areas promptly.
9. Inspect and maintain control measures.

16.3.4On-Site Erosion Management

Exposed and unprotected soils are the main cause of erosion in most situations. Therefore, the erosion management plan and the revegetation and rehabilitation plan should be closely linked to one another and should not operate independently, but should rather be seen as complementary activities within the broader environmental management of the site and should therefore be managed together.

General factors to consider regarding erosion risk at the site includes the following:

- Soil loss will be greater during wet periods than dry periods. Intense rainfall events outside of the wet season, such as occasional unseasonal showers can also however cause significant soil loss. Therefore precautions to prevent erosion should be present throughout the year.
- Soil loss is related to the length of time that soils are exposed prior to rehabilitation or stabilization. Therefore the gap between construction activities and rehabilitation

should be minimized. Allied to this the fact that topsoil does not store well and should preferably be used within a month or at most within 3 months to aid in the revegetation and rehabilitation of disturbed areas.
- Phased construction and progressive rehabilitation are important elements of the erosion control strategy.
- The extent of disturbance will influence the risk and consequences of erosion. Therefore large areas should not be cleared at a time, especially in areas such as slopes where the risk of erosion is higher.

16.4 Concentration of flows into downstream areas

Road crossings over drainage lines, streams and wetlands can impact downstream wetland ecosystems. Crossings that result in narrowing of the downstream system can result in concentration of flows and channelisation downstream. This may result in a loss of wetland function, and result in the drying out and shrinkage of the wetland area. Erosion and increased vulnerability to invasion of drier banks by alien vegetation may occur.

- Culverts should be adequately spaced such that they do not result in shrinkage of downstream wetlands. Where roads cross minor drainage channels, a single culvert may be adequate, aligned with the downstream drainage line. Where more substantial wetland systems are intercepted by a road, sufficient culverts should be provided such that downstream shrinkage of wetland width does not occur. Moreover, culverts should be aligned, as far impossible, with existing, natural channels.
- All crossings of drainage systems should ensure that both surface and shallow subsurface flows can be accommodated where appropriate and that unnatural channelisation does not occur downstream.

16.5 Runoff Concentration

The increase in hardened surfaces associated with roads, and other infrastructure will lead to a significant increase in volume and velocity of flow generated from these areas during large rainfall events.

Runoff from road surfaces is usually channelled off of the road surface towards the downslope side of the road. On steep slopes, the volumes and velocity of runoff generated may result in erosion of the surrounding areas. Therefore specific measures to curb the speed of runoff water is usually required in such areas, such as rock beds or even gabions. In addition, these areas should be monitored for at least a year after construction to ensure that erosion is not being initiated in the receiving areas. Once erosion on steep slopes has been initiated, it can be very difficult to arrest.

16.5.1 Diversion of Flows

Diversion of flows from natural drainage channels may occur when roads interrupt natural drainage lines, and water is forced to run in channels along the manipulated road edge to formalized crossing points. Even slight diversion from the natural drainage line can result in excessive downstream erosion, as the new channel cuts across the slope to reach the valley bottom. Should the access road to the site traverse any major drainage lines, the following principles should apply.

- Adequate culverts should be provided along the length of all roads to prevent diversion of flow from natural drainage lines.
- Culverts should be carefully located, such that outlet areas do in fact align with drainage lines.
- The downstream velocity of runoff should be managed, such that it does not result in downstream erosion – on steep slopes, where roads have been constructed on cut

areas, allowance should be made for culverts to daylight sufficiently far down the slope that their velocities are managed and erosion does not occur.
- Where necessary, anti-erosion structures should be installed downstream of road drains – these may comprise appropriate planting, simple riprap or more formal gabion or other structures.
- Roads and their drainage system should be subject to regular monitoring and inspection, particularly during the wet season, so that areas where head cut erosion is observed can be addressed at an early stage.

16.6 Monitoring Requirements

16.6.1 Construction Phase

The following monitoring actions should be implemented during the construction phase of the development

Monitoring Action	Indicator	Timeframe
Identify all river and drainage line crossings affected by the development	Map of sites of potential concern	Preconstruction
Monitor cleared areas for erosion problems	Record of monitoring site, problems encountered and remedial actions implemented	Monthly during the rainy season and following significant rainfall events otherwise
Monitor vegetation clearing activities near sensitive areas such as wetlands or drainage lines	Activity log of monitoring actions and any mitigation and avoidance measures implemented	Monthly during the rainy season and following significant rainfall events otherwise
Monitor revegetated and stabilised areas	Record of monitoring site, problems encountered and remedial actions implemented	Monthly during the rainy season and following significant rainfall events otherwise

16.6.2 Operational Phase

The following monitoring actions should be implemented during the operational phase of the development:

Monitoring Action	Indicator	Timeframe
Monitor for the development of new erosion problems across the site, with a focus on areas where water has been diverted or collected from upslope onto downslope areas	Map of erosion problem areas	Quarterly
Document erosion control measures implemented	Records of control measures and their success rate.	Quarterly
Document the extent of erosion at the site and the remedial actions implemented	Decline in erosion and vulnerable bare areas over time	Biannually

17 FIRE MANAGEMENT PLAN

The National Veld and Forest Fires Act states that it is the landowner's responsibility to ensure that the appropriate equipment as well as trained personnel are available to combat fires.

Although fires are not a regular occurrence at the site, fires may occasionally occur under the right circumstances. Ignition risk sources in the area include the following:

- Lightning strikes
- The railway line which runs through the facility
- Personnel within the facility
- Infrastructure such as transmission lines

17.1.1 Firebreaks

Extensive firebreaks are not recommended as a fire risk management strategy at the site. The site is very large compared to the extent of the infrastructure and the maintenance of firebreaks would impose a large management burden on the operation of the facility. In addition, the risk of fires is not distributed equally across the site and within many of the lowlands of the site, there is not sufficient biomass to carry fires and the risk of fires within these areas is very low. Rather targeted risk management should be implemented around vulnerable or sensitive elements of the facility such as substations or other high risk components. Within such areas, the extent over which management action needs to be applied is relatively limited and it is recommended that firebreaks are created by mowing and that burning to create firebreaks is not used as this in itself poses a risk of runaway fires. Where such firebreaks need to be built such as around substations, a strip of vegetation 5 - 10 m wide can be cleared manually and maintained relatively free of vegetation through manual clearing on an annual basis. However if alien species colonise these areas, more regular clearing should be implemented.

18 FUEL STORAGE MEASURES

18.1 Storage Tanks

The storage tanks will be within contained areas to prevent spills contaminating soil and water, and with a design to capture and contain a volume of spill of at least 110% of the volume of stored fuel. These containers can be built in concrete and painted with anti-corrosive paint. The floor of the container must be inclined to permit the collection of the spilled liquids.

The storage tanks must also have a cover protection on top, prepared for drainage and collection of runoff.

18.2 GENERAL PROCEDURES

- Transport routes for the transport of fuel will be clearly indicated;
- Pollution control equipment (spill and leak cleaning kits) must be readily available;
- Ensure personnel training, including: measures to prevent fuel spills, to treat/clean fuel spills, how to react on spill of flammable liquids on clothing and in the inhalation of vapours, leaks simulations; fuel vapour recovery processes, etc. Keep records of all training;
- Maintain the premises and equipment in a clean and tidy state;
- Regularly clean outdoor areas with a broom;
- Wastewater from outside areas must be directed to the contaminated water drainage system, and not enter the storm water system;

- Used oils (waste oil) will be collected, re-used, stored and disposed of in line with disposal procedures for hazardous wastes;
- Ensure the proper management of other hazardous wastes (contaminated soils, used spilling kits, waste lube, etc).

FILLING OPERATIONS

- Isolate the area by cones and a rope;
- Prohibit refuelling operations during tank filling operations;
- Avoiding having people who are not involved in the operation within a 10 metre radius;
- Prohibit smoking and the use of mobile telephones or any other ignition sources during tank filling operations or vehicle refuelling, within a 3 metre radius;
- Use a tight-fill cap to completely seal off the connections between the tubing and the truck's and station's tanks;
- Engines must be turned off during refuelling;
- Prevent overflowing and spilling situations when the storage tanks are being filled (verify filling sensors and be aware of overflow alarms).

Preventing Accidents with fuel mixtures

- Establish a procedure to deal with the potential occurrence of these situations, such as:
- The chemicals and reaction mechanisms associated with the substances mixed or blended must be well understood and documented
- Chemical and process hazards must be understood and addressed and the facilities should ensure that process equipment, controls, and procedures are designed, installed and maintained to safely operate the process
- All employees should understand the chemical and process hazards
- Facilities should establish a system for Standard Operating Procedures and ensure that they are understood and followed
- Display clear and informative messages for users of the station, as to how to deal with this situation;
- Prepare a procedure to suitably dispose of wastes recovered from the batches of fuel mixture.

Spill Kits

- Emergency spill kits of absorbent material (e.g. sand) must be provided and stored next to the higher risk sites, and must be easily-accessible, ideally outside, in order to allow an immediate response when a spill occurs. This will be clearly labelled and ready for use.
- Drums for the storage of contaminated material must be provided.
- An accurate drawing of the local drainage system shall be posted next to the spill kit.

Closure Phase

- During the closure phase, there may be loss of product into the soil, as a result of a deliberate or accidental release during closure and removal of tanks and tubing. In addition, this risk may arise outside of the facility site, if the tanks and/or tubing are not properly disposed of.
- In the closure phase, it is important to remove all tanks and pipes. A risk may arise if the tanks are left on site with residual products. As the integrity of the equipment will no longer be ensured or monitored.
- During closure, it must be ensured that facilities do not present a risk to the environment, health or safety. Measures must be taken to ensure that the closure does not result in an unacceptable risk, including:

- Any and all waste products will be removed from the tanks. Care will be taken to ensure that no product is lost into the soil. Tank closure must be carried out safely, with the removal of explosive vapours, for example by filling the tanks with water or inert gases. All tanks will be safe prior to their removal from the ground. Similar methods will be employed prior to the removal of the pipes.
- Water used in this process will be contaminated with residual product, and thus a water contamination risk may arise if the contaminated water is not disposed of in a way which is appropriate for hydrocarbon contamination. This would normally imply the removal to a suitable waste handling facility.
- According to best environmental practices, the tanks, tubing and distributors will be disposed of. However, if the tanks remain in situ, it will be ensured that the procedure is safe. After making the tanks inert and safe, they will be filled in with sand, concrete, inert mud or hydrophobic foam.
- The tanks and associated tubing which are no longer considered appropriate or safe for fuel storage will not be used for storage of other hydrocarbons, without first ensuring their integrity.
- The oil/water separators will be removed for disposal, off the facility site. Otherwise they will be filled in a similar way to the tanks. Regardless of the fate of the oil/water separator, all liquid and mud waste will be removed (off the facility site) and all the inlets and outlets will be sealed.
- Whatever drainage system left behind will be modified to ensure that it does not serve as a path for pollutants to reach groundwater or other waters.
- If the deactivation is temporary, product can be left in the tanks. In this case, all monitoring procedures will be carried out as if the facility were in operation. If for any reason the monitoring cannot carry on, the tanks will be emptied and made inert.
- Personnel involved in the closure of a filling and fuel station will be aware and respect obligations with regards to waste disposal, in line with the best practices described above.

Environmental Aspect	**Action or Measure**
Prevent accidental spills from entering the stormwater drainage system	Provide cleaning equipment conceived specifically to deal with minor spills as may occur at the station. Place a clearly-identified spill kit in a visible location for each fuelling line.
	Develop a step-by-step guide to use of the spill kit.
	Develop an evacuation plan and/or response procedures for emergencies involving large fuel spills.
	Train the whole team in the emergency response procedures. Make sure that all staff knows where the emergency equipment is to be found and is acquainted with its maintenance.
	Label all of the stormwater drains on site in the proximity of the facilities as "Clean Water Only".
	Inspect the fuel distribution area in order to confirm that rainwater drained or emptied from the roof doesn't enter the areas marked out.
	Check whether the embankment around the fuel distribution area is in good condition and has the capacity to contain a fuel leak in the event of an emergency.

Environmental Aspect	Action or Measure
Minimise the risks of environmental contamination and from issues of workers' health and safety	Provide training to the staff regarding the disposal of material contaminated with fuel, such as absorbent material from the spill kit, soaked in fuel.
	Ensure that the product safety cards for all fuels and oils are up-to-date and accessible at all times.
Minimise the risks of fuel leaks as may result in pollution of the sub-soil and groundwater	Check if there is fuel, from a possible leak, in the spill containment sumps installed at the tank's discharge nozzle.
	Check if there is fuel, from a possible leak, in the all tanks containment sumps, installed on the manhole to the storage tanks. In the event of suspected leakage, report it immediately.
	Check if there is fuel or lube, from a possible leak in the containment sumps installed under the tanks.
Minimise the risks of fuel leaks as this may result in pollution of the sub-soil and groundwater	Check if there is fuel, from a possible leak, in the chambers of the containment sumps installed under the pumps
Minimise the risks of harmful emissions to the atmosphere and the loss of fuel	Check that lids, flanges and connections are closed.
	Confirm that the ventilation conduits are not blocked.
	Supervise the fuel deliveries.
Minimise the risks of water pollution	Carry out an Oil-Water Separator inspection to ensure effective treatment.
Integrity control	Adequate maintenance and calibration of the monitoring equipment

19 DECOMMISSIONING PHASE

Should the WEF be decommissioned a decommissioning plan must be produced. The plan must include details on the decommissioning and dismantling of the WEF, taking in consideration the potential environmental impact associated with it. Environmental monitoring plans must be produced so ensure no pollution occurs during this phase. The plan must include the steps that will be taken to rehabilitate the area after the WEF is dismantled, as well as recycling options of the equipment and structures.

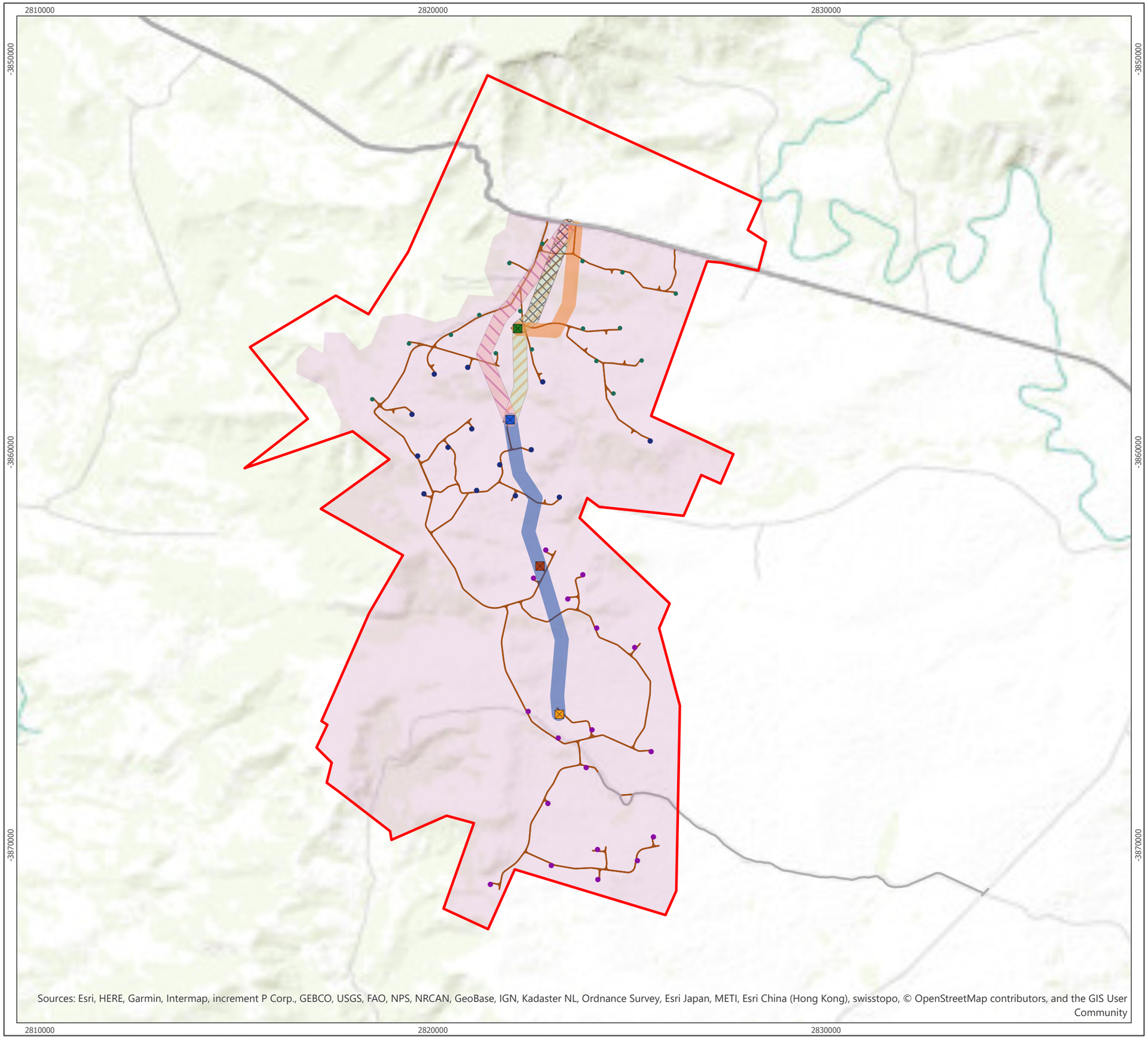
20 CONCLUSION

In terms of the National Environmental Management Act 107 of 1998 everyone is required to take reasonable measures to ensure that they do not pollute the environment. Reasonable measures include informing and educating employees about the environmental risks of their work and training them to operate in an environmentally acceptable manner.

Furthermore, in terms of the 'Act', the cost to repair any environmental damage shall be borne by the person responsible for the damage.

It is therefore imperative that the management plan is successfully implemented, as a failure to comply could have legal implications.

The environmental impacts on the site will not be significant if the construction management is well implemented, and a set of operational guidelines are developed by the long term site management body.



ARCUS

- Site Land Parcels Boundary
- Proposed Development Area
- Existing Road
- Proposed Roads
- North WEF Turbine Location
- Central WEF Turbine Location
- South WEF Turbine Location
- North WEF Substation (A)
- Central WEF Substation (B)
- South WEF Substation (C1)
- South WEF Substation (C2)
- North Grid Alternative 1
- North Grid Alternative 2
- Central Grid Alternative 1
- Central Grid Alternative 2
- South Grid Alternative 1
- South Grid Alternative 2
- South Grid Alternative 1&2

1:93,242 Scale @ A3

0 2 4 km

NORTH

Produced By: AA	Ref: 2780-REP-033
Checked By: SC	Date: 09/09/2018

Highlands WEFs Development Plan
Figure 1

Highlands South WEF Environmental Management Programme

C:\Users\Anja\Desktop\2780 Highlands WEF EIA\Document Files\Reports\2780_Highlands WEF EIA.aprx\EMPr South WEF Fig 1 Highlands WEFs Development Plan

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-3860000 -3870000

103 RE/102 2/101 5/104 1/104 RE/104 1/105 2/104 C1 RE/105 144 RE/145 8/145 C2 143 RE/361 1/146

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

ARCUS

- Land Parcel Boundary
- Existing Road
- South WEF Turbine Location
- South WEF Internal Cabling
- Substation A, O&M Complex & Laydown Area
- Hardstands & Laydown Areas
- Proposed Road
- Watercrossing

1:70,000 Scale @ A3

0 1 2 3 km

NORTH

Produced By: AA	Ref: 2780-REP-037
Checked By: SC	Date: 09/09/2018

Highlands South WEF Development Plan
Figure 2

Highlands South WEF Environmental Management Programme

C:\Users\Anja\Desktop\2780 Highlands WEF EIA\Document Files\Reports\2780_Highlands WEF EIA.aprx\EMPr South WEF Fig 2 Highlands South WEF Development Plan