


**SOUTH AFRICA MAINSTREAM RENEWABLE
POWER LOERIESFONTEIN 2 (PTY) LTD**

**Proposed Construction of a 140
MW Wind Farm on Portion 1 and 2
of the Farm Aan De Karree Doorn
Pan No. 213 near Loeriesfontein,
Northern Cape Province**

Final Draft Environmental Management Programme

DEA Ref No:	12/12/20/2321/3
NEAS Ref No:	DEA/EIA/0001086/2012
Issue Date:	19 April 2013
Revision No.:	1
Project No.:	10777

Date:	19 April 2013
Document Title:	Construction of a 140MW Wind Farm on Portion 1 and 2 of the Farm Aan De Karree Doorn Pan No. 213 near Loeriesfontein, Northern Cape Province, South Africa: Final Draft Environmental Management Programme
Author:	Daniela Venzo
Revision Number:	1
Checked by:	Shaun Taylor
Approved:	Rebecca Thomas
Signature:	
For:	SiVEST Environmental Division

*COPYRIGHT IS VESTED IN SiVEST IN TERMS OF THE COPYRIGHT ACT (ACT 98 OF 1978)
AND NO USE OR REPRODUCTION OR DUPLICATION THEREOF MAY OCCUR WITHOUT
THE WRITTEN CONSENT OF THE AUTHOR*

**SOUTH AFRICA MAINSTREAM RENEWABLE POWER
LOERIESFONTEIN 2 (PTY) LTD**

**CONSTRUCTION OF A 140MW WIND FARM FACILITY ON
PORTION 1 AND 2 OF THE FARM AAN DE KARREE DOORN PAN
NO. 213 NEAR LOERIESFONTEIN**

**FINAL DRAFT ENVIRONMENTAL MANAGEMENT
PROGRAMME**

Contents	Page
1 INTRODUCTION	1
1.1 Site Locality and Description	2
1.1.1 Regional Locality.....	2
1.1.2 Study Site Description.....	3
1.1.3 Climate	4
1.2 Overview of the proposed project	5
1.2.1 Turbines	5
1.2.2 Electrical Connections	7
1.2.3 Substations	7
1.2.4 Roads.....	8
1.2.5 Temporary construction area	8
1.2.6 Other infrastructure	8
1.3 Site Layout	8
1.4 Project Responsibilities	9
1.4.1 Project Manager.....	10
1.4.2 Environmental Control Officer.....	10
1.4.3 Main Contractor	11
1.4.4 The Environmental Liaison Officer.....	11
1.4.5 Environmental Audits	15
1.5 Layout of Environmental Management Programme	17
1.5.1 Introduction	17
1.5.2 Pre-construction (Site establishment).....	18
1.5.3 Construction.....	18
1.5.4 Operation	19
1.5.5 Decommissioning Phase	19
1.6 Objectives of an EMPr	19
1.6.1 Environmental monitoring	20
1.7 Compliance with the EMPr	21
1.7.1 Penalties for non-compliance	21
1.7.2 Training and awareness.....	22
1.8 Applicable Legislation, Development Strategies and Guidelines	23
1.8.1 The Equator Principles.....	23
2 MITIGATION GUIDELINES.....	27
2.1 Introduction	27
2.2 Pre-construction (Site Establishment).....	27

2.3	Pre-Construction Phase	29
2.3.1	Site preparation.....	29
2.3.2	Consultation	32
2.3.3	Site Clearing	33
2.3.4	Social and Environmental Management Systems	34
2.4	Construction Phase	35
2.4.1	Construction Camp	35
2.4.2	Construction traffic and access.....	38
2.4.3	Environmental Education and Training.....	40
2.4.4	Soils and Geology.....	42
2.4.5	Erosion Control	45
2.4.6	Water Use and Quality.....	46
2.4.7	Surface and Groundwater.....	49
2.4.8	Waste Management.....	55
2.4.9	Flora	58
2.4.10	Fauna.....	62
2.4.11	Avi-fauna.....	63
2.4.12	Bats.....	66
2.4.13	Air Quality	66
2.4.14	Noise and Vibrations	68
2.4.15	Energy use	71
2.4.16	Agricultural Potential.....	71
2.4.17	Employment.....	72
2.4.18	Occupational Health and Safety	74
2.4.19	Security.....	80
2.4.20	Social Environment.....	81
2.4.21	Heritage	86
2.4.22	Community Engagement.....	88
2.4.23	Visual Impact	89
2.5	Operation Phase.....	91
2.5.1	Construction Site Decommissioning	91
2.5.2	Operation and Maintenance	93
2.5.3	Surface and Groundwater.....	94
2.5.4	Biodiversity.....	96
2.5.5	Waste Management.....	97
2.5.6	Health and Safety	98
2.5.7	Visual Impact	99
2.5.8	Bats.....	100
2.5.9	Avi-fauna	101
2.5.10	Social	102
2.5.11	Noise.....	103
2.6	Decommissioning phase.....	106
2.6.1	Ongoing Stakeholder involvement.....	107
2.6.2	Community health and safety	108
2.6.3	Waste Management.....	108
2.6.4	Surface and Groundwater.....	109
2.6.5	Biodiversity.....	109
2.6.6	Air Quality	110
3	MANAGEMENT PLANS REQUESTED BY DEA	111
3.1	Alien Invasive Management Plan.....	111
3.2	Plant Rescue Protection Plan	112
3.3	Re-Vegetation and Habitat Rehabilitation Plan	113
3.4	Open Space Management Plan	114
3.5	Erosion Management Plan	116

4	CONCLUSION.....	118
4.1	Pre-Construction Phase	118
4.2	Construction Phase	118
4.3	Operational Phase.....	119
4.4	Decommissioning Phase.....	119

List of Tables:

Table 1: Mean monthly rainfall for Loeriesfontein (Source: South Africa's Rain Atlas).....	4
Table 2: Mean monthly and annual temperature for Loeriesfontein (Source: http://www.saexplorer.co.za)	4
Table 3: Responsible Parties and Auditing Process	11
Table 4: Environmental Management Responsibilities	12
Table 5: Example of Procedure for Conducting Audits	15
Table 6: IFC Performance Standards.....	24
Table 7: Site preparation	29
Table 8: Consultation.....	32
Table 9: Site Clearing	33
Table 10: Social and Environmental Management Systems.....	34
Table 11: Construction Camp.....	35
Table 12: Construction Traffic and Access.....	38
Table 13: Environmental Education and Training	40
Table 14: Soils and Geology	42
Table 15: Erosion Control	45
Table 16: Water Use and Quality	46
Table 17: Surface and Groundwater	49
Table 18: Waste Management	55
Table 19: Flora.....	58
Table 20: Fauna.....	62
Table 21: Avi-fauna Impact.....	63
Table 22: Bats Impact.....	66
Table 23: Air Pollution	66
Table 24: Noise and Vibrations	68
Table 25: Energy use	71
Table 26: Agricultural Potential.....	71
Table 27: Employment.....	72
Table 28: Occupational Health and Safety	74
Table 29: Security.....	80
Table 30: Social Environment.....	81
Table 31: Heritage	86
Table 32: Community Engagement	88
Table 33: Visual Impact	89
Table 34: Construction Site Decommissioning.....	91

Table 35: Operation and Maintenance	93
Table 36: Surface and Groundwater	94
Table 37: Biodiversity	96
Table 38: Waste Management	97
Table 39: Health and Safety	98
Table 40: Visual Impact	99
Table 41: Bats Impact.....	100
Table 42: Avi-fauna	101
Table 43: Social	102
Table 44: Noise.....	103
Table 45: Ongoing Stakeholder involvement	107
Table 46: Community health and safety	108
Table 47: Waste Management	108
Table 48: Surface and Groundwater	109
Table 49: Biodiversity	109
Table 50: Air Pollution	110
Table 51: Alien Invasive Management Plan	111
Table 52: Plant Rescue Protection Plan.....	112
Table 53: Re-Vegetation and Habitat Rehabilitation Plan	113
Table 54: Open Space Management Plan	114
Table 55: Erosion Management Plan	116

List of Figures

Figure 1: Loeriesfontein 2 Regional Study Area.....	2
Figure 2: Loeriesfontein Site Locality Map	3
Figure 3: Mean Monthly Rainfall Graph for Loeriesfontein	4
Figure 4: Typical Components of a wind turbine.	6
Figure 5: Conceptual wind farm electricity generation process showing electrical connections	7
Figure 6: Preferred Site Layout	9

List of Appendices

Appendix A: Environmental Incidents
Appendix B: Management of Soils - Guidelines
Appendix C: Stormwater Management Plan

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 Mainstream to carry out parts of the work for the proposed development.

Decommissioning: Means to take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it can not be readily recommissioned.

Engineer (E)/ Project Manager (PM): Person/ organisation appointed by Mainstream to oversee the work of all consultants, sub-developers, contractors, residents and visitors.

Environmental Control Officer (ECO): Person/organisation appointed by Mainstream who will provide direction to the Project Manager concerning the activities within the Construction Zone, and who will be responsible for conducting the environmental audit of the project during the construction phase of the project according to the provisions of the Environmental Management Programme.

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 EMP 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.

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 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 in before disruption. Rehabilitation for the purposes of this specification is aimed at post-reinstatement re-vegetation of a disturbed area and the insurance of a stable land surface. Re-vegetation 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. The Site Manager will liaise with the Project Manager in order to ensure that the project is conducted in accordance with the Environmental Management Programme

Abbreviations:

C	Contractor
CPV	Concentrating Photovoltaic
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
ELO	Environmental Liaison Officer
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EP	Equator Principles
EPCM	Engineering Procurement and Contracts Management
ESS	Environmental Scoping Study
IFC	International Finance Corporation (World Bank Group)
I & APs	Interested and Affected Parties
MC	Main Contractor
OECD	Organisation for Economic Co-operation and Development
SM	Site Manager
PM	Project Manager
MSDS	Material Safety Data Sheets
MRP	Mainstream Renewable Power

**SOUTH AFRICA MAINSTREAM RENEWABLE POWER
LOERIESFONTEIN 2 (PTY) LTD**

**CONSTRUCTION OF A 140MW WIND FARM FACILITY ON
PORTION 1 AND 2 OF THE FARM AAN DE KARREE DOORN PAN
NO. 213 NEAR LOERIESFONTEIN**

**FINAL DRAFT ENVIRONMENTAL MANAGEMENT
PROGRAMME**

1 INTRODUCTION

South Africa Mainstream Renewable Power Loeriesfontein (Pty) Ltd (hereafter referred to as Mainstream) has appointed SiVEST to undertake the EIA process and Environmental Management Programme (EMPr) for the proposed construction of a 140 MW wind farm on Portion 1 and 2 of the Farm Aan De Karree Door Pan No. 213 near Loeriesfontein in the Northern Cape Province of South Africa. The objective of the project is to develop a wind farm in order to generate electricity to feed into the national grid. The project is also in line with the government's commitment to provide renewable energy as an alternative energy source to those currently utilized.

This EMPr has been compiled in line with the recommendations in the above-mentioned EIA, as well as from issues identified by SiVEST Environmental Division. More details will be provided by the contractors and engineers once the detailed design has been completed.

1.1 Site Locality and Description

1.1.1 Regional Locality

Loeriesfontein is a small town in the Northern Cape of South Africa. It falls within the Hantam Local Municipality, which is within the greater Namakwa District Municipality, Northern Cape province. The town of Loeriesfontein is within a basin surrounded by mountains, and it is accessed from the N7 highway (north out of Cape Town), turning off on the R27 at Van Rhynsdorp to Nieuwoudtville, then following the R357 to Loeriesfontein (a further 65km north).

The proposed site is located on Portion 1 and 2 of the Farm Aan De Karree Doorn Pan No. 213 approximately 49km north of Loeriesfontein. The site near Loeriesfontein falls within the boundaries of the Hantam Local Municipality.

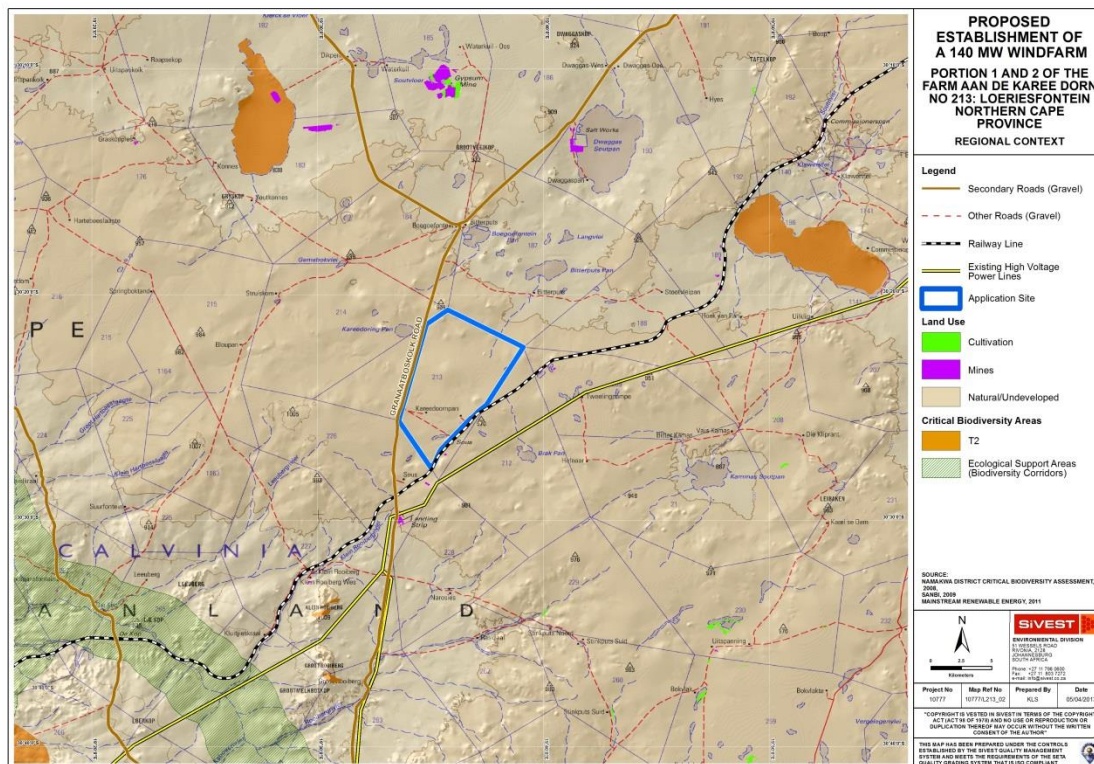


Figure 1: Loeriesfontein 2 Regional Study Area.

1.1.2 Study Site Description

The sites that are proposed for the wind farm near Loeriesfontein are located on the following farms (Figure 2):

- Portion 1 of the Farm No. 213, Calvinia Road, Northern Cape
- Portion 2 of the Farm No. 213, Calvinia Road, Northern Cape

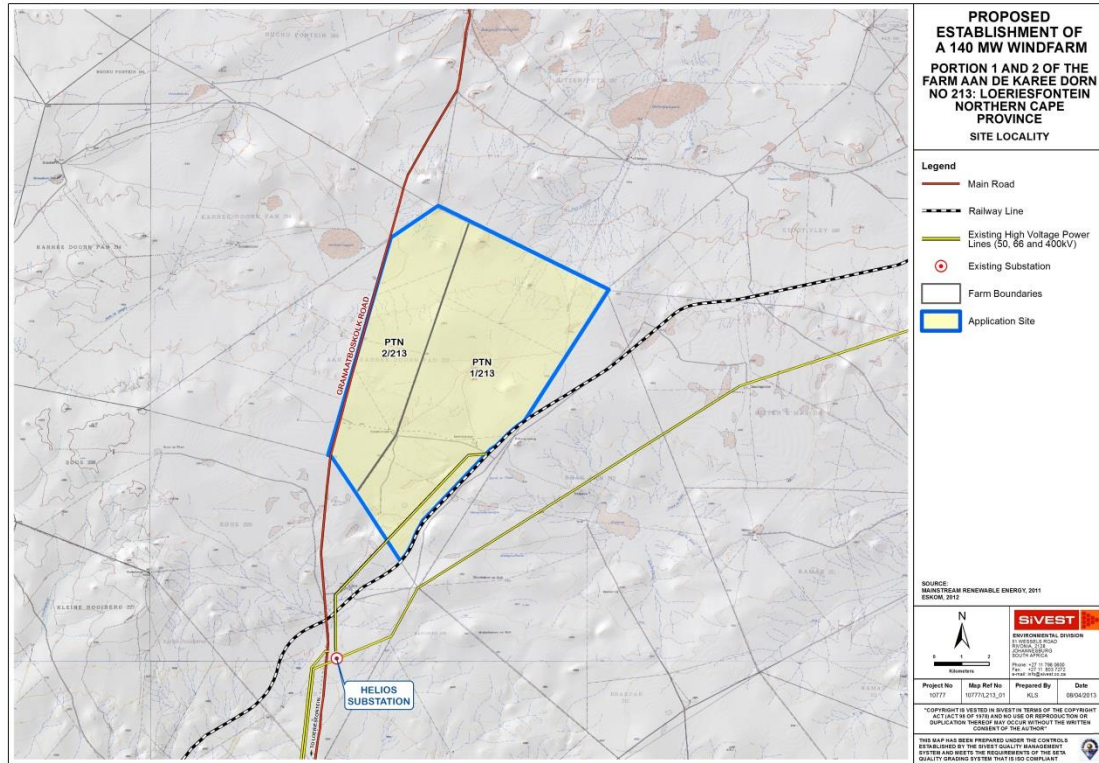


Figure 2: Loeriesfontein Site Locality Map

The study area is considered to be fairly natural karoo shrubland with low intensity sheep grazing on the site. The study area is classified as natural / vacant and is used as general grazing land for sheep and wildlife. As such the human footprint in most of the area is considered to be relatively low. Vast grazing land is interspersed with seasonal pans and non-perennial streams. The non-perennial streams are located to the southwest of the site.

The southern end of the study area contains an existing substation which will be the link between the proposed development and the national electricity grid. Stocking rate for the area is approximately at a low stocking rate of around 1 SSM (small stock unit) per 6 hectares.

The site is traversed by a railway line and a district road (Granaatboskolk Road).

It is characterised by flat and gently sloping topography. The flat topography makes this area ideal for the proposed development. The drainage systems situated in the southwest of the site are not anticipated to be impacted upon

1.1.3 Climate

The study area has an arid Mediterranean type climate with winter rainfall regime i.e. most of the rainfall is confined to early autumn and winter. Mean Annual Precipitation (MAP) is approximately 179 mm per year and without some form of supplementary irrigation natural rainfall is insufficient to produce sustainable harvests (Table 1 and Figure 3). This is reflected in the lack of dry land crop production within the study area. Average daily temperatures range from 30°C in summer to 17 °C in winter. Average night time temperatures drop to around 2.4 °C during winter (Table 2).

Table 1: Mean monthly rainfall for Loeriesfontein (Source: South Africa's Rain Atlas)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
Rainfall (mm)	8.7	11.3	17	20.8	23.3	21.1	18.3	14.3	11.1	9	7	7	14.1

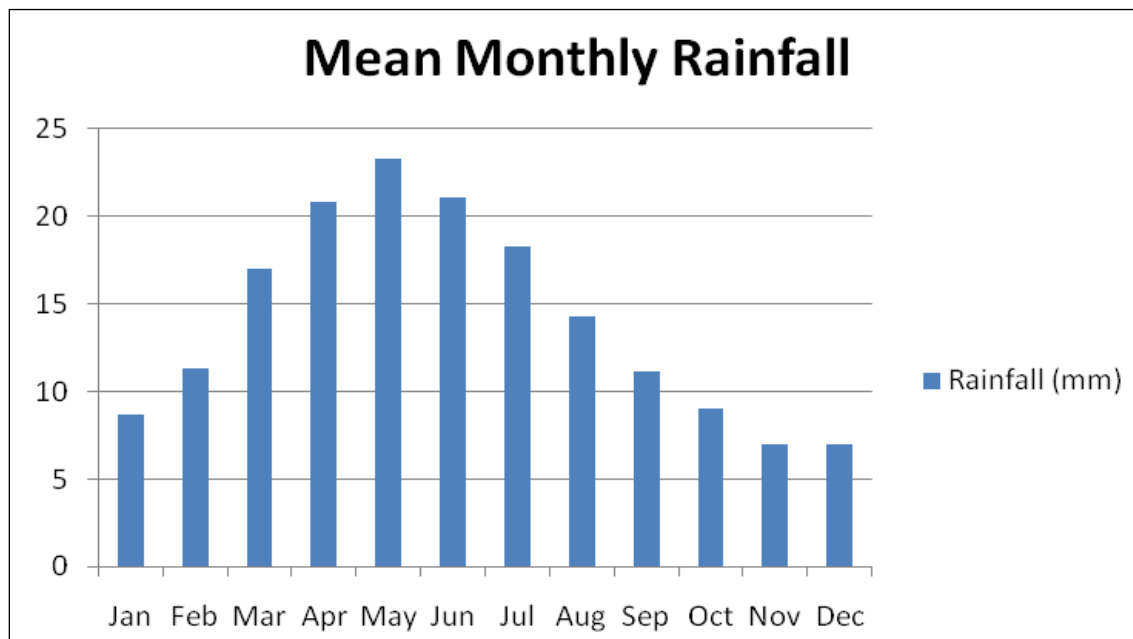


Figure 3: Mean Monthly Rainfall Graph for Loeriesfontein

Table 2: Mean monthly and annual temperature for Loeriesfontein (Source: <http://www.saexplorer.co.za>)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Avg
Midday Temp (°C)	21	32	29	25	21	17	17	19	22	25	28	30	24
Night Temp (°C)	31	14	13	9	6	4	2	3	5	8	10	12	8

1.2 Overview of the proposed project

At this stage, it is estimated that the wind farm proposed project will encompass the installation of a number of wind turbine generators their associated components in order to generate electricity that is to be fed into the existing Eskom distribution and / or transmission lines that cross or are located near the proposed sites. The total power generation capacity limit and the number of wind turbines to be accommodated will ultimately depend on the size of the developable area which will be determined by the EIA. The project (including the associated power line) is proposed on the following farm portions:

- Remainder of the Farm No. 226, Calvinia Road, Northern Cape (Remainder of the Farm Sous No. 226)
- Portion 1 of the Farm No. 213, Calvinia Road, Northern Cape (Portion 1 of the Farm Aan de Karree Doorn Pan No. 213)
- Portion 2 of the Farm No. 213, Calvinia Road, Northern Cape (Portion 2 of the Farm Aan de Karree Doorn Pan No. 213)

A total of up to 107 wind turbines may be required. The project will involve the construction of a 140MW Wind Energy Facility and its associated infrastructure on the above mentioned farms portions. The project will comprise of the following component:

- 140MW connecting a 66kV to 132kV power line to Eskom's 400kV Helios Substation.

The key components of the project follow in the sub-sections below.

1.2.1 Turbines

The size and ultimate number of the wind turbines will depend amongst others on the developable area wind resource and available technology when the wind farm is constructed, and the total generation capacity that can be produced as a result. The wind turbines will therefore have a hub height of between 80 to 120m and a rotor diameter of 87 to 120m (Figure 4). The blade rotation direction will depend on wind measurement information received later in the

process. The rotation will range from 6 to 20 rpm. The foundation of each wind turbine will be approximately 20m x 20m. The footprint for each wind turbine will therefore be approximately 400m². A hard standing area of approximately 2 400m² for crane usage will accompany each wind turbine. Hence, the total footprint for each wind turbine and the associated hard standing area will be 2 800m². The foundation will be up to 2.5m deep. As already mentioned, it is anticipated at this stage that 95 wind turbines will be constructed. The total area for all the wind turbines for the Loeriesfontein 2 study site will therefore be approximately 29.98 hectares (including the hard standing areas). The electrical generation capacity for each turbine will range from 1 – 3MW depending on the final wind turbine selected for the proposed development.

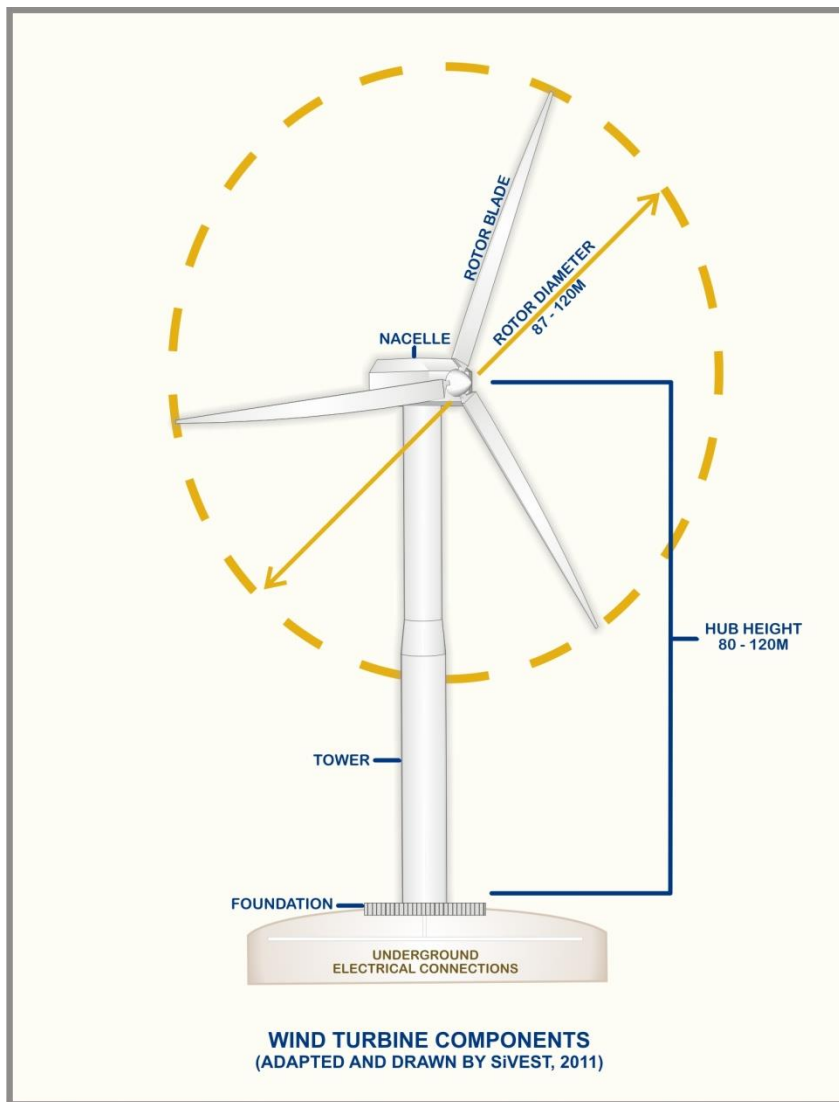


Figure 4: Typical Components of a wind turbine.

1.2.2 Electrical Connections

The wind turbines will be connected to each other and to the substation using buried (up to a 1m depth) medium voltage cables (Figure 5) except where a technical assessment of the proposed design suggests that overhead lines are appropriate such as over rivers and gullies. Where overhead power lines are to be constructed, monopole tower structures will be used. The dimensions of the monopole structures will depend on grid safety requirements and the grid operator. No servitudes will be associated with the wind farm infrastructure although servitudes for Eskom infrastructure may be required on site. A 66kV to 132kV power line will be connected from the wind farm substation to the Eskom 400kV Helios Substation.

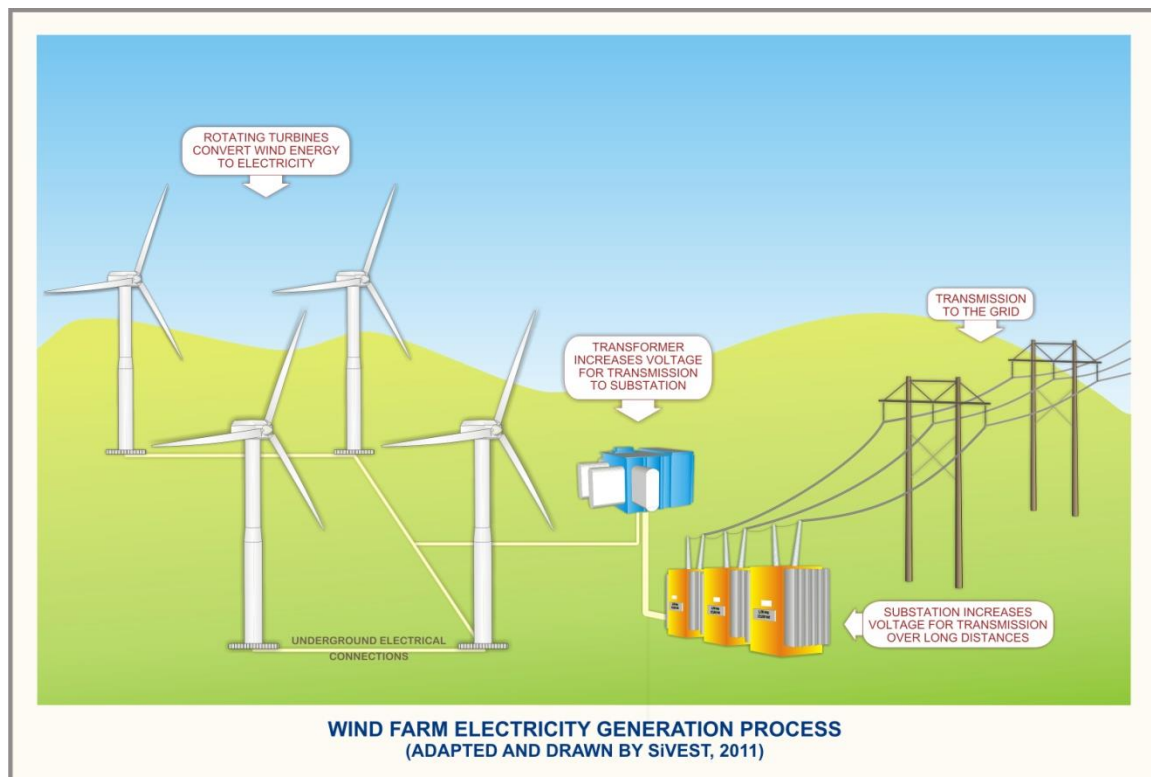


Figure 5: Conceptual wind farm electricity generation process showing electrical connections

1.2.3 Substations

A new substation (approx. 90 x 120m) and associated transformers will be developed which will supply the generated electricity to the Eskom grid. The transformers' operating voltage may range from 22 to 132kV. The footprint of the substation site will be approximately 10 800m². The Substation will be built preferably close to existing transmission line(s). The connection from the substation to the Eskom grid line will be an overhead line and pole. This will be dependent on the

location of the substation relative to the existing line(s). Eskom grid line and access servitudes will be required, the sizes of which depend on the voltage connection.

1.2.4 Roads

The access roads are proposed to be 6-10m wide. The roads will be gravel roads from the site on to the public road. An internal road network to the turbines and other infrastructure will include;

- Turning circles for large trucks.
- Passing points and culverts over gullies and rivers if required
- Existing roads will be upgraded.

1.2.5 Temporary construction area

A maximum 10 000m² temporary lay down area will be constructed for the proposed development. Components that will comprise the temporary lay down area include an access route and a contractor's site office area of up to 5 000m².

1.2.6 Other infrastructure

Other infrastructure includes the following:

- Administration and warehouse buildings: A single storey building with a maximum area of up to 5 000 m² with a warehouse/workshop space and access, office, telecoms space, security and ablution facilities are to be developed. The buildings will most likely be situated preferably close to the substation. Security will be required.
- Borrow pits (if required).
- Fencing (if required).
- Panel Maintenance - The panels will require cleaning and dust will accumulate on them affecting their productivity. Cleaning will take place once every quarter (providing job creation). Municipal water will be utilised for this exercise.

1.3 Site Layout

It was determined during the assessment that the proposed facility will result in limited potential negative impacts and certain positive impacts. **Alternative 1 of the wind farm infrastructure location and alternative 1 of the power line route were selected as the preferred option.** The preferred proposed layout is illustrated in Figure 6 below.

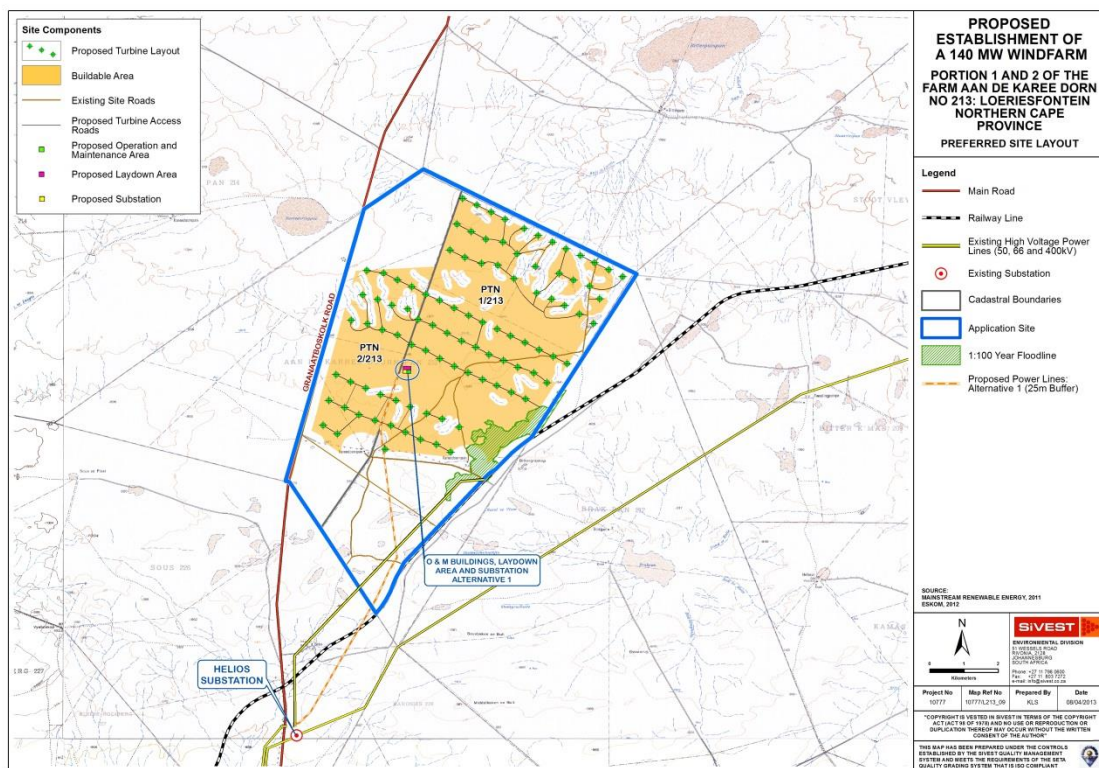


Figure 6: Preferred Site Layout

1.4 Project Responsibilities

Several professionals will form part of the construction team. The most important from an environmental perspective are the Project Manager (PM), the Environmental Control Officer (ECO) and the main contractor (MC).

The PM is responsible for the implementation of the EMPr on the site during the pre-construction and construction phases of the project.

The ECO is responsible for monitoring the implementation of the EMPr during the design, pre-construction and construction phases of the project.

The MC is responsible for abiding by the mitigation measures of the EMPr which are implemented by the Project Manager during the construction phase.

The MC is also responsible for the implementation of the EMPr during the operational and decommissioning phases of the project.

1.4.1 *Project Manager*

The PM is responsible for overall management of the project as well as the implementation of the EMPr. The following tasks will fall within his / her responsibilities:

- Be aware of the findings and conclusions of the Environmental Impact Assessment and the conditions stated within the environmental authorisation.
- Be familiar with the recommendations and mitigation measures of this EMPr, and implement these measures.
- Monitor site activities on a daily basis for compliance.
- Conduct internal audits of the construction site against the EMPr.
- Confine the construction site to the demarcated area.
- Rectify transgressions through the implementation of corrective action.

1.4.2 *Environmental Control Officer*

The ECO is responsible for the implementation of the EMPr during the construction phase and liaison between the Contractor and the Landowners. The ECO will liaise and report to the Contractor, landowners and authorities. The following tasks will fall within his / her responsibilities:

- Be aware of the findings and conclusions of the Environmental Impact Assessment and the conditions stated within the environmental authorisation.
- Be familiar with the recommendations and mitigation measures of this EMPr.
- Conduct monthly audits of the construction site according to the EMPr and EA.
- Educate the construction team about the management measures of the EMPr and EA.
- Regular liaison with the construction team and the project leader.
- Recommend corrective action for any environmental non-compliance incidents on the construction site.
- Compile a regular report highlighting any non-compliance issues. Good compliance with the EMPr will also be noted.
- All negotiations for any reason shall be between the ECO, the affected parties, and the Contractor. No verbal agreements shall be made. All agreements shall be recorded in writing and all parties shall co-sign the documentation.
- The affected parties shall always be kept informed about any changes to the construction programme should they be involved. If the ECO is not on site the Contractor should keep the affected parties informed. The contact numbers of the Contractor and the ECO shall be made available to the affected parties. This will ensure open channels of communication and prompt response to queries and claims.

1.4.3 Main Contractor

The MC is responsible for the implementation and compliance with recommendations and conditions set out in the EMPr.

- Ensure compliance with the EMPr at all times during construction.
- Maintain an environmental register which keeps a record of all incidents which occur on the site during construction. These incidents include:
 - Public involvement / complaints.
 - Health and safety incidents.
 - Hazardous materials stored on site.
 - Non-compliance incidents.

The Contractor shall under no circumstances interfere with the property of landowners or nearby communities.

1.4.4 The Environmental Liaison Officer

The Environmental Liaison Officer (ELO) will be appointed by the contractor to monitor activities on site on a daily basis. The ELO will be the ECO's representative on the site and will report back on all audit trips. The ELO must report any major incidents immediately to the ECO

Table 3: Responsible Parties and Auditing Process

TITLE	PARTY	ROLE DURING CONSTRUCTION	ROLE DURING OPERATION
Proponent	Mainstream Renewable Power	Assume ultimate responsibility	Assume ultimate responsibility
Project Management	Engineering Procurement and Contracts Management (EPCM) contractor	Project management	Project management

Main Contractor/s	There will be multiple contracts placed and managed by the EPCM contractor for the construction phase. These will cover civil earthworks and concrete, structural mechanical and electrical / instrumentation (CI). Then there could also be the construction camp management contract.	Main Contractor will undertake day to day construction activities covering aspects such as civil earthworks and concrete, structural mechanical and electrical / instrumentation (CI).	N/A
Environmental Liaison Officer	To be appointed by Main Contractors	Day to day environmental responsibility, point of contact for ECO	N/A
Environmental Control Officer	To be appointed by proponent	Monthly audits	Annual audits
Determining Authority	National Department of Environmental Affairs (DEA)	Conduct site visits when necessary.	Conduct site visits when necessary

The following are the environmental management responsibilities of the various parties during construction and operational phases. Unless otherwise stated the EMPr will be adhered to as follows:

- The ELO will be the responsible party for all compliance of this EMPr during the construction phase.
- The monitoring party will be the ECO.
- Method of record keeping will be monthly audits.
- Audit Technique will be the review of records that will be kept on site by the ELO and/ or site inspections.
- Mainstream will bear ultimate responsibility.

Table 4: Environmental Management Responsibilities

ITEM	PROJECT COMPONENT AND ACTIVITY	RESPONSIBLE PARTY	MONITORING PARTY	AUDIT TECHNIQUE
1.1	PRE-CONSTRUCTION (SITE ESTABLISHMENT)			
1.1.1	Site preparation	MAINSTREAM, MC,ELO,ECO	MAINSTREAM, ECO	SITE VISIT
1.1.2	Consultation	MC,	ELO,ECO	SITE VISIT

ITEM	PROJECT COMPONENT AND ACTIVITY	RESPONSIBLE PARTY	MONITORING PARTY	AUDIT TECHNIQUE
1.1.3	Cumulative impacts	MC,	ELO,ECO	SITE VISIT
1.1.4	Social and Environmental Management Systems	MC,	ELO,ECO	SITE VISIT
2.1	CONSTRUCTION ACTIVITIES			
2.1.1	Site Clearing	MC,	ELO,ECO	SITE VISIT
2.1.2	Construction traffic and access	MC, ELO	ECO	SITE VISIT
2.1.3	Construction Camp	MC,ELO,ECO	ECO	SITE VISIT
2.1.4	Environmental Education and Training	MC, MAINSTREAM	MAINSTREAM	SITE VISIT
2.1.5	Soils and Geology	MC, ELO	ECO	SITE VISIT
2.1.6	Erosion Control	ELO	ECO	SITE VISIT
2.1.7	Water Use and Quality	ELO	ECO	SITE VISIT
2.1.8	Surface and Groundwater	ELO	ECO	RECORDS REVIEW
2.1.9	Waste Management	ELO	ECO	SITE VISIT
2.1.10	Flora	ELO	ECO, Ecologist (When necessary)	SITE VISIT
2.1.11	Fauna	ELO	ECO, Ecologist (When necessary)	RECORDS REVIEW, SITE VISIT
2.1.12	Air Quality	ELO	ECO	RECORDS REVIEW
2.1.13	Noise and Vibrations	ELO	ECO	RECORDS REVIEW
2.1.14	Energy use	ELO	ECO	RECORDS REVIEW
2.1.15	Climate Change	ELO	ECO	RECORDS REVIEW
2.1.16	Agricultural Potential	ELO	ECO	RECORDS REVIEW

ITEM	PROJECT COMPONENT AND ACTIVITY	RESPONSIBLE PARTY	MONITORING PARTY	AUDIT TECHNIQUE
2.1.17	Employment	MAINSTREAM, MC	ECO	RECORDS REVIEW
2.1.18	Occupational Health and Safety	MC, ELO	Safety Officer	SITE VISIT
2.1.19	Health and Safety	MC, ELO	Safety Officer	SITE VISIT
2.1.20	Security	MC, ELO	ECO	SITE VISIT
2.1.21	Social Environment	MAINSTREAM, MC, ELO	ECO	RECORDS REVIEW, SITE VISIT
2.1.22	Community Engagement	ELO	ECO	SITE VISIT
2.1.23	Visual Impact	ELO, LA	ECO	SITE VISIT
4.1	OPERATION ACTIVITIES			
4.1.1	Construction Site Decommissioning	LA, MAINSTREAM,	ECO	RECORDS REVIEW
4.1.2	Operation and Maintenance	MAINSTREAM,	ECO	RECORDS REVIEW
4.1.3	Surface and Groundwater	LA, MC	ECO	RECORDS REVIEW
4.1.6	Pollution Control	MAINSTREAM, MC	ECO	
4.1.7	Biodiversity	ELO		
4.1.8	Waste Management	ELO		
4.1.9	Health and Safety	ELO, MAINSTREAM		
4.1.10	Visual Impact	ELO		
5.1	DECOMMISSIONING ACTIVITIES OF PROPOSED DEVELOPMENT			
5.1.1	Ongoing Stakeholder involvement	MAINSTREAM, ELO	MAINSTREAM,	SITE VISIT
5.1.2	Community health and safety	MAINSTREAM, ELO	MAINSTREAM,	

ITEM	PROJECT COMPONENT AND ACTIVITY	RESPONSIBLE PARTY	MONITORING PARTY	AUDIT TECHNIQUE
5.1.3	Waste management	MAINSTREAM, ELO	MAINSTREAM,	
5.1.4	Surface and groundwater	MAINSTREAM, ELO	MAINSTREAM,	
5.1.5	Biodiversity	MAINSTREAM, ELO	MAINSTREAM,	
5.1.6	Air quality	MAINSTREAM, ELO	MAINSTREAM,	

1.4.5 Environmental Audits

Table 5 below provides an outline of the generic process involved in the auditing process. It briefly describes the activities of the process initially beginning with defining the objectives and scope of the auditing process as well as the responsibilities of the various parties. The procedure for the auditing process is explained through to the production of audit findings and the compliance (or non-compliance) of the audit findings.

Table 5: Example of Procedure for Conducting Audits

Objective	To ensure that formal audits of the EMPr are scheduled and performed so as to verify compliance with the requirements of the EMPr.
Scope	This procedure describes the sequence of events required to perform a compliance audit and the verification of implemented corrective action.
Responsibilities	<p>The ECO or a person authorised and appointed by him, is responsible for the maintenance of the Environmental Audit System</p> <p>The ECO is responsible for the scheduling and execution of the audit, as well as the verification of the implementation of corrective action. At his/her discretion, this authority may be delegated to responsible company personnel or to an independent Environmental Auditing Authority to perform the audit on his/her behalf.</p> <p>Auditors shall have no direct responsibility in the area/ system being audited.</p> <p>They will be trained in techniques for auditing</p>

	<p>environmental systems.</p> <p>The head of department (HOD)/ supervisor for an area/system to be audited (or a responsible person nominated by him/ her) will assist the audit team in the execution of the audit. The HOD will also be responsible for timely corrective actions based on the findings of the audit.</p>
Planning the audit	<p>The ECO or his authorised delegate, shall plan the audit of a particular environmental area or system as follows:</p> <ul style="list-style-type: none"> ▪ He shall inform, in writing, the division to be audited of the intention to conduct an audit at least two weeks prior to the audit. This notification should include the audit objective, scope and duration and any assistance required from the division. ▪ On completion of the audit, an audit findings sheet shall be prepared and submitted to company senior management as well as to the Department/ section, which was audited. ▪ Corrective actions shall be implemented, within eight weeks after the audit, where possible.
Audit External Schedule	The external environmental audits will be scheduled annually.
Audit Check List	<p>Auditing will be performed by collecting evidence for verification through interviews, relevant documentation and observation of activities and conditions. Instances of non-conformity to EMPr criteria should be recorded. An environmental audit checklist can be used as a guide to address all relevant issues.</p>
Audit Compliance	See below.
Audit Findings and Reporting of non-compliances	<p>The audit team shall review all evidence of their audit findings to decide on non-compliance. Audit findings of non-compliance must be documented and supported by evidence in the</p>

	<p>Audit Findings Report.</p> <p>The non-compliance findings will be communicated to the Operations Manager and his representatives during an audit feedback meeting.</p> <p>The person responsible for corrective action, will sign the audit findings report sheet to indicate acceptance and commitment to the required corrective action</p>
--	--

The Independent auditor will:

- Conduct audits
- Submit audit reports to ECO and relevant authority
- Engage specialist sub consultants when required.

1.5 Layout of Environmental Management Programme

1.5.1 Introduction

This EMPr addresses both generic issues as well as specific issues. The generic and issues specific EMPr's are each separated into different phases. Each phase has specific issues unique to that period of the development and operation of the wind farm as well as associated infrastructure. The impact is identified and given a brief description. The phases of the development are then identified as below:

- Pre-construction (Site Establishment)
- Construction (including associated rehabilitation of affected environment)
- Operation Phase
- Decommissioning

This EMPr seeks to manage and keep to a minimum the negative impacts of a development and at the same time, enhance the positive and beneficial impacts.

The EMPr specifies mitigation measures for the following environmental aspects:

1.5.2 *Pre-construction (Site establishment)*

- Site preparation
- Consultation
- Site clearing
- Social and Environmental Management Systems

1.5.3 *Construction*

- Construction Camp
- Construction Traffic and Access
- Environmental Education and Training
- Soils and Geology
- Erosion Control
- Water Use and Quality
- Surface and Groundwater
- Waste Management
- Flora
- Fauna
- Air Quality
- Noise and Vibrations
- Energy Use
- Climate Change
- Agricultural Potential
- Employment
- Occupational Health and Safety
- Security
- Social Environment
- Community Engagement
- Visual Impact
- Cultural and Heritage Artefacts
- Bats
- Avi-fauna
- Operation and Maintenance

1.5.4 *Operation*

- Construction Site Decommissioning
- Operation and Maintenance
- Surface and Groundwater
- Biodiversity
- Waste Management
- Health and Safety
- Visual Impact
- Bats
- Avi-fauna
- Social
- Noise

1.5.5 *Decommissioning Phase*

- Ongoing Stakeholder involvement
- Community health and safety
- Waste Management
- Surface and Groundwater
- Biodiversity
- Air Pollution

1.6 **Objectives of an EMP**

The objectives of this EMP are to:

- Identify a range of mitigation measures which could reduce and mitigate the potential impacts to minimal or insignificant levels
- To identify measures that could optimize beneficial impacts
- To create management structures that address the concerns and complaints of I&APs with regards to the development
- To establish a method of monitoring and auditing environmental management practices during all phases of development
- Ensure that the construction and operational phases of the project continues within the principles of Integrated Environmental Management and Environmental Management System (EMS) ISO 14001 Principles
- Detail specific actions deemed necessary to assist in mitigating the environmental impact of the project.

- Ensure that the safety recommendations are complied with.
- Propose mechanisms for monitoring compliance with the EMPR and reporting thereon.
- Specify time periods within which the measures contemplated in the Environmental Management Programme are implemented, where appropriate.

The EMPr Seeks to highlight the following:

- Avoiding impacts by not performing certain actions
- Minimising impacts by limiting aspects of an action
- Rectifying impacts through rehabilitation, restoration, etc of the affected environment
- Compensating for impacts by providing substitute resources or environments
- Minimising impacts by optimising processes, structural elements and other design features
- Provide ongoing monitoring and management of environmental impacts of a development and documenting of any digressions /good performances
- The EMPr is a legally binding document that all parties involved in the project must be made aware of.

1.6.1 Environmental monitoring

A monitoring programme will be implemented for the duration of the lifecycle of proposed development. This programme will include:

- Monthly audits according to the EMPr conditions will be conducted by the Environmental Control Officer. These audits can be conducted randomly and do not require prior arrangement with the project manager.
- Compilation of an audit report with a rating of the compliance with the EMPr. This report will be submitted to the relevant authorities.
- An annual audit will also be undertaken by an external specialist.

The ECO shall keep a photographic record of any damage to areas outside the demarcated site area. The date, time of damage, type of damage and reason for the damage shall be recorded in full to ensure the responsible party is held liable. All claims for compensation emanating from damage should be directed to the ECO for appraisal. A register shall be kept of all complaints from the landowner or community (Appendix A). All complaints / claims shall be handled immediately to ensure timeous rectification / payment by the responsible party.

A copy of the EMPr must be kept on site during the life of the wind farm. The EMPR will be made binding on all contractors operating on the site and must be included within the Contractual Clauses. Those responsible for environmental damage must pay the repair costs both to the

environment and human health and the preventative measures to reduce or prevent further pollution and/or environmental damage (the polluter pays principle).

1.7 Compliance with the EMPr

The Contractor/s is/are deemed not to have complied with the EMPr if:

- Within the boundaries of the site, site extensions and access roads there is evidence of contravention of clauses;
- If environmental damage ensues due to negligence;
- The contractor fails to comply with corrective or other instructions issued by the ECO or Authorities within a specified time,
- The Contractor fails to respond adequately to complaints from the public.

Mainstream is deemed not to have complied with the EMPr if:

- Within the boundaries of the site there is evidence of contravention of clauses;
- If environmental damage ensues due to negligence;
- They fail to respond adequately to complaints from the public.

1.7.1 Penalties for non-compliance

Application of a penalty clause to the contractor will apply for incidents of non-compliance. The penalty imposed will be per incident and will be deducted from the contractor's monthly payment certificate. Unless stated otherwise in the project specification, the penalties imposed per incident or violation will be pre-determined and agreed upon between the Contractor and the ECO. These will vary in amount based upon the severity and/or regularity of the incidence occurring.

The ECO in consultation and with the approval of the Senior Site Supervisor shall issue spot fines if the Contractor infringes specifications of the EMPr and EA. The Contractor shall be advised in writing of the nature of the infringement and the amount of the spot fine. The Contractor shall be liable for the fine and it is his responsibility to recover the fine from the relevant employee. The Contractor (through the Environmental Officer) shall also take the necessary steps (e.g. training) to prevent a recurrence of the infringement. The Contractor is also advised that the imposition of spot fines does not replace any legal proceedings from the authorities, landowners and/or members of the public that may institute against the Contractor. Spot fines for minor offences shall be between R500.00 and R5 000.00, depending upon the severity of the infringement. The decision on how much to impose will be made by the ECO and will be final. In addition to the spot fine, the Contractor shall be required to make good any damage caused as a result of the

infringement at his own expense. A preliminary list of infringements for which spot fines will be imposed is as follows:

- Using areas outside the working areas without permission/accessing “no-go areas”;
- Clearing and/or levelling area outside of the working areas;
- Littering of the site and surrounds;
- Burying waste on site and surrounds;
- The undertaking of informal ablutions
- Making fires on site;
- Spillage onto the ground or water bodies of oil, diesel, or any other potential pollutants;
- Picking/damaging plant material, especially that from the residual areas of natural bush on the site;
- Damaging/killing wild or domestic animals/birds;
- Discharging effluent and/or stormwater onto the ground or into surface water;
- Repeated contravention of the specification or failure to comply with instruction

In this context the ECO shall retain records of all fines issued. Monies for the spot fines will be deducted from the Contractors monthly certificate. It is recommended that these monies be collected and donated to a suitable charity or cause.

The Senior Site Supervisor, on recommendation from the ECO, may also order the Contractor to suspend part or all the works if the Contractor repeatedly causes damage to the environment by not adhering to the EMPr (i.e. more than 3 cases of infringements). The suspension will be enforced until such time as the offending actions, procedure or equipment is corrected. No extension of time will be granted for such delays and all costs will be borne by the Contractor.

1.7.2 Training and awareness

- Training of construction workers

The Construction Workers must receive basic training in environmental awareness, including the storage and handling of hazardous substances, minimisation of disturbance to sensitive areas, management of waste, and prevention of water pollution. They must be informed of how to recognise historical / archaeological artefacts that may be uncovered. They must also be appraised of the EMPr's requirements.

- Contractor performance

The Contractor must ensure that the conditions of the Environmental Management Programme are adhered to. Should the Contractor require clarity on any aspect of the EMPr the Contractor must contact the Environmental Control Officer for advice.

1.8 Applicable Legislation, Development Strategies and Guidelines

The following legislation applies:

- Constitution of South Africa (Act No. 108 of 1996)
- National Environmental Management Act (Act No 107 of 1998) – NEMA
- Environment Conservation Act (Act No 73 of 1989)
- National Heritage Resources Act (Act No 25 of 1999)
- National Water Act (Act No 36 of 1998)
- Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009)
- National Environmental Management: Biodiversity (Act No. 10 of 2004)
- National Forests Act, 1998 (Act No. 84 of 1998)
- Conservation of Agricultural Resources Act No. 43 of 1983)
- Subdivision of Agricultural Land (Act No. 70 of 1970, as amended)
- National Road Traffic (Act No. 93 of 1996, as amended)
- Astronomy Geographic Advantage (Act No. 21 of 2007)
- Occupational Health and Safety Act No. 85 of 1993
- National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)
- National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
- Development Facilitation Act No. 67 of 1995
- Northern Cape Planning and Development Act, 1998 (Act No. 7 of 1998)

Several regulations will be applicable to the construction phase of the project. These guidelines are mentioned in the EMPr tables. Also of significance in this EMPr are:

- World Bank IFC, EHS Guidelines and
- Equator Principles

1.8.1 *The Equator Principles*

The Equator Principles (EPs) were developed by the financial services sector for the purpose of creating a level playing field in the application of environmental and social risk management in project financing¹ and advisory services.

The EPs aim to provide a common baseline and framework against which a financial institution can develop and implement its own internal social and environmental risk management system.

¹ Currently the Equator Principles are only applied to project financing as defined under Basel II

Under Principle 3, the Equator Principles establish the International Finance Corporations (IFC) Performance Standards (April 30, 2006) and associated General and Sector Specific EHS Guidelines as the applicable social and environmental standards that a project should comply with if the project is located in a non-OECD country or OECD country that is not designated as high income.

The social and environmental assessment that is undertaken for a project establishes whether or not the project is in compliance with the IFC Performance Standards².

According to these principles, the performance standards relevant to the proposed development are summarised in Table 6.

Table 6: IFC Performance Standards

Performance Standard	Intent and objective
Social & Environmental Assessment Management Systems (1)	<ul style="list-style-type: none"> ▪ Adverse and beneficial impacts should be identified within the projects Area of Influence. Emphasis on integrated assessment of social and environmental impacts. ▪ Compliance with national legislation and IFC PS and EHS guidelines as appropriate. ▪ Emphasis on avoidance of impacts wherever practical and where this is not feasible, minimizes, mitigate and compensate. ▪ To ensure effective and ongoing stakeholder engagement ▪ To assess specifically the capacity and commitment of clients to manage risks and opportunities over the course of the transaction.
Labour working conditions (2)	<ul style="list-style-type: none"> ▪ Looks at the working conditions by following these principles; ▪ To establish and maintain the worker-management relationship (including specifically a human resources policy). ▪ To promote fair treatment, non-discrimination and equal opportunity of employees (and some contractors) and meet national employment laws. ▪ To protect the workforce by addressing child labour and forced labour.

² **NB** A project does not seek compliance with the Equator Principles per se but the standards that the EP refers to. A financial institution that has adopted the EP must ensure that any projects it is financing meet the standards referred to and that it adopts an appropriate risk management system to ensure this.

	<ul style="list-style-type: none"> ▪ To promote healthy and safe working conditions.
Pollution, Prevention and Abatement (3)	<ul style="list-style-type: none"> ▪ To avoid and minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities. ▪ To promote the reduction of emissions that contributes to climate change.
Community Health, Safety and security (4)	<ul style="list-style-type: none"> ▪ To avoid or minimize risks to and impacts on the health and safety of the local community during the project life cycle from both routine and non-routine circumstances. ▪ To ensure that the use of security personnel is carried out in a legitimate manner that avoids or minimizes risks to the community's safety and security.
Land Acquisition & Involuntary Settlement (5)	<ul style="list-style-type: none"> ▪ To avoid or at least minimize involuntary resettlement wherever feasible by exploring alternative project designs. ▪ To mitigate adverse social and economic impacts from land acquisition or restrictions on affected persons' use of land by; (i) providing compensation for loss of assets at replacement cost, and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected. ▪ To improve or at least restore the livelihoods and standards of living of displaced persons. ▪ To improve living conditions among displaced persons through provision of adequate housing with security of tenure at resettlement sites.
Biodiversity Conservation & Sustainable Natural Resources Management (6)	<ul style="list-style-type: none"> ▪ To promote and conserve biodiversity. ▪ To avoid the introduction of alien invasive species. ▪ To promote sustainable management and use of natural resources (NRM).
Indigenous people (7)	<ul style="list-style-type: none"> ▪ To foster full respect for the dignity, human rights, aspirations, cultures and natural resource-based livelihoods of Indigenous Peoples (IP). ▪ To avoid impacts or where avoidance is not feasible, minimize, mitigate and compensate in a culturally appropriate fashion and within the framework of successful good faith negotiation (a

	<p>form of stakeholder engagement requiring approval of both parties).</p> <ul style="list-style-type: none"> ▪ To establish and maintain effective relationships with IPs over the course of the project.
Cultural Heritage (8)	<ul style="list-style-type: none"> ▪ To protect cultural heritage from adverse impacts of project activities and support its preservation. ▪ To promote the equitable sharing of benefits from the use of cultural heritage in business activities.

(Source; IFC Guidelines, 2006)

2 MITIGATION GUIDELINES

2.1 Introduction

Mitigation guidelines are addressed through four phases namely Pre-construction (Site Establishment) Phase; Construction Phase (and associated rehabilitation of affected environment); Operational Phase (Post-Construction) as well as Decommissioning Phase. Each phase has specific issues unique to that period of the development and operation of the wind farm and the associated infrastructure. The impact is identified and given a brief description. The four phases of the development are then identified as below:

2.2 Pre-construction (Site Establishment)

Requirements for the pre-construction phase

- Proper and continuous liaison between the ECO, the Contractor and Landowners to ensure all parties are appropriately informed at all times.
- The Contractor must adhere to all conditions of the contract including the Environmental Management Programme.
- Adequate planning of the construction programme to allow for disruptions due to rain and very wet conditions.
- Where existing private roads are in a bad state of repair, such roads' condition shall be documented before they are used for construction purposes. This will allow for easy assessment of any damage to the roads which may result from the construction process. If necessary some repairs should be done to prevent damage to equipment. All roads no matter what the condition need to be documented prior to construction.
- Proper documentation and record keeping of all complaints and actions taken.
- Appointment of an Environmental Control Officer to implement this EMP.
- Regular site inspections by the ECO and good control over the construction process throughout the construction period.
- Independent Environmental Audits to be carried out during and upon completion of construction.
- A formal communications protocol should be set up during the construction phase. The aim of the protocol should be to ensure that effective communication on key issues that may arise during this phase be maintained between key parties such as the ECO, project manager and contractor. The protocol should also ensure that concerns / issues raised by I&APs are formally recorded and considered and where necessary acted upon. If necessary, a forum for communicating with key stakeholders on a regular basis may

need to be set up. This could be done through an Environmental Monitoring Committee that would meet on a regular basis. The communications protocol should be maintained throughout the construction phase.

2.3 Pre-Construction Phase

2.3.1 Site preparation

Table 7: Site preparation

IMPACT	SITE PREPARATION This section deals with the preparation of the site and actions that need to be implemented before construction commences	RESPONSIBILITY
PHASE	SITE ESTABLISHMENT	MC, ELO, ECO
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION METHOD STATEMENT	<p data-bbox="464 805 1083 833">Appoint construction team and suitable manager</p> <p data-bbox="464 883 1495 951">1. Appoint an Environmental Control Officer and Environmental Liaison Officer. The ELO is from the contractor's side while the ECO is from the client's side.</p> <p data-bbox="464 1002 888 1029">Site demarcation and compliance</p> <p data-bbox="464 1079 1495 1148">2. Before construction begins, all areas to be developed must be clearly demarcated with fencing or orange construction barrier where applicable.</p> <p data-bbox="464 1159 1495 1344">3. All Construction Camps are to be fenced off in such a manner that unlawful entry is prevented and access is controlled. Signage shall be erected at all access points in compliance with all applicable occupational health and safety requirements. All access points to the Construction Camp should be controlled by a guard or otherwise monitored, to prevent unlawful access.</p>	

	<p>4. The contractor and ECO must ensure compliance with conditions described in the EA.</p> <p>5. Records of compliance/ non-compliance with the conditions of the authorisation must be kept and be available on request.</p> <p>6. Records of all environmental incidents must be maintained and a copy of these records be made available to provincial department on request throughout the project execution.</p> <p>7. No protected plant species were identified on site during the biodiversity investigations for this project. However should any protected plant species be identified on site during the pre - construction phase, a license for their destruction should be applied for from a competent authority</p> <p>Construction Camp</p> <p>8. Site establishment shall take place in an orderly manner and all required amenities shall be installed at camp sites before the main workforce move onto site.</p> <p>9. All construction equipment must be stored within this construction camp.</p> <p>10. All associated oil changes etc (no servicing) must take place within this camp over a sealed surface such as a concrete slab.</p> <p>11. An area for the storage of hazardous materials must be established that conforms to the relevant safety requirements and that provides for spillage prevention and containment</p> <p>12. All Construction Camps shall be provided with portable fire extinguishing equipment, in accordance with all relevant legislation and must be readily accessible.</p> <p>13. The Contractor must provide sufficient ablution facilities, in the form of portable / VIP toilets, at the Construction Camps, and shall conform to all relevant health and safety standards and codes. No pit latrines, French drain systems or soak away</p>	
--	--	--

	<p>systems shall be allowed and toilets may not be situated within 100 meters of any surface water body or 1:100 year flood line. A sufficient number of toilets shall be provided to accommodate the number of personnel working in the area.</p> <p>14. The Contractor shall inform all site staff to make use of supplied ablution facilities and under no circumstances shall indiscriminate sanitary activities be allowed.</p> <p>15. No fires will be allowed and the Contractor must make alternative arrangements for heating. LP Gas may be used, provided that all required safety measures are in place. The Contractor shall take specific measures to prevent the spread of veld fires, caused by activities at the campsites. These measures may include appropriate instruction of employees about fire risks and the construction of firebreaks around the site perimeter.</p> <p>Labour</p> <p>1. All unskilled labourers for pre-site construction should be drawn from the local market and where possible use should be made of local semiskilled and skilled personnel.</p> <p>Training of site staff</p> <p>16. 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.</p> <p>17. Project manager shall ensure that the training and capabilities of the Contractor's site staff are adequate to carry out the designated tasks.</p> <p>18. Staff operating equipment (such as loaders, etc.) shall be adequately trained and sensitised to any potential hazards associated with their tasks.</p> <p>19. No operator shall be permitted to operate critical items of mechanical equipment without having been trained by the Contractor and certified competent by the</p>	
--	---	--

	<p>Project Manager.</p> <p>20. 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.</p> <p>21. Staff must be trained in the hazards and required precautionary measures for dealing with these substances</p> <p>22. Spillage packs must be available at construction areas.</p>	
--	---	--

2.3.2 Consultation

Table 8: Consultation

IMPACT	CONSULTATION This section deals with the public consultation of the site and actions that need to be implemented before construction commences	RESPONSIBILITY
PHASE	PRE-CONSTRUCTION	MC
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION METHOD STATEMENT	<p>Consultation</p> <ol style="list-style-type: none"> 1. Provide a mechanism through which information could be exchanged between the project proponent and stakeholders. 2. Identify relevant stakeholders and engage them at applicable stages of the EIA process. 3. Inform the public about the proposed construction process. 4. Surrounding communities must be kept informed, through the identified and agreed consultation channels, of the commencement of construction. 5. Solicit views and concerns from the public and allow them to suggest mitigations and enhancement measures 	

	6. Determine stakeholder satisfaction levels.	
--	---	--

2.3.3 Site Clearing

Table 9: Site Clearing

IMPACT	SITE CLEARING This section deals with site clearing and actions that need to be implemented before construction commences	RESPONSIBILITY
PHASE	PRE-CONSTRUCTION	MC
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	Site clearing <ol style="list-style-type: none"> 1. Site clearing must take place in a phased manner, as and when required. 2. Areas which are not to be constructed on within two months must not be cleared to reduce erosion risks. 3. The area to be cleared must be clearly demarcated and this footprint strictly maintained. 4. Spoil that is removed from the site must be removed to an approved spoil site or a licensed landfill site. 5. The necessary silt fences and erosion control measures must be implemented in areas where these risks are more prevalent. 	

2.3.4 Social and Environmental Management Systems

Table 10: Social and Environmental Management Systems

IMPACT	SOCIAL AND ENVIRONMENTAL MANAGEMENT SYSTEMS This section deals with the Social and Environmental Management Systems and actions that need to be implemented before construction commences	RESPONSIBILITY
PHASE	SITE ESTABLISHMENT	MC
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	Social <ol style="list-style-type: none"> 1. Performance Standard One underscores the importance of managing social and environmental performance throughout the life of a project. 2. An effective social and environmental management system is a dynamic, continuous process initiated by management and involving communication between the client, its workers and the local communities directly affected by the project. 3. The client will establish and maintain a Social and Environmental Management System, appropriate to the nature and scale of the project and commensurate to the level of social and environmental risks and impacts. The management system will incorporate the following elements: <ul style="list-style-type: none"> o Social and Environmental Assessment o Management program o Organizational capacity o Training o Community Engagement o Monitoring and Reporting 	

2.4 Construction Phase

2.4.1 Construction Camp

Table 11: Construction Camp

IMPACT	CONSTRUCTION CAMP This section deals with construction camp (equipment and batching camp) and actions that need to be implemented during construction	RESPONSIBILITY
PHASE	CONSTRUCTION	MC / ELO / ECO
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	<p>Site of construction camp</p> <ol style="list-style-type: none"> 1. The size of the construction camp must be minimized. 2. Adequate parking must be provided for site staff and visitors. The Contractor must attend to drainage of the camp site to avoid standing water and / or sheet erosion. 3. Suitable control measures over the Contractor's yard, plant and material storage to mitigate any visual impact of the construction activity must be implemented. <p>Storage of materials (including hazardous materials)</p> <ol style="list-style-type: none"> 4. 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. 5. Storage areas must be designated, demarcated and fenced if necessary. 	

	<ol style="list-style-type: none"> 6. Storage areas should be secure so as to minimize the risk of crime. They should also be safe from access by unauthorised persons i.e. children / animals etc. 7. Fire prevention facilities must be present at all storage facilities. 8. 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 must include a bund wall high enough to contain at least 110% of any stored volume, and this must be sited away from drainage lines in a site with the approval of the Project Manager. The bund wall must be high enough to contain 110% of the total volume of the stored hazardous material with an additional allocation for potential stormwater events. 9. All fuel storage areas must be roofed to avoid creation of dirty stormwater 10. These storage facilities (including any tanks) must be on an impermeable surface that is protected from the ingress of storm water from surrounding areas and that will not infiltrate into the ground in order to ensure that accidental spillage does not pollute local soil or water resources. 11. Material Safety Data Sheets (MSDSs) shall be readily available on site for all chemicals to be used on site. Where possible the available, MSDS's must additionally include information on ecological impacts and measures to minimise negative environmental impacts during accidental releases or escapes. 12. Storage areas containing chemical substances / materials must be clearly sign posted. 13. Staff dealing with these materials / substances must be aware of their potential impacts and follow the appropriate safety measures. 	
--	---	--

	<p>14. An approved waste disposal contractor must be employed to remove and recycle waste oil, if practical. 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.</p> <p>15. All excess cement and concrete mixes are to be contained on the construction site prior to disposal off site.</p> <p>16. All major spills as specified in the contractor emergency response procedure of any materials, chemicals, fuels or other potentially hazardous or pollutant substances must be cleaned immediately and the cause of the spill investigated. Preventative measures must be identified and submitted to the MC and ECO for information. Emergency response procedures to be followed and implemented.</p> <p>Drainage of construction camp</p> <p>17. Surface drainage measures must be established in the Construction Camps so as to prevent</p> <ul style="list-style-type: none"> ▪ Ponding of water; ▪ Erosion as a result of accelerated runoff; and, ▪ Uncontrolled discharge of polluted runoff. 	
--	--	--

2.4.2 Construction traffic and access

Table 12: Construction Traffic and Access

IMPACT	CONSTRUCTION TRAFFIC AND ACCESS This section deals with construction traffic and access and actions that need to be implemented during construction	RESPONSIBILITY
PHASE	CONSTRUCTION	MC / ELO
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	Construction traffic <ol style="list-style-type: none"> 1. Construction routes and required access roads must be clearly defined. 2. Recommendations of the stormwater management plan must be implemented. 3. Delivery of equipment must be undertaken with the minimum amount of trips to reduce the carbon footprint of these activities 4. Access of all construction and material delivery vehicles should be strictly controlled, especially during wet weather to avoid compaction and damage to the topsoil structure. 5. Damping down of the un-surfaced roads must be implemented to reduce dust and nuisance. 6. Vehicles and equipment shall be serviced regularly to avoid the contamination of soil from oil and hydraulic fluid leaks etc. 7. Servicing must be done in dedicated service areas on site or else off site if no such area exists. 8. Oil changes must take place on a concrete platform and over a drip tray to avoid pollution. 9. Soils compacted by construction shall be deep ripped to loosen compacted layers and re-graded to even running levels. 	

	<p>Access</p> <p>10. The main routes on the site must be clearly sign posted and printed delivery maps must be issued to all suppliers and Sub-contractors.</p> <p>11. Planning of access routes to the site for construction purposes shall be done in conjunction with the Contractor and the Landowner. All agreements reached should be documented and no verbal agreements should be made. The Contractor shall clearly mark all access roads. Roads not to be used shall be marked with a "NO ENTRY for construction vehicles" sign.</p> <p>12. Access to the site must be via secondary roads as requested by SANRAL.</p> <p>Road maintenance</p> <p>13. Where necessary suitable measures shall be taken to rehabilitate damaged areas.</p> <p>14. Contractors should ensure that access roads are maintained in good condition by attending to potholes, corrugations and stormwater damages as soon as these develop.</p> <p>15. If necessary, staff must be employed to clean surfaced roads adjacent to construction sites where materials have spilt.</p> <p>16. Recommendations of the surface water report must be taken into consideration.</p> <p>General</p> <p>17. The contractor shall meet safety requirements under all circumstances. All equipment transported shall be clearly labelled as to their potential hazards according to specifications. All the required safety labelling on the containers and trucks used shall be in place.</p> <p>18. The Contractor shall ensure that all the necessary precautions against damage to the environment and injury to persons are taken.</p>	
--	--	--

	19. Care for the safety and security of community members crossing access roads should receive priority at all times.	
--	---	--

2.4.3 Environmental Education and Training

Table 13: Environmental Education and Training

IMPACT	ENVIRONMENTAL EDUCATION AND TRAINING This section deals with the environmental training of construction employees who will work at the proposed power plants	RESPONSIBILITY
PHASE	CONSTRUCTION	MAINSTREAM
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	Environmental training <ol style="list-style-type: none"> 1. The project manager must appoint an ECO prior to construction. 2. Ensure that all site personnel have a basic level of environmental awareness training. The Contractor must submit a proposal for this training to the ECO for approval. Topics covered should include: <ul style="list-style-type: none"> ▪ 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 mitigate against such impacts ▪ Awareness of emergency and spills response provisions ▪ Social responsibility during construction e.g. being considerate to local residents 3. Training should be undertaken by a party such as the ECO who has sufficient expertise and knowledge of environmental issues. 4. It is the Contractor's responsibility to provide the site foreman with no less than 1 hour's environmental training and to ensure that the foreman has 	

	<p>sufficient understanding to pass this information onto the construction staff.</p> <ol style="list-style-type: none"> 5. Training should be provided to the staff members in the use of the appropriate fire-fighting equipment. Translators are to be used where necessary. 6. Use should be made of environmental awareness posters on site. 7. The need for a “clean site” policy also needs to be explained to the workers. 8. Staff operating equipment (such as loaders, etc.) shall be adequately trained and sensitized to any potential hazards associated with their tasks. <p>Monitoring of environmental training</p> <ol style="list-style-type: none"> 9. The Contractor must monitor the performance of construction workers to ensure that the points relayed during their introduction have been properly understood and are being followed. If necessary, the ECO and / or a translator should be called to the site to further explain aspects of environmental or social behaviour that are unclear. Toolbox talks are recommended. 	
--	--	--

2.4.4 Soils and Geology

General guidelines for management of soils are provided in Appendix B

Table 14: Soils and Geology

IMPACT	SOILS AND GEOLOGY This section deals with soils and geology and actions that need to be implemented during construction	RESPONSIBILITY
PHASE	CONSTRUCTION	MC/ ELO
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	<p>Topsoil</p> <ol style="list-style-type: none"> 1. The contractor should, prior to the commencement of earthworks determine the average depth of topsoil, and agree on this with the ECO. The full depth of topsoil should be stripped from areas affected by construction and related activities prior to the commencement of foundations. This should include the building footprints, working areas and storage areas. Topsoil must be reused at the where possible to rehabilitate disturbed surface areas. 2. Care must be taken not to mix topsoil and subsoil during stripping. 3. Should any topsoil become polluted the contractor must remove the polluted soil to the full depth of pollution and replace it at his own expense with clean topsoil. 4. Removed polluted topsoil should be transported to a licensed landfill site. 5. The topsoil must be conserved on site in and round the pit area <p>Soil Stripping</p> <ol style="list-style-type: none"> 6. No soil stripping must take place on areas within the site that the contractor does not require for construction works or areas of retained vegetation. 7. Subsoil and overburden in all construction and lay down areas should be 	

	<p>stockpiled separately to be returned for backfilling in the correct soil horizon order.</p> <p>8. Construction vehicles must only be allowed to utilize existing tracks or pre-planned access routes.</p> <p>Soil Stockpiles</p> <p>9. Stockpiles should not be situated such that they obstruct natural water pathways.</p> <p>10. Stockpiles should not exceed 2m in height unless otherwise permitted by the Engineer.</p> <p>11. If stockpiles are exposed to windy conditions or heavy rain, they should be covered either by vegetation or geofabric, depending on the duration of the project. Stockpiles may further be protected by the construction of berms or low brick walls around their bases.</p> <p>12. Stockpiles should be kept clear of weeds and alien vegetation growth by regular weeding.</p> <p>13. Where contamination of soil is expected, analysis must be done prior to disposal of soil to determine the appropriate disposal route. Proof from an approved waste disposal site where contaminated soils are dumped if and when a spillage / leakage occurs should be attained and given to the project manager.</p> <p>Fuel storage</p> <p>14. Topsoil and subsoil to be protected from contamination. This should be monitored on a monthly basis by a visual inspection of diesel/oil spillage and pollution prevention facilities.</p> <p>15. Fuel and material storage must be away from stockpiles.</p> <p>16. Concrete and chemicals must be mixed on an impervious surface and</p>	<p><i>Main contractor / ECO</i></p>
--	---	-------------------------------------

	<p>provisions should be made to contain spillages or overflows into the soil.</p> <p>17. Any storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces. The bund walls must be high enough to contain 110% of the total volume of the stored hazardous material.</p> <p>Concrete mixing</p> <p>18. Should a concrete batching plant be required, it must be contained within a bunded area.</p> <p>19. Concrete mixing must only take place within designated areas.</p> <p>20. Ready mixed concrete must be utilised where possible.</p> <p>21. No vehicles transporting concrete to the site may be washed on site.</p> <p>22. If a batching plant is necessary, run-off should be managed effectively to avoid contamination of other areas of the site. Run-off from the batch plant must not be allowed to enter the storm water system.</p> <p>Earthworks</p> <p>23. Soils compacted during construction should be deeply ripped to loosen compacted layers and re-graded to even running levels. Topsoil should be re-spread over landscaped areas. According to specifications by a landscape architect, the area should be re-vegetated upon completion of construction activities.</p>	
--	---	--

2.4.5 Erosion Control

Table 15: Erosion Control

IMPACT	EROSION CONTROL This section deals with erosion and actions that need to be implemented during construction	RESPONSIBILITY
PHASE	CONSTRUCTION	ECO
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	<ol style="list-style-type: none"> 1. Wind screening and stormwater control should be undertaken to prevent soil loss from the site. 2. The use of silt fences and sand bags must be implemented in areas that are susceptible to erosion. 3. Other erosion control measures that can be implemented are as follows: <ul style="list-style-type: none"> ▪ Brush packing with cleared vegetation ▪ Mulch or chip packing ▪ Planting of vegetation ▪ Hydroseeding / hand sowing 4. Sensitive areas need to be identified prior to construction so that the necessary precautions can be implemented. 5. All erosion control mechanisms need to be regularly maintained. 6. Seeding of topsoil and subsoil stockpiles to prevent wind and water erosion of soil surfaces. 7. Retention of vegetation where possible to avoid soil erosion 8. Vegetation clearance should be phased to ensure that the minimum area of soil is exposed to potential erosion at any one time. 9. Re-vegetation of disturbed surfaces should occur immediately after construction activities are completed. This should be done through seeding 	

	<p>with indigenous grasses.</p> <p>10. No impediment to the natural water flow other than approved erosion control works is permitted.</p> <p>11. To prevent stormwater damage, the increase in stormwater run-off resulting from construction activities must be estimated and the drainage system assessed accordingly.</p> <p>12. Stockpiles not used in three (3) months after stripping must be seeded to prevent dust and erosion.</p>	
--	--	--

2.4.6 Water Use and Quality

Table 16: Water Use and Quality

IMPACT	WATER USE AND QUALITY This section deals with water use and quality as well as actions that need to be implemented during construction	RESPONSIBILITY
PHASE	CONSTRUCTION	ECO
MITIGATION / METHOD STATEMENT	<p>Water Use</p> <ol style="list-style-type: none"> 1. Develop a sustainable water supply management plan to minimize the impact to natural systems by managing water use, avoiding depletion of aquifers and minimizing impacts to water users. 2. Water must be reused, recycled or treated where possible. 3. Consultation with key stakeholders to understand any conflicting water use demands and the communities dependency on water resources and conservation requirements within the area. <p>Water Quality</p> <ol style="list-style-type: none"> 4. The quality and quantity of effluent streams discharged to the environment 	<p>Engineer</p> <p>ECO</p>

	<p>15. If a batching plant is necessary, run-off should be managed effectively to avoid contamination of other areas of the site. Untreated runoff from the batch plant must not be allowed to get into the storm water system or nearby streams, rivers or erosion channels or dongas.</p> <p>Sanitation</p> <p>16. Adequate sanitary facilities and ablutions must be provided for construction workers (1 toilet per every 15 workers).</p> <p>17. The facilities must be regularly serviced to reduce the risk of surface or groundwater pollution.</p> <p>Concrete mixing</p> <p>18. Concrete contaminated water must not enter soil or any natural drainage system as this disturbs the natural acidity of the soil and affects plant growth.</p> <p>Public areas</p> <p>19. Food preparation areas should be provided with adequate washing facilities and food refuse should be stored in sealed refuse bins which should be removed from site on a regular basis.</p> <p>20. The contractor should take steps to ensure that littering by construction workers does not occur and persons should be employed on site to collect litter from the site and immediate surroundings, including litter accumulating at fence lines.</p> <p>21. No washing or servicing of vehicles on site.</p>	
--	--	--

2.4.7 Surface and Groundwater

Table 17: Surface and Groundwater

IMPACT	SURFACE WATER AND GROUNDWATER This section deals with surface and groundwater and actions that need to be implemented during construction	RESPONSIBILITY
PHASE	CONSTRUCTION	ECO / Main Contractor
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION METHOD STATEMENT	<p data-bbox="464 615 596 643">Sanitation</p> <ol data-bbox="516 656 1362 802" style="list-style-type: none"> 1. Adequate sanitary facilities and ablutions must be provided for construction workers (1 toilet per every 15 workers). 2. The facilities must be regularly serviced to reduce the risk of surface or groundwater pollution. <p data-bbox="464 850 726 878">Hazardous materials</p> <ol data-bbox="516 891 1362 1362" style="list-style-type: none"> 3. Use and or storage of materials, fuel and chemicals which could potentially leak into the ground must be controlled. 4. All storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces. The bund walls must be high enough to contain 110% of the total volume of the stored hazardous material. 5. Any hazardous substances must be stored at least 20m from any of the water bodies on site. 6. The Contractor (monitored by the Environmental Control or Liaison Officer) should be responsible for ensuring that potentially harmful materials are properly stored in a dry, secure, ventilated environment, with concrete or sealed flooring and a means of 	

	<p>preventing unauthorised entry.</p> <p>7. Contaminated wastewater must be managed by the Contractor to ensure existing water resources on the site are not contaminated. All wastewater from general activities in the camp shall be collected and removed from the site for appropriate disposal at a licensed commercial facility.</p> <p>Concrete mixing</p> <p>8. Concrete contaminated water must not enter soil or any natural drainage system as this disturbs the natural acidity of the soil and affects plant growth</p> <p>Public areas</p> <p>9. Food preparation areas should be provided with adequate washing facilities and food refuse should be stored in sealed refuse bins which should be removed from site on a regular basis.</p> <p>10. The contractor should take steps to ensure that littering by construction workers does not occur and persons should be employed on site to collect litter from the site and immediate surroundings, including litter accumulating at fence lines.</p> <p>11. No washing or servicing of vehicles on site.</p> <p>Water resources</p> <p>12. Site staff shall not be permitted to use any other open water body or natural water source adjacent to or within the designated site for the purposes of bathing, washing of clothing or for any construction or related activities.</p> <p>13. Municipal water (or another source approved by the ECO) should</p>	
--	---	--

	<p>instead be used for all activities such as washing of equipment or disposal of any type of waste, dust suppression, concrete mixing, compacting, etc.</p> <p>14. Relevant departments and other emergency services should be contacted in order to deal with spillages and contamination of aquatic environments.</p>	
SITE SPECIFIC MITIGATION MEASURES		
	<ol style="list-style-type: none"> 1. Excavation of Soils from Watercourses and Buffer Zones – Where appropriate, all removed soils should be backfilled into trenches or excavations. However, where the excavated materials are not suitable, the soils are to be removed from site and dumped at a registered landfill site where sufficient capacity exists. 2. All stockpiled soils from the watercourses and associated buffer zones must be bunded by suitable materials (for example, fixed wooden planks or bricks) that can resist rains and increased run-off. The bunded materials of choice should be high enough to prevent overspill (for example 40-50cm high). This will prevent erosion and sedimentation within the sensitive hydrological systems. 3. Separate stockpiles must be made for topsoil and sub-soils. Once the foundations have been constructed, the backfill of excavated soils needs to be done in a manner that re-instates the proper soil horizons in the correct order. For example, the sub-soils must be back filled first and then the topsoil backfill. 4. Prevention of Pollutants and other potentially Hazardous Substances entering Watercourses and the associated Buffer Zones – Any mixing of cement must take place outside of the watercourses and the associated buffer zones. Where this cannot 	

	<p>be undertaken and cement mixing in the watercourses and associated buffer zones are absolutely necessary, this must either only take place over a covered surface (for example, mixing boards) and must be bunded to prevent spread during mixing and must be nearby or beside the excavation pits or immediate construction areas. Alternatively, cement mixing can take place in the load bin of vehicle. It is important that no cement spills unnecessarily in the area around the powerline construction or wind turbine construction areas for risk of entering the watercourses.</p> <p>5. Heavy machinery and vehicles must be checked for oil leaks before being allowed to operate in the watercourse and the associated buffer zone areas. Additionally, no fuelling, re-fuelling or stockpiling of hazardous materials (oils, fuels and cement) is allowed to take place in the cleared vegetation areas prepared for construction activities.</p> <p>6. Sanitary facilities - Sanitary facilities must be available for workers (at a ratio of 1 toilet to ten workers) to use to prevent urine and faecal waste entering the buffer zones of the wetlands and watercourses. Sanitary facilities must be placed at least 100m from the watercourse and associated buffer zones.</p> <p>7. Movement and Degradation of Vehicles and Workers – Vehicles will be required for construction activities to take place for the powerlines and where access roads and wind turbines are to be constructed. It is important that the lightest possible vehicles and equipment are employed so as to limit damage to the watercourse and associated buffer zone areas. Heavy vehicles with tracks ideally are not to be allowed into the watercourses or the associated buffer zones unless absolutely necessary.</p>	
--	--	--

	<p>8. Establishment of access into watercourses and the associated buffer zones will be required. Where this takes place and the necessary authorisations and water use licences have been obtained permitting access roads into the watercourse and associated buffer zones, a single access route or “Right of Way” (RoW) is to be established. The width of the RoW must be limited to the width of the vehicles required to enter the watercourse and associated buffer zone areas. An additional area around the locations of the wind turbines and new powerline structure locations will be required in order for construction vehicles and machinery to operate in the required areas. This too must be limited to the smallest possible area required to prevent unnecessary degradation. These construction areas must be cordoned off so that access into the watercourse is limited.</p> <p>9. Storage of Construction Vehicles, Materials and Equipment – All vehicles, materials and equipment must be stored at an established construction camp away from the watercourse and associated buffer zone areas.</p> <p>10. Impacts to Avi-fauna – Where the powerlines are to be strung across the watercourses, the fitment of bird anti-collision devices (flappers) or flight deviators will be required. Importantly, the fitment of such devices must be done prior to the powerlines being strung. For example, the fitment must take place on the ground so that vehicles are not required to enter watercourses unnecessarily for the fitment of the devices to the powerlines.</p> <p>11. Seasonality of Construction Activities – Construction activities should take place during summer months when rainfall is at its lowest (preferably between September to March). This will be</p>	
--	---	--

	<p>significant in negating potential run-off impacts from occurring.</p> <p>12. Construction Phase Stormwater Management Plan - The development and implementation of an adequate storm water management plan to be designed by an appropriate engineer will assist in formulating adequate measures to address any potential stormwater impacts from occurring. Here, the engineer should account for both natural run-off (that which can be released into the natural landscape with no detrimental effect) and excess artificial run-off generated over the exposed bare construction laydown areas. In order to prevent acceleration of stormwater run-off, energy dissipating structures can be used. Such structures can reduce the amount and rate of excess run-off generated by the proposed development entering wetlands and thereby prevent the onset of erosion.</p> <p>13. Stormwater management structures or devices should also take into account the potential for sedimentation and siltation effects associated with stormwater run-off. In this instance, exposed bare areas should be contained by silt fencing or other appropriate devices or materials to trap sediment and dissipate stormwater run-off.</p>	
--	---	--

2.4.8 Waste Management

Table 18: Waste Management

IMPACT	WASTE MANAGEMENT This section deals with waste management and actions that need to be implemented during construction	RESPONSIBILITY
PHASE	CONSTRUCTION	ELO
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION METHOD STATEMENT	<p data-bbox="466 607 709 633"><i>Litter management</i></p> <ol style="list-style-type: none"> <li data-bbox="466 646 1365 716">1. Refuse bins must be placed at strategic positions to ensure that litter does not accumulate within the construction site. <li data-bbox="466 727 1365 834">2. The Contractor shall supply waste collection bins where such is not available and all solid waste collected shall be disposed of at registered/licensed landfill. <li data-bbox="466 846 1365 915">3. A housekeeping team should be appointed to regularly maintain the litter and rubble situation on the construction site. <li data-bbox="466 927 1365 1034">4. If possible and feasible, all waste generated on site must be separated into glass, plastic, paper, metal and wood and recycled. An independent contractor can be appointed to conduct this recycling. <li data-bbox="466 1045 1365 1153">5. Littering by the employees of the Contractor shall not be allowed under any circumstances. The ECO shall monitor the neatness of the work sites as well as the Contractor campsite. <li data-bbox="466 1164 1365 1271">6. Skip waste containers should be maintained on site. These should be kept covered and arrangements made for them to be collected regularly. <li data-bbox="466 1282 1365 1352">7. All waste must be removed from the site and transported to a landfill site promptly to ensure that it does not attract vermin or produce 	

	<p>odours.</p> <p>8. 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.</p> <p>9. A certificate of disposal shall be obtained by the Contractor and kept on file, if relevant.</p> <p>10. Under no circumstances may solid waste be burnt on site.</p> <p>11. All waste must be removed promptly to ensure that it does not attract vermin or produce odours.</p> <p>Hazardous waste</p> <p>12. All waste hazardous materials, if present, must be carefully stored as advised by the ECO, and then disposed of off site at a licensed landfill site, where practical. Incineration may be used where relevant.</p> <p>13. Contaminants to be stored safely to avoid spillage.</p> <p>14. Machinery must be properly maintained to keep oil leaks in check</p> <p>15. All necessary precaution measures shall be taken to prevent soil or surface water pollution from hazardous materials used during construction and any spills shall immediately be cleaned up and all affected areas rehabilitated</p> <p>Sanitation</p> <p>16. The Contractor shall install mobile chemical toilets on the site.</p> <p>17. Staff shall be sensitised to the fact that they should use these facilities at all times. No indiscriminate sanitary activities on site shall be allowed.</p> <p>18. Ablution facilities shall be within 50m from workplaces and not closer than 100m from any natural water bodies or boreholes. There should be enough toilets available to accommodate the workforce (minimum</p>	
--	---	--

	<p>requirement 1: 15 workers). Male and females must be accommodated separately where possible.</p> <p>19. Toilets shall be serviced regularly and the ECO shall inspect toilets regularly.</p> <p>20. Toilets should be no closer than 100m or above the 1:100 year flood line from any natural or manmade water bodies or drainage lines or alternatively located in a place approved of by the Engineer.</p> <p>21. Under no circumstances may open areas, neighbours fences or the surrounding bush be used as a toilet facility.</p> <p>22. The construction of “Long Drop” toilets are forbidden. Rather, portable toilets are to be used.</p> <p>23. Potable water must be provided for all construction staff.</p> <p><i>Remedial actions</i></p> <p>24. Depending on the nature and extent of the spill, contaminated soil must be either excavated or treated on-site.</p> <p>25. Excavation of contaminated soil must involve careful removal of soil using appropriate tools/machinery to storage containers until treated or disposed of at a licensed hazardous landfill site.</p> <p>26. The ECO must determine the precise method of treatment for polluted soil. This could involve the application of soil absorbent materials as well as oil-digestive powders to the contaminated soil.</p> <p>27. If a spill occurs on an impermeable surface such as cement or concrete, the surface spill must be contained using oil absorbent material.</p> <p>28. If necessary, oil absorbent sheets or pads must be attached to leaky machinery or infrastructure.</p> <p>29. Materials used for the remediation of petrochemical spills must be used according to product specifications and guidance for use.</p>	
--	---	--

	30. Contaminated remediation materials must be carefully removed from the area of the spill so as to prevent further release of petrochemicals to the environment, and stored in adequate containers until appropriate disposal.	
--	--	--

2.4.9 Flora

Table 19: Flora

IMPACT	FLORA This section deals with flora and actions that need to be implemented during construction	RESPONSIBILITY
PHASE	CONSTRUCTION	ELO
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION METHOD STATEMENT	<p>Existing vegetation</p> <ol style="list-style-type: none"> 1. Vegetation removal must be limited to the wind farm construction site 2. Vegetation to be removed as it becomes necessary rather than removal of all vegetation throughout the site in one step 3. Materials should not be delivered to the site prematurely which could result in additional areas being cleared or affected. 4. No vegetation to be used for firewood. <p>Rehabilitation</p> <ol style="list-style-type: none"> 5. All damaged areas shall be rehabilitated upon completion of the contract 6. Re-vegetation of the disturbed site is aimed at approximating as near as possible the natural vegetative conditions prevailing prior to 	

	<p>construction.</p> <ol style="list-style-type: none"> 7. All natural areas impacted during construction must be rehabilitated with locally indigenous species typical of the representative botanical unit. 8. Rehabilitation must take place in a phased approach as soon as possible. 9. Rehabilitation process must make use of species indigenous to the area. Seeds from surrounding seed banks can be used for re-seeding. 10. Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas. 11. Planting of indigenous tree species in areas not to be cultivated or built on must be encouraged. <p>Demarcation of construction and laydown areas</p> <ol style="list-style-type: none"> 12. All plants not interfering with the operation of the wind farm construction shall be left undisturbed, clearly marked and indicated on the site plan. 13. The construction area must be well demarcated and no construction activities must be allowed outside of this demarcated footprint. 14. Vegetation removal must be phased in order to reduce impact of construction. 15. Construction site office and laydown areas must be clearly demarcated and no encroachment must occur beyond demarcated areas. 16. Strict and regular auditing of the wind farm construction process to ensure containment of the construction and laydown areas. 17. Soils must be kept free of petrochemical solutions that may be kept on site during construction. Spillage can result in a loss of soil functionality thus limiting the re-establishment of flora. <p>Utilisation of resources</p>	
--	---	--

	<p>18. Gathering of firewood, fruit, muti plants, or any other natural material onsite or in areas adjacent to the site is prohibited unless with prior approval of the ECO.</p> <p>Exotic vegetation</p> <p>19. Alien vegetation on the site will need to be controlled.</p> <p>20. The contractor should be responsible for implementing a programme of weed control (particularly in areas where soil has been disturbed); and grassing of any remaining stockpiles to prevent weed invasion.</p> <p>21. The spread of exotic species occurring throughout the site should be controlled.</p> <p>Herbicides</p> <p>22. Herbicide use shall only be allowed according to contract specifications. The application shall be according to set specifications and under supervision of a qualified technician. The possibility of leaching into the surrounding environment shall be properly investigated and only environmentally friendly herbicides shall be used.</p> <p>23. The use of pesticides and herbicides on the site must be discouraged as these can impact on important pollinator species of indigenous vegetation.</p>	
	SITE SPECIFIC MITIGATION MEASURES	
	<p>1. An on-site ecologist should be present when excavation takes place to ensure that any uncovered species are protected from destruction. It is important to remember that even though these species have not been encountered, they could be in a dormant stage and suddenly arise during construction due to more</p>	

	<p>favourable conditions.</p> <ol style="list-style-type: none"> 2. Demarcation of sensitive areas prior to construction activities starting 3. Use of appropriate construction methods in the sensitive area. 4. Intensive environmental audits (frequently in sensitive areas) by an independent party during this construction period. 5. A copy of the Environmental Impact Report and associated Environmental Management Programme as well as the specialist study must be present at the construction site for easy reference to specialist recommendations in sensitive areas. 6. It is recommended that the construction crew be educated about the sensitivities involved in these areas as well as the potential species they could encounter. A poster of sensitive species (compiled by a qualified specialist) should be kept on the construction site for easy reference. 7. Rehabilitation to be undertaken as soon as possible after construction in sensitive area has been completed 8. Only vegetation within the study area must be removed. 9. Vegetation removal must be phased in order to reduce impact of construction. 10. Construction site office and laydown areas must be clearly demarcated and no encroachment must occur beyond demarcated areas. 11. All natural areas impacted during construction must be rehabilitated with locally indigenous plant species. 12. A buffer zone should be established in areas where construction will not take place to ensure that construction activities do not extend into these areas. 	
--	---	--

	<p>13. Construction areas must be well demarcated and these areas strictly adhered to.</p> <p>14. Remove and relocate any plants of botanical or ecological significance (these must be indicated by the ECO)</p> <p>15. The use of pesticides and herbicides in the study area must be discouraged as these impacts on important pollinator species of indigenous vegetation.</p> <p>16. Soils must be kept free of petrochemical solutions that may be kept on site during construction. Spillage can result in a loss of soil functionality thus limiting the re-establishment of flora.</p>	
--	---	--

2.4.10 Fauna

Table 20: Fauna

IMPACT	FAUNA This section deals with fauna and actions that need to be implemented during construction	RESPONSIBILITY
PHASE	CONSTRUCTION	ECO
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION METHOD STATEMENT	<p>1. Demarcation of sensitive areas must be verified on site by the ECO prior to construction activities starting.</p> <p>2. Use of appropriate construction techniques</p> <p>3. Rehabilitation to be undertaken as soon as possible after construction has been completed.</p> <p>4. No trapping or snaring to fauna on the construction site is allowed.</p> <p>5. No faunal species are to be harmed by maintenance staff during any</p>	

	routine maintenance at the development.	
--	---	--

2.4.11 Avi-fauna

Table 21: Avi-fauna Impact

IMPACT	Avi-fauna This section deals with avi-faunal issues and actions that need to be implemented during construction	RESPONSIBILITY
PHASE	CONSTRUCTION	ELO/ LA
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION METHOD STATEMENT	<ol style="list-style-type: none"> 1. Ensuring that key areas of conservation importance and sensitivity are avoided; 2. Implementing appropriate working practices to protect sensitive habitats; 3. Providing adequate briefing for site personnel and, in particularly sensitive locations, employing an on-site ecologist during construction; 4. Implementing an agreed post-development monitoring programme; 5. Siting turbines close together to minimise the development footprint (subject to technical constraints such as the need for greater separation between larger turbines); 6. Grouping turbines to avoid alignment perpendicular to main flight paths and to provide corridors between clusters, aligned with main flight trajectories, within large wind farms; 7. Increasing the visibility of rotor blades – research indicates that high contrast patterns might help reduce collision risk (McIsaac 2001; Hodos 	

	<p>2002), although this may not always be acceptable on landscape grounds. Another suggested, but untested possibility is to paint blades with UV paint, which may enhance their visibility to birds;</p> <p>8. Where possible, installing transmission cables underground (subject to habitat sensitivities and in accordance with existing best practice guidelines for underground cable installation);</p> <p>9. Marking overhead cables using deflectors and avoiding use over areas of high bird concentrations, especially for species vulnerable to collision;</p> <p>10. Timing construction to avoid sensitive periods; and</p> <p>11. Implementing habitat enhancement for species using the site.</p>	
	SITE SPECIFIC MITIGATION MEASURES	
	<p>1. Due to the uniformity of the habitat at the site itself, no specific key areas of conservation importance and sensitivity have emerged so far that are specifically linked to conditions on the ground, subject to further monitoring at the site.</p> <p>2. There is a potential for waterbird flight paths over the northern part of the study area linked to ephemeral pans outside the actual boundaries of the site. It is recommended that development of the northern part of the site is delayed until better information is available on actual bird traffic over the site, which should emerge as the monitoring for Phase 2 is implemented in due course.</p> <p>3. Habitat destruction should be limited to what is absolutely necessary for the construction of the infrastructure, including the construction of new roads. In this respect, the recommendations from the Ecological Specialist Study should be applied strictly. Personnel should be adequately briefed on the need to restrict habitat destruction, and must be restricted to the actual construction area.</p> <p>4. The proposed power line should be routed as far as possible from high</p>	

	<p>risk areas, specifically from the pan that borders on the north-western part of the study area. In addition, the entire line should be marked with Bird Flight Diverters, to reduce the risk of collisions of specifically Ludwig's Bustard.</p> <ol style="list-style-type: none"> 5. The proposed pole design must be assessed by the author of this report to ensure that the power line design poses no potential electrocution risk of large raptors, particularly Martial Eagle, which may use the poles as hunting perches. 6. A 250m exclusion zone should be implemented around the existing Greater Kestrel breeding pair where no construction activity should take place. 7. Post-construction monitoring should be implemented as part of the continuation of the current monitoring programme, to assess displacement and actual collision rates. If actual collision and displacement levels are high, the following mitigation measures would need to be considered: <ul style="list-style-type: none"> ▪ Negotiating appropriate off-set compensation for turbine related displacement and collision mortality; ▪ As a last resort, halting operation of specific turbines during peak flight periods, or reducing rotor speed, to reduce the risk of collision mortality. 	
--	--	--

2.4.12 Bats

Table 22: Bats Impact

IMPACT	BATS This section deals with avi-faunal issues and actions that need to be implemented during construction	RESPONSIBILITY
PHASE	CONSTRUCTION	Bat specialist
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION METHOD STATEMENT	12. Long term bat monitoring should be undertaken during the construction phase to gain an understanding of the potential impacts to bats during the construction phase to contribute to the reaserch and development in this academic area.	

2.4.13 Air Quality

Table 23: Air Pollution

IMPACT	AIR POLLUTION This section deals with air pollution and actions that need to be implemented during construction	RESPONSIBILITY
PHASE	CONSTRUCTION	ELO
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	Dust control 1. Wheel washing and damping down of un-surfaced and un-vegetated	

	<p>areas must be undertaken if required.</p> <ol style="list-style-type: none"> 2. Retention of vegetation where possible will reduce dust travel. 3. Clearing activities must only be done during agreed working times and permitting weather conditions to avoid drifting of sand and dust into neighbouring areas. 4. Damping down of all exposed soil surfaces with a water bowser or sprinklers when necessary to reduce dust. 5. The Contractor shall be responsible for dust control on site to ensure no nuisance is caused to the neighbouring communities. 6. A speed limit of 25km/h must not be exceeded on site. 7. Any complaints or claims emanating from the lack of dust control shall be attended to immediately by the Contractor. 8. Any dirt roads that are utilised by the workers must be regularly maintained to ensure that dust levels are controlled. <p>Odour control</p> <ol style="list-style-type: none"> 9. Regular servicing of vehicles in order to limit gaseous emissions. 10. Regular servicing of on site toilets to avoid potential odours. 11. Allocated cooking areas must be provided. 12. The contractor must make alternative arrangements (other than fires) for cooking and/ or heating requirements. LP gas cookers may be used provided that all safety regulations are followed. <p>Rehabilitation</p> <ol style="list-style-type: none"> 13. The contractor should commence rehabilitation of exposed soil surfaces as soon as practical after completion of earthworks. <p>Fire prevention</p>	
--	--	--

	<p>14. No open fires shall be allowed on site under any circumstance. All cooking shall be done in demarcated areas that are safe and cannot cause runaway fires.</p> <p>15. The Contractor shall have operational fire-fighting equipment available on site at all times. The level of fire fighting equipment must be assessed and evaluated through a typical risk assessment process.</p>	
--	---	--

2.4.14 Noise and Vibrations

Table 24: Noise and Vibrations

IMPACT	NOISE This section deals with noise and actions that need to be implemented during construction	RESPONSIBILITY
PHASE	CONSTRUCTION	ELO
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	<ol style="list-style-type: none"> 1. The construction phase must aim to adhere to the relevant noise regulations and limit noise to within standard working hours in order to reduce disturbance of surrounding farms. 2. Construction site yards, workshops, concrete batching plants, and other noisy fixed facilities should be located well away from noise sensitive areas. Once the proposed final layouts are made available by the contractor(s), the sites must be evaluated in detail and specific measures designed in to the system. 3. Truck traffic should be routed away from noise sensitive areas, where possible. 4. Noise levels must be kept within acceptable limits. 	

	<ol style="list-style-type: none"> 5. Noisy operations should be combined so that they occur where possible at the same time. 6. 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. 7. Construction workers to wear necessary ear protection gear. 8. Noisy activities to take place during allocated construction hours 9. Noise from labourers must be controlled. 10. 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. 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 11. The contractor must take measures to discourage labourers from loitering in the area and causing noise disturbance. Where possible labour shall be transported to and from the site by the contractor or his Sub-Contractors by the contractors own transport. 12. Implementation of enclosure and cladding of processing plants 13. Applying regular and thorough maintenance schedules to equipment and processes. An increase in noise emission levels very often is a sign of the imminent mechanical failure of a machine. 14. Route construction traffic as far as practically possible from potentially sensitive receptors; 15. Ensure a good working relationship between the developer and all potentially sensitive receptors. Communication channels should be established to ensure prior notice to the sensitive receptor if work is to take place close to them. Information that should be provided to the 	
--	--	--

	<p>potential sensitive receptor(s) include:</p> <ul style="list-style-type: none"> ▪ Proposed working times; ▪ how long the activity is anticipated to take place; ▪ what is being done, or why the activity is taking place; ▪ contact details of a responsible person where any complaints can be lodged should there be an issue of concern. <p>16. When working near (within 500 meters – potential construction of access roads and trenches) to a potential sensitive receptor(s), limit the number of simultaneous activities to the minimum as far as possible;</p> <p>17. When working near to potentially sensitive receptors, coordinate the working time with periods when the receptors are not at home where possible. An example would be to work within the 08:00 to 14:00 time-slot to minimize the significance of the impact because:</p> <ul style="list-style-type: none"> ▪ Potential receptors are most likely at school or at work, minimizing the probability of an impact happening; ▪ Normal daily activities will generate other noises that would most likely mask construction noises, minimizing the probability of an impact happening. <p>18. Reduce the noise impact during the construction phase by:</p> <ul style="list-style-type: none"> ▪ Using the smallest/quietest equipment for the particular purpose. For modelling purposes the noise emission characteristics of large earth-moving equipment (typically of mining operations) were used, that would most likely over-estimate the noise levels. The use of smaller equipment therefore would have a significantly lower noise impact; ▪ Ensuring that equipment is well-maintained and fitted with the correct and appropriate noise abatement measures. 	
--	---	--

2.4.15 Energy use

Table 25: Energy use

IMPACT	ENERGY USE This section deals with energy use and actions that need to be implemented during construction	RESPONSIBILITY
PHASE	CONSTRUCTION	ELO
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	<ol style="list-style-type: none"> 1. Energy saving lighting must be implemented across the board. 2. Water saving measures must be implemented across the plant to ensure little wastage. 3. Minimal lighting, while maintaining health and safety regulations, must be kept on during the night operations. 4. Equipment not in use must be switched off and unplugged to save on unnecessary energy costs. 	

2.4.16 Agricultural Potential

Table 26: Agricultural Potential

IMPACT	AGRICULTURAL POTENTIAL This section deals with agricultural potential and actions that need to be implemented during construction	RESPONSIBILITY
PHASE	CONSTRUCTION	ECO
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD	<ol style="list-style-type: none"> 1. The development footprint must be maintained and not encroach on agricultural areas on the site as well as the nearby drainage areas. 	

STATEMENT	<p>2. Clearing activities should be kept to a minimum (turbine, road and site footprint).</p> <p>3. In the unlikely event that heavy rains are expected activities should be put on hold to reduce the risk of erosion.</p> <p>4. If additional earthworks are required, any steep or large embankments that are expected to be exposed during the 'rainy' months should either be armoured with fascine like structures.</p> <p>5. If earth works are required then storm water control and wind screening should be undertaken to prevent soil loss from the site</p>	
------------------	---	--

2.4.17 Employment

Table 27: Employment

IMPACT	EMPLOYMENT This section deals with employment and actions that need to be implemented during construction	RESPONSIBILITY
PHASE	CONSTRUCTION	MC
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION METHOD STATEMENT	<p>Labour</p> <p>1. The use of labour intensive construction measures should be used where appropriate.</p> <p>2. Training of labour to benefit individuals beyond completion of the project.</p> <p>Recruitment Plan</p> <p>3. All unskilled labourers should be drawn from the local market i.e. from</p>	

	<p>the Loeriesfontein area and where possible use should be made of local semiskilled and skilled personnel.</p> <ol style="list-style-type: none"> 4. Local suppliers to be used where possible. 5. The Project Manager must ensure that all staff working on the proposed project are in possession of a South African Identity Document or a relevant work permit. 6. Ensure adequate advertising in the project community areas, local papers for skilled labour. Adverts are to be placed in each area where the public meetings were conducted. 7. Local community leaders must be utilised to source labour. 8. The recruitment process must be equitable and transparent. A concerted effort will be made to guard against nepotism and/or any form of favouritism during the process 9. The recruitment of skilled labour will follow standard advertising process in national newspapers and interview based selection 10. A record of official complaints by employees is to be maintained and submitted to authorities i.e. Labour and Social Security. 	
	SITE SPECIFIC MITIGATION	
	<ol style="list-style-type: none"> 1. Ensure that the unskilled local jobs created are linked to a skills development programme for permanent employment 	

2.4.18 Occupational Health and Safety

Table 28: Occupational Health and Safety

IMPACT	HEALTH AND SAFETY This section deals with health and safety and actions that need to be implemented during construction	RESPONSIBILITY
PHASE	CONSTRUCTION	MC/ ELO
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION METHOD STATEMENT	<p data-bbox="464 605 646 634">Worker safety</p> <ol data-bbox="464 646 1365 1347" style="list-style-type: none"> 1. Implementation of safety measures, work procedures and first aid must be implemented on site. 2. Workers should be thoroughly trained in using potentially dangerous equipment 3. Contractors must ensure that all equipment is maintained in a safe operating condition. 4. A safety officer must be appointed. 5. A record of health and safety incidents must be kept on site. 6. Any health and safety incidents must be reported to the Project Manager immediately. 7. First aid facilities must be available on site at all times and a number of employees trained to carry out first aid procedures. 8. Workers have the right to refuse work in unsafe conditions. 9. The Contractor shall take all the necessary precautions against the spreading of disease such as measles, foot and mouth, etc. especially under livestock. 10. A record shall be kept of drugs administered or precautions taken and the time and dates when this was done. This can then be used as 	

	<p>evidence in court should any claims be instituted against Mainstream or the Contractor.</p> <p>11. 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.</p> <p>12. Material stockpiles or stacks must be stable and well secured to avoid collapse and possible injury to site workers / local residents.</p> <p>Worker facilities</p> <p>13. Eating areas should be regularly serviced and cleaned to ensure the highest possible standards of hygiene and cleanliness.</p> <p>14. Fires are not to be allowed outside controlled areas.</p> <p>Hazardous substances</p> <p>15. Working areas should be provided with adequate ventilation and dust/fume extraction systems to ensure that inhalation exposure levels for potentially corrosive, oxidizing, reactive or siliceous substances are maintained and managed at safe levels.</p> <p>Machinery and Equipment</p> <p>16. Use of contrast colouring on equipment/ machinery including the provision of reflective markings to enhance visibility.</p> <p>17. Use of moving equipment/machinery equipped with improved operator sight lines.</p> <p>18. Issuing workers with high visibility clothing</p> <p>19. Use of reflective markings on structures, traffic junctions, and other areas with a potential for accidents.</p>	
--	--	--

	<p>20. Installing safety barriers in high risk locations</p> <p>Fitness for work</p> <p>21. Review shift management systems to minimize risk of fatigue. Establish alcohol and other drugs policy for the operation.</p> <p>Travel and remote site health</p> <p>22. Develop programs to prevent both chronic and acute illnesses through appropriate sanitation and vector control systems.</p> <p>23. Where food is prepared on site, food preparation storage and disposal should be reviewed regularly and monitored to minimise risk of illness.</p> <p>Protective gear</p> <p>24. Personal Protective Equipment (PPE) must be made available to all construction staff and must be compulsory. Hard hats and safety shoes must be worn at all times and other PPE worn where necessary i.e. dust masks, ear plugs etc.</p> <p>25. No person is to enter the site without the necessary PPE.</p> <p>Site safety</p> <p>26. The construction camp must remain fenced for the entire construction period.</p> <p>27. Potentially hazardous areas are to be demarcated and clearly marked</p> <p>28. Adequate warning signs of hazardous working areas.</p> <p>29. Emergency numbers for local police and fire department etc must be placed in a prominent area.</p> <p>30. Fire fighting equipment must be placed in prominent positions across the site where it is easily accessible. This includes fire extinguishers, a</p>	
--	---	--

	<p>fire blanket as well as a water tank.</p> <p>31. Suitable conspicuous warning signs in English and all other applicable languages must be placed at all entrances to the site.</p> <p>32. All speed limits must be adhered to.</p> <p>Construction equipment safety</p> <p>33. All equipment used for construction, including drills, TLB's must be in good working order with up to date maintenance records.</p> <p>Hazardous Material Storage</p> <p>34. All storage tanks containing hazardous materials (fuel) must be placed in bunded containment areas with sealed surfaces. The bund walls must be high enough to contain 110% of the total volume of the stored hazardous material. These areas should be roofed to avoid contamination of stormwater.</p> <p>35. Material Safety Data Sheets (MSDS) which contain the necessary information pertaining to a specific hazardous substance must be present for all hazardous materials stored on the site.</p> <p>Procedure in the event of a petrochemical spill</p> <p>36. A spill kit needs to be kept on site to address any unforeseen spillages.</p> <p>37. The individual responsible for or who discovers the petrochemical spill must report the incident to the Project Manager, Contractor or ECO.</p> <p>38. The problem must be assessed and the necessary actions required will be undertaken.</p> <p>39. The immediate response must be to contain the spill.</p> <p>40. The source of the spill must be identified, controlled, treated or removed wherever possible.</p>	
--	--	--

	<p>Fire management</p> <p>41. Fire fighting equipment should be present on site at all times.</p> <p>42. All construction staff must be trained in fire hazard control and fire fighting techniques.</p> <p>43. All flammable substances must be stored in dry areas which do not pose an ignition risk to the said substances.</p> <p>44. No open fires will be allowed on site.</p> <p>45. Smoking may only be conducted in demarcated areas.</p> <p>46. Landowners must adhere to chapter 5 of the National Veld and Forest Fires Act, Act 101 of 1998 as amended</p> <p>Safety of surrounding residents</p> <p>47. All I & AP's should be notified in advance of any known potential risks associated with the construction site and the activities on it. Examples of these are:</p> <ul style="list-style-type: none"> ○ Blasting ○ Earthworks / earthmoving machinery on steep slopes above houses / infrastructure ○ Risk to residence along haulage roads / access routes <p>Emergency evacuation plan</p> <p>48. Upon completion of the construction phase, an emergency preparedness plan must be drawn up to ensure the safety of the staff and surrounding land users in the case of an emergency.</p> <p>49. All permanent staff must undergo safety training.</p> <p>Maintenance</p>	
--	--	--

	50. The wind farm and surrounding areas are to be regularly maintained. A maintenance schedule must be drawn up and records of all maintenance kept.	
	SITE SPECIFIC MITIGATION	
	<ol style="list-style-type: none"> 1. Problem areas that are brought under the attention of the contractor should be rectified immediately. If the contractor is unable to do so, this should be communicated to the landowner along with a plan on how and when the problem will be addressed. The landowner should be given regular feedback on the matter. 2. All mitigation measures contained in the EMP should be implemented and monitored by an ECO. Remedial action should be taken where the contractor fails to comply with the EMP. 3. Mainstream or its contractor should appoint a service provider or local NGO to develop, implement and manage an HIV/AIDS prevention programme. The service provider or NGO should specialise in the field of HIV/AIDS. 4. The HIV/AIDS prevention programme should extend to the local community and should pay special attention to vulnerable groups such as women and youth. 	

2.4.19 Security

Table 29: Security

IMPACT	SECURITY This section deals with security and actions that need to be implemented during construction	RESPONSIBILITY
PHASE	CONSTRUCTION	MC /ELO
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION METHOD STATEMENT	<ol style="list-style-type: none"> 1. A security company should be employed to guard the construction site and monitor access. This company should also be utilised for the operation phase. 2. Labour should be transported to and from the site to discourage loitering in adjacent areas and possible increase in crime or disturbance. 3. Unsocial activities such as consumption or illegal selling of alcohol, drug utilisation or selling and prostitution on site shall be prohibited. Any persons found to be engaged in such activities should receive disciplinary or criminal action taken against them. 4. Only pre-approved staff must be permitted to stay within the staff accommodation which will be provided. 5. The site shall be fenced, where necessary to prevent any loss or injury to persons during the construction phase. 6. No alcohol/ drugs are to be present or taken on site. 7. No firearms allowed on site or in vehicles transporting staff to / from site (unless used by security personnel). 8. No harvesting of firewood from the site or from the business property adjacent to it without prior consent from the ECO. 	

	<p>9. Construction staff are to make use of the facilities provided for them, as opposed to ad-hoc alternatives (e.g. fires for cooking, the use of surrounding bush as a toilet facility are forbidden).</p> <p>10. Trespassing on private / commercial properties adjoining the site is forbidden.</p> <p>11. Driving under the influence of alcohol is prohibited.</p> <p>12. All employees must undergo the necessary safety training and wear the necessary protective clothing.</p> <p>13. The site must be secured in order to reduce the opportunity for criminal activity in the locality of the construction site.</p>	
--	--	--

2.4.20 Social Environment

Table 30: Social Environment

IMPACT	SOCIAL ENVIRONMENT This section deals with social environment and actions that need to be implemented during construction	RESPONSIBILITY
PHASE	CONSTRUCTION	MC /ELO
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	<p>1. All contact with the affected parties shall be courteous at all times. The rights of the affected parties shall be respected at all times.</p> <p>2. A complaints register should be kept on site. Details of complaints should be incorporated into the audits as part of the monitoring process. This should be in carbon copy format, with numbered pages. Any missing pages must be accounted for by the Contractor.</p> <p>3. Damage to infrastructure shall not be tolerated and any damage shall</p>	

	<p>be rectified immediately by the Contractor. A record of all damage and remedial actions shall be kept on site.</p> <p>4. Care must be taken not to damage irrigation equipment, lines, channels and crops.</p>	
SITE SPECIFIC MITIGATION		
Security	<ol style="list-style-type: none"> 1. Problem areas that are brought under the attention of the contractor should be rectified immediately. If the contractor is unable to do so, this should be communicated to the landowner along with a plan on how and when the problem will be addressed. The landowner should be given regular feedback on the matter. 2. All mitigation measures contained in the EMP should be implemented and monitored by an ECO. Remedial action should be taken where the contractor fails to comply with the EMP. 	
Roads	<ol style="list-style-type: none"> 1. Construction traffic should only make use of an approved route. 2. The number of trucks that pass through communities should be kept to a minimum and should be restricted to certain times of the day. 3. General road rules should be enforced. 	
Influx of construction workers	<ol style="list-style-type: none"> 1. Alert local businesses to the fact that construction workers will move into the area to enable local businesses to plan for the extra demand. 	
Influx of job seekers	<ol style="list-style-type: none"> 1. Ensure that employment procedures/ policy are communicated to local stakeholders, especially community representative organisations. 2. Have clear rules and regulations for access to the camp / site office to control loitering. Consult with the local police to establish standard operating procedures for the control and/or removal of loiterers at the construction site. 3. Construction workers should be clearly identifiable by wearing proper construction uniforms displaying the logo of the construction company. 	

	Construction workers could also be issued with identification tags.	
Outflow of labourers	<ol style="list-style-type: none"> 1. Implement methods (posters, talks, etc.) to create HIV and STD awareness amongst construction workers. 2. Payment should comply with applicable Labour Law legislation in terms of minimum wages. 	
Direct formal employment opportunities for local individuals	<ol style="list-style-type: none"> 1. Unskilled job opportunities should be afforded to local community members. Local trade unions could assist with the recruitment process to counteract the potential for social mobilisation. 2. Equal opportunities for employment should be created to ensure that the local female population also has access to these opportunities. Females should be encouraged to apply for positions. 3. Individuals with the potential to develop their skills should be afforded training opportunities. 4. Mechanisms should be developed to provide alternative solutions for creating job security upon completion of the project. This could include formal and/or informal training on how to look for alternative employment, information on career progression, etc. to ensure that people are equipped to seek other jobs with the skills that they have gained. 5. Payment should comply with applicable Labour Law legislation in terms of minimum wages. 	
Indirect formal and/or informal employment opportunities for local individuals	<ol style="list-style-type: none"> 1. Develop a procurement policy that is easy to understand and ensure that local subcontractors also comply with the procurement policy and any other applicable policies. 2. Ensure that local subcontractors receive the necessary support in terms of resources. 3. Agree on specific performance criteria prior to appointment. 4. Identify the segment that might benefit from informal indirect 	

	<p>opportunities, and assist them with skills development and subsidise initiatives that are sustainable.</p> <ol style="list-style-type: none"> 5. Encourage construction workers to use local services. 6. Consider housing construction workers in local communities. 	
Attitude formation against the project	<ol style="list-style-type: none"> 1. Transparent information should be supplied to the community from the outset of the project. 2. The local community should play an active participatory role in the planning process. This could be achieved by means of establishing a community forum that meet quarterly or once a month to discuss issues and progress surrounding the project. 3. Employment opportunities should first be offered to the local community if the skills are available within the community. 4. The undertakings in the EMPR should also be implemented effectively and with due diligence. 	
Disaster Management Plan	<ol style="list-style-type: none"> 1. Develop and implement a disaster management plan for implementation during the construction and operation phase. 2. Identify suitable individuals that can be trained and used as first aid officers on site. Training of these individuals should ideally take place during this phase of the project to ensure that qualified first aid officers are on site once construction commences. 3. Establish a fully functional and equipped disaster management centre. 4. Establish disaster prevention programmes that focus on the most vulnerable communities – and, at the same time, support sustainable livelihoods; 5. Establish and maintain fire protection around the wind farm; 6. The way in which the disaster management plan is communicated to the surrounding communities and/or households should be jargon-free and outline an easy to follow step-by-step procedure. Cognisance 	

	<p>should be taken of the fact that some members of the surrounding communities and/or households are illiterate – make use of alternative communication methods (e.g. picture posters) to educate and inform these individuals;</p> <p>7. Where possible, markers should display the emergency contact number.</p>	
Pollution and fire risk	<p>1. Sufficient portable chemical toilets on site during construction only until permanent toilets are established.</p> <p>2. Refuse on site should be discarded in sealed bins and/or covered skips. Refuse should be removed from the site on regular intervals (at least once a week) and disposed of at an approved waste disposal site.</p> <p>3. Construction workers should only be allowed to make fire in designated areas. Construction workers who do not keep within designated areas should be fined.</p>	
Sanitation	<p>1. Construction workers should receive medical advice regarding correct sanitation and should receive medical attention where required.</p> <p>2. Adequate water facilities should be provided.</p>	
Third party tampering	<p>1. Ensure that physical security systems and emergency tactical response measures are adequate and effective.</p> <p>2. Fence off and control access to key facilities on the development.</p>	
Increase in crime	<p>1. Consultation with the Police and local authorities.</p>	

2.4.21 Heritage

Table 31: Heritage

IMPACT	CULTURAL AND HERITAGE ARTEFACTS This section deals with the impact that the new development has on potential archaeological artefacts of the site	RESPONSIBILITY
PHASE	CONSTRUCTION	MC /ELO
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION METHOD STATEMENT	<ol style="list-style-type: none"> 1. Any finds must be reported to the nearest National Monuments office to comply with the National Heritage Resources Act (Act No 25 of 1999) and to DEA. 2. Local museums as well as the South African Heritage Resource Agency (SAHRA) should be informed if any artefacts are uncovered in the affected area. 3. The contractor must ensure that his workforce is aware of the necessity of reporting any possible historical or archaeological finds to the ECO so that appropriate action can be taken. 4. Any discovered artefacts shall not be removed under any circumstances. Any destruction of a site can only be allowed once a permit is obtained and the site has been mapped and noted. Permits shall be obtained from the South African Heritage Resources Association (SAHRA) should the proposed site affect any world heritage sites or if any heritage sites are to be destroyed or altered. 5. Should any archaeological sites / graves be uncovered during construction, their existence shall be reported to MRP immediately. 	
	SITE SPECIFIC MITIGATION MEASURES	

	<ol style="list-style-type: none"> 1. Known sites should be clearly marked in order that they can be avoided during construction activities. 2. The contractors and workers should be notified that archaeological sites might be exposed during the construction activities. 3. Should any heritage artefacts be exposed during excavation, work on the area where the artefacts were discovered, shall cease immediately and the Environmental Control Officer shall be notified as soon as possible; 4. All discoveries shall be reported immediately to a heritage practitioner so that an investigation and evaluation of the finds can be made. Acting upon advice from these specialists, the Environmental Control Officer will advise the necessary actions to be taken; 5. Under no circumstances shall any artefacts be removed, destroyed or interfered with by anyone on the site; and 6. Contractors and workers shall be advised of the penalties associated with the unlawful removal of cultural, historical, archaeological or palaeontological artefacts, as set out in the National Heritage Resources Act (Act No. 25 of 1999), Section 51. (1). In order to achieve this, the following should be in place: <ul style="list-style-type: none"> ▪ A person or entity, e.g. the Environmental Control Officer, should be tasked to take responsibility for the heritage sites and should be held accountable for any damage. ▪ Known sites should be located and isolated, e.g. by fencing them off. All construction workers should be informed that these are no-go areas, unless accompanied by the individual or persons representing the Environmental Control Officer as identified above. ▪ In areas where the vegetation is threatening the heritage 	
--	--	--

	sites, e.g. growing trees pushing walls over, it should be removed, but only after permission for the methods proposed has been granted by SAHRA. A heritage official should be part of the team executing these measures.	
--	--	--

2.4.22 Community Engagement

Table 32: Community Engagement

IMPACT	COMMUNITY ENGAGEMENT This section deals with surrounding community and actions that need to be implemented during construction	RESPONSIBILITY
PHASE	CONSTRUCTION	ELO
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	<ol style="list-style-type: none"> 1. A communication guideline to be drafted and agreed upon with authority representatives and affected communities. 2. Open and transparent community engagement to be followed as culturally appropriate. 3. Records (written) are to be kept of all community engagements (e.g. complaints, resolutions, etc). 	

2.4.23 Visual Impact

Table 33: Visual Impact

IMPACT	VISUAL This section deals with visual issues and actions that need to be implemented during construction	RESPONSIBILITY
PHASE	CONSTRUCTION	ELO/ LA
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION METHOD STATEMENT /	<ol style="list-style-type: none"> 1. Construction activities must not occur at night and lighting should only be erected where absolutely necessary 2. Construction traffic must stick to designated routes or access roads; 3. Construction areas are to be kept clean and tidy 4. Measures must be taken to suppress dust arising from construction activities 5. Labour being transported to the site must take cognisance of litter and waste concerns 6. Equipment being transported to the site must be covered with tarps should they be fines etc 7. Topsoil stockpiles must be well managed and seeded when possible if not utilised within three months 8. It is recommended that equipment be stored discreetly so as not to increase visual impacts 9. Construction must be conducted in the shortest possible time in order to reduce visual impacts. 	
	SITE SPECIFIC MITIGATION MEASURES	
	<ol style="list-style-type: none"> 10. Make use of fittings that focus the light and prevent light spill. 11. Direct perimeter lighting in a downward direction toward the site. 	

	<p>12. Limit the use of flood lighting where possible.</p> <p>13. Limit construction activities to day-time hours in order to prevent night lighting during construction.</p> <p>14. Bury cables under the ground where possible.</p> <p>15. New overhead power lines should be aligned to follow exiting power lines or other infrastructure, such as roads.</p> <p>16. Buildings should be painted with natural tones that fit with the surrounding environment</p> <p>17. Select the alternative for the substation and operation and maintenance building that will have the least impact on visual receptors.</p> <p>18. Do not locate any turbines within 500m from an existing dwelling.</p> <p>19. Bury cables under the ground where possible.</p> <p>20. New overhead power lines should be aligned to follow exiting power lines or other infrastructure, such as roads.</p> <p>21. Buildings should be painted with natural tones that fit with the surrounding environment.</p>	
--	--	--

2.5 Operation Phase

2.5.1 Construction Site Decommissioning

Table 34: Construction Site Decommissioning

IMPACT	CONSTRUCTION SITE DECOMMISSIONING	RESPONSIBILITY
PHASE	OPERATION	Main contractor / Developer / ECO / ELO
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	<p>Removal of equipment</p> <ol style="list-style-type: none"> 1. All structures comprising the construction camp are to be removed from site. 2. The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc, and these shall be cleaned up. 3. All hardened surfaces within the construction camp area should be ripped, all imported materials removed, and the area shall be top soiled and regressed using the guidelines set out in the re-vegetation that forms part of this document. <p>Temporary services</p> <ol style="list-style-type: none"> 4. The Contractor must arrange the cancellation of all temporary services. 5. Temporary roads must be closed and access across these, blocked. 6. All areas where temporary services were installed are to be rehabilitated to the satisfaction of the ECO. 	

	<p>Associated infrastructure</p> <ol style="list-style-type: none"> 7. Surfaces are to be checked for waste products from activities such as concreting or asphaltting and cleared in a manner approved by the Engineer. 8. All surfaces hardened due to construction activities are to be ripped and imported material thereon removed. 9. All rubble is to be removed from the site to an approved disposal site as approved by the Engineer. Burying of rubble on site is prohibited. 10. The site is to be cleared of all litter. 11. The Contractor is to check that all watercourses are free from building rubble, spoil materials and waste materials. 12. Fences, barriers and demarcations associated with the construction phase are to be removed from the site unless stipulated otherwise by the Engineer. 13. All residual stockpiles must be removed to spoil or spread on site as directed by the Engineer. 14. All leftover building materials must be returned to the depot or removed from the site. 15. The Contractor must repair any damage that the construction works has caused to neighbouring properties, specifically, but not limited to, damage caused by poor storm water management. <p>Rehabilitation plan</p> <ol style="list-style-type: none"> 16. Rehabilitate and re-vegetate cleared areas with indigenous plant species. 	
--	---	--

2.5.2 Operation and Maintenance

Table 35: Operation and Maintenance

IMPACT	OPERATION AND MAINTENANCE	RESPONSIBILITY
PHASE	OPERATION	Developer
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	<p>Maintenance</p> <ol style="list-style-type: none"> 1. All applicable standards, legislation, policies and procedures must be adhered to during operation. 2. Regular ground inspection of the power plants must take place to monitor their status. <p>Public awareness</p> <ol style="list-style-type: none"> 3. The emergency preparedness plan must be ready for implementation at all times should an emergency situation arise. 	

2.5.3 Surface and Groundwater

Table 36: Surface and Groundwater

IMPACT	SURFACE AND GROUNDWATER	RESPONSIBILITY
PHASE	OPERATION	Developer
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	<p>Surface water</p> <ol style="list-style-type: none"> 1. Correct drainage of the site should ensure that contaminants do not impact upon surface water. 2. The stormwater system on the proposed site needs to be regularly maintained to ensure effective working. <p>Monitoring and Reporting</p> <ol style="list-style-type: none"> 3. Specific activities that should be monitored include: <ul style="list-style-type: none"> ▪ Erosion potential (specifically in and around roads and storm-water discharge points). ▪ Stormwater management and design ▪ Identified problem areas 	
	SITE SPECIFIC MITIGATION MEASURES	
	<ol style="list-style-type: none"> 1. Use of Existing Roads - It is crucial that existing roads are used so that damage is limited. Where new access roads are required and the necessary authorisations and licences are obtained (i.e. water use licence and environmental authorisation), these roads must be limited in extent (i.e. go directly to the desired tower) and will need to be maintained. 2. Ideally, if access roads are required inside the watercourses, coarse gravel should be used. This material will not erode away easily after 	

	<p>rainfall events and will provide a relatively solid foundation when surface water accumulates.</p> <ol style="list-style-type: none"> 3. If dirt roads will be the means of access, these will have to be regularly monitored and checked for erosion. Monitoring should be conducted on a weekly to monthly basis. Moreover, after short or long periods of heavy rainfall or after long periods of sustained rainfall, the roads will need to be checked for erosion and the necessary rehabilitation measures will need to be employed. 4. Where erosion begins to take place, this must be dealt with immediately to prevent severe erosion damage to the watercourses and the associated buffer zones. Should large scale erosion occur, a rehabilitation plan will be required. Input from a suitably qualified wetland or aquatic specialist must be obtained. 5. Operation Phase Stormwater Management Plan - The development and implementation of an adequate storm water management plan to be designed by an appropriate engineer for the operation phase of the proposed development will assist in formulating adequate measures to address any potential stormwater impacts from occurring. Here, the engineer should account for both natural run-off (that which can be released into the natural landscape with no detrimental effect) and excess artificial run-off generated over the exposed bare construction laydown areas. In order to prevent acceleration of stormwater run-off, energy dissipating structures can be used. Such structures can reduce the amount and rate of excess run-off generated by the proposed development entering wetlands and thereby prevent the onset of erosion. 6. Stormwater management structures or devices should also take into account the potential for sedimentation and siltation effects associated 	
--	---	--

	with stormwater run-off. In this instance, exposed bare areas should be contained by silt fencing or other appropriate devices or materials to trap sediment and dissipate stormwater run-off.	
--	--	--

2.5.4 Biodiversity

Table 37: Biodiversity

IMPACT	BIODIVERSITY (FAUNA AND FLORA)	RESPONSIBILITY
PHASE	OPERATION	Developer
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	<p>Vegetation</p> <ol style="list-style-type: none"> 1. Indigenous vegetation must be maintained and all exotics removed as they appear and disposed off appropriately. 2. Re-vegetation of the disturbed site is aimed at approximating as near as possible the natural vegetative conditions prevailing prior to construction. 3. Vegetative re-establishment shall, as far as possible, make use of indigenous or locally occurring plant varieties within a 20-metre radius of the site. 4. Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas during and following rehabilitation. <p>Other fauna</p>	

	5. No faunal species must be harmed by maintenance staff during any routine maintenance at the development.	
	SITE SPECIFIC MITIGATION MEASURES	
	<ol style="list-style-type: none"> 1. Six monthly checks of the area should take place for the emergence of invader species. 2. Mitigation measures mentioned for the construction phase above must be implemented for any maintenance of the development that may be undertaken during the operation phase. 3. Correct rehabilitation with locally indigenous species. 4. Monitoring programme to ensure that rehabilitation efforts are successful to ensure that risks such as erosion and the edge effect are avoided. 5. Constant maintenance of the area to ensure re-colonisation of floral species. 6. Regular removal of alien species which may jeopardise the proliferation of indigenous species. 	

2.5.5 Waste Management

Table 38: Waste Management

IMPACT	WASTE MANAGEMENT	RESPONSIBILITY
PHASE	OPERATION	Developer
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	<i>Recycling and litter management</i> <ol style="list-style-type: none"> 1. The site should be kept clear of litter at all times. 	

	<ol style="list-style-type: none"> 2. Solid waste separation and recycling should take place for the duration of the operational phase for the development at the administration block. 3. All waste must be removed promptly to ensure that it does not attract vermin or produce odours. 4. In house treatment procedures must be followed strictly. 5. Solid waste should be collected on a regular basis. 6. Package treatment plant must be regularly serviced. 	
--	---	--

2.5.6 Health and Safety

Table 39: Health and Safety

IMPACT	HEALTH AND SAFETY	RESPONSIBILITY
PHASE	OPERATION	Developer
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	<p>Emergency evacuation plan</p> <ol style="list-style-type: none"> 1. Upon completion of the construction phase, an emergency evacuation plan must be drawn up to ensure the safety of the staff and surrounding land users in the case of an emergency. <p>Maintenance</p> <ol style="list-style-type: none"> 2. The wind farm is to be regularly maintained. A maintenance schedule must be drawn up and records of all maintenance kept. <p>Fire safety</p> <ol style="list-style-type: none"> 3. Fire fighting equipment in the form of fire hydrants or fire 	

IMPACT	HEALTH AND SAFETY	RESPONSIBILITY
	<p>extinguishers must be available on the site. These must be regularly maintained by an appropriate company.</p> <p>Storage and handling of hazardous waste</p> <ol style="list-style-type: none"> Transformer oil containers must be regularly maintained to ensure that leaks do not occur. A spill kit needs to be kept on site to address any unforeseen spillages. Transport of all hazardous substances must be in accordance with the relevant legislation. The bund wall surrounding the transformer oil containers must be regularly maintained to ensure that any spills are completely contained. 	

2.5.7 Visual Impact

Table 40: Visual Impact

IMPACT	VISUAL IMPACT	RESPONSIBILITY
PHASE	OPERATION	Developer
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	<p>Maintenance and lighting</p> <ol style="list-style-type: none"> Lighting must be kept to a minimum and restricted to low level, downward facing lights to reduce light spill; Lighting must be inward and downward pointing to reduce glare in surrounding areas. The wind farm area and surrounds must be kept clean, tidy and 	

IMPACT	VISUAL IMPACT	RESPONSIBILITY
	<p>well maintained to reduce negative visual impacts;</p> <p>4. Rehabilitation of surrounding areas must take place with indigenous species;</p> <p>5. Surrounding roads must be well maintained;</p> <p>6. Regular maintenance of exteriors and associated infrastructure must be undertaken.</p>	

2.5.8 Bats

Table 41: Bats Impact

IMPACT	BATS	RESPONSIBILITY
	This section deals with avi-faunal issues and actions that need to be implemented during construction	
PHASE	OPERATION	Developer
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION METHOD STATEMENT	1. Should mortality monitoring over 6 months or less indicate bat mortalities that are alarming according to the specialist's opinion, the implementation of curtailment will be required	

2.5.9 *Avi-fauna*

Table 42: Avi-fauna

IMPACT	AVI-FAUNA	RESPONSIBILITY
PHASE	OPERATION	Developer
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	<ol style="list-style-type: none"> Once the turbines have been construction monitoring should be implemented to compare actual collision rates with predicted collision rates. If actual collision rates indicate high mortality levels, the following mitigation measures will have to be considered: <ul style="list-style-type: none"> Negotiating appropriate off-set compensation for turbine related collision mortality; As a last resort, halting operation of specific turbines during peak flight periods, or reducing rotor speed, to reduce the risk of collision mortality. A 250m no-turbine zone should be implemented around the existing Greater Kestrel nest. This should reduce the risk of the fledglings flying into the turbines when they start to fly. Maintenance staff should not be allowed to access other parts of the property unless it is necessary for wind farm related work. If actual displacement levels of priority species prove to be high, particularly Red Lark, appropriate off-sets should be considered. The proposed power line should be routed as far as possible from high risk areas, specifically from the pan that borders on the north-western part of the study area. In addition, the entire line should be marked with Bird Flight Diverters, to reduce the risk of collisions of specifically Ludwig's Bustard. 	

	5. The proposed pole design must be assessed to ensure that the power line design poses no potential electrocution risk of large raptors, particularly Martial Eagle, which may use the poles as hunting perches.	
--	---	--

2.5.10 Social

Table 43: Social

IMPACT	SOCIAL	RESPONSIBILITY
PHASE	OPERATION	Developer
ENVIRONMENTAL MANAGEMENT PROGRAMME		
	SITE SPECIFIC MITIGATION MEASURES	
MITIGATION	<ol style="list-style-type: none"> 1. Linking new and existing local businesses to the supply chain of the wind farm 2. Using the most effective community structures for the trust fund, inclusion of existing structures, transparent rules in allocating funds, prioritisation according to community needs and building on existing regional synergies 3. The impact on livelihoods should be monitored and evaluated before and after the construction of the wind farm. 	

2.5.11 Noise

Table 44: Noise

IMPACT	NOISE	RESPONSIBILITY
PHASE	OPERATION	Developer
ENVIRONMENTAL MANAGEMENT PROGRAMME		
	SITE SPECIFIC MITIGATION MEASURES	
MITIGATION	<p>Mitigation measures that could be considered around NSD01 before the development of this wind energy facility would include:</p> <ol style="list-style-type: none"> 1. The selection of a different make and model of wind turbine; 2. Ensuring a larger setback around the potentially sensitive receptors taking cognisance of prevailing wind directions; 3. The developer should discuss the findings of this report with NSD01, and if required by this NSD, turbines 107 should be relocated further than 1,000 meters from this NSD. 4. The developer can consider larger wind turbines which would require less wind turbines for the same power generation potential, but increase the buffer zone with an appropriate level. Should the developer select to use a larger or different wind turbine the noise impact assessment should again review the potential noise impact if any wind turbines are closer than 1,500 meters from any NSDs; 5. A combination of the above options such as the use of more quiet wind turbine closer to potential noise sensitive developments, larger (and possibly louder) machines further from the NSDs, possibly with an increased setback. <p>Mitigation measures that would reduce a potential noise impact after the implementation of the facility includes (if a reasonable</p>	

	<p>noise complaint is registered):</p> <ol style="list-style-type: none"> 1. Operating all, or selected wind turbines in a different mode. Most manufacturers allow the turbines to be operated in a different mode. This allows the wind turbine generator to operate more silently, albeit with a slight reduction of electrical power generation capability. 2. Problematic wind turbines could also be disabled, or the rotational speeds significantly decreased during periods when a quieter environment is desired (and reasonable complaints registered). <p>In addition:</p> <ol style="list-style-type: none"> 1. Good public relations are essential. At all stages surrounding receptors should be educated with respect to the sound generated by wind turbines. The information presented to stakeholders should be factual and should not set unrealistic expectations. It is counterproductive to suggest that the wind turbines will be inaudible, or to use vague terms like “quiet”. Modern wind turbines produce a sound due to the aerodynamic interaction of the wind with the turbine blades, audible as a “swoosh”, which can be heard at some distance from the turbines. The magnitude of the sound will depend on a multitude of variables and will vary from day to day and from place to place with environmental and operational conditions. Audibility is distinct from the sound level, because it depends on the relationship between the sound level from the wind turbines and the ambient background sound level. 2. Community involvement needs to continue throughout the project. Annoyance is a complicated psychological phenomenon; as with many industrial operations, expressed annoyance with sound can reflect an overall annoyance with the project, rather than a rational 	
--	---	--

	<p>reaction to the sound itself. Wind projects offer a benefit to the environment and the energy supply for the greater population, and offer economic benefits to the land owners leasing installation sites to the wind farm. A positive community attitude throughout the greater area should be fostered, particularly with those residents near the wind farm, to ensure they do not feel that advantage have been taken of them.</p> <p>3. The developer must implement a line of communication (i.e. a help line where complaints could be lodged. All potential sensitive receptors should be made aware of these contact numbers. The Wind Energy Facility should maintain a commitment to the local community and respond to concerns in an expedient fashion. Sporadic and legitimate noise complaints could develop. For example, sudden and sharp increases in sound levels could result from mechanical malfunctions or perforations or slits in the blades. Problems of this nature can be corrected quickly, and it is in the developer's interest to do so</p>	
--	---	--

2.6 Decommissioning phase

The mitigation measures presented below are of relevance to the decommissioning of the wind farm. Furthermore, mitigation measures implemented during construction with regards to the construction camp and equipment will remain the same for the decommissioning phase when a construction camp will need to be established again.

2.6.1 Ongoing Stakeholder involvement

This is the process that is recommended when the proposed wind farms are decommissioned.

Table 45: Ongoing Stakeholder involvement

IMPACT	ONGOING STAKEHOLDER INVOLVEMENT	RESPONSIBILITY
PHASE	DECOMMISSIONING	MAINSTREAM
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	<ol style="list-style-type: none"> 1. Community to be notified, as culturally appropriate, timeously of the planned decommissioning, e.g.: <ul style="list-style-type: none"> ▪ Proposed decommissioning start date; and ▪ Process to be followed. 2. Recommend that a meeting with community leader(s) be held before decommissioning commence to inform them: <ul style="list-style-type: none"> ▪ What activities will take place during the decommissioning phase. ▪ How these activities will impact upon the communities and/or their properties. ▪ Regarding the timeframes of scheduled activities 3. Regular interaction between Mainstream and community leader(s) during the decommissioning phase 4. A reporting office/ channel to be established should community members experience problems with contractors/ sub-contractors during the decommissioning phase. 5. A register to be kept of problems reported by community members and the steps taken to address / resolve it. 	

2.6.2 Community health and safety

Table 46: Community health and safety

IMPACT	COMMUNITY HEALTH AND SAFETY	RESPONSIBILITY
PHASE	DECOMMISSIONING	MAINSTREAM
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	<ol style="list-style-type: none"> 1. Demarcated routes to be established for construction vehicles to ensure the safety of communities, especially in terms of road safety and communities to be informed of these demarcated routes. 2. Where dust is generated by trucks passing on gravel roads, dust mitigation to be enforced. 3. Any infrastructure that would not be decommissioned must be appropriately locked and/or fenced off to ensure that it does not pose any danger to the community. 	

2.6.3 Waste Management

Table 47: Waste Management

IMPACT	WASTE MANAGEMENT	RESPONSIBILITY
PHASE	DECOMMISSIONING	MAINSTREAM
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	<ol style="list-style-type: none"> 1. All decommissioned equipment must be removed from site and disposed of at a registered land fill. Records of disposal must be kept. 2. Wind turbines must be returned to the manufacturer to be recycled. 	

2.6.4 Surface and Groundwater

Table 48: Surface and Groundwater

IMPACT	SURFACE AND GROUNDWATER	RESPONSIBILITY
PHASE	DECOMMISSIONING	MAINSTREAM
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	<ol style="list-style-type: none"> 1. Removal of any historically contaminated soil as hazardous waste must be undertaken. 2. Removal of hydrocarbons and other hazardous substances by a suitable contractor to reduce contamination risks must be undertaken. 3. Removal of all substances which can result in groundwater (or surface water) contamination must be undertaken. 4. Re-vegetation of exposed soil surfaces to ensure no erosion in these areas is to be undertaken. 	

2.6.5 Biodiversity

Table 49: Biodiversity

IMPACT	BIODIVERSITY	RESPONSIBILITY
PHASE	DECOMMISSIONING	MAINSTREAM
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	<ol style="list-style-type: none"> 1. Rehabilitation of exposed surfaces with indigenous species. 2. Adherence to surface and groundwater mitigation measures to prevent secondary impacts on biodiversity 3. Prevention of expansion of current footprints 	

2.6.6 Air Quality

Table 50: Air Pollution

IMPACT	AIR POLLUTION	RESPONSIBILITY
PHASE	DECOMMISSIONING	MAINSTREAM
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	1. Regular maintenance of equipment to ensure reduced exhaust emissions	

3 MANAGEMENT PLANS REQUESTED BY DEA

3.1 Alien Invasive Management Plan

Table 51: Alien Invasive Management Plan

ALIEN INVASIVE MANAGEMENT PROGRAMME	
MITIGATION MEASURES	<ol style="list-style-type: none">1. Stockpiles should be kept clear of weeds and alien vegetation growth by regular weeding.2. Alien vegetation and the spread of exotic species on the site will need to be controlled.3. The contractor should be responsible for implementing a programme of weed control (particularly in areas where soil has been disturbed); and grassing of any remaining stockpiles to prevent weed invasion.4. Herbicide use shall only be allowed according to contract specifications. The application shall be according to set specifications and under supervision of a qualified technician. The possibility of leaching into the surrounding environment shall be properly investigated and only environmentally friendly herbicides shall be used.5. The use of pesticides and herbicides on the site must be discouraged as these can impact on important pollinator species of indigenous vegetation.6. Six monthly checks of the area should take place for the emergence of invader species.7. Mitigation measures mentioned for the construction phase above must be implemented for any maintenance of the development that may be undertaken during the operation phase.8. Correct rehabilitation with locally indigenous species.9. Monitoring programme to ensure that rehabilitation efforts are successful to ensure that risks such as erosion, spread of exotic species and the edge effect are avoided.10. Constant maintenance of the area to ensure re-colonisation of floral species.11. Regular removal of alien species which may jeopardise the proliferation of indigenous species.

3.2 Plant Rescue Protection Plan

Table 52: Plant Rescue Protection Plan

PLANT RESCUE PROTECTION PLAN	
MITIGATION MEASURES	<ol style="list-style-type: none"> 1. Vegetation removal must be limited to the wind farm construction site 2. Vegetation to be removed as it becomes necessary rather than removal of all vegetation throughout the site in one step 3. Materials should not be delivered to the site prematurely which could result in additional areas being cleared or affected. 4. No vegetation to be used for firewood. 5. Gathering of firewood, fruit, muti plants, or any other natural material onsite or in areas adjacent to the site is prohibited unless with prior approval of the ECO. 6. Only vegetation within the study area must be removed. 7. Vegetation removal must be phased in order to reduce impact of construction. 8. Construction site office and laydown areas must be clearly demarcated and no encroachment must occur beyond demarcated areas. 9. All natural areas impacted during construction must be rehabilitated with locally indigenous plant species. 10. A buffer zone should be established in areas where construction will not take place to ensure that construction activities do not extend into these areas. 11. Construction areas must be well demarcated and these areas strictly adhered to. 12. The use of pesticides and herbicides in the study area must be discouraged as these impacts on important pollinator species of indigenous vegetation. 13. Soils must be kept free of petrochemical solutions that may be kept on site during construction. Spillage can result in a loss of soil functionality thus limiting the re-establishment of flora. 14. The grid access power line must span rocky areas in order to avoid transformation in these areas. 15. Soil stockpiles must not become contaminated with oil, diesel, petrol, garbage or any other

	material, which may inhibit the later growth of vegetation in the soil.
--	---

3.3 Re-Vegetation and Habitat Rehabilitation Plan

Table 53: Re-Vegetation and Habitat Rehabilitation Plan

RE-VEGETATION AND HABITAT REHABILITATION PLAN	
MITIGATION MEASURES	<ol style="list-style-type: none"> 1. Re-vegetation should aim to accelerate the natural succession processes so that the plant community develops in the desired way, i.e. promote rapid vegetation establishment 2. Re-vegetation of disturbed surfaces should occur immediately after construction activities are completed. This should be done through seeding with indigenous grasses. 3. All damaged areas shall be rehabilitated upon completion of the contract 4. Re-vegetation of the disturbed site is aimed at approximating as near as possible the natural vegetative conditions prevailing prior to construction. 5. All natural areas impacted during construction must be rehabilitated with locally indigenous species typical of the representative botanical unit. 6. Rehabilitation must take place in a phased approach as soon as possible. 7. Rehabilitation process must make use of species indigenous to the area. Seeds from surrounding seed banks can be used for re-seeding. 8. Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas. 9. Planting of indigenous tree species in areas not to be cultivated or built on must be encouraged. 10. Habitat destruction should be limited to what is absolutely necessary for the construction of the infrastructure, including the construction of new roads. In this respect, the recommendations from the Ecological Specialist Study should be applied strictly. Personnel should be adequately briefed on the need to restrict habitat destruction, and must be restricted to the actual construction area. 11. Monitoring programme to ensure that rehabilitation efforts are successful to ensure that risks such as erosion, spread of exotic species and the edge effect are avoided.

3.4 Open Space Management Plan

Table 54: Open Space Management Plan

OPEN SPACE MANAGEMENT PLAN	
MITIGATION MEASURES	<ol style="list-style-type: none"> 1. A buffer zone should be established in areas where construction will not take place to ensure that construction activities do not extend into these areas. 2. Vehicle movement should be restricted to authorised access roads 3. Before construction begins, all areas to be developed must be clearly demarcated with fencing or orange construction barrier where applicable. 4. All Construction Camps are to be fenced off in such a manner that unlawful entry is prevented and access is controlled. Signage shall be erected at all access points in compliance with all applicable occupational health and safety requirements. All access points to the Construction Camp should be controlled by a guard or otherwise monitored, to prevent unlawful access. 5. The contractor and ECO must ensure compliance with conditions described in the EA. 6. Records of compliance/ non-compliance with the conditions of the authorisation must be kept and be available on request. 7. Records of all environmental incidents must be maintained and a copy of these records be made available to provincial department on request throughout the project execution. 8. Site establishment shall take place in an orderly manner and all required amenities shall be installed at camp sites before the main workforce move onto site. 9. All construction equipment must be stored within this construction camp. 10. An area for the storage of hazardous materials must be established that conforms to the relevant safety requirements and that provides for spillage prevention and containment 11. The Contractor must provide sufficient ablution facilities, in the form of portable / VIP toilets, at the Construction Camps, and shall conform to all relevant health and safety standards and codes. No pit latrines, French drain systems or soak away systems shall be allowed and toilets

	<p>may not be situated within 100 meters of any surface water body or 1:100 year flood line. A sufficient number of toilets shall be provided to accommodate the number of personnel working in the area.</p> <p>12. The Contractor shall inform all site staff to make use of supplied ablution facilities and under no circumstances shall indiscriminate sanitary activities be allowed.</p> <p>13. No fires will be allowed and the Contractor must make alternative arrangements for heating. LP Gas may be used, provided that all required safety measures are in place. The Contractor shall take specific measures to prevent the spread of veld fires, caused by activities at the campsites. These measures may include appropriate instruction of employees about fire risks and the construction of firebreaks around the site perimeter.</p> <p>14. 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.</p> <p>15. Project manager shall ensure that the training and capabilities of the Contractor's site staff are adequate to carry out the designated tasks.</p> <p>16. 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.</p> <p>17. Staff must be trained in the hazards and required precautionary measures for dealing with these substances</p>
--	--

3.5 Erosion Management Plan

Table 55: Erosion Management Plan

EROSION MANAGEMENT PLAN	
MITIGATION MEASURES	<ol style="list-style-type: none"> 1. To prevent erosion, material stockpiled for long periods (2 weeks) should be retained in a bermed area. 2. Areas which are not to be constructed on within two months must not be cleared to reduce erosion risks. 3. The area to be cleared must be clearly demarcated and this footprint strictly maintained. 4. Spoil that is removed from the site must be removed to an approved spoil site or a licensed landfill site. 5. The necessary silt fences and erosion control measures must be implemented in areas where these risks are more prevalent. 6. Wind screening and stormwater control should be undertaken to prevent soil loss from the site. 7. The use of silt fences and sand bags must be implemented in areas that are susceptible to erosion. 8. Other erosion control measures that can be implemented are as follows: 9. Brush packing with cleared vegetation 10. Mulch or chip packing 11. Planting of vegetation 12. Hydroseeding / hand sowing 13. Sensitive areas need to be identified prior to construction so that the necessary precautions can be implemented. 14. All erosion control mechanisms need to be regularly maintained. 15. Seeding of topsoil and subsoil stockpiles to prevent wind and water erosion of soil surfaces. 16. Retention of vegetation where possible to avoid soil erosion 17. Vegetation clearance should be phased to ensure that the minimum area of soil is exposed to potential erosion at any one time.

	<p>18. Re-vegetation of disturbed surfaces should occur immediately after construction activities are completed. This should be done through seeding with indigenous grasses.</p> <p>19. No impediment to the natural water flow other than approved erosion control works is permitted.</p> <p>20. To prevent stormwater damage, the increase in stormwater run-off resulting from construction activities must be estimated and the drainage system assessed accordingly. \</p> <p>21. Stockpiles not used in three (3) months after stripping must be seeded to prevent dust and erosion.</p>
--	--

4 CONCLUSION

The environmental and social impacts of the project were identified through the four project phases (pre-construction, construction, operation and decommissioning). Both positive and negative project impacts were identified. The following section briefly describes some of the major impacts and proposed mitigation measures within each of the project phases.

4.1 Pre-Construction Phase

The first site activities before mobilization of equipment will be a survey, required for final design of wind farm foundations. There will be negative impacts on land associated with the construction of camps (temporary loss) and storage of construction materials, and foundations for the buildings (permanent loss) and wind turbines. Expectations of improvement in livelihood among locals should be addressed through public participation. Construction contracts will include environmental monitoring and management procedures and requirements. These must be in place prior to the commencement of any construction activities. Avifauna and Bat Monitoring programmes have been initiated to document the current baseline of Avifauna and bat activity on the site and the area surrounding the site.

4.2 Construction Phase

This phase of the activity will have both positive and negative impacts. The positive impacts are employment opportunities offered to the construction workers and any other labourer who will be hired to provide their services during the construction phase. The negative impacts would include wastes generated, accidents, health and safety, air, dust and noise pollution, vegetation clearance, soil erosion, socio-environmental issues, loss of vegetation, and compaction of soil. Most of the negative impacts are minor and temporary and the significance of the impacts can be greatly reduced by the implementation of mitigation measures, which are outlined in this EMPr. The contractor shall ensure that all staff have adequate protective clothing and are adequately trained. Avifauna and Bat Monitoring should be initiated to document the impact of the construction phase on Avifauna and bat activity on the site and the area surrounding the site.

4.3 Operational Phase

The proposed project will have minimal negative effects which mainly relates to loss of aesthetic value and habitat. The habitat that will be lost is not regarded as pristine and therefore, is not viewed as significant. Most of the negative impacts are minor and the significance of the impacts can be greatly reduced by the implementation of mitigation measures, which are outlined in this EMPr.

4.4 Decommissioning Phase

As with any project, the facilities used in this project will have a lifetime after which they may no longer be cost effective to continue with operation. At that time, the project would be decommissioned, and the existing equipment removed.

Potential environmental impacts caused during decommissioning are those, which will be mitigated as provided by the Environmental Management Programme. These include: noise and emissions to the surrounding environment, removal of hazardous waste and substances, fire, oil spills, wastes and public safety.

The disposal of materials from the decommissioned plant is not viewed as high risk. Much of the material would be recyclable (steel structures and panels, turbine engines etc.) or inert (concrete foundations, etc.). These materials would however, need to be disposed off at a formal waste disposal or recycling centre.

Based on the above information, it is unlikely that the Project will have significant adverse social and environmental impacts. Most adverse impacts will be of a temporary nature during the construction phase and can be managed to acceptable levels with implementation of the recommended mitigation measures for the Project such that the overall benefits from the Project will greatly outweigh the few adverse impacts.

All the negative impacts will either be moderate or lesser in rating and could be easily mitigated. Generally, the proposed wind farm will result in appreciable benefits to the people in the project area of influence and bring opportunities for development to the country.



Appendix A

Environmental Incidents

LOG Environmental Incident Log

[illegible]

Complaints Record Sheet

Complaints Record Sheet

COMPLAINTS RECORD SHEET	File Ref:	DATE:
	Page of
COMPLAINT RAISED BY:		
CAPACITY OF COMPLAINANT:		
COMPLAINT RECORDED BY:		
COMPLAINT:		
PROPOSED REMEDIAL ACTION:		
ECO: _____ Date: _____		
NOTES BY ECO:		
ECO: _____ Date: _____ Site Manager: _____ Date: _____		

Appendix B

Management of Soils: Guidelines

Topsoil

- Source of topsoil
 - Topsoil shall be stripped from all areas that are to be utilised during the construction period and where permanent structures and access is required. These areas will include temporary and permanent access roads, construction camps, and lay down areas. Topsoil shall be stripped after clearing of woody vegetation and before excavation or construction commences.
 - The topsoil is regarded as the top 300mm of the soil profile irrespective of the fertility appearance, structure, agricultural potential, fertility and composition of the soil.
- Topsoil stripping
 - Soil shall be stripped to a minimum depth of 150mm and maximum depth of 300mm or to the depth of bedrock where soil is shallower than 300mm. Herbaceous vegetation, overlying grass and other fine organic matter shall not be removed from the stripped soil.
 - No topsoil which has been stripped shall be buried or in any other way be rendered unsuitable for further use by mixing with spoil or by compaction using machinery.
 - Topsoil shall preferably be stripped when it is in a dry condition in order to prevent compaction.
- Topsoil stockpiling
 - The Consulting Engineer or Environmental Control Officer shall stockpile stripped topsoil in areas, which have been approved. Soil stockpiles may take the form of windrows.
 - To prevent erosion, material stockpiled for long periods (2 weeks) should be retained in a bermed area.
 - Topsoil, mulch and subsoil stockpiles must be placed in higher-lying areas of the site, and must not be positioned within stormwater channels or areas of ponding.
 - Topsoil stripped from different soil zones shall be stockpiled separately and clearly identified as such. Under no circumstances shall topsoil obtained from different soil zones be mixed.
 - Soil stockpiles shall not be higher than 2m or stored for a period longer than one year. The slopes of soil stockpiles shall not be steeper than 1 vertical to 2.5 horizontal.

- No vehicles shall be allowed access onto the stockpiles after they have been placed. Topsoil stockpiles shall be clearly demarcated in order to prevent vehicle access and for later identification when required.
 - Soil stockpiles must not become contaminated with oil, diesel, petrol, garbage or any other material, which may inhibit the later growth of vegetation in the soil.
 - After topsoil removal has been completed, the Contractor shall apply soil conservation measures to the stockpiles where and as directed by the Consulting Engineer or Environmental Control Officer. This may include the use of erosion control fabric or grass seeding.
- Topsoil replacement
 - Topsoil shall be replaced to a minimum depth of 75mm over all areas where it has been stripped and over disused borrow pits, after construction in those areas has ceased. Topsoil placement shall follow as soon as construction in an area has ceased.
 - All areas onto which topsoil is to be spread shall be graded to the approximate original landform with maximum slopes of 1:25 and shall be ripped prior to topsoil placement. The entire area shall be ripped parallel to the contours to a minimum depth of 300mm.
 - Topsoil shall be placed in the same soil zone from which it had been stripped. However, if there is insufficient topsoil available from a particular soil zone to produce the minimum specified depth, topsoil may be brought from other soil zones at the approval of the Consulting Engineer or Environmental Control Officer.
 - Where topsoil that has been stripped by the Contractor is insufficient to provide the minimum specified depth, the Contractor shall obtain suitable substitute material from other sources at no cost to the employer. The suitability of the substitute material shall be determined by means of soil analyses, which are acceptable to the Consulting Engineer or Environmental Control Officer.
 - No vehicles shall be allowed access onto or through topsoil after it has been reinstated.
 - After topsoil reinstatement is complete, cleared and stockpiled vegetative matter shall be spread randomly by hand over the top soiled area. The vegetative material must be replaced on the areas from where it has been removed.

Appendix C

Stormwater Management Plan



SiVEST Environmental Division

51 Wessels Road, Rivonia. 2128. South Africa
PO Box 2921, Rivonia. 2128. South Africa

Tel + 27 11 798 0600
Fax +27 11 803 7272
Email info@sivest.co.za
www.sivest.co.za

Contact Person: Kelly Tucker
Cell No.: +27 83 652 4017
Email: kellyt@sivest.co.za