
PROPOSED ABERDEEN 200MW WIND FARM & ASSOCIATED INFRASTRUCTURE, EASTERN CAPE PROVINCE

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

Submitted as part of the
Draft Environmental Impact Assessment Report
February 2015

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PROJECT DETAILS

- DEA Reference No.** : DEA Ref: 12/12/20/2211
- Title** : Environmental Impact Assessment Process
Draft Environmental Management Programme:
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in the Eastern Cape Province
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- Client** : Eskom Holdings SOC Limited
- Report Status** : Environmental Management Programme submitted as
part of the Draft Environmental Impact Assessment
Report

When used as a reference this report should be cited as: Savannah Environmental (2015) Draft Environmental Management Programme: Aberdeen Wind Energy Facility, located near Aberdeen in the Eastern Cape Province.

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DEFINITIONS AND TERMINOLOGY

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

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

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

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

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

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

Construction: Construction means the building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity as per the EIA Regulations. Construction begins with any activity which requires Environmental Authorisation.

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

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

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

Decommissioning: To take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it cannot be readily re-commissioned. This usually occurs at the end of the life of a facility.

Department/ the competent authority: Department of Environmental Affairs.

Development footprint: in respect of land, means any evidence of its physical transformation as a result of the undertaking of any activity.

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

Disturbing noise: A noise level that exceeds the ambient sound level measured continuously at the same measuring point by 7 dB or more.

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

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

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

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

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

- (i) The land, water and atmosphere of the earth;
- (ii) Micro-organisms, plant and animal life;
- (iii) Any part or combination of (i) and (ii) and the interrelationships among and between them; and

(iv) The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental assessment practitioner: An individual responsible for the planning, management and coordinating of environmental management plan or any other appropriate environmental instruments introduced by legislation.

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

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

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

Environmental management inspector: A person designated as an environmental management inspector in terms of Section 31B or 31C on the National Environmental Management Act 107 of 1998.

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

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

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

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

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

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

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

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

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

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

Pre-construction: The period prior to the commencement of construction, which may include activities which do not require Environmental Authorisation (e.g. geotechnical surveys).

Rare species: Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range.

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

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

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

Tower: The tower, which supports the nacelle to which the rotor is attached, is constructed from tubular steel or concrete. It is approximately 80 m to 140m tall. The nacelle and the rotor are attached to the top of the tower. The tower on which

a wind turbine is mounted is not just a support structure. It also raises the wind turbine so that its blades safely clear the ground and so it can reach the stronger winds at higher elevations. Larger wind turbines are usually mounted on towers ranging from 80 to 140 m tall. The tower must be strong enough to support the nacelle and blades, and to sustain vibration, wind loading and the overall weather elements for the lifetime of the wind turbine.

Waste: Is defined as follows:

- a) any substance, material or object, that is unwanted, rejected, abandoned, discarded or
- b) disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to this Act; or
- c) any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister by notice in the Gazette, but any waste or portion of waste, referred to in paragraphs (a) and (b), ceases to be a waste.

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

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

ABBREVIATIONS AND ACRONYMS

DEA	National Department of Environmental Affairs
DWS	Department of Water and Sanitation
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EO	Environmental Office
GG	Government Gazette
GN	Government Notice
Ha	Hectare
I&AP	Interested and Affected Party
km ²	Square kilometres
kV	Kilovolt
m ²	Square meters
m/s	Meters per second
MW	Mega Watt
NEMA	National Environmental Management Act (Act No 107 of 1998)
NHRA	National Heritage Resources Act (Act No 25 of 1999)
NIRP	National Integrated Resource Planning
NWA	National Water Act (Act No 36 of 1998)
PM	Project Manager
SHE	Safety, Health and Environment
SAHRA	South African Heritage Resources Agency
SANRAL	South African National Roads Agency Limited

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PROJECT DETAILS

CHAPTER 1

1.1. Overview of the Proposed Project

Eskom Holdings SOC (State Owned Company) **Limited** is proposing to establish a commercial wind energy facility and associated infrastructure on a site located approximately 24 km west of the town of Aberdeen in the Eastern Cape Province, within the Camdeboo Local Municipality. This proposed project will be referred to as the Aberdeen 200 MW Wind Farm. This development is proposed to comprise a cluster of up to 100 wind turbines (typically described as a wind energy facility or a wind farm) to be constructed over an area of approximately 8 198 ha in extent.

The site for the proposed Aberdeen Wind Farm falls within the Camdeboo Local Municipality in the Eastern Cape Province. The broader area (~8 198ha in extent) includes the following farm portions (refer to Figure 1.1).

- » RE of Portion 3 of Sambokdoorns 92
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- » RE of Sambokdoorns 92
- » Portion 2 of Klipdrift 73
- » Portion 2 of Farm 94, and
- » RE of Portion 2 of Farm 94

Wind turbines use the energy from the wind to generate electricity. In essence, the blades of the turbine are turned by the wind and the energy captured is converted into electrical energy and supplied to the electricity grid for use in homes and elsewhere.

Eskom will be considering various wind turbine technologies in order to maximise the capacity of the site. The worst case scenario, i.e. a wind turbine up to 3MW in capacity, has been considered in the EIA. Up to 100 wind turbines are proposed to be constructed on the site. Infrastructure which is required for such a facility includes, inter alia:

The project will include the following infrastructure:

- » A cluster of up to **100 wind turbines** to be constructed over an area of ~ **8 198 ha** in extent
 - * Installed capacity of up to 3 MW
 - * Hub height up to 140 m
 - * Rotor Diameter up to 140 m
 - * Maximum length of blades is 70 m

- » **Concrete foundations** to support the turbine towers (22m wide x 22m length x 3m deep)
- » **Mounting area** for erecting of each turbine (also referred to as a laydown area - 40m x 40 m)
- » **Cabling** between the turbines to be laid underground where practical
- » An on-site **substation** to facilitate the connection between the facility and the electricity grid (100 m x 100 m (including HV yard))
- » An overhead power line (400kV) feeding into Eskom's electricity grid at the Droërivier Substation, approximately 140 km from the site¹
- » Internal **access roads** between each wind turbines (permanent roads of approximately 6 m wide and 7m during construction)
- » **Borrow pits** within the site for the construction of access roads
- » **Office/Workshop** area for operations, maintenance and storage (approximately 100m x 100m).
- » **Information centre**
- » Ablution facilities and temporary **water storage** for construction and small storage for operation drinking water will be required at the site.

1.2. Conclusions and Recommendations of the EIA

This EMP has been developed based on the findings of the Environmental Impact Assessment (EIA) (Savannah Environmental, 2015), and must be implemented to protect sensitive on-site and off-site features through controlling construction and operation activities that could have a detrimental effect on the environment, and through avoiding or minimising potential impacts.

The construction of the Aberdeen Wind Farm will lead to permanent disturbance of an area of approximately 326 088 m² in extent (i.e. 0.4% of the site). Permanently affected areas include the turbine footprints and associated infrastructure, as well as the internal underground internal connection cable routes and the internal access roads. From the specialist investigations undertaken for the proposed wind energy facility development site, it was concluded that the majority of impacts identified through the EIA are of moderate to low significance with the implementation of appropriate mitigation. Limited areas of potential high sensitivity were identified (refer to the sensitivity map - Figure 1.2). These potentially sensitive areas and general EIA findings include:

- » **Ecology:** The larger drainage systems with associated floodplains fall within the Southern Karoo Riviere vegetation type. The drainage systems are considered to be ecologically significant and vulnerable to disturbance. As a result, the

¹ The proposed power line is being assessed within a separate Basic Assessment process (DEA ref: 14/12/16/3/3/2/357) and is not further discussed or evaluated in this EIA Report. Reference to the power line connecting the facility to the grid is provided in the interest of fully describing all infrastructures associated with the project, such that a holistic picture of the project is provided.

areas of Southern Karoo Riviere are considered sensitive ecosystems that should be avoided as far as possible. In terms of the layout assessed in the EIA, a number of turbines are located within these areas (i.e. **T1, 3, 4, 5, 9, 10, 11, 26 and 52**). It was recommended that these should be relocated to adjacent less sensitive plains.

Overall, the development would be likely to generate moderate ecological impacts during construction and low impacts during operation. There are no long-term impacts associated with the development that cannot be mitigated to a low level and no impacts which are likely to represent a fatal flaw or red flag for the development. Although the site is located within a CBA and this is certainly a significant concern for the development, the ultimate impact of the development on the CBA is not likely to compromise the overall ecological functioning of the CBA or impact on any features of high potential concern that warrant longer-term protection in order to retain biodiversity pattern.

- » ***Bird Habitat and Sensitive Areas*** – The proposed site was found to be moderately sensitive in terms of avifauna, with areas of high, medium and sensitivity being present on site and a large number of sightings of priority birds, specifically Bustards species and Blue Crane. The flight modelling and risk mapping undertaken as part of this monitoring should be used to guide the final positioning of the turbines. This will reduce the impact on bird species in the area. The proposed facility has the potential to significantly impact on avifauna in the area. Priority species were observed flying in the rotor swept area and where this has happened regularly, buffers have been indicated. This however does not mean that birds will collide with turbines as collision rates may vary from species to species. There are no foreseeable fatal flaws associated with the site, however the project should proceed in line with the recommendations and mitigations provided stating that the proposed turbine placements must be critically revised with the key objectives of moving the Turbines located in area of High Avifaunal Sensitivity (i.e. **T57-63, 8-11, 37-37 and 64-66**) to an alternative location outside of high sensitivity areas.

- » ***Bat sensitive areas*** - With the exception of the areas delineated with higher sensitivities (i.e. areas around **T3-6, 8-11, 23, 46, 52, 53, 55, 56, 66, 67, 77-84, 94 and 95**), the Aberdeen wind energy facility is considered a low-medium bat sensitive site, with certain seasons considered as highly sensitive. It has medium to high bat activity compared with other sites for the Nama Karoo, but lower activity compared with sites in the coastal Lowland Fynbos or Coastal Forest. The potential impacts of key significance for this site would be associated with bat fatalities due to collision with or barotrauma from wind turbines. The significance of this can be reduced if areas of Medium-High and High sensitivity are avoided for development. A tiered adaptive operational

mitigation approach is recommended based on the findings of the operational monitoring; this is outlined within the Bat Impact Report (Appendix F).

- » **Heritage artefacts** - Eight large areas / sites comprising several cores and surface scatters of stone artefacts were identified on the site. These areas comprise several micro-sites that were difficult to determine individually, therefore the demarcation of the larger areas. Mainly isolated surface scatters of Middle Stone Age stone artefacts were observed distributed across the proposed development area. It is unlikely that the stone artefact surface scatters that occur on the exposed surface areas are positioned in situ; however, stone artefacts may occur between 50 – 80 cm below the surface. One stone walling farmstead complex was documented outside of the area proposed for the wind turbines, however, caution must be taken if the existing internal road farm will be upgraded for access to the turbines and associated infrastructure, and otherwise it is preferable that an alternative route be established. One collapsed circular stone walling feature with possible associated historical artefacts was documented near to the proposed positions of wind turbines, underground cabling, and access route. The appropriate mitigation measures should be implemented as outlined in the heritage report (refer to **Appendix H**) to protect and conserve the significant archaeological and historical heritage resources.

- » **Noise sensitive receptors** - The input data as used this assessment indicated that the potential noise impact would be insignificant during the construction phase but there could be an impact of medium significance during the operational phase considering the noise impact on NSD03. Noise measurements are recommended at NSD02, NSD03² and NSD04 over a period of at least 24 hours during a period that the wind turbines are operational. Measurements should be collected in 10 minute bins and co-ordinated with the wind speeds as measured by the developer. If a valid and reasonable noise complaint is registered relating to the operation of the facility additional noise monitoring should be conducted by an acoustic consultant during the quarterly noise measurements. Noise monitoring must be continued as long as noise complaints are registered. The developer should re-evaluate the layout if any wind turbines are added within 1,000 meters from any NSD.

- » **Visual receptor** - The study area has a natural character and is located within a picturesque part of the country. The character of the landscape is one of undeveloped, wide open spaces and scenic topography in the form of the Kamdeboo Mountains. The visual quality is generally considered to be high due to these factors. Potential visual exposure remains high in the core and medium distance (i.e. within 5 and 10km), this areas includes the R61, two secondary roads and a number of farms and homesteads. The south western tip of the Kamdeboo Mountains also lies within this zone, and the south western slopes will

² If relocated no noise monitoring is recommended for this receptor.

be visually exposed. Even though the facility may appear to be quite prominent in the landscape, the facility would be considered to be acceptable from a visual perspective.

No construction housing will be established on the site, and construction workers will be housed in the towns of Aberdeen, or other available/existing accommodation. Construction activities on the site will be restricted to daylight hours. The construction phase is anticipated to extend over approximately 18 - 24 months. Negative impacts on the social environment during construction relate mainly to impacts due to presence of construction workers and visual impacts imposed by the facility on the local environment. With the implementation of the recommended mitigation measures, negative impacts will be reduced to be of medium to low significance, and are therefore considered acceptable.

There will be a positive impact due to employment creation, which is a much needed relief by the Camdeboo Local Municipality (which has high unemployment levels). The positive impact due to employment creation will be lower during operation as there will be a limited number of staff required compared to the construction phase. The potential negative social impacts of the proposed development are offset by the potential positive impacts. With the implementation of the recommended enhancement measures, positive impacts will be of medium to high significance, and are therefore considered acceptable.

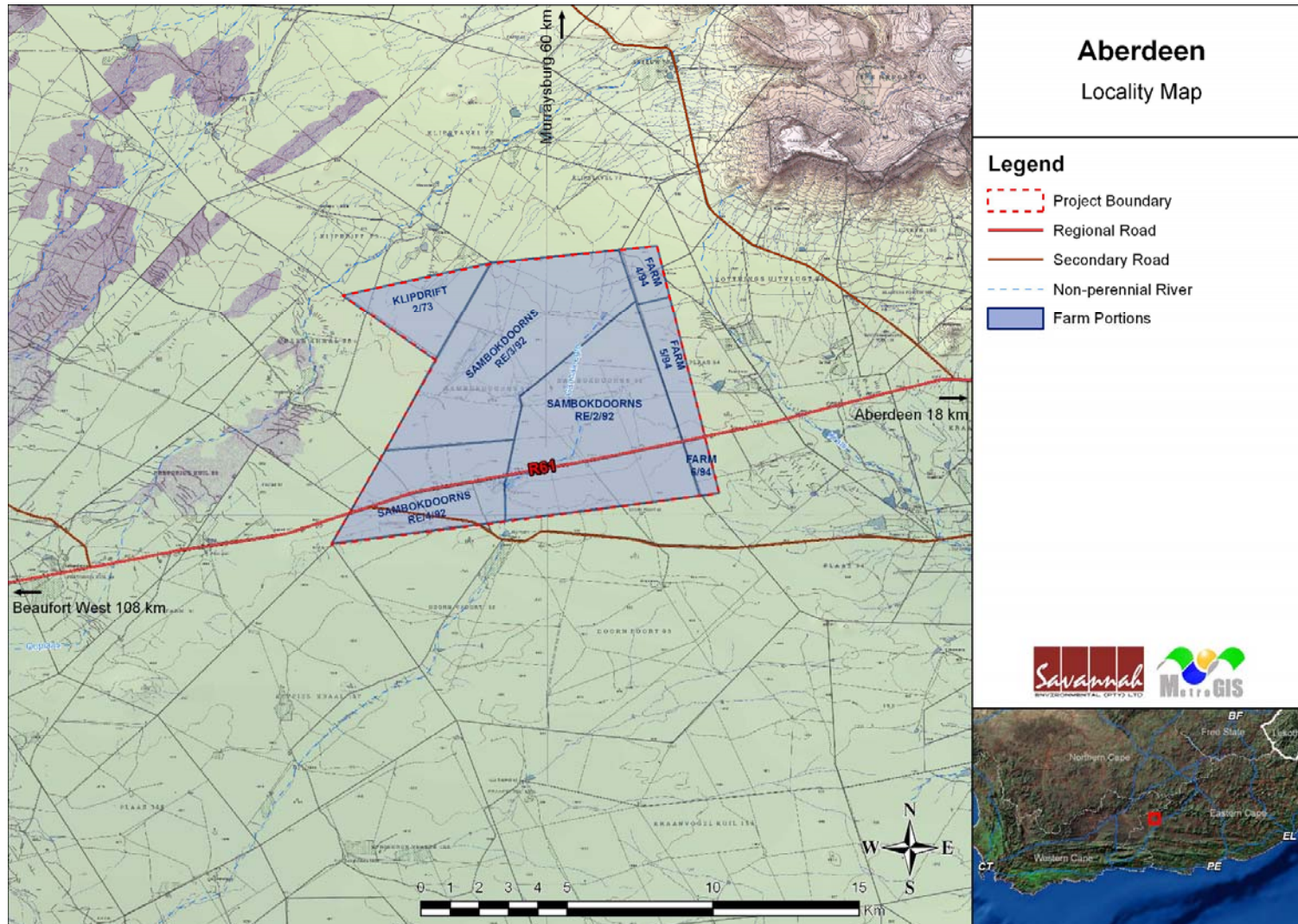


Figure 1.1: Locality map showing the farm portions and study area for the establishment of the Aberdeen Wind Energy Facility, Eastern Cape Province

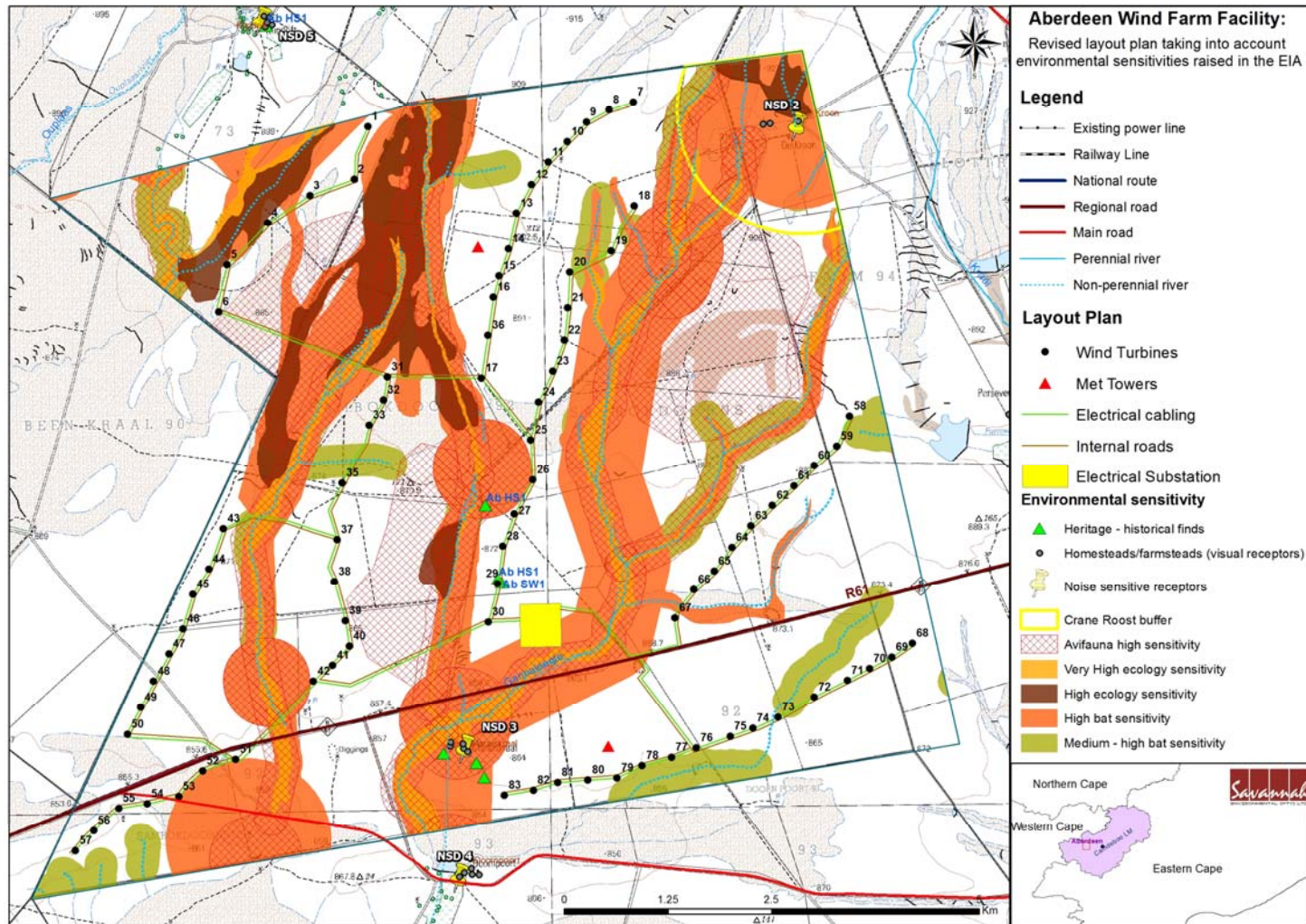


Figure 1.2: Environmental sensitivity map for the project study area illustrating sensitive areas in relation to the proposed revised development footprint for the Aberdeen Wind Energy Facility

1.3. Activities and Components associated with the Facility

The main activities/components associated with the Aberdeen Wind Energy Facility are detailed in Table 1.1.

Table 1.1: Activities Associated with Planning, Construction, Operation and Decommissioning of the Facility

Main Activity/Project Component	Components of Activity	Details
<i>Planning</i>		
Conduct technical surveys	<ul style="list-style-type: none"> » Geotechnical survey by geotechnical engineer; » Site survey by specialists, and confirmation of the infrastructure micro-siting footprint; » Survey of substation sites 	<ul style="list-style-type: none"> » All surveys are to be undertaken prior to initiating construction.
Establishment of access roads	<ul style="list-style-type: none"> » Upgrade access/haul roads to the site, as required (this only refers to the main access roads leading directly to site itself). » Temporary access roads will be up to 13m wide in some places due to turning circles that are required. » Establish internal access roads: up to 6 m wide permanent roadway within the site between the turbines for use during construction and operation phase. » Temporary track of 7 m for use during construction phase only. 	<ul style="list-style-type: none"> » The Aberdeen site is currently accessible from the R61. » Existing access roads will be utilised and upgraded. » Access roads will be constructed/upgraded in advance of any components being delivered to site, and will remain in place after completion for future access and possibly access for replacement of parts if necessary. » Existing access roads to the site will be utilised, and upgraded where required. Special haul roads may need to be constructed to and within the site to accommodate abnormally loaded vehicle access and circulation. » The internal service road alignment is informed by the final micro-siting/positioning of the wind turbines (which will be informed by the EIA and specialist walk through surveys). To accommodate the large crawler crane required for turbine assembly, a track of up to 13 m in width is required to be established on the site.
Undertake site preparation	<ul style="list-style-type: none"> » Site establishment of offices / workshop with ablutions and stores and contractors' yards. 	<ul style="list-style-type: none"> » These activities will require the stripping of topsoil, which will need to be appropriately stockpiled for use in rehabilitation.

Main Activity/Project Component	Components of Activity	Details
	<ul style="list-style-type: none"> » Clearance of vegetation at the footprint of each turbine and associated laydown area » Excavations for foundations 	
Establishment of laydown areas on site	<ul style="list-style-type: none"> » Laydown areas at each turbine position for the storage of wind turbine components and accommodation of construction and crane lifting equipment. » Temporary lay down area for crane assembly. 	<ul style="list-style-type: none"> » Each turbine needs a flat and hardened lay down area of 40m x 40 m during the construction process. » This area can be rehabilitated after construction. » The lay down area will need to accommodate the cranes required for the erection of the turbine. Lay down and storage areas will be required to be established for the normal civil engineering construction equipment which will be required on site. A large lay down area will be required at each position where the main lifting crawler crane may be required to be erected and/or disassembled. This area would be required to be compacted and levelled to accommodate the assembly crane, which would need to access the crawler crane from all sides. » Such areas to make use of already compacted areas as far as possible, such as roadways or other laydown areas.
Construct wind turbine foundations	<ul style="list-style-type: none"> » Concrete foundations of up to 22m wide x 22m length x 3m deep at each turbine location (final dimensions to be defined by geotechnical survey of the site) – refer to Figure 7.1 	<ul style="list-style-type: none"> » Foundation holes will be mechanically excavated. » Shoring and safety barriers will be erected. » Aggregate and cement to be transported from the closest centre to the development, with the establishment of a small concrete batching plant on site.
Transport of components and equipment to site	<ul style="list-style-type: none"> » Flatbed trucks will be used to transport the majority of components to site from the nearest port. * Turbine units consist of a tower comprised of 4 segments, a nacelle, and three rotor blades. * Components of various specialised 	<ul style="list-style-type: none"> » Turbine units consist of a tower comprised of 4 segments, a nacelle, and three rotor blades. Components of various specialised construction, lifting equipment and counter weights etc. are required on site (e.g. 200 ton mobile assembly crane and a 750 ton main lift crawler crane) to erect the wind turbines. Other components include components required for the establishment of the substations (including transformers) and those required for the

Main Activity/Project Component	Components of Activity	Details
	<p>construction, lifting equipment and counter weights etc. are required on site (e.g. mobile assembly crane and main lift crawler crane) to erect the wind turbines.</p> <ul style="list-style-type: none"> * Civil engineering construction equipment for the civil works (e.g. excavators, trucks, graders, compaction equipment etc.). * The components required for the establishment of the substations (including transformers) * Ready-mix cement trucks for turbine and substation foundations (if not batched on site) 	<p>establishment of the power line (including towers and cabling).</p> <ul style="list-style-type: none"> » The wind turbine will be brought to site by the supplier in sections. The individual components are defined as abnormal loads in terms of the Road Traffic Act (Act No 29 of 1989) by virtue of the dimensional limitations (abnormal length of the blades) and load limitations (i.e. the nacelle). The dimensional requirements of the load during the construction phase (length/height) may require alterations to the existing road infrastructure (widening on corners, removal of traffic islands), accommodation of street furniture (electricity, street lighting, traffic signals, telephone lines etc.), and protection of road-related structures (bridges, culverts, portal culverts, retaining walls etc.) as a result of abnormal loading. The equipment will be transported to the site using appropriate National and Provincial routes, and the dedicated access/haul road to the site itself.
Erect turbines	<ul style="list-style-type: none"> » Large lifting crane used for lifting of large, heavy components » A crane for the assembly of the rotor 	<ul style="list-style-type: none"> » The large lifting crane will lift the tower sections into place » The nacelle, which contains the gearbox, generator, and yawing mechanism, will then be placed onto the top of the assembled tower. » The rotor (i.e. the blades of the turbine) will then be assembled or partially assembled on the ground. It will then be lifted to the nacelle and bolted in place. » It will take approximately 2 days to erect each turbine, although this will depend on the climatic conditions as a relatively wind-free day will be required for the installation of the rotor.
Construct substations and associated ancillary infrastructure.	<ul style="list-style-type: none"> » Substations and associated components; » Security fencing around high-voltage (HV) yard; and » An operations and maintenance building, including a workshop 	<ul style="list-style-type: none"> » A temporary construction area is needed for containers, chemical toilets, and equipment. » Permanent operational buildings are as follows: <ul style="list-style-type: none"> * Operations and maintenance facility, including a storage building (100m X 100m), will require the clearing of vegetation and levelling of the development site and the excavation of

Main Activity/Project Component	Components of Activity	Details
	building, is proposed.	<p>foundations prior to construction.</p> <ul style="list-style-type: none"> » A laydown area for building materials and equipment associated with these buildings will also be required (40m x 40 m). » A 400 kV on-site substation will be constructed with a HV yard footprint of up to 100 m x 100 m » The substation would be constructed as follows: <ul style="list-style-type: none"> * <u>Step 1:</u> Survey of the site * <u>Step 2:</u> Site clearing and levelling and construction of access road to substation site * <u>Step 3:</u> Construction of terrace and foundations * <u>Step 4:</u> Assembly, erection and installation of equipment (including transformers) * <u>Step 5:</u> Connection of conductors to equipment * <u>Step 6:</u> Rehabilitation of any disturbed areas and protection of erosion sensitive areas.
Connection of the wind turbines to the on-site substations	<ul style="list-style-type: none"> » Wind turbines » 33 kV underground (where practical) electrical cabling connecting each turbine to the substations. 	<ul style="list-style-type: none"> » The installation of cables will require the excavation of trenches, approximately 1 m in depth within which these cables can then be laid. » The underground cables would follow the internal access roads as far as reasonably possible.
Connect substations to power grid	<ul style="list-style-type: none"> » A new 132kV overhead power line feeding into the power grid at the new Droërivier Substation. 	<ul style="list-style-type: none"> » The route for the power line will be assessed, surveyed, and pegged prior to construction.
Commissioning of the facility	<ul style="list-style-type: none"> » Start up for electricity generation 	<ul style="list-style-type: none"> » Prior to the start-up of a wind turbine, a series of checks and tests will be carried out, including both static and dynamic tests to make sure the turbine is working within appropriate limits. » Grid interconnection and unit synchronisation will be undertaken to confirm the turbine performance. Physical adjustments may be needed such as changing the pitch of the blades of the turbines.
Undertake site rehabilitation	<ul style="list-style-type: none"> » Remove all construction equipment 	<ul style="list-style-type: none"> » On full commissioning of the facility, any access points to the site

Main Activity/Project Component	Components of Activity	Details
	<p>from the site.</p> <ul style="list-style-type: none"> » Rehabilitation of temporarily disturbed areas where practical and reasonable. 	<p>which are not required during the operation phase will be closed and prepared for rehabilitation.</p>
Operation		
Operation	<ul style="list-style-type: none"> » Operation of the wind turbines 	<ul style="list-style-type: none"> » It is anticipated that there will be full time security, maintenance and control room staff required on site. » Each turbine in the facility will be operational, except under circumstances of mechanical breakdown, extreme weather conditions, or maintenance activities.
Maintenance	<p>Maintenance activities include:</p> <ul style="list-style-type: none"> » Oil and grease – turbines » Transformer oil – substation » Waste product disposal » Cleaning of turbines 	<ul style="list-style-type: none"> » The wind turbines will be subject to periodic maintenance and inspection. » Periodic oil changes will be required for the substation transformers and any waste products (e.g. oil) will be disposed of in accordance with relevant waste management legislation. » The turbine infrastructure is expected to have a lifespan of approximately 25 - 30 years, with maintenance.
Decommissioning		
Site preparation	<ul style="list-style-type: none"> » Confirming the integrity of the access to the site to accommodate required equipment and lifting cranes. » Preparation of the site (e.g. lay down areas, construction platform) » Mobilisation of construction equipment 	<p>Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life. It is most likely that decommissioning activities of the infrastructure of the facility would comprise the disassembly and replacement of the turbines with more appropriate technology/ infrastructure available at that time.</p>
Disassemble wind turbines	<ul style="list-style-type: none"> » A large crane will be used to disassemble the turbine and tower sections. » The turbines will be disassembled and removed. 	<ul style="list-style-type: none"> » Turbine components would be reused, recycled, or disposed of in accordance with regulatory requirements. » Waste will be dispose of at landfill and scrape sold were possible
Site rehabilitation	<ul style="list-style-type: none"> » Where disturbed during operation and decommissioning, sites will be 	<ul style="list-style-type: none"> » The site will be rehabilitated and can be returned to the agricultural or other land-use

Main Activity/Project Component	Components of Activity	Details
	rehabilitated through the stabilisation and re-vegetation of disturbed areas. Vegetation compatible with the surrounding area must be used.	

PURPOSE AND OBJECTIVES OF THE EMPR

CHAPTER 2

An Environmental Management Programme (EMPr) is defined as “an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented or mitigated, and that the positive benefits of the projects are enhanced”³. The objective of this EMPr is to provide consistent information and guidance for implementing the management and monitoring measures established in the permitting process and help achieve environmental policy goals. The purpose of an EMPr is to help ensure continuous improvement of environmental performance, reducing negative impacts and enhancing positive effects during the construction and operation of the facility. An effective EMPr is concerned with both the immediate outcome as well as the long-term impacts of the project.

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

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

The EMPr has the following objectives:

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

³ Provincial Government Western Cape, Department of Environmental Affairs and Development Planning: *Guideline for Environmental Management Plans*. 2005

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

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

Eskom must ensure that the implementation of the project complies with the requirements of any and all environmental authorisations and permits (once issued), as well as with obligations emanating from all relevant environmental legislation. This obligation is partly met through the development of the EMPr, and the implementation of the EMPr through its integration into the contract documentation for activities associated with both construction and operation. Since this EMPr is part of the EIA process undertaken for the proposed Aberdeen Energy Wind Facility, it is important that this document be read in conjunction with the draft EIA Report (February 2015), as well as the Environmental Authorisation (once issued). This will contextualise the EMPr and enable a thorough understanding of its role and purpose in the integrated environmental management process. This EMPr for construction and operation activities has been compiled in accordance with Section 33 of the EIA Regulations and will be further developed in terms of specific requirements listed in any authorisations issued for the proposed project. This EMPr should be considered a dynamic document, requiring regular review and updating as new information becomes available in order for it to remain relevant to the requirements of the site and the environment.

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

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

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

The EMPr is a dynamic document, which must be updated when required. It is considered critical that this draft EMPr be updated to include site-specific information and specifications as required throughout the life-cycle of the facility. This will ensure that the project activities are planned and implemented taking sensitive environmental features into account.

STRUCTURE OF THIS EMPR

CHAPTER 3

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

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

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

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

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

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

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

The objectives and EMPr tables are required to be reviewed and possibly modified throughout the life of the facility whenever changes, such as the following, occur:

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

Any amendments must be approved by the Competent Authority (i.e. DEA) prior to implementation, unless these are required to address an emergency situation.

3.1. Project Team

This EMP was compiled by:

EMP Compilers	
Sheila Muniongo	Savannah Environmental
Jo-Anne Thomas	Savannah Environmental
Input from Specialists	
Specialist	Area of Expertise
Simon Todd of Simon Todd Consulting	Ecology
Lourens Leeuwner of EWT	Avifauna pre-construction monitoring and impact assessment
Kate MacEwan of Inkululeko Wildlife Services	Bat pre-construction monitoring and impact assessment
Lourens du Plessis of MetroGIS	Visual impacts

Celeste Booth of the Department of Archaeology, Albany Museum	Heritage
Tony Barbour Environmental Consulting and Research	Social
Iain Paton & Theodore Robertson of Outeniqua Geotechnical Services cc	Soils, erosion and agricultural potential
Morne de Jager of M2 Environmental Connections CC	Noise
John Almond of Natura Viva cc	Palaeontology

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

**MANAGEMENT PLAN FOR THE WIND ENERGY FACILITY:
 PRE-CONSTRUCTION**

CHAPTER 4

4.1. Goal for Pre-Construction

Overall Goal for Pre-Construction (Planning and Design): Undertake the pre-construction (planning and design) phase of the Wind Energy Facility in a way that:

- » Ensures that the design of the facility responds to the identified environmental constraints and opportunities.
- » Ensures that pre-construction activities are undertaken in accordance with all relevant legislative requirements
- » Ensures that adequate regard has been taken of any landowner concerns and that these are appropriately addressed through design and planning (where appropriate).
- » Ensures that the best environmental options are selected for the project.
- » Enables the wind energy facility construction activities to be undertaken without significant disruption to other land uses in the area.

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

4.2. Objectives

OBJECTIVE P1: To ensure that the design of the facility responds to the identified environmental constraints and opportunities

From the specialist investigations undertaken for the proposed Aberdeen Wind Energy Facility development site, areas of high sensitivity were identified (refer to Figure 1.2 for sensitivities and preferred layout). The principle mitigation should be avoidance of identified sensitive areas.

Project component/s	<ul style="list-style-type: none"> » Wind turbines » Access roads » Substation and buildings
Potential Impact	<ul style="list-style-type: none"> » Design fails to respond optimally to the identified environmental considerations
Activities/risk sources	<ul style="list-style-type: none"> » Positioning of turbines and access roads » Positioning of substation and buildings

Mitigation: Target/Objective	» To ensure that the design of the facility responds to the identified environmental constraints and opportunities
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Mitigation: Action/control	Responsibility	Timeframe
Consider design level mitigation measures recommended by the specialists, especially with respect to visual aesthetics, noise, flora, ecology, avifauna and bats, as detailed within the EIA report and relevant appendices.	Engineering Design Consultant / turbine supplier Eskom	Tender design, design review stage
As far as possible, access roads and cable trenches which could potentially impact on sensitive areas should be shifted in order to avoid these areas of high sensitivity (i.e. best practice is impact avoidance). Where this is not possible, alternative mitigation measures as detailed in this EIA report must be implemented.	Engineering Design Consultant Eskom	Tender design, design review stage
A walk-through survey of final infrastructure positions for the wind energy facility and associated infrastructure should be undertaken by an ecologist and heritage specialist prior to the commencement of construction. The EMPr for construction must be updated to include site-specific information and specifications resulting from the final walk-through surveys. This EMPr must be submitted to DEA for approval prior to the commencement of construction.	Specialists	Final design phase
A comprehensive search for protected plant and animal populations must be undertaken within the footprint of the proposed infrastructure prior to construction, once the final position of infrastructure is known. For plants, this must take place during an appropriate season to maximise the likelihood of detecting plants of conservation concern. If any plants or animals of conservation concern are found within areas proposed for infrastructure, localised modifications in the position of infrastructure must be made (if possible) to avoid such populations and a suitable buffer zone around them applied, where applicable. Where it is not possible to relocate infrastructure, a permit may be required to be obtained in terms of Chapter 7 of the National Environmental Management: Biodiversity Act to carry out a restricted activity involving a specimen of a listed threatened or protected species.	Eskom	Planning Phase and/ prior to construction
Align underground cables and internal access	Eskom	Design

Mitigation: Action/control	Responsibility	Timeframe
roads as far as possible along existing infrastructure and disturbances.		
The monitoring programme already implemented to document the effect of the wind turbines on birds and bats should be continued. This should continue during the operation. The monitoring protocols as required by the EIA report should be implemented (Appendix G & H)	Eskom in consultation with relevant Specialists	Pre-construction, construction, operation
A 1.5km buffer around the identified Blue Crane roost site as well as a 500m buffer around wetlands and/or farm dams should be maintained	Eskom	Design
A 1km buffer around the confirmed bat roost site (and 500m around potential bat roost, 200m around tributaries and drainage) as well as a 500m buffer around wetlands and/or rivers should be maintained	Eskom	Design
No development should occur within 50 m of stone walling heritage features. No development should occur within 100 m of the areas marked Ab SW1 and Ab H1.	Eskom	Design
Should the layout (or type of wind turbines used) change significantly during the final design, the new layout must be submitted to the Department for approval prior to the commencement of construction.	Eskom	Design phase
A detailed geotechnical investigation is required for the design phase for all infrastructure components.	Eskom	Design phase
Compile and implement a stormwater management plan for hard/compacted surfaces (e.g. substation footprints) as part of the final design of the project (see Appendix C for generic plan)	Eskom	Design phase
Make use of existing roads where possible when finalising the access road layout for the facility.	Relevant specialists Eskom	Design phase
Obtain any additional environmental permits required (e.g. water use license, protected tree and protected plant permits, etc.). Copies of permits/licenses must be submitted to the Director: Environmental Impact Evaluation at the DEA.	Eskom	Design phase
Mining permit/license to be obtained for any borrow pits to be established for the project (if applicable).	Eskom	Design phase
Obtain required abnormal load permits for	Eskom /contractor	Design phase

Mitigation: Action/control	Responsibility	Timeframe
transportation of project components to site.		
The noise emission specifications of wind turbine generators should be considered when selecting the equipment in order to ensure that noise impacts are minimised as far as possible.	Eskom	Design phase
Plan the placement of lay-down areas and temporary construction accommodation in order to minimise vegetation clearing and avoidance of identified sensitive areas.	Eskom	Design phase
Ensure that proper planning is undertaken regarding the placement of lighting structures for the substation and that light fixtures only illuminate areas inside the substation site.	Eskom	Design
A lighting engineer must be consulted to assist in the planning and placement of light fixtures in order to reduce visual impacts associated with glare and light trespass. In addition, the possibility of motion activated security lighting should be investigated. This will allow for a predominantly dark site to be lit only as required.	Eskom	Design
Aviation warning lights must be planned on turbine hub or such measures required by the Civil Aviation Authority. Indications are that the facility may not be required to fit a light to each turbine, but rather place synchronous flashing lights on the turbines representing the outer perimeter of the facility.	Eskom	Design
An ECO to be appointed prior to the commencement of any authorised activities. Once appointed the name and contact details of the ECO must be submitted to the Director: Compliance Monitoring at the DEA.	Eskom	Pre-construction
Identify potential opportunities for local businesses.	Eskom	Tender Design and Review stage
Develop a database of local BEE service providers and ensure that they are informed of relevant tenders and job opportunities.	Eskom	Pre-construction
This EMPr and the Environmental Authorisation (once issued) must be included in all tender documentation and Contractors contracts.	Eskom	Tender process

Performance Indicator	<ul style="list-style-type: none"> » Design meets objectives and does not degrade the environment » Design and layouts respond to the mitigation measures and recommendations in the EIA report.
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Monitoring	<ul style="list-style-type: none"> » Ensure that the design implemented meets the objectives and mitigation measures in the EIA report through review of the design by the Project Manager and Environmental Control Officer (ECO) prior to the commencement of construction.
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OBJECTIVE P2: To ensure effective communication mechanisms

On-going communication with affected and surrounding landowners is important to maintain during the construction and operational phases of the wind energy facility. Any issues and concerns raised should be addressed as far as possible in as short a timeframe as possible.

Project component/s	<ul style="list-style-type: none"> » Wind turbines » Access roads » Substation and buildings
Potential Impact	<ul style="list-style-type: none"> » Impacts on affected and surrounding landowners and land uses
Activity/risk source	<ul style="list-style-type: none"> » Activities associated with construction » Activities associated with operation
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Effective communication with affected and surrounding landowners » Addressing of any issues and concerns raised as far as possible in as short a timeframe as possible

Mitigation: Action/control	Responsibility	Timeframe
Compile and implement a grievance mechanism procedure for the public (as outlined in Appendix E) to be implemented during both the construction and operational phases of the facility. This procedure should include details of the contact person who will be receiving issues raised by interested and affected parties, and the process that will be followed to address issues.	Eskom	Pre-construction (construction procedure) Pre-operation (operation procedure)
Develop and implement a grievance mechanism for the construction, operational and closure phases of the project for all employees, contractors, subcontractors and site personnel. This procedure should be in line with the South African Labour Law.	Eskom	Pre-construction (construction procedure) Pre-operation (operation procedure)
Liaison with landowners is to be undertaken prior to the commencement of construction in order to agree on landowner-specific conditions during construction and maintenance.	Eskom	Pre-construction

Performance Indicator	» Effective communication procedures in place for all phases as required.
Monitoring	» An incident reporting system should be used to record non-conformances to the EMPr. Grievance mechanism procedures should be implemented.

MANAGEMENT PLAN FOR WIND ENERGY FACILITY: CONSTRUCTION

CHAPTER 5

5.1. Overall Goal for Construction

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

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

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

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

The **Project Manager / Eskom's Representative** will:

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

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

The **Site Manager** (Eskom's On-site Representative or Engineers Representative) will:

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

The **Safety, Health and Environmental Representatives (Eskom and Main Contractor)** will:

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

Main Contractor: All contractors are ultimately responsible for:

- » Ensuring adherence to all environmental management specifications contained within this EMPr (and the Environmental Authorisation, once issued), as well as any specific specifications detailed by Eskom.
- » Ensuring that Method Statements are submitted to the Site Manager (and ECO) for approval before any work is undertaken. Any lack of adherence to this will be considered as non-compliance to the specifications of the EMPr.
- » Ensuring that any instructions issued by the Site Manager on the advice of the ECO are adhered to.

- » Ensuring that a report is tabled at each site meeting, which will document all incidents that have occurred during the period before the site meeting.
- » Ensuring that a register is kept in the site office, which lists all transgressions issued by the ECO.
- » Ensuring that a register of all public complaints is maintained.
- » Ensuring that all employees, including those of sub-contractors receive training before the commencement of construction in order that they can constructively contribute towards the successful implementation of the EMPr (i.e. ensure their staff are appropriately trained as to the environmental obligations).

An independent **Environmental Control Officer (ECO)** must be appointed by the project proponent prior to the commencement of any authorised activities and will be responsible for monitoring, reviewing and verifying compliance by the Main Contractor (EPC) with the environmental specifications of the EMPr and the conditions of the Environmental Authorisation. Accordingly, the ECO will:

- » Be fully knowledgeable with the contents with the Environmental Impact Assessment.
- » Be fully knowledgeable with the contents with the conditions of the Environmental Authorisation (once issued).
- » Be fully knowledgeable with the contents with the Environmental Management Programme.
- » Be fully knowledgeable of all the licences and permits issued to the site.
- » Be fully knowledgeable with the contents with all relevant environmental legislation, and ensure compliance with them.
- » Ensure that the contents of this EMPr are communicated to the Contractor site staff and that the Site Manager and Contractor are constantly made aware of the contents through discussion.
- » Ensure that the compliance of the EMPr is monitored through regular and comprehensive inspection of the site and surrounding areas.
- » Ensure that if the EMPr conditions or specifications are not followed then appropriate measures are undertaken to address any non-compliances (for example an ECO may cease construction or an activity to prevent a non-compliance from continuing where a notification regarding non-conformance does not result in rectification).
- » Monitoring and verification must be implemented to ensure that environmental impacts are kept to a minimum, as far as possible.
- » Ensure that the Site Manager has input into the review and acceptance of construction methods and method statements.
- » Ensure that activities on site comply with all relevant environmental legislation.
- » Remedial action will be required by the responsible party in the event of contravention of the specifications of the EMPr.

- » Ensure that the compilation of progress reports for submission to the Project Manager, with input from the Site Manager, takes place on a regular basis, including a final post-construction audit.
- » Ensure that there is communication with the Site Manager regarding the monitoring of the site.
- » Ensure that any non-compliance or remedial measures that need to be applied are reported.
- » Keep record of all activities on site, problems identified, transgressions noted and a schedule of tasks undertaken by the ECO in the form of a daily diary.
- » Independently report to DEA in terms of compliance with the specifications of the EMP and conditions of the Environmental Authorisation (once issued).

As a general mitigation strategy, the Environmental Control Officer (ECO) should be present for the site preparation and initial clearing activities to ensure the correct demarcation of no-go areas, facilitate environmental induction with construction staff and supervise any flora relocation and faunal rescue activities that may need to take place during the site clearing (i.e. during site establishment, and excavation of foundations). Thereafter weekly site compliance inspections would probably be sufficient. However, in the absence of the ECO, there should be a designated environmental officer present to deal with any environmental issues that may arise such as fuel or oil spills. The ECO shall remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site handed over for operation.

5.3. Objectives

In order to meet the goal outlined in Section 5.1, the following objectives have been identified, together with necessary actions and monitoring requirements.

OBJECTIVE C1: Securing the site and site establishment

Project component/s	<ul style="list-style-type: none"> » Wind turbines » Access roads » Substation » Operation and maintenance buildings
Potential Impact	<ul style="list-style-type: none"> » Hazards to landowners/public » Security of materials » Substantially increased damage to natural vegetation
Activities/risk sources	<ul style="list-style-type: none"> » Open excavations (foundations and cable trenches) » Movement of construction vehicles in the area and on-site
Mitigation:	<ul style="list-style-type: none"> » To secure the site against unauthorised entry

Target/Objective » To protect members of the public/landowners/residents

Mitigation: Action/control	Responsibility	Timeframe
Secure site, working areas and excavations in an appropriate manner.	Contractor	During site establishment Maintenance: for duration of Contract
Where necessary to control access, fence and secure area and implement access control procedures.	Contractor	During site establishment Maintenance: for duration of Contract
Fence and secure Contractor's equipment camp.	Contractor	During site establishment Maintenance: for duration of Contract
The Contractor must take all reasonable measures to ensure the safety of the public in the surrounding area. Where the public could be exposed to danger by any of the works or site activities, the Contractor must, as appropriate, provide suitable flagmen, barriers and/or warning signs in English and any other relevant indigenous languages, all to the approval of the Site Manager.	Contractor	Duration of Contract
Contractors and construction workers must be informed of the no-go areas on site	Eskom	Construction
Concrete batching plant/s to be located in areas of low sensitivity within the approved development area.	Contractor	During site establishment
All unattended open excavations shall be adequately demarcated and/or fenced (fencing shall consist of a minimum of three strands of wire wrapped with danger tape).	Contractor	Erection: during site establishment Maintenance: for duration of Contract
Perimeter fencing around the broader site/farm portions for the wind energy facility (which is clearly indicated with flags to be implemented. All deep excavations must be adequately protected. There is to be no unauthorised disturbance outside the demarcated development footprint. Any activities outside the development footprint to be authorised by the Owner's Representative.	Contractor	Erection: during site establishment Maintenance: for duration of Contract
An open space management plan must be implemented during the construction of the facility (refer to Appendix C).	Contractor	Pre-Construction

Performance Indicator	» Site is secure and there is no unauthorised entry » No members of the public/ landowners injured
Monitoring	» Regular visual inspection of fence for signs of deterioration/forced

access

- » An incident reporting system must be used to record non-conformances to the EMPr.
- » Public complaints register must be developed and maintained on site.
- » ECO to monitor all construction areas on a continuous basis until all construction is completed; immediate report backs to site manager.
- » EO to address any infringements with responsible contractors as soon as these are recorded.

OBJECTIVE C2: Maximise local employment and business opportunities associated with the construction phase

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

Project component/s	» Construction activities associated with the establishment of the wind energy facility, including associated infrastructure.
Potential Impact	» The opportunities and benefits associated with the creation of local employment and business should be maximised. However, due to the relatively small size of the facility the number of employment and business opportunities for locals will be limited.
Activities/risk sources	» The employment of outside contractors to undertake the work and who make use of their own labour will reduce the employment and business opportunities for locals. Employment of local labour will maximise local employment opportunities.
Mitigation: Target/Objective	» The appointed contractor should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. » Eskom should develop a database of local BEE service providers.

Mitigation: Action/control	Responsibility	Timeframe
Employ as many workers (skilled, semi-skilled / low-skilled) from the local area/ nearby towns as possible.	Contractor	Construction
Where required, implement appropriate training and skills development programmes prior to the initiation of the construction phase to ensure that local employment target is met.	Contractor	Pre-construction
Identify potential opportunities for local businesses	Contractor	Tender Design and Review stage

Performance Indicator	» Source as many local labourers as possible. » Database of potential local BEE services providers in place before construction phase commences.
Monitoring and Reporting	» Eskom and appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase. » An incident reporting system must be used to record non-conformances to the EMPr. » Public complaints register must be developed and maintained on site.

OBJECTIVE C3: Minimise negative social impacts on family structures and social networks due to the presence of construction workers

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

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

Project component/s	» Construction and establishment activities associated with the establishment of the wind energy facility, including associated infrastructure.
Potential Impact	<ul style="list-style-type: none"> » The presence of construction workers who live outside the area and who are housed in local towns can impact on family structures and social networks. » Presence of construction workers on site may result in loss of livestock due to stock theft and damage to farm infrastructure, such as gates and fences. Poaching of wild animals may also occur. » Due to the relatively small number of workers associated with the construction of the proposed facility, the risk of impacts is likely to be low.
Activities/risk sources	<ul style="list-style-type: none"> » The presence of construction workers can impact negatively on family structures and social networks, especially in small, rural communities. » The presence of construction workers on the site can result in stock thefts and damage to farm infrastructure.
Mitigation: Target/Objective	» Avoid and or minimise the potential impact of construction workers on the local community and livelihoods.

Mitigation: Action/control	Responsibility	Timeframe
Employ as many workers (skilled, semi-skilled / low-skilled) from the local area as possible. This should be included in the tender documents. Construction workers should be recruited from the local area in and	Contractor	Identify suitable local contractors prior to the

Mitigation: Action/control	Responsibility	Timeframe
around the towns such as Sutherland.		tender process for the construction phase.
Establish contact with the adjacent farmers and develop a Code of Conduct for construction workers. Ensure that construction workers attend a briefing session before they commence activities. The aim of the briefing session is to inform them of the rules and regulations governing activities on the site as set out in the Code of Conduct. Ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct.	Eskom & Contractor	Briefing session for construction workers held before they commence work on site.
Ensure that construction workers who are found guilty of breaching the Code of Conduct are dealt with appropriately. Dismissals must be in accordance with South African labour legislation.	Eskom and contractors	Construction
No housing of construction workers on the site to be permitted, apart from security personnel.	Contractors	Construction
Implement a policy that no employment will be available at the gate.	Contractors	Construction
Compensate farmers / community members for cost for any losses, such as livestock, damage to infrastructure etc. proven to be associated with the project.	Contractors	Construction
Procedures for managing and storing waste on site, must be outline specifically plastic waste that poses a threat to livestock if ingested.	Contractors	Construction

Performance Indicator	<ul style="list-style-type: none"> » Employment policy and tender documents that set out requirement for local employment and targets completed before construction phase commences. » Code of Conduct developed and approved prior to commencement of construction phase. » Labour locally sourced, where possible. » Tender documents for contractors include recommendations for construction camp. » All construction workers made aware of Code of Conduct within first week of being employed. » Briefing session with construction workers held at outset of construction phase.
Monitoring and Reporting	<ul style="list-style-type: none"> » Eskom and appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

	<ul style="list-style-type: none"> » An incident reporting system must be used to record non-conformances to the EMP. » Public complaints register must be developed and maintained on site.
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OBJECTIVE C4: Noise control

Various construction activities would be taking place during the development of the facility and may pose a noise risk to sensitive receptors.

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

Mitigation: Action/control	Responsibility	Timeframe
Where possible, construction work should be undertaken during normal working hours (06H00 – 18H00), from Monday to Friday. If work is required on the weekend / public holiday, agreements can be reached (in writing) with the landowners adjacent to the work, these working hours can be extended.	Contractor	Construction
The construction crew must abide by the national standards and local by-laws regarding noise.	Contractor	Construction
All construction equipment, including vehicles, must be properly and appropriately maintained in order to minimise noise generation.	Contractor	Construction
Establish a line of communication and notify all stakeholders and sensitive receptors of the means of registering any issues, complaints or comments.	Contractor	All phases of project
Notify potentially sensitive receptors about work to take place at least 2 days before the activity in the vicinity	Contractor	At least 2 days, but not

Mitigation: Action/control	Responsibility	Timeframe
(within 500 m) of the PSR is to start. The following information to be presented in writing: » Description of activity to take place » Estimated duration of activity » Working hours » Contact details of responsible party		more than 5 days before activity is to commence
When any noise complaints are received noise monitoring should be conducted at the complainant, followed by feedback regarding noise levels measured	Suitably qualified staff from the project team/ Acoustical Consultant / Approved Noise Inspection Authority	Within 7 days after complaint was registered

Performance Indicator	» Equivalent A-weighted noise levels below 45 dBA at potentially sensitive receptors (8 hours). » Ensure that maximum noise levels at potentially sensitive receptors are less than 65 dBA. » No noise complaints are registered
Monitoring and Reporting	» Should a complaint about noise be reported, Eskom to look into the matter and determine steps to deal with the complaint. An incident reporting system must be used to record non-conformances to the EMP. » Public complaints register must be developed and maintained on site.

OBJECTIVE C5: Management of dust and emissions

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

Project component/s	» wind turbines » access roads » substation and buildings
Potential Impact	» Heavy vehicles can generate noise and dust impacts. Movement of heavy vehicles can also damage roads.
Activities/risk sources	» The movement of heavy vehicles and their activities on the site can result in noise and dust impacts and damage roads.
Mitigation:	» To avoid and or minimise the potential noise and dust impacts

Target/Objective	associated with heavy vehicles, and also minimise damage to roads.
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Mitigation: Action/control	Responsibility	Timeframe
Implement appropriate dust suppression measures on site such as wetting roads on a regular basis.	Contractor	Construction
Haul vehicles moving outside the construction site carrying material that can be wind-blown should be covered with tarpaulins.	Contractor	Duration of contract
Ensure vehicles adhere to speed limits on public roads and speed limits set within the site by the Site Manager. Vehicles should be fitted with recorders to record when vehicles exceed the speed limit.	Contractor/ transportation contractor	Duration of contract
Disturbed areas must be re-vegetated as soon as practicable after construction is complete in an area.	Contractor	At completion of the construction phase
Vehicles and equipment must be maintained in a road-worthy condition at all times.	Contractor	Prior to construction phase
Ensure that damage to gravel public roads and access roads attributable to construction vehicles is repaired before completion of construction phase.	Contractor	Before completion of construction phase
Regular dust control of materials (sand, soil, cement) must be used at concrete batching plants on site	Contractor	Construction

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

OBJECTIVE C6: Soil and rock degradation and erosion control

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

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

Project component/s	<ul style="list-style-type: none"> » wind turbines » access roads » substation » Sealed surfaces (e.g. roofs, concrete surfaces, compacted road surfaces, paved roads / areas). » All other infrastructure
Potential Impact	<ul style="list-style-type: none"> » Erosion and soil loss » Negative impacts on wetlands » Disturbance to or loss of wetland/pan habitat » Sedimentation of watercourses/wetland areas » A loss of indigenous vegetation cover » Increased runoff into drainage lines can potentially be associated with accelerated erosion
Activities/risk sources	<ul style="list-style-type: none"> » Rainfall and wind erosion of disturbed areas » Excavation, stockpiling and compaction of soil » Concentrated discharge of water from construction activity » Stormwater run-off from sealed surfaces » Mobile construction equipment movement on site » River/stream/drainage line road crossings » Roadside drainage ditches » Project related infrastructure, such as buildings, turbines and fences
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To minimise erosion of soil from site during construction » To minimise deposition of soil into drainage lines » To minimise damage to vegetation by erosion or deposition » To minimise damage to rock, soil and vegetation by construction

	activity » No accelerated overland flow related surface erosion as a result of a loss of vegetation cover » No reduction in the surface area of wetlands (drainage lines and other wetland areas) as a result of the establishment of infrastructure » Minimal loss of vegetation cover due to construction related activities » No or insignificant loss of wetland area in the specialist study area » No increase in runoff into drainage lines as a result of construction of project related infrastructure » No increase in runoff into drainage lines as a result of road construction
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Mitigation: Action/control	Responsibility	Timeframe
Stockpile topsoil for re-use in rehabilitation phase. Maintain stockpile shape and protect from erosion. All stockpiles must be positioned at least 50 m away from drainage lines. Limit the height of stockpiles to 2m to reduce compaction.	Contractor	During site establishment and any activity related to earthworks as well as the duration of construction
New access roads to be carefully planned and constructed to minimise the impacted area and prevent unnecessary excavation, placement and compaction of soil.	Engineer / Contractor	Before and during construction
Identify and demarcate construction areas for general construction work and restrict construction activity to these areas.	Contractor	Construction
Rehabilitate disturbance areas as soon as construction in an area is completed.	Contractor	During and after construction
Stockpiles not used in three (3) months after stripping must be seeded or appropriately covered to prevent dust and erosion - only if natural seeding does not occur.	Contractor	During and after construction
Erosion control measures: Implement run-off attenuation on slopes (sand bags, logs), silt fences, stormwater catch-pits, shade nets or temporary mulching over denuded areas.	Contractor	Erection: Before construction Maintenance: Duration of contract
Particular care should be taken in the design of road drainage line and wetland crossings in order to ensure there is no step in the channel bed, substrate continuity is maintained and no undue constriction of flow takes	Contractor	Erection: during site establishment Maintenance:

Mitigation: Action/control	Responsibility	Timeframe
place.		for duration of contract
Where access roads cross natural drainage lines or culverts (or other appropriate measures) must be designed to allow free flow. Regular maintenance of the culverts must be carried out.	Engineer / Contractor	Before and during construction
Control depth of all excavations and stability of cut faces/sidewalls.	Engineer / Contractor	Maintenance over duration of contract
Compile a comprehensive stormwater management plan as part of the final design of the project and implement during construction and operation.	Contractor	Compile during design; implement during construction & operation
Cement batching to take place in designated areas only, as approved on site layout (if applicable).	Contractor	Construction
Spillages of cement to be cleaned up immediately and disposed or re-used in the construction process.	Contractor	Construction
Spill kits to be kept on active parts of the construction site & at site offices.	Contractor	Construction
Soil erosion control measures (such as hessian mats and gabions) be used for in erosion prone areas such as steep slopes.	Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » No activity outside of designated areas » Minimal level of soil erosion around site as a result of construction activities » Minimal level of increased siltation in drainage lines as a result of construction activities » Minimal level of soil degradation as a result of construction activities
Monitoring and Reporting	<ul style="list-style-type: none"> » Continual inspections of the site by ECO » Fortnightly inspections of sediment control devices by ECO » Reporting of ineffective sediment control systems and rectification as soon as possible. » An incident reporting system must record non-conformances to the EMPr. » Public complaints register must be developed and maintained on site.

OBJECTIVE C7: Limit disturbance and avoid damage to drainage lines

The layout for the wind energy facility as indicated in Figure 1.2 avoids the placement of infrastructure within drainage areas. However, there are still some instances where roads and cables cross identified drainage lines. Mitigation measures are required to minimise impacts on those systems affected in this regard.

Project component/s	<ul style="list-style-type: none"> » access roads » cabling
Potential Impact	<ul style="list-style-type: none"> » Damage to drainage line areas by any means that will result in hydrological changes (includes erosion, siltation, dust, direct removal of soil of vegetation, dumping of material within wetlands). The focus should be on the functioning of the drainage line as a natural system.
Activity/risk source	<ul style="list-style-type: none"> » Construction of access roads and cabling
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Minimal damage to drainage lines within project area

Mitigation: Action/control	Responsibility	Timeframe
Rehabilitate any disturbed areas as soon as possible once construction is completed in an area.	Contractor	Construction
Control stormwater and runoff water. Contaminated runoff from the construction site(s) should be prevented from entering the rivers/streams.	Contractor	Construction
For any new construction where direct impacts on drainage lines are unavoidable cross watercourses perpendicularly to minimise disturbance footprints.	Contractor	Construction
Construction must not result in the width of the watercourse being narrowed.	Contractor	Construction
Utilise erosion control measures on access roads and drainage lines where required.	Contractor	Construction
Ablution facilities at the construction sites must be located at least 100m away from drainage lines and regularly serviced	Contractor	Construction
Concrete batching plants and stockpiles to be located more than 500m away from drainage lines.	Contractor	Construction
Obtain a license as required in terms of the National Water Act from DWS to impact on any wetland or water resource.	Eskom, Construction team, ECO	Construction & Operation

Performance Indicator	<ul style="list-style-type: none"> » No impacts on water quality, water quantity, wetland vegetation, natural status of wetland
Monitoring and Reporting	<ul style="list-style-type: none"> » An incident reporting system must be used to record non-conformances to the EMPr. » Public complaints register must be developed and maintained on

site.

OBJECTIVE C8: Protection of vegetation / control alien invasive plants

Impacts on vegetation at the construction stage are expected to be mainly as a result of direct permanent loss of vegetation in development footprint areas.

The larger drainage systems with associated floodplains fall within the Southern Karoo Riviere vegetation type. The drainage systems are considered to be ecologically significant and vulnerable to disturbance. As a result, the areas of Southern Karoo Riviere are considered sensitive ecosystems that should be avoided as much as possible.

Project component/s	All infrastructure and activities which result in vegetation loss or clearing including: <ul style="list-style-type: none"> » Clearing for roads and excavation for turbine foundations » Underground cabling » Access roads » Substation
Potential Impact	» Loss of plant cover leading to erosion as well as loss of faunal habitat and loss of specimens of protected plants
Activity/risk source	Vegetation clearing for the following: <ul style="list-style-type: none"> » Turbine construction and service areas » Access roads » Laydown areas » Construction equipment Camps » Substation
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To reduce the footprint and low impact on terrestrial environment » To reduce the impact on protected plant species

Mitigation: Action/control	Responsibility	Timeframe
Minimise vegetation clearance as far as possible within the development footprint.	Contractor	Construction
Restrict construction activities to designated construction areas.		
Revegetation of cleared areas or monitoring should be implemented to ensure that recovery is taking place	Contractor	Construction
A site rehabilitation programme should be compiled and implemented.	Contractor in consultation with Specialist	Duration of contract
Avoid creating conditions in which alien plants may become established:	Contractor	Construction

Mitigation: Action/control	Responsibility	Timeframe
<ul style="list-style-type: none"> » Keep disturbance of indigenous vegetation to a minimum » Rehabilitate disturbed areas as quickly as possible once construction is complete in an area » Do not import soil from areas with alien plants 		
Establish an on-going monitoring programme to detect, quantify and remove any alien species that may become established and identify the problem species (as per Conservation of Agricultural Resources Act, Act 43 of 1983 and NEM: Biodiversity Act) (refer to a generic plan in Appendix B)	Contractor	Construction
Immediately control any alien plants that become established using registered control methods.	Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » Vegetation loss must be restricted to infrastructure footprint » Low impact on protected plant species » A permit must be obtained for the destruction or translocate affected individuals of protected species.
Monitoring and Reporting	ECO to monitor construction to ensure that: <ul style="list-style-type: none"> » Vegetation is cleared only within essential areas » Erosion risk is maintained at an acceptable level through flow regulation structures where appropriate and the maintenance of plant cover wherever possible

OBJECTIVE C9: Protection of fauna, avifauna and bats

Infrastructure associated with the facility often impacts on birds, bats and terrestrial animals. New roads constructed will also have a disturbance and habitat destruction impact.

Project component/s	<ul style="list-style-type: none"> » wind turbines and associated laydown areas » access roads and cabling » substation » workshop area » batching plants » temporary laydown areas » associated access road
Potential Impact	<ul style="list-style-type: none"> » Vegetation clearance and associated impacts on faunal habitats » Disturbance of birds
Activity/risk source	<ul style="list-style-type: none"> » Site preparation and earthworks » Construction-related traffic » Foundations or plant equipment installation » Mobile construction equipment

Mitigation:	» To minimise footprints of habitat destruction
Target/Objective	» To minimise disturbance to resident and visitor faunal and avifaunal species

Mitigation: Action/control	Responsibility	Timeframe
Clearly mark areas to be cleared in order to eliminate unnecessary clearing/disturbance.	Contractor in consultation with Specialist	Pre-construction
<ul style="list-style-type: none"> » Potential bat roosts should be monitored at least once a month for the duration of the construction phase to search for evidence of roosting bats (i.e. guano, culled insects remains). If and construction roosting bats are located, a bat specialist should be consulted to determine future actions » Blasting activities not to occur within 2km of any known bat roosts. » Any new roosts discovered, should be reported and incorporated into the adaptive management plan. 	Contractor in consultation with Specialist	During entire construction phase, until commercial operation.
The extent of clearing and disturbance to the native vegetation must be kept to a minimum so that impact on fauna and their habitats is restricted.	Contractor	Site establishment & duration of contract
<ul style="list-style-type: none"> » Sensitive zones described elsewhere in this report (rivers, wetlands), should be avoided where possible. » Site walkthrough is recommended so that the ECO can identify any breeding sensitive bird species in close proximity to specified turbines and associated infrastructure positions. » If any of the "Focal Species" identified in this report are observed to be roosting and/or breeding in the vicinity, the EWT is to be contacted for further instruction. 	Contractor in consultation with Specialist	Duration of contract
A site rehabilitation programme should be compiled and implemented.	Contractor in consultation with Specialist	Duration of contract

Performance Indicator	<ul style="list-style-type: none"> » Minimum disturbance outside of designated work areas » Minimised clearing of existing/natural vegetation and habitats for fauna and avifauna » Limited impacts on faunal species (i.e. noted/recorded fatalities), especially those of conservation concern.
Monitoring and Reporting	<ul style="list-style-type: none"> » Observation of vegetation clearing activities by ECO throughout construction phase » Supervision of all clearing and earthworks by ECO

- » An incident reporting system must be used to record non-conformances to the EMP.
- » Public complaints register must be developed and maintained on site.

OBJECTIVE C10: Protection of fossils and sites of heritage value

The main cause of impacts to archaeological sites is physical disturbance of the material itself and its context. The heritage and scientific potential of an archaeological site is highly dependent on its geological and spatial context. This means that even though, for example a deep excavation may expose archaeological artefacts, the artefacts are relatively meaningless once removed from the area in which they were found. Large-scale excavations for foundations will damage archaeological sites, as will road construction activities.

Sensitive sites must be physically identified and cordoned to prevent any accidental incursion and damage during the construction and operational phases.

Before any major construction commences a thorough field scoping survey of natural and artificial rock exposures within the study region as a whole should be undertaken by a qualified palaeontologist to identify specific areas or horizons of paleontological sensitivity on the ground. On the basis of the initial scoping, a realistic, collaborative monitoring programme and protocol should be drawn up by the palaeontologist in conjunction with the developer. Note that the palaeontologist involved will be required to obtain a paleontological collection permit from SAHRA and to arrange a suitable repository for any fossils collected. An ECO should be appointed during the construction phases to observe whether any depth of deposit and in situ archaeological material remains is uncovered.

The followings are recommended on site in order to minimise impact on heritage materials:

- » An alternative access route should be established to avoid negative impact to the stone walling complex (Ab HS1) during the construction and development phases.
- » No development should occur within 50 m of stone walling features.
- » No development should occur within 100 m of the areas marked Ab SW1 and Ab H1.

Project component/s	<ul style="list-style-type: none"> » wind energy turbines » access roads » substation
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Potential Impact	<ul style="list-style-type: none"> » Heritage objects or artefacts found on site are inappropriately managed or destroyed » Loss of fossil resources
Activity/risk source	<ul style="list-style-type: none"> » Site preparation and earthworks » Foundations or plant equipment installation » Mobile construction equipment movement on site
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure that any heritage objects found on site are treated appropriately and in accordance with the relevant legislation

Mitigation: Action/control	Responsibility	Timeframe
A professional archaeologist must be appointed during all construction and development activities including vegetation clearing and the excavation activities to monitor and identify possible archaeological material remains and features that may occur below the surface and make further appropriate recommendations on removing and / or protecting the archaeological material remains and features.	Contractor in consultation with Specialist	Construction
Monitoring of all substantial bedrock excavations for fossil remains by EO, with reporting of substantial new paleontological finds (notably fossil vertebrate bones & teeth) to ECPHRA for possible specialist mitigation	Contractor, ECO in consultation with Specialist	Pre-construction
Areas required to be cleared during construction must be clearly marked in the field to avoid unnecessary disturbance of sensitive areas.	Contractor in consultation with Specialist	Pre-construction
Grave and burial areas must be identified and cordoned off prior to the commencement of development so that negative impact and vandalism is avoided.	Eskom	Pre-construction
Construction managers/foremen should be informed before construction starts on the possible types of heritage sites and cultural material they may encounter and the procedures to follow when they find sites.	Eskom	Pre-construction
If a heritage object is found, work in that area must be stopped immediately, and appropriate specialists brought in to assess to site, notify the administering authority of the item/site, and undertake due/required processes.	Eskom /Contractor in consultation with Specialist	Duration of contract

Performance Indicator	<ul style="list-style-type: none"> » Minimal disturbance outside of designated work areas » All heritage items located are dealt with as per the legislative guidelines
Monitoring	<ul style="list-style-type: none"> » Observation of excavation activities by EO and ECO throughout construction phase » Monitoring / Inspection of all clearing and earthworks by ECO. » An incident reporting system will be used to record non-conformances to the EMP.

OBJECTIVE C11: Minimisation of visual impacts associated with construction

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

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

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

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

site.

OBJECTIVE C12: Appropriate handling and storage of chemicals, hazardous substances and waste

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

Project component/s	<ul style="list-style-type: none"> » wind turbines » substation » concrete batching plant
Potential Impact	<ul style="list-style-type: none"> » Release of contaminated water from contact with spilled chemicals » Generation of contaminated wastes from used chemical containers » Inefficient use of resources resulting in excessive waste generation » Litter or contamination of the site or water through poor waste management practices
Activity/risk source	<ul style="list-style-type: none"> » Vehicles associated with site preparation and earthworks » Power line construction activities » Substation construction activities » Packaging and other construction wastes » Hydrocarbon use and storage » Spoil material from excavation, earthworks and site preparation
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure that the storage and handling of chemicals and hydrocarbons on-site does not cause pollution to the environment or harm to persons » To ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons » To comply with waste management legislation » To minimise production of waste » To ensure appropriate waste storage and disposal » To avoid environmental harm from waste disposal

Mitigation: Action/control	Responsibility	Timeframe
The storage of flammable and combustible liquids such as oils must be in designated areas which are appropriately banded, and stored in compliance with Material Safety Data Sheets (MSDS) files.	Contractor	Duration of contract
Any spills will receive the necessary clean-up action. Bioremediation kits are to be kept on-site and used to remediate any spills that may occur. Appropriate arrangements to be made for appropriate collection and	Contractor	Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
disposal of all cleaning materials, absorbents and contaminated soils (in accordance with a waste management plan).		
Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals will be complied with.	Contractor	Duration of contract
Routine servicing and maintenance of vehicles is not to take place on-site (except for emergency situations or large cranes which cannot be moved off-site). If repairs of vehicles must take place on site, an appropriate drip tray must be used to contain any fuel or oils.	Contractor	Duration of contract
Transport of all hazardous substances must be in accordance with the relevant legislation and regulations.	Contractor	Duration of contract
Waste disposal records must be available for review at any time.	Contractor	Duration of contract
Construction contractors must provide specific detailed waste management plans to deal with all waste streams.	Contractor	Duration of contract
Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap) and contaminated waste. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage and vermin control.	Contractor	Duration of contract
Where possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation and storage of waste streams (such as wood, metals, general refuse etc.).	Contractor	Duration of contract
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors and licensed waste disposal sites.	Contractor	Duration of contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area.	Contractor	Duration of contract
Waste and surplus dangerous goods must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal.	Contractor	Duration of contract
Documentation (waste manifest) must be maintained detailing the quantity, nature and fate of any hazardous waste.	Contractor	Duration of contract
An incident/complaints register must be established and	Contractor	Duration of

Mitigation: Action/control	Responsibility	Timeframe
maintained on-site.		contract
Hazardous and non-hazardous waste must be separated at source. Separate waste collection bins must be provided for this purpose. These bins must be clearly marked and appropriately covered.	Contractors	Erection: during site establishment Maintenance: for duration of Contract within a particular area
All solid waste collected must be disposed of at a registered waste disposal site. A certificate of disposal must be obtained and kept on file. The disposal of waste must be in accordance with all relevant legislation. Under no circumstances may solid waste be burnt or buried on site.	Contractors	Erection: during site establishment Maintenance: for duration of Contract within a particular area
Supply waste collection bins at construction equipment and construction crew camps.	Contractors	Erection: during site establishment Maintenance: for duration of Contract within a particular area
Construction equipment must be refuelled within designated refuelling locations, or where remote refuelling is required, appropriate drip trays must be utilised.	Contractor	Duration of contract
All stored fuels to be maintained within a bund and on a sealed surface.	Contractor	Duration of contract
Fuel storage areas must be inspected regularly to ensure bund stability, integrity and function.	Contractor	Duration of contract
Construction machinery must be stored in an appropriately sealed area.	Contractor	Duration of contract
Oily water from bunds at the substation must be removed from site by licensed contractors.	Contractor	Duration of contract
Spilled cement and concrete must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site, particularly for cement which is hazardous.	Contractor	Duration of contract
Corrective action must be undertaken immediately if a complaint is made, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the	Contractor	Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
affected environment as much as practically possible and implementing preventive measures.		
In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents. Spill kits to be kept on-site	Contractor	Duration of contract
Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility.	Contractor	Duration of contract
Upon the completion of construction, the area will be cleared of potentially polluting materials.	Contractor	Completion of construction

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

OBJECTIVE C13: Ensure disciplined conduct of on-site contractors and workers

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

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

Mitigation: Action/control	Responsibility	Timeframe
Contractors must use chemical toilets/ablution facilities situated at designated areas of the site; no ablution must be permitted outside the designated area. These facilities must be regularly serviced by appropriate contractors. Ablution facilities must not be placed within 100m from any river, wetland or drainage line.	Contractor (and sub-contractor/s)	Duration of contract
Cooking must take place in a designated area. No firewood or kindling may be gathered from the site or surrounds.	Contractor (and sub-contractor/s)	Duration of contract
All litter must be deposited in a clearly marked, closed, animal-proof disposal bin in the construction area; particular attention needs to be paid to food waste.	Contractor (and sub-contractor/s)	Duration of contract
No one other than the ECO or personnel authorised by the ECO, will disturb flora or fauna outside of the demarcated construction area/s.	Contractor (and sub-contractor/s)	Duration of contract

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

OBJECTIVE C14: To avoid and or minimise the potential risk of increased veld fires during the construction phase.

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

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

Performance Indicator	<ul style="list-style-type: none"> » Designated areas for fires identified on site at the outset of the construction phase. » Firefighting equipment and training provided before the construction phase commences. » Compensation claims settled after claim verified by independent party.
Monitoring	<ul style="list-style-type: none"> » A complaints register must be maintained, in which any complaints from the community are to be logged. Complaints must be investigated and, if appropriate, acted upon. » An incident reporting system must be used to record non-conformances in the EMPr.

5.4. Detailing Method Statements

OBJECTIVE C15: Ensure all construction activities are undertaken with the appropriate level of environmental awareness to minimise environmental risk

The environmental specifications are required to be underpinned by a series of Method Statements, within which the Contractors and Service Providers are required to outline how any identified environmental risks will practically be mitigated and managed for the duration of the contract, and how specifications within this EMPr will be met. That is, the Contractor will be required to describe how specified requirements will be achieved through the submission of written Method Statements to the Site Manager and ECO.

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

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

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

5.5. Awareness and Competence: Construction Phase of the Renewable Energy Facility

OBJECTIVE C16: To ensure all construction personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm

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

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

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

OBJECTIVE C17: To monitor the performance of the control strategies employed against environmental objectives and standards

An environmental monitoring programme should be developed and implemented not only to ensure conformance with the EMP, but also to monitor any environmental issues and impacts which have not been accounted for in the EMP that are, or could result in significant environmental impacts for which corrective action is required. The period and frequency of environmental monitoring will most likely be stipulated by the Environmental Authorisation.

Where this is not clearly dictated, Eskom will determine and stipulate the period and frequency of monitoring required in consultation with relevant stakeholders and authorities. The Project Manager will ensure that the monitoring is conducted and reported.

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

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

The ECO must have the appropriate experience and qualifications to undertake the necessary tasks. The ECO will ensure compliance with the EMP, will conduct monitoring activities, and will report any non-compliance or where corrective action is necessary to the Owner's Representative and/or any other monitoring body stipulated by the regulating authorities. The following reports will be applicable:

5.6.1 Non-Conformance Reports

All supervisory staff including Foremen, Resident Engineers, and the ECO must be provided the means to be able to submit non-conformance reports to the Owner's Representative. Non-conformance reports will describe, in detail, the cause, nature and effects of any environmental non-conformance by the Contractor. Records of any penalties imposed may be required by the relevant authority.

The non-conformance report will be updated on completion of the corrective measures indicated on the finding sheet. The report must indicate that the remediation measures have been implemented timeously and that the non-conformance can be closed-out to the satisfaction (approval) of the ECO.

5.6.2 Monitoring Reports

A monitoring report will be compiled by the ECO on a monthly basis and must be submitted to DEA for their records. This report should include details of the activities undertaken in the reporting period, any non-conformances or incidents recorded, corrective action required, and details of those non-conformances or incidents which have been closed out.

5.6.3 Final Audit Report

A final environmental audit report must be submitted to DEA upon completion of the construction and rehabilitation activities. This report must indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance with the environmental authorisation conditions and the requirements of the EMP.

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

CHAPTER 6

6.1. Overall Goal for the Rehabilitation of Disturbed Areas

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

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

6.2. Objectives

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

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

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

OBJECTIVE R1: To ensure rehabilitation of disturbed areas

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

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

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

Performance Indicator	<ul style="list-style-type: none"> » All portions of site, including construction camp and working areas, cleared of equipment and temporary facilities » Topsoil replaced on all areas and stabilised » Disturbed areas rehabilitated and at least 40% plant cover achieved on rehabilitated sites over a period of 2 to 5 years. » Closed site free of erosion and alien invasive plants
Monitoring and Reporting	<ul style="list-style-type: none"> » On-going inspection of rehabilitated areas in order to determine effectiveness of rehabilitation measures implemented. » On-going alien plant monitoring and removal should be undertaken on an annual basis. » An incident reporting system must be used to record non-conformances to the EMPr.

MANAGEMENT PROGRAMME FOR THE WIND ENERGY FACILITY: OPERATION

CHAPTER 7

An environmental manager or similar should be appointed during operation whose duty it will be to minimise impacts on surrounding sensitive habitats. In addition, it is important to monitor the incidence of bird collisions with the wind turbines, as well as bat fatalities. Should any significant impacts of the facility on priority bird or bat populations be detected by the monitoring programmes, mitigation could be required to be investigated for those selected problem turbines.

7.1. Overall Goal for Operation

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

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Facility Manager and Environmental Manager for the operation phase of this project are detailed below.

The **Facility Manager** will:

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

The **Environmental Manager** will:

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

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

7.2. Objectives

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

OBJECTIVE O1: Securing the site

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

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

Mitigation: Action/control	Responsibility	Timeframe
Where necessary, control and secure access to the site and entrances to the site	Eskom	Operation
Post information boards about public safety hazards and emergency contact information	Eskom	Operation

Performance Indicator	<ul style="list-style-type: none"> » Site is secure and there is no unauthorised entry » No members of the public/ landowners injured
Monitoring and	<ul style="list-style-type: none"> » Regular visual inspection of fence for signs of deterioration/forced

Reporting	access » An incident reporting system must be used to record non-conformances to the EMPr. » Public complaints register must be developed and maintained on site.
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OBJECTIVE O2: Limit the ecological footprint of the facility

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

Project component/s	» Areas requiring regular maintenance » Route of the security team » Areas disturbed during the construction phase and subsequently rehabilitated at its completion
Potential Impact	» Disturbance to or loss of vegetation and/or habitat » Alien plant invasion » Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention.
Activity/Risk Source	» Movement of employee vehicles within and around site.
Mitigation: Target/Objective	» Maintain minimised footprints of disturbance of vegetation/habitats on-site. » Ensure and encourage plant regrowth in non-operational areas of post-construction rehabilitation.

Mitigation: Action/Control	Responsibility	Timeframe
Vehicle movements must be restricted to designated roadways.	Eskom	Operation
Existing roads must be maintained to ensure limited erosion and impact on areas adjacent to roadways.	Eskom	Operation
Alien vegetation control within the facility should be by manual clearing and herbicides should not be used except to control alien plants in the prescribed manner	Eskom / Specialist	Operation
An on-going alien plant monitoring and eradication programme must be implemented, where necessary.	Eskom	Operation
Annual site inspection for erosion or water flow	Eskom /Specialist	Annual

regulation problems – with follow up remedial action where problems are identified		monitoring until successful re-establishment of vegetation in an area
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Performance Indicator	<ul style="list-style-type: none"> » No further disturbance to vegetation or terrestrial faunal habitats » No erosion problems within the facility or along the power line route » Low abundance of alien plants within affected areas » Maintenance of a ground cover of perennial grasses and forbs that resist erosion » Continued improvement of rehabilitation efforts
Monitoring	<ul style="list-style-type: none"> » Observation of vegetation on-site by environmental manager. » Regular inspections to monitor plant regrowth/performance of rehabilitation efforts and weed infestation compared to natural/undisturbed areas » Annual monitoring with records of alien species presence and clearing actions » Annual monitoring with records of erosion problems and mitigation actions taken with photographs

OBJECTIVE O3: Protection of avifauna, priority bird species and bat species

During operation of the facility, the threat of collision of birds and bats with the turbine blades is a concerning issue. However, the real extent of this threat is not currently well understood within the South African context due to the limited numbers of wind turbines in South Africa with which bird and bat interactions have been monitored. Lighting of turbines and other infrastructure has the potential to attract birds, thereby increasing the risk of collisions with turbines. Bird and bat monitoring is to be undertaken during the operation of the facility in order to monitor impacts on the facility on these communities and make recommendations for any additional measures which may be required to be implemented to minimise this impact.

Project component/s	<ul style="list-style-type: none"> » wind energy facility (turbines)
Potential Impact	<ul style="list-style-type: none"> » Disturbance to or loss of birds as a result of collision with the turbine blades » Disturbance to or loss of bats as a result of collision with turbines and/or barotrauma »

Activity/risk source	» Spinning turbine blades
Mitigation: Target/Objective	<ul style="list-style-type: none"> » More accurately determine the impact of the operating wind energy facility on priority bird species » To minimise the number of bat fatalities on site and to avoid impacts on species of conservation importance. » Minimise impacts associated with the substation

Mitigation: Action/control	Responsibility	Timeframe
A monitoring program must be set up post construction to monitor for the real impact the facility will have on birds and bats. This should be done in accordance with the most recent best practice guidelines for avian and bat monitoring, where required, additional mitigation should be implemented to minimise impacts.	Eskom / specialist	Operation
Periodically collate and analyse post-construction monitoring data for bird and bat monitoring and recommend additional mitigation measures for implementation as required.	Advising scientist/biologist	Every 3 months of monitoring
Review bird and bat monitoring report on the full year of post-construction monitoring, and integrate findings into operational EMPr and broader mitigation scheme.	Advising scientist/biologist, monitoring agency	1 year post-construction

Performance Indicator	<ul style="list-style-type: none"> » Minimal additional disturbance to bird or bat populations on the wind energy facility site. » Continued improvement of bird and bat protection devices, as informed by the operational monitoring. » Regular provision of clearly worded, logical and objective information on the interface between the local avifauna and bats and the proposed/ operating wind energy facility. » Clear and logical recommendations on why, how and when to institute mitigation measures to reduce avian impacts of the development, from pre-construction to operational phase.
Monitoring and Reporting	<ul style="list-style-type: none"> » Observation of avifaunal populations and incidence of injuries/death from collisions from turbine blades » The monitoring team to monitor turbine field for fatalities. » Review of bird monitoring report on the full year of post-construction monitoring

OBJECTIVE O4: Minimisation of visual impact

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

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

According to the proponent, no security or after hours lighting will be used during the operational phase of the facility. Therefore, glare from security lighting may be experienced during the construction phase only

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

Mitigation: Action/control	Responsibility	Timeframe
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Mitigation: Action/control	Responsibility	Timeframe
Maintain the general appearance of the facility in an aesthetically pleasing way.	Eskom	Operation and maintenance
Undertake regular maintenance of light fixtures.	Eskom	Operation and maintenance

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

OBJECTIVE 05: Minimisation of noise impacts from turbines

From the results of the EIA studies undertaken, noise impacts associated with the wind energy facility are expected to be of low significance. However, mitigation measures are proposed in order to further reduce any potential for noise impact. The rating level in the area for the wind energy facility is likely to be 35 dBA at night. That would also be the “lower limit”. Due to the limited noise receptors in and around the site (as identified in the noise impact assessment report), noise from the turbine is unlikely to negatively affect any residents in the broader study area.

Project component/s	<ul style="list-style-type: none"> » Wind turbines
Potential Impact	<ul style="list-style-type: none"> » Increased noise levels at potentially sensitive receptors » Changing ambient sound levels could change the acceptable land use capability » Disturbing character of sound
Activity/risk source	<ul style="list-style-type: none"> » Wind turbines
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Ensure that the change in ambient sound levels (measured in L_{Aeq}) as experienced by Potentially Sensitive Receptors is less than 5 dBA; (change from the measured and calculated ambient sound levels for the corresponding wind speed); » Prevent the generation of disturbing noise from the wind turbines; » Ensure acceptable noise levels at surrounding stakeholders and potentially sensitive receptors

Mitigation: Action/control	Responsibility	Timeframe
Design and implement a noise monitoring programme.	Acoustical Consultant	Before operational phase commence
Define ambient sound levels at NSD02, NSD03 and NSD04 employing the ETSU-R97 methodology before the development of the wind energy facility, unless these receptors are relocated	Acoustical Consultant	Before operational phase commence
Minimise impacts at NSD03 through: <ul style="list-style-type: none"> » The operation of wind turbines in a quieter mode; » The use of quieter wind turbines; » The relocation of the NSD03; or » Relocating of closest wind turbines from NSD03. 	Eskom	Before operational phase commence
Add noise monitoring points at any complainants that registered a valid noise complaint relating to the operation of the wind energy facility.	Eskom Acoustical Consultant	With quarterly monitoring

Performance Indicator	» Change in ambient sound levels (L_{Aeq}) as experienced by Potentially Sensitive Receptors is less than 5 dBA
Monitoring and Reporting	<ul style="list-style-type: none"> » Defining of ambient sound levels as per the ETSU-R97 methodology. These measurements should be taken in 10-minute bins for a period not less than 72 hours. This data should be co-ordinated with the mast wind speed (as calculated for the 10 meter height wind speed) (at NSD02, NSD03 and NSD04). » Once operational quarterly noise measurements at NSD02, NSD03 and NSD04 over a period of at least 24 hours during a period that the wind turbines are operational, unless these NSDs are relocated. Measurements should be collected in 10 minute bins and co-ordinated with the wind speeds as measured by the developer. These measurements should continue for a period of one year. » If a valid and reasonable complaint is registered at the developer relating to the operation of the facility additional noise monitoring should be undertaken as recommended by an acoustic consultant.

OBJECTIVE O6: Appropriate handling and management of hazardous substances and waste

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

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

Mitigation: Action/control	Responsibility	Timeframe
Hazardous substances must be stored in sealed containers within a clearly demarcated designated area.	Eskom	Operation
Storage areas for hazardous substances must be appropriately sealed and bunded.	Eskom	Operation
All structures and/or components replaced during maintenance activities must be appropriately disposed of at an appropriately licensed waste disposal site or sold to a recycling merchant for recycling.	Eskom	Operation
Care must be taken to ensure that spillage of oils and other hazardous substances are limited during maintenance. Handling of these materials should take place within an appropriately sealed and bunded area. Should any accidental spillage take place, it must be cleaned up according to specified standards regarding bioremediation.	Eskom	Operation and maintenance
Waste handling, collection and disposal operations must be managed and controlled by a waste management contractor.	Eskom / waste management contractor	Operation
Used oils and chemicals: <ul style="list-style-type: none"> » Where these cannot be recycled, appropriate disposal must be arranged with a licensed facility in consultation with the administering authority. » Waste must be stored and handled according to the relevant legislation and regulations. 	Eskom	Operation
General waste must be recycled where possible or disposed of at an appropriately licensed landfill.	Eskom	Operation
Hazardous waste (including hydrocarbons) and general waste must be stored and disposed of separately.	Eskom	Operation

Mitigation: Action/control	Responsibility	Timeframe
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Eskom	Operation
No waste may be burned or buried on site.	Eskom	Operation

Performance Indicator	<ul style="list-style-type: none"> » No complaints received regarding waste on site or dumping. » Internal site audits identifying that waste segregation, recycling and reuse is occurring appropriately. » Provision of all appropriate waste manifests. » No contamination of soil or water.
Monitoring and Reporting	<ul style="list-style-type: none"> » Waste collection must be monitored on a regular basis. » Waste documentation must be completed and available for inspection on request. » An incidents/complaints register must be maintained, in which any complaints from the community must be logged. Complaints must be investigated and, if appropriate, acted upon. » Regular reports on exact quantities of all waste streams exiting the site must be compiled by the waste management contractor and monitored by the environmental manager. All appropriate waste disposal certificates must accompany the monthly reports.

OBJECTIVE 07: Maximise local employment and business opportunities during operation

Based on information provided by Eskom approximately 8 permanent and 4 temporary employment opportunities will be created during the operational phase of the project. The operational phase is expected to last for at least 20 years.

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

Mitigation: Action/control	Responsibility	Timeframe
Identify local members of the community who are suitably qualified or who have the potential to be employed full time.	Eskom	Prior to commencement of operation
Develop training and skills transfer programme for local personnel.	Eskom	Prior to commencement of operation

Performance Indicator	<ul style="list-style-type: none"> » Public exposure to the project. » Meeting with Local Municipality and local tourism organisations during the construction phase.
Monitoring and Reporting	<ul style="list-style-type: none"> » Developer should be able to demonstrate that the above indicators are implemented.

OBJECTIVE 08: Implement an appropriate fire management plan during the operation phase

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

Project Component/s	<ul style="list-style-type: none"> » Operation and maintenance of the wind energy facility and associated infrastructure.
Potential Impact	<ul style="list-style-type: none"> » Veld fires can pose a personal safety risk to local farmers and communities, and their homes, crops, livestock and farm infrastructure, such as gates and fences. In addition, fire can pose a very minor risk to the wind energy facility infrastructure.
Activities/Risk Sources	<ul style="list-style-type: none"> » The presence of operation and maintenance personnel and their activities on the site can increase the risk of veld fires.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To avoid and or minimise the potential risk of veld fires on local communities and their livelihoods.

Mitigation: Action/Control	Responsibility	Timeframe
Provide adequate firefighting equipment on site. Apply for membership to local Fire Protection Association, should there be one in existence.	Eskom	Operation
Provide fire-fighting training to selected operation and maintenance staff.	Eskom	Operation
Ensure that appropriate communication channels are established to be implemented in the event of a fire.	Eskom	Operation
Fire breaks should be established where and when required. Cognisance must be taken of the relevant legislation when planning and burning firebreaks (in	Eskom	Operation

Mitigation: Action/Control	Responsibility	Timeframe
terms of timing, etc.). Access roads may also act as fire breaks.		
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.	Eskom	Operation
Contact details of emergency services should be prominently displayed on site.	Eskom	Operation

Performance Indicator	<ul style="list-style-type: none"> » Firefighting equipment and training provided before the construction phase commences. » Appropriate fire breaks in place.
Monitoring and Reporting	<ul style="list-style-type: none"> » Eskom must monitor indicators listed above to ensure that they have been met.

OBJECTIVE 09: Minimise the potential negative impact on farming activities and on the surrounding landowners

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

Once construction is completed, no farming activities are expected on site besides grazing which may take place where appropriate.

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

Mitigation: Action/Control	Responsibility	Timeframe
Effective management of the facility to avoid any environmental pollution focusing on water, waste and sanitation infrastructure and services.	Eskom	Operation
Vehicle movement to and from the site should be minimised as far as possible.	Eskom	Operation
Local roads should be maintained to keep the road surface up to a reasonable standard.	Eskom	Operation
Limit the development of new access roads on site.	Eskom	Operation

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

MANAGEMENT PLAN FOR WIND ENERGY FACILITY: DECOMMISSIONING

CHAPTER 8

The turbine infrastructure which will be utilised for the proposed Wind Energy Facility is expected to have a lifespan of 25 to 30 years (with maintenance). Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life. It is most likely that decommissioning activities of the infrastructure of the facility would comprise the disassembly and replacement of the turbines with more appropriate technology/infrastructure available at that time. The relevant mitigation measures contained under the construction section should be applied during decommissioning and therefore is not repeated in this section. It must be noted that decommissioning activities will need to be undertaken in accordance with the legislation applicable at that time, which may require this section of the EMP to be revisited and amended.

8.1. Site Preparation

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

8.2 Disassemble and Remove Existing Components

The wind (turbine and tower sections) of the proposed facility will be disassembled once it reaches the end of its economic lifespan. A large crane would be required for disassembling the turbine and tower sections. Once disassembled, the components will be reused, recycled, or disposed of in accordance with regulatory requirements (NEMA / NEM:WA). All parts of the turbine would be considered reusable or recyclable except for the blades.

8.2 Rehabilitation of the Site

In order to minimise the extent of rehabilitation activities required during the decommissioning phase, Eskom must ensure that constant effort is applied to rehabilitation activities throughout the construction, operation and maintenance phases of the project.

In decommissioning the facility, Eskom must ensure that:

- » All sites not already vegetated are vegetated as soon as possible after operation ceases with species appropriate to the area.
- » Any fauna encountered during decommissioning should be removed to safety by a suitably qualified person.
- » All structures, foundations and sealed areas are demolished, removed and waste material disposed of at an appropriately licensed waste disposal site.
- » All access/service roads not required to be retained by landowners are closed and fully rehabilitated.
- » All vehicles to adhere to low speed limits (40km/h max) on the site, to reduce risk of faunal collisions as well as reduce dust.
- » All disturbed areas are compacted, sloped and contoured to ensure drainage and runoff and to minimise the risk of erosion.
- » All rehabilitated areas are monitored for erosion.
- » Components of the facility are removed from the site and disposed of appropriately.
- » Retrenchments should comply with South African Labour legislation of the day.

The section on Rehabilitation (Chapter 6) is also relevant to the decommissioning of sections of the proposed distribution line and must be adhered to.

**REVISION OF THE
ENVIRONMENTAL MANAGEMENT PROGRAMME**

CHAPTER 9

The EMPr is a dynamic document, which must be updated to include any additional specifications as and when required. It is considered critical that this draft EMPr be updated to include site-specific information and specifications following the final walk-through survey by specialists of the development site. This will ensure that the construction and operation activities are planned and implemented considering sensitive environmental features. In addition, the EMPr should be updated throughout the life of the facility in order to ensure that appropriate measures are included for the minimisation of impacts on the environment. Any amendments must be approved by the Competent Authority (i.e. DEA) prior to implementation, unless these are required to address an emergency situation.

APPENDIX A:
PLANT RESCUE AND PROTECTION AND
REHABILITATION

METHODS FOR PLANT RESCUE AND HABITAT REHABILITATION

List of Abbreviations

CARA:	Conservation of Agricultural Resources Act 43 of 1983
DEA:	Department of Environmental Affairs
EA:	Environmental Authorisation
ECO:	Environmental Control Officer
EMP:	Environmental Management Plan
NEMA:	National Environmental Management Act 107 of 1998
LFA:	Landscape Functional Analysis (Tongway and Hindley 2004)
IAP:	Invasive Alien Plant

List of Definitions:

Accelerated soil erosion: Soil erosion induced by human activities.

Acceptable cover: An acceptable cover shall mean that not less than 75% (in an area with rainfall above 400 mm per annum), or 40% (in regions receiving less than 400 mm rain per annum), of the area planted or hydroseeded shall be covered with grass and that there shall be no bare patches of more than 500 mm in maximum dimension.

Alien: originating from another country or continent and originally different environment, commonly used to describe plants that are not indigenous to South Africa and have become problematic (spreading rapidly, threatening existing biodiversity).

Allelopathic components: one or more biochemical compound produced by a plant and released through leaf litter or roots that suppresses the growth, survival, and reproduction of other surrounding vegetation.

Bare soil: Un-vegetated soil surface, unaltered by humans.

Compacted soil surface: A soil surface that has been hardened by an outside source, causing the soil to be more compacted than the surrounding area.

Container plants: Container plants include all vegetation which are bought or supplied in acceptable containers from nurseries or vegetation lifted out of their natural position and placed in containers.

Desirable end state: the future condition or target on which the rehabilitation is designed and that will serve later as a basis for rehabilitation success evaluation. This can be based on a reference site or modelled according to available information on historic vegetation.

Ecological rehabilitation: The process of assisting the recovery of a degraded or damaged ecosystem in a trajectory that renders the ecosystem fully functional, stable, and able to develop further, but not necessarily returning to the original historic state.

Ecological restoration: The process of assisting the recovery of an ecosystem that has been degraded damaged or destroyed, in a trajectory that ultimately returns the ecosystem to its natural successional stage.

Ecosystem: The combination of biota within a given area, together with a suitable environment that sustains the biota and the interactions between biota. It can have a spatial unit of any size, but shows some degree of homogeneity as far as structure, function and species composition is concerned. Small-scale ecosystems typically link up to larger scale ecosystems and all contribute to the ecosystem function and services at the landscape-scale.

Environmental Management Plan: an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction and operation, and decommissioning of a project are prevented; and that the positive benefits of the projects are enhanced.

Establishment of grass: All procedures necessary to produce an acceptable cover of grass on an area.

Establishment Period: The Establishment Period is defined as the period beginning from the actual planting or placing of vegetation until three months thereafter, unless otherwise specified or unless grass cover is unacceptable or unless plants have not taken.

Extinction debt: is a concept that describes the future extinction of species due to events in the past. Extinction debt occurs because of time delays between impacts on a species, such as destruction of habitat or reduction of population size, and the species' ultimate disappearance.

Geophytic: resprouting during the growing season from an underground storage organ such as bulbs, corms, tubers or rhizomes, and dying back completely during unfavourable seasons.

Hydroseeding: To apply seed in a slurry with water (plus other materials to enhance growth) by means of a spraying device.

Indigenous: refers to a plant or animal that occurs naturally in the place in which it is currently found.

Invasive plant: a kind of plant which has under section 2 (3) of CARA been declared an invader plant, and includes the seed of such plant and any vegetative part of such plant which reproduces itself asexually.

Landscape: Consists of a mosaic of two or more ecosystems that exchange organisms, energy, water, and nutrients.

Nursery conditions: These are the necessary conditions to maintain healthy growth of rescued and/or container plants. This includes protection of such plants against wind, frost, direct sunlight, pests, rodents, diseases, and drought. It also includes the provision of suitable water, fertilizer and any other measures required to maintain the container plants.

Period of Maintaining: The Period of Maintaining is defined as the period following directly after the Establishment Period until the end of the Period

of Maintenance for the whole Contract as defined in the General Conditions of Contract, unless otherwise specified.

Revegetation: The process of establishing a vegetative cover on exposed soils, regardless of species composition or structure, as long as the species are non-invasive and their presence will not impede the gradual process of ecological rehabilitation or –restoration.

Soil Erosion: is a natural process whereby the ground level is lowered by wind or water action and may occur as a result of inter alia chemical processes and or physical transport on the land surface.

Scarifying: To roughen the surface of soil as a preparation for seeding or topsoil addition.

Trimming: To neatly round off the levels of existing or previously shaped earthworks to blend in with the levels of other earthworks, constructed works, or natural landforms.

Transformation: The conversion of an ecosystem to a different ecosystem or land use type.

Topsoil: uppermost layer of soil, in natural vegetation maximally 30 cm, in cultivated landscapes the total depth of cultivation, containing the layer with humus, seeds and nutrients. Topsoils that are applied to landscapes to be rehabilitated must be free of refuse, large roots and branches, stones, alien weeds and/or any other agents that would adversely affect the topsoils suitability for re-vegetation.

Weed: a plant that grows where it is not wanted, and can therefore be an indigenous or alien species. An unwanted plant growing in a garden is just called a weed, but the 198 listed IAPs are called “declared weeds and invaders”.

1. Purpose

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

The objective of the plan is therefore to provide:

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

2. Scope

This document is a plant rescue, rehabilitation, and revegetation plan that provides a guideline to be applied by all contractors on the development site. This plan, as part of the project EMP, is a legally binding document that must be implemented to fulfill the requirements of relevant legislation. However, the management plan is an evolving guideline that needs to be updated or adapted as progress is made with the rehabilitation and revegetation of the project area, and successes and failures of procedures identified.

The objective of rescuing plants, rehabilitation and revegetation on the project area is:

- » Preventing the loss of species either directly or through future extinction and minimising impacts of development on population dynamics of species of conservation concern.
- » Preserving the natural configuration of habitats as part of ecosystems, thus ensuring a diverse but stable hydrology, substrate and general environment for species to be able to become established and persist.
- » Preserving or re-creating the structural integrity of natural plant communities.
- » Actively aid the improvement of indigenous biodiversity according to a desirable end state according to a previously recorded reference state. This reference

state, if healthy, will be dynamic and able to recover after occasional disturbances without returning to a degraded state.

- » Improving the ecosystem function of natural landscapes and their associated vegetation.

3. Legislation and Standards

Relevant legislation:

- » Conservation of Agricultural Resources Act 43 of 1983
- » Environmental Conservation Act 73 of 1989
- » National Forestry Act 84 of 1998
- » National Environmental Management Act 107 of 1998
- » The Nature and Environmental Conservation Ordinance, 1974 (Ordinance 19 of 1974)
- » The Western Cape Nature Conservation Laws Amendment Act, 2000 (Ordinance 3 of 2000)

4. Effect of clearing alien vegetation

Invasive and Alien Plants (IAPs) gradually displace and suppress indigenous and/or herbaceous vegetation as their stands become bigger and denser. In addition, they use more water, hence desiccate the soil more, and may alter chemical properties of the soil – partially through secondary compounds released from their litter, partially from compounds released from roots. These altered soils suppress the germination and establishment of herbaceous species, leading to bare soil underneath dense IAP canopies.

After clearing dense stands of invasive shrubs, soil surfaces are thus generally bare with topsoil exposed to erosion and often already somewhat capped and eroded.

5. Effect of removing individuals of species of conservation concern

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

the original habitat as possible to minimise loss of individuals and fragmentation of populations to prevent the creation of future extinction debts of the development.

6. General: Plant rescue and protection

Successful plant rescue can only be achieved if:

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

6.1. Time of planting

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

7. General: IAP removal

Removal of invasive plants should at all time follow the specifications and guidelines of the Working for Water Programme (refer also to invasive plant management plan).

Information can be obtained from the relevant website:

<http://www.dwaf.gov.za/wfw>

Detailed information on clearing methods is available on the above websites "Alien Invasive Plants" menu (clearing methods, operational standards and species-specific treatment methods).

8. General: Rehabilitation and re-vegetation

Successful rehabilitation can only be achieved with:

- » A long-term commitment
- » Practical, adaptive management
- » Viable goals of desired outcomes

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

- » What the rehabilitation is ultimately aiming for– rehabilitation of cropping/grazing lands or rehabilitation of indigenous vegetation, after soil erosion and storm water management is in place and IAPs have been cleared?
- » A clear definition of incompatible and compatible vegetation on and in the immediate surroundings of the development must be defined and maintained as such. No tree or shrubs shall be allowed to grow to a height in excess of the horizontal distance of that tree or shrub from the nearest newly developed structure or to grow in such a manner as to endanger the development or its operation
- » Who will take long-term ownership and hence responsibility for the rehabilitation and its subsequent monitoring and management? Continued monitoring of vegetation establishment and composition, as well as erosion detection will have to be coupled with continued follow-up maintenance of rehabilitation and erosion control from commencement of activity up to the decommissioning phase.

The ultimate objective for rehabilitation should focus on the stabilisation of soil erosion, retaining agricultural potential of transformed areas and /or the establishment of a dense and protective plant cover and the maintenance of habitats to enable vegetation to persist and flourish on rehabilitated areas indefinitely, ultimately relying only on environmental resources.

8.1. Map and create management areas

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

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

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

- » what will happen there
- » what needs to be mitigated – including storm water- and erosion management
- » which management units need priority intervention/mitigation

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

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

8.2. Setting realistic rehabilitation goals

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

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

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

8.3. Remove or ameliorate the cause of degradation

This will include:

- » Physical rehabilitation of topsoil where it has been removed.
- » Topsoil on areas that have not been cultivated are considered as the upper 20 - 30 cm only. These contain the most important nutrients, micro flora and –fauna essential for nutrient cycling processes. Topsoils are also an important source of seeds.

- » Subsoils and overburden substrata lack the above elements and will first have to be used for physical rehabilitation of landscapes as and where necessary, and then overlain with topsoils
- » Stabilisation of topsoils and prevention of erosion – refer to the Erosion management plan
- » Removal of all invasive vegetation – refer to the Invasive Management Plan
 - Where it is desirable to use brush or logs of the cleared vegetation for soil stabilisation, such material must be free of regenerative material – e.g. seeds or root suckers

8.4. Initial revegetation

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

8.5. Plant Search and Rescue

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

8.6. Natural seed banks and improvement of plant structural and compositional diversity

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

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

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

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

For drainage areas:

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

8.7. Monitoring and follow-up action

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

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

The following are the minimum criteria that should be monitored:

- » Composition and density of replanted vegetation, distinguishing between species introduced for initial revegetation only and species that are part of the pre-determined desirable end state
- » Associated nature and stability of surface soils
 - It is recommended that permanent transects are marked and surveyed annually according to the LFA technique (Tongway and Hindley 2004), adapted to integrate both surface soil characteristics and the vegetation to be monitored
- » Re-emergence of IAPs

- If noted, remedial action must be taken immediately according to Working for Water specifications
- » Nature and dynamics of riparian zones
 - Stability of riparian vegetation
 - Any form of bank erosion, slumping or undercutting
 - Stability of channel form and width of streams – if this increases, it shows that vegetation on plains and/or riparian areas and upper drainage lines are not yet in a stable enough state to be fully functional in reducing excess runoff and the ecosystem overall is losing valuable resources

8.8. Timeframes and duration

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

9. Conclusion

The Plant Rescue and Revegetation Management Plan is a document to assist the contractor, the developer, and the ECO with guidelines on how to plan and implement the required work, and understand the concepts behind successful rehabilitation. This plan will have to be implemented in conjunction with erosion-, storm water- and IAP management plans. The exact details of the rehabilitation plan will depend on the determined extent of rehabilitation that will have to be undertaken, available funding, and desirable end state of the vegetation after rehabilitation.

10. References and further reading

- Clewell, A., Rieger, J. and Munro, J. (2005). *Guidelines for Developing and Managing Ecological Restoration Projects, 2 Edition*. www.ser.org and Tucson: Society for Ecological Restoration International.
- Coetzee, K. (2005). *Caring for Natural Rangelands*. Scottsville: University of KwaZulu-Natal Press.
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- Society for Ecological Restoration International Science & Policy Working Group. 2004. *The SER International Primer on Ecological Restoration*. www.ser.org & Tucson: Society for Ecological Restoration International.
- Tongway, D.J. and Hindley, N.L. (2004) *Landscape Function Analysis: Procedures for Monitoring and Assessing Landscapes*, CSIRO Sustainable Ecosystems, CANBERRA, AUSTRALIA.
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A. APPENDIX: RECOMMENDED OPERATIONAL STANDARDS

OBJECTIVE: Revegetate and Rehabilitate disturbed areas

The Contractor must take all reasonable measures to ensure that plant species of conservation concern are rescued and survive indefinitely. Landscaped topsoils as well as areas cleared of IAPs must be adequately rehabilitated and /or revegetated to ensure that the ecosystems affected by the development regain and/or retain their functionality indefinitely.

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

Mitigation measures relating to the vegetative cover as part of a healthy ecosystem must be implemented in order to effectively limit and gradually reverse the impact on the environment. The focus of the mitigation measures laid out below relate to project-related disturbances. Where such disturbances are exacerbated by farming-related disturbances or vice versa, mitigation measures must be carried out in consultation with the land-user responsible.

Project component/s	Project components affecting the objective: <ul style="list-style-type: none"> » Turbines » Access roads and cabling between and to turbine units » Power line » Sealed surfaces (e.g. roofs, concrete surfaces, compacted road surfaces, paved roads / areas) » Substation » All other infrastructure
Potential Impact	<ul style="list-style-type: none"> » Loss of suitable substrate for a stable vegetation cover » De-stabilisation and/or alteration of substrate and hence degradation of vegetation cover, significant change in species composition or loss of agricultural potential » Loss of suitable habitat for flora and fauna » Leaky ecosystem due to loss of nutrients and moisture from the system, leading to a less resilient vegetation cover and loss of ecosystem function and -services » Degradation and/or loss of riparian areas and wetlands on and beyond the project boundaries » A loss of indigenous vegetation cover and possibly endangered species » Disturbance of fauna species
Activities/risk sources	<ul style="list-style-type: none"> » Rainfall and wind erosion of disturbed areas » Excavation, stockpiling and compaction of soil » Existing IAPs as well as clearing thereof » Concentrated discharge of water from construction activity or new

	<p>infrastructure</p> <ul style="list-style-type: none"> » Storm water run-off from sealed, altered or bare surfaces » Mobile construction equipment movement on site » Cabling and access roads construction activities » Power line construction activities » River/stream/drainage line road crossings » Roadside drainage ditches » Project related infrastructure » Premature abandonment of follow-up monitoring and adaptive management of rehabilitation
Mitigation: Target/ Objective	<ul style="list-style-type: none"> » To minimise loss of plant species of conservation concern » To minimise unfavourable runoff conditions and loss of resources from the ecosystems » To minimise erosion of soil from site during and after construction » To minimise and mitigate unfavourable alteration to drainage lines, especially incision » To minimise damage to indigenous vegetation during and after construction » No accelerated overland flow related surface erosion as a result of project infrastructure » No reduction in the surface area or general nature and functionality of wetlands (drainage lines and other wetland areas) as a result of the establishment of infrastructure on the project areas and beyond its boundaries » A clear reduction of IAPs on the project area and replacement thereof by indigenous vegetation according to a pre-determined desirable end state

Mitigation: Action/control	Responsibility	Timeframe
Planning		
Classify the entire project area into management units according to current land cover and state of the environment and map accordingly	Developer / Contractor	Prior to construction
<p>For each management unit</p> <ul style="list-style-type: none"> » establish what interventions will be necessary relating to IAPs, soil erosion management, topsoil handling, landscape rehabilitation and revegetation » where rehabilitation and revegetation will be necessary, decide on the desired end state of vegetation for that management unit and create a list of species to be established on specific sites » outline the management of construction activities, including topsoils, excavated materials and felled biomass in a manner that will optimise the rehabilitation goals as fast and as effective as possible for that management unit 	Developer / Contractor in collaboration with ECO and land-users	Prior to construction
Plant Rescue and indigenous plant materials		
<p>All harvested plant materials shall be labelled with</p> <ul style="list-style-type: none"> » Genus as minimum, species if known » Habitat from which materials were collected 	ECO	Prior to construction

Mitigation: Action/control	Responsibility	Timeframe
<p>Indigenous plant materials for re-vegetation:</p> <ul style="list-style-type: none"> » All plant material shall be obtained from the search-and-rescue operation on the site prior to clearing or from local nurseries or reputable seed providers » Indigenous materials shall only be removed from their habitat with the necessary permits whenever applicable » Each plant removed shall be handled, packed and stored in a manner suitable for that species » Removed plants shall be protected from windburn or other damage during transportation » No plants or plants with exposed roots shall be subjected to excessive exposure to drying winds and sun, or subjected to water logging » All plants shall be kept free from plant diseases and pests and protected from rodents or other damaging agents » All indigenous plants that have been removed prior to clearing shall be returned to conditions resembling their original habitat as close as practically possible 	Contractor in collaboration with ECO	Before, during and after construction
<p>Seed stocks for rehabilitation</p> <ul style="list-style-type: none"> » Seed can be used for cultivation of desirable species for revegetation » Seed shall be utilised for direct sowing or hydroseeding » Seed collected from the site must be dried and stored in a suitable facility under cool (7-10 °C), dry, insect free conditions until required for cultivation or seeding. Only viable, ripe seed shall be used » Seed harvested shall be insect- and pathogen free » Seed harvested shall not contain materials of any invasive species » Prior to clearing, seed should be collected from the site on a regular basis as species start to seed to maximise the amount of fully developed seed secured » From sites that will be cleared, 100% of all seeds available may be collected » From sites adjacent to the development, 25% of seeds can be collected for rehabilitation 	Contractor and ECO	Before, during and after construction
<p>Site-specific nursery</p> <ul style="list-style-type: none"> » On-site nursery facilities shall be erected for the holding of rescued plant material and the propagation of appropriate species for re-vegetation » Where nursery facilities can only cater for rescued plants, a suitable (local) nursery shall be identified that will be willing to receive seeds collected and propagate the necessary species for later revegetation » Soil or other propagation media, were used, shall be weed- and pathogen free » Argentine ants shall be controlled at all times » The area where plants are stored shall be kept free of 	Contractor, ECO to control	Prior to construction

Mitigation: Action/control	Responsibility	Timeframe
weeds <ul style="list-style-type: none"> » Plants stored in the designated area shall be protected from rodents, excessive sun and wind, and inspected regularly until being planted for pathogens and pests, and then treated accordingly » The nursery shall be adequately secured to prevent loss or theft of species 		
Protected flora <ul style="list-style-type: none"> » Ensure that no indigenous protected flora is removed from its original habitat in the project area without legal documents from the relevant authorities 	ECO	Before, during and after construction
Topsoil		
Avoid <ul style="list-style-type: none"> » Management units that will not be developed or selected elements – trees, rocky outcrops on site shall be maintained in situ and demarcated clearly to prevent any disturbance during construction » These units will be considered as NO-GO areas during construction 	Contractor and ECO	Before, during and immediately after construction
Invasives <ul style="list-style-type: none"> » Remove all invasive shrubs as per the Working for Water specifications 	Contractor, ECO to control	Before, during and after construction
Mulch <ul style="list-style-type: none"> » all trees felled shall be debranched and the logs used in controlling erosion from re-landscaped topsoils and/or adding surface roughness and organic matter to topsoils to be rehabilitated » all cut branches from trees, as well as all shrubs cleared from the construction site shall be shredded to mulch, either by a chipper or by hand to sticks no longer than 10 cm » preparation of mulch shall be done at source » mulched material shall be free of seed-bearing invasive plant material » the mulch shall be suitably stored – bagged if necessary - and will be used in rehabilitation and soil erosion management on the site » should additional mulch be used for rehabilitation, this should be obtained from invasive shrubs of areas not cleared » mulch shall be stored for as short a period as possible 	Contractor, ECO to control	Before, during and immediately after construction
Storage of topsoil and subsoil: <ul style="list-style-type: none"> » topsoils constitute the upper 20 – 30 cm of soil only, lower layers of soil are regarded as subsoil » stockpiling of topsoils and subsoils shall only be done on previously transformed areas, and be kept at least 50 m from any remaining natural vegetation » care shall be taken during stockpiling to prevent the 	Contractor, ECO to control	During and immediately after construction

Mitigation: Action/control	Responsibility	Timeframe
<p>mixing of topsoil with subsoil and/or any other material</p> <ul style="list-style-type: none"> » topsoils shall be stored in heaps no higher than 100 cm, and shall be re-applied as soon as possible » care shall be exercised during stockpiling of topsoils to prevent compaction thereof » topsoils shall be adequately protected from erosion by preventing concentration of surface water and scouring of slopes » erosion of topsoils has to be contained and repaired as soon as it occurs, before large scale erosion and loss of topsoil develops » any logs obtained during clearing operations can be used in continuous rows to curtail erosion where necessary. Geojute (geotextile) shall be used additionally if the logs are not sufficient to remedy any erosion – for details refer to the erosion management plan » where topsoils need to be stored longer than 6 months, such stockpiles shall be revegetated, even if this has to include re-seeding to achieve an acceptable cover of vegetation 		
<p>Boulders and rocks</p> <ul style="list-style-type: none"> » where removed during clearing, should be stored separately and used in the rehabilitation program » boulders and rocks must be partially buried within the topsoil layer wherever practical to provide greater soil-holding stability and reduce water erosion » placement of rocks and boulders shall mimic the natural occurrence of rocks and boulders in the area 	Contractor, ECO to control	During and after construction
Rehabilitation of surface		
<p>Prior to the application of topsoil</p> <ul style="list-style-type: none"> » subsoil shall be shaped and trimmed to blend in with the surrounding landscape or used for erosion mitigation measures » ground surface or shaped subsoil shall be ripped or scarified with a mechanical ripper or by hand to a depth of 15 – 20 cm, » compacted soil shall be ripped to a depth greater than 25 cm and the trimmed by hand to prevent re-compacting the soil » any rubbish, concrete remnants, steel remnants or other objects introduced to the site during the construction process shall be cleared before ripping, or shaping and trimming of any landscapes to be rehabilitated takes place » shaping will be to roughly round off cuts and fills and any other earthworks to stable forms, sympathetic to the natural surrounding landscapes 	Contractor, ECO to control	During and after construction

Mitigation: Action/control	Responsibility	Timeframe
<p>Application of topsoil</p> <ul style="list-style-type: none"> » topsoils shall be spread evenly over the ripped or trimmed surface, if possible not deeper than the topsoil originally removed » the final prepared surface shall not be smooth but furrowed to follow the natural contours of the land » the final prepared surface shall be free of any pollution or any kind of contamination » care shall be taken to prevent the compaction of topsoil » where applicable, the final prepared surface will also contain scattered rocks and/or logs to mimic the natural condition of the original habitat or area and to aid in soil stabilisation and erosion control 	Contractor, ECO to control	During and after construction
<p>Soil stabilisation</p> <ul style="list-style-type: none"> » mulch from brush shall be applied by hand to achieve a layer of uniform thickness » mulch shall be rotovated into the upper 10 cm layer of soil <ul style="list-style-type: none"> ○ this operation shall not be attempted if the wind strength is such as to remove the mulch before it can be incorporated into the topsoil » in very rocky areas a layer of mulch shall be applied prior to adding the topsoil » measures shall be taken to protect all areas susceptible to erosion by installing temporary and permanent drainage work as soon as possible <ul style="list-style-type: none"> ○ where natural water flow-paths can be identified, subsurface drains or suitable surface drains and chutes need to be installed » additional measures shall be taken to prevent surface water from being concentrated in streams and from scouring slopes, banks or other areas <ul style="list-style-type: none"> ○ if mulch is limited, available mulch, together with harvested seeds, should be concentrated in these hollows to promote rapid re-vegetation in them » runnels or erosion channels developing shall be back-filled and restored to a proper condition <ul style="list-style-type: none"> ○ such measures shall be effected immediately before erosion develops at a large scale » where erosion cannot be remedied with available mulch, logs or rocks, geojute shall be used to curtail erosion 	Contractor, ECO to control	During and after construction
<p>Borrow-pits</p> <ul style="list-style-type: none"> » shall be shaped to have undulating, low-gradient slopes and surfaces that are rough and irregular, suitable for trapping sediments and facilitation of plant growth » upon completion of rehabilitation these reshaped and revegetated areas shall blend into the natural terrain 	Contractor, ECO to control	After construction

Mitigation: Action/control	Responsibility	Timeframe
Revegetation		
<p>Recreate a non-invasive, acceptable vegetation cover that will facilitate the establishment of desirable and/or indigenous species</p> <ul style="list-style-type: none"> » revegetation of the final prepared area is expected to occur spontaneously to some degree where topsoils could be re-applied within 6 months » revegetation will be done according to an approved planting/landscaping plan according to the management units initially delineated and their respective desirable end states and permissible vegetation 	Contractor, ECO to control	Successively during construction , as construction of individual components is completed, then followed up until desired end state is reached
<p>Re-seeding</p> <ul style="list-style-type: none"> » revegetation can be increased where necessary by hand- seeding indigenous species <ul style="list-style-type: none"> o previously collected and stored seeds shall be sown evenly over the designated areas, and be covered by means of rakes or other hand tools » re-seeding shall occur at the recommended time to take advantage of the growing season » in the absence of sufficient follow-up rains after seeds started germinating, watering of the new vegetation cover until it is established shall become necessary to avoid loss of this vegetative cover and the associated seedbank » where, after initial re-seeding, the no acceptable vegetation cover has established within 12 months, hydroseeding should be considered as an option for follow-up revegetation work » sowing rates of seeds used during hydro-seeding should be obtained from the relevant supplier and in accordance with the existing environment 	Contractor, ECO to control	Successively during construction , as construction of individual components is completed, then followed up until desired end state is reached
<p>Planting of species</p> <ul style="list-style-type: none"> » species to be planted include all rescued species » the size of planting holes shall be sufficiently large to ensure that the entire root system is well covered with topsoil » soil around the roots of container plants shall not be disturbed » bulbous plants shall be planted in groups or as features in selected areas » before placement of larger plant specimens into prepared holes, the holes shall be watered if not sufficiently moist » during transplanting care shall be taken to limit or 	Contractor, ECO to control	Successively during construction , as construction of individual components is completed, then followed up until desired end state is reached

Mitigation: Action/control	Responsibility	Timeframe
prevent damage to roots <ul style="list-style-type: none"> » plants should be watered immediately after transplanting to help bind soil particles to the roots (or soil-ball around rooted plants) and so facilitate the new growth and functioning of roots 		reached
Traffic on revegetated areas <ul style="list-style-type: none"> » designated tracks shall be created for pedestrian or vehicle traffic where necessary » Disturbance of vegetation and topsoil must be kept to a practical minimum, no unauthorised off road driving will be allowed » All livestock shall be excluded from revegetated areas 	Contractor	Before, during and after construction
Establishment <ul style="list-style-type: none"> » The establishment and new growth of revegetated and replanted species shall be closely monitored » Where necessary, reseeding or replanting will have to be done if no acceptable plant cover has been created 	Contractor	Successively during construction, as construction of individual components is completed, then followed up until desired end state is reached
Monitoring and follow-up treatments		
Monitor success of rehabilitation and revegetation and take remedial actions as needed according to the respective plan <ul style="list-style-type: none"> » Erosion shall be monitored at all times and measures taken as soon as detected » Where necessary, reseeding or replanting will have to be done if no acceptable plant cover has been created 	ECO during construction, suitable designated person/institution after that	During and after construction, during operational and decommissioning phase
Weeding <ul style="list-style-type: none"> » It can be anticipated that invasive species and weeds will germinate on rehabilitated soils <ul style="list-style-type: none"> o These need to be hand-pulled before they are fully established and/or reaching a mature stage where they can regenerate o Where invasive shrubs re-grow, they will have to be eradicated according to the Working for Water specifications 		
Performance Indicator	<ul style="list-style-type: none"> » No activity in identified no-go areas » Acceptable level of activity within disturbance areas, as 	

	<p>determined by ECO</p> <ul style="list-style-type: none">» Natural configuration of habitats as part of ecosystems or cultivated land is retained or recreated, thus ensuring a diverse but stable hydrology, substrate and general environment for species to be able to become established and persist» The structural integrity and diversity of natural plant communities is recreated or maintained» Indigenous biodiversity continually improves according to the pre-determined desirable end state<ul style="list-style-type: none">○ This end state, if healthy, will be dynamic and able to recover by itself after occasional natural disturbances without returning to a degraded state» Ecosystem function of natural landscapes and their associated vegetation is improved or maintained
Monitoring	<ul style="list-style-type: none">» Fortnightly inspections of the site by ECO during construction» An incident reporting system must record non-conformances to the EMP.» Quarterly inspections and monitoring of the site by the ECO or personnel designated to the rehabilitation process until 80% of the desired plant species have become established<ul style="list-style-type: none">○ These inspections should be according to the monitoring protocol set out in the rehabilitation plan» Thereafter annual inspections according to the minimal monitoring protocol

B. APPENDIX: CHECKLIST OF ACTIONS FOR REHABILITATION PLANNING

Conceptual Planning	<ul style="list-style-type: none"> » Identify rehabilitation site locations and its boundaries » Identify ownership of rehabilitation program » Describe improvements that are anticipated following rehabilitation » Identify the kind of ecosystem to be rehabilitated at each site » Identify rehabilitation goals and desirable end state » Identify physical site conditions in need of repair » Identify stressors in need of regulation or re-initiation to maintain the integrity of the ecosystem, such as aliens, erosion, fire-regime » Identify the list and kinds of interventions of abiotic and biotic interventions that are and will be needed » Identify landscape restrictions and whether or not its integrity is dependent on a functioning ecosystem outside the project area » Determine project funding and sources » Identify labour sources and equipment needs » Identify biotic resource needs and sources, e.g. suitable topsoil, seeds » Identify any permit requirements or other legal issues » Determine project duration » Outline adaptable strategies for long-term protection and management
Preliminary Tasks	<ul style="list-style-type: none"> » Appoint a rehabilitation practitioner who is in charge of all the technical aspects of rehabilitation » Appoint a restoration team and train where necessary to ensure effective implementation » Prepare a budget to accommodate the completion of preliminary tasks » Document existing site conditions, also describing biota » Conduct pre-project monitoring as needed, including soil chemistry, that may affect the success of the rehabilitation program » Establish a reference site or past reference that represents the desired end state of the site » Gather information on key species to be re-introduced » Conduct investigations as needed to assess the effectiveness of restoration methods and strategies used in similar habitats up to date » Decide if rehabilitation goals are realistic or need modification » Prepare a list of objectives that need to be reached to achieve restoration goals » Ensure liaison with affected stakeholders, especially as far as rehabilitation goals are concerned » Investigate available accedes and infrastructure needed to facilitate implementation of rehabilitation
Implementation phase	<ul style="list-style-type: none"> » Describe the interventions that will be implemented to attain each set objective » Acknowledge potential for passive restoration where viable » Prepare performance standards and monitoring protocols to measure the attainment of each objective » Schedule tasks needed to fulfil each objective

	<ul style="list-style-type: none"> » Obtain equipment, supplies and biotic resources as needed » Prepare an appropriate budget
Implementation tasks	<ul style="list-style-type: none"> » Mark boundaries and work areas » Install permanent monitoring fixtures » Implement restoration tasks
Post-implementation tasks	<ul style="list-style-type: none"> » Protect the rehabilitation site against initial disturbance, including herbivores » Perform post-implementation maintenance, especially continued monitoring and eradication of emerging IAPs » Monitor site at least once per year, using the LFA technique, and identify needs for adaptive management
Evaluation	<ul style="list-style-type: none"> » Assess monitoring data to determine whether performance standards are met and rehabilitation objectives reached and maintained » Conduct an ecological evaluation of the newly completed rehabilitation

C. APPENDIX: TRANSPLANTING GUIDELINES FOR PLANTS WITH UNDERGROUND STORAGE ORGANS

Many of the plants in harsh environments have underground storage organs from which they resprout every year after sufficient rains, flower and then die back soon after fruiting and remain dormant, out of sight until the next growing season. All species of the families Amaryllidaceae, Iridaceae, Orchidaceae are protected provincially, nationally and/or internationally, as are many species of other monocot species.

Root system: underground storage organs are variable in size, but usually between 15 and 40 cm deep in the soil

Transplanting: success of transplanting is usually very high IF handled correctly

Rescue 101: Plants should be lifted and transplanted after flowering and fruiting, preferably as the leaves start to die back. For lifting, loosen the soil or wedge apart rocks working from a circle of about 20 cm away from the base of the plant, working inwards but not closer than about 5 cm of the plant with a sharp narrow object such as a koevoet. Once the soil is loosened, gently feel by hand where the bulb, corm, or other storage organ is, and wedge out by hand, taking care not to damage it. Remove loose soil, gently cleanse off most of remaining soil, or rinse off the storage organ. Group these according to species and label clearly, keep records of labels to include name if that is known, or a brief description or photo, also the average depth of the organs when they were removed, and the habitat they were removed from. Spread these plants so that the storage organ can dry completely, and then loosely pack into newspaper or paper bag and then store in a shaded, dry position for maximally 3 months. Transplant into soil that is as similar as possible to the original habitat, TAKING CARE that the growing point of the organ points to the top, else the plant will die. Make sure the storage organs are positioned according to the records kept about original depth of the storage organ.

Aftercare: Firm down soil around the base of the plant once it is in a new position. Allow plant to resprout naturally after sufficient rains, do not water. As these plants may not be visible for a while, clearly demarcate the area where these have been planted to avoid disturbing and potentially destroying them later on.

APPENDIX B:
ALIEN INVASIVE MANAGEMENT PLAN

ALIEN INVASIVE PLANT MANAGEMENT PLAN

OVERALL OBJECTIVE

Manage alien and invasive plant species during the construction and operation of the Wind Energy Facility, through the implementation of an alien invasive species management and control programme.

PROBLEM OUTLINE

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

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

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

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

The following guide is a useful starting point for the identification of alien species:

Bromilow, C. 2010. *Problem Plants and Alien Weeds of South Africa*. Briza, Pretoria.

SPECIFIC MANAGEMENT OBJECTIVES:

- Ensure alien plants do not become dominant in parts or the whole landscape
- Initiate and implement a monitoring and eradication programme for alien and invasive species
- Control alien and invasive species dispersal & encroachment
- Promote the natural reestablishment and planting of indigenous species

VULNERABLE ECOSYSTEMS AND HABITATS

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

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

- Wetlands, drainage lines and other mesic areas
- Cleared and disturbed areas such as road verges, crane pads and construction footprints etc.
- Construction camps and lay-down areas which are cleared or are active for an extended period

Wetlands, drainage lines and other mesic areas

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

Cleared and disturbed areas

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

Construction camps and laydown areas

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

GENERAL CLEARING & GUIDING PRINCIPLES

- Alien control programs are long-term management projects and should include a clearing plan which includes follow up actions for rehabilitation of the cleared area. Alien problems at the site should be identified during preconstruction surveys of the development footprint. This may occur simultaneously to other required searches and surveys. The clearing plan should then form part of the preconstruction reporting requirements for the site.

- The plan should include a map showing the alien density & indicating dominant alien species in each area.
- Lighter infested areas should be cleared first to prevent the build-up of seed banks.
- Dense mature stands of woody species where present should be left for last, as they probably will not increase in density or pose a greater threat than they are at the moment.
- Collective management and planning with neighbours may be required as seeds of aliens are easily dispersed across boundaries by wind or water courses.
- All clearing actions should be monitored and documented to keep track of which areas are due for follow-up clearing.

CLEARING METHODS

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

USE OF HERBICIDES FOR ALIEN CONTROL

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

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

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

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

ALIEN PLANT MANAGEMENT PLAN

CONSTRUCTION PHASE ACTIVITIES

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

Action	Frequency
The ECO is to provide permission prior to any vegetation being cleared for development.	Daily
Clearing of vegetation must be undertaken as the work front progresses – mass clearing is not allowed unless the entire cleared area is to be rehabilitated immediately.	Weekly
Should re-vegetation not possible immediately, the cleared areas must be protected with packed brush, or appropriately battered with fascine work. Alternatively, jute (Soil Saver) may be pegged over the soil to stabilise it.	Weekly
Cleared areas that have become invaded can be sprayed with appropriate herbicides provided that these are such that break down on contact with the soil. Residual herbicides should not be used.	Weekly
Although organic matter is frequently used to encourage regrowth of vegetation on cleared areas, no foreign material for this purpose should be brought onto site. Brush from cleared areas should be used as much as possible. Arid soils are usually very low in organic matter and the use of manure or other soil amendments is likely to encourage invasion.	Weekly
Clearing of vegetation should not be allowed within 50m of any wetland or pan, 80m of any wooded area, within 1:100 year floodlines, in conservation servitude areas or on slopes steeper than 1:3, unless permission is granted by the ECO for specifically allowed construction activities in these areas.	Weekly
Care must be taken to avoid the introduction of alien plant species to the site and surrounding areas. (Particular attention must be paid to imported material such as building sand or dirty earth-moving equipment.) Stockpiles should be checked regularly and any weeds emerging from material stockpiles should be removed.	Weekly
Alien vegetation regrowth must be controlled throughout the entire site during the construction period.	Monthly
The alien plant removal and control method guidelines should adhere to best-practice for the species involved. Such information can be obtained from the DWAF Working for Water website.	Monthly
Clearing activities must be contained within the affected zones and may not spill over into demarcated No Go areas.	Daily
Pesticides may not be used. Herbicides may be used to control listed alien weeds and invaders only.	Monthly

Drainage lines and other sensitive areas should remain demarcated with appropriate fencing or hazard tape while construction activities within the area are underway. These areas are no-go areas (this must be explained to all workers) that must be excluded from all development activities.	Daily
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MONITORING – CONSTRUCTION PHASE

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

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

OPERATIONAL PHASE ACTIVITIES

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

Action	Frequency
Surveys for alien species should be conducted regularly. Every 3 months for the first two years after construction and biannually thereafter. All aliens identified should be cleared.	Every 3 months for 2 years and biannually thereafter
Re-vegetation with indigenous, locally occurring species should take place in areas where natural vegetation is slow to recover or where repeated invasion has taken place.	Biannually, but re-vegetation should take place at the start of the rainy season.
Areas of natural vegetation that need to be maintained or managed to reduce plant height or biomass, should be controlled using methods that leave the soil protected, such as using a weed-eater to mow above the soil level.	When necessary
No alien species should be cultivated on-site. If vegetation is required for esthetic purposes, then non-invasive, water-wise locally-occurring species should be used.	When necessary

MONITORING – OPERATIONAL PHASE

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

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

DECOMMISSIONING PHASE ACTIVITIES

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

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

MONITORING – DECOMMISSIONING PHASE

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

Monitoring Action	Indicator	Timeframe
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Monitor newly disturbed areas where infrastructure has been removed to detect and quantify any aliens that may become established for 3 years after decommissioning and rehabilitation.	Alien plant surveys and distribution map	Biannually until such time as the natural vegetation has recovered sufficiently to resist invasion.
Monitor re-vegetated areas to detect and quantify any aliens that may become established for 3 years after decommissioning and rehabilitation.	Alien plant surveys and distribution map	Biannually for 3 years
Document alien plant control measures implemented & success rate achieved	Records of control measures and their success rate. A decline in alien distribution and cover over time at the site	Annually for 3 years

REFERENCES:

AGIS (2006) Weeds and Invasive Plants Atlas (www.agis.agric.za/wip)

APPENDIX C:
EROSION MANAGEMENT PLAN

PRINCIPLES FOR EROSION MANAGEMENT

1. Purpose

An Erosion Management Plan addresses the management and mitigation of significant impacts relating to soil erosion. The objective of the plan is to provide:

- » A general framework for erosion management, which enables the contractor to identify areas where erosion can be accelerated from their action.
- » An outline of general methods to monitor, manage and rehabilitate erosion in ensuring that all erosion caused by this development is addresses.

2. Legislation and Standards

Soil conservation pertaining to erosion has been a topic within legislation form the 1930's till today in South Africa. Internationally, standards have been set by the International Finance Corporation and the World Bank to address soil erosion in construction and decommissioning of areas. Therefore this document will ensure that the developer meets the South African legislative requirements and the IFC standards with regards to monitoring, managing and rehabilitating soil erosion on the Cookhouse wind energy facility site.

Relevant legislation:

- » Conservation of Agricultural Resources Act No 43 of 1983
- » Environmental Conservation Act No 73 of 1989
- » National Forestry Act No 84 of 1998
- » National Environmental Management Act No 107 of 1998
- » The Department of Water Affairs and Forestry, February 2005. Environmental Best Practice Specifications: Construction Integrated Environmental Management Sub-Series No. IEMS 1.6. Third Edition. Pretoria.

3. Areas with a high soil erodability potential

The following areas are generally associated with high soil erodibility potential:

- » Any areas without vegetation cover
- » Excavated areas
- » Steep areas
- » Areas where the soil has been degraded already
- » Dispersive, duplexed soil areas
- » Areas with fine grained soil material with a low porosity
- » Areas which undergo overland flow of water.
- » Areas close to water

- » Irrigated areas
- » Compacted areas
- » Rivers
- » Drainage lines
- » And any areas where developments cause water flow to accelerate on a soil surface.
- » Coarsely gravelly covered surfaces

4. Precautionary management activities to avoid erosion

In the assessment process the ECO and the contractor must assess all:

- » Infrastructure and equipment placements and function to ensure that the infrastructure or equipment is not causing accelerating soil erosion on the site.
- » Construction activities to ensure that no erosion indicators are forming as a result of the construction activities.

5. Monitoring

5.1. General Erosion

The ECO must assess the site for erosion indicators in the monitoring process, which include:

- » Bare soil
- » Desiccation cracks
- » Terracettes
- » Sheet erosion
- » Rill erosion (small erosion features with the same properties and characteristics as gullies)
- » Hammocking (Soil build-up)
- » Pedestalling (Exposing plant roots)
- » Erosion pavements
- » Gullies
- » Evidence of Dispersive soils

In the assessment process, the ECO and the contractor must assess all:

- » Infrastructure and equipment placements and function to ensure that the infrastructure or equipment is not causing accelerated soil erosion on the site.
- » Construction activities to ensure that no erosion indicators are forming as a result of the construction activities.

If any activities or placement of equipment cause pooling on the site, degrade the vegetation, result in removal of the surface or subsurface soil horizons, create

compacted surfaces with steep gradients, or minimise runoff areas, the erosion potential on the site will increase.

If any erosion features are begin forming or are present as a result of the activities mentioned above the ECO must:

- » Assess the situation.
- » Take photographs of the soil degradation.
- » Determine the cause of the soil erosion.
- » Inform and show the relevant contractors the soil degradation.
- » Inform the contractor that rehabilitation must take place and that the contractor is to implement a rehabilitation method statement and management plan.
- » Monitor that the contractor is taking action to stop the erosion and assist them where needed.
- » Report and monitor the progress of the rehabilitation weekly and recorded all the findings in a site diary.
- » All actions with regards to the incidents must be reported on a monthly compliance report which will be submitted to the department.

The contractor/ developer (with the ECO's consultation) must:

- » Select a system to treat the erosion
- » Design the treatment system
- » Implement the system
- » Monitor the area to see if the system functions like it should, if the system fails, the method must be adapt or adjust to ensure the accelerated erosion is controlled.
- » Monitoring must continue until the area has been stabilised

5.2. Stormwater Management

The ECO is responsible to monitor the site and the activities to ensure that no unnatural soil degradation is taking place.

The ECO must assess the site for erosion indicators such as:

- » Bare soil
- » Exposed plant roots, pedestalling
- » Sheet erosion
- » Rill erosion
- » Hammocking
- » Erosion pavements
- » Terracettes
- » Gullies

In the assessment process the ECO and the contractor must assess all:

- » Disturbed watercourse areas by the development: roads, bridges, river crossings, cabling, permanent laydown areas, crane pads and any other remaining hard surfaces.
- » Construction activity limited to specified areas. Stockpiles of aggregate and material will be positioned at least 50 m away from drainage lines and wetlands.

If any erosion features are present as a result of the activities mentioned above the ECO must:

- » Assess the situation
- » Take photographs of the soil degradation.
- » Determine the cause of the erosion.
- » Inform and show the relevant contractors the soil degradation.
- » Inform the contractor that rehabilitation must take place and that the contractor is to implement a rehabilitation method statement and management plan.
- » Monitor that the contractor is taking action to stop the erosion and assist them where needed.
- » Monitor the rehabilitation weekly and record the findings in a site diary.
- » All actions with regards to the incidents must be reported on in the monthly compliance monitoring report.

The contractor/ developer must (with the ECO's consultation):

- » Select a system to treat the erosion
- » Design the treatment system
- » Implement the system
- » Monitor the area to ensure that the erosion has been addressed adequately.
- » Monitor the erosion until the area has been stabilised.

6. Rehabilitation

The following erosion control measures and rehabilitation specifications must be implemented to ensure that good environmental practice is conducted and environmental compliance is achieved.

6.1. General Erosion Management

In this section the equipment needed to remediate erosion, the precautionary measures which must be taken to avoid erosion and mitigation requirements for already degraded areas.

6.1.1. Equipment

The civil works contractor may use the following instruments to combat erosion when necessary:

- » Reno mattresses
- » Slope attenuation
- » Hessian material
- » Shade catch nets
- » Gabion baskets
- » Mulching Run-off control (increase the amounts of runoff areas to disperse the water)
- » Silt fences
- » Storm water channels and catch pits
- » Shade / catch nets
- » Soil bindings
- » Geofabrics
- » Hydroseeding and/or re-vegetating
- » Mulching over cleared areas
- » Stone packing
- » Tilling (roughing the surface)

6.1.2. Methods to prevent accelerated erosion

The following practises should be considered and adhered to:

- » Ensure steep slopes are stabilised.
- » Ensure that steep slopes are not stripped of vegetation and left to dry out and become water repellent (which will cause increased runoff and a decreased infiltration rate) increasing the erosion potential.
- » Ensure that all water on site (rain water or water wastage from the construction process) does not result in any surface flow (increase velocity and capacity of water) as a result of the poor drainage systems.
- » Ensure that pooling of water on site is avoided, as the site and the general area consists of dispersive soils, pooling will cause an increase of infiltration on one area, causing the subsurface to begin eroding.
- » Ensure that heavy machinery does not compact those areas which are not intended to be compacted (i.e. areas intended to be managed), as this will result in compacted hydrophobic, water repellent soils which increase the erosion potential of the area. where compaction does occur, the areas should be ripped.
- » Ensure that compacted areas have adequate drainage systems to avoid pooling and surface flow.
- » Prevent the concentration or flow of surface water or stormwater down cut or fill slopes, or along pipeline routes or roads, and ensure measures to prevent erosion are in place prior to construction.

- » Ensure that stormwater and any runoff generated by hard surfaces should be discharged into retention swales or areas with rock rip-rap. These areas should be grassed with indigenous vegetation. These energy dissipation structures should be placed in a manner that surface flows are managed prior to being discharged back into a natural watercourse to support the maintenance of natural base flows within the ecological systems and prevent erosion, i.e. hydrological regime (water quantity and quality) is maintained.
- » Ensure siltation and sedimentation through the use of the erosion equipment mentioned structures.
- » Ensure that all stormwater control features have soft engineered areas that attenuate flows, allowing for water to percolate into the local ground watertable in low quantities (to reduce runoff but prevent subsurface erosion).
- » Minimise and restrict site clearing to areas required for construction purposes only and restrict disturbance to adjacent undisturbed natural vegetation.
- » Ensure that vegetation clearing is conducted in parallel with the construction progress across the site to minimise erosion and/or run-off.
- » Ensure that large tracts of bare soil which would cause dust pollution in high winds, or have high erosion susceptibility and increase sedimentation in the lower portions of the catchment are controlled through temporary surface covering.
- » Ensure no diversion of water flows in catchment occurs.
- » Ensure that dust control measures are implemented, but prevent over-wetting/saturating the area (to cause pooling) and run-off (that may cause erosion and sedimentation).
- » Watercourse (stream) crossings should not trap any run-off, thereby creating inundated areas, but allow for free flowing watercourses.

6.1.3. Mitigation for previously degraded areas

Previously degraded areas could pose a threat to construction activities in the area and must therefore be stabilised, then remediated and rehabilitated through:

- » Protecting, stabilise and isolate the degraded areas to ensure no further damage is caused by erosion due to construction activities.
- » Increase the drainage in the area but avoid pooling.
- » Prevent increasing sedimentation in areas that have been choked by soils from degraded areas.
- » Once construction has been completed, a method statement must be drafted for the rehabilitation of the previously degraded areas, using equipment mentioned above and implemented.
- » Stabilisation of steep slopes must be undertaken.
- » Ensure that bare soil is covered and hydro seeded to reduce topsoil loss.

6.2. Methodologies

The following erosion control measures and rehabilitation specifications may be required to be implemented to ensure that good environmental practice is conducted and environmental compliance is achieved.

- » Topsoil covered with a geotextile or hessian material and a grass seed mixture (see Rehabilitation Specifications).
- » Logging or stepping following the contours of the slope, to reduce surface runoff.
- » Earth or rock-pack cut-off berms.
- » Packed branches to roughen the surface and promote infiltration.
- » Benches (sand bags).
- » Stabilisation of near vertical slopes (1:1 – 1:2), if created during construction, will be required to utilise hard structures that have a natural look. The following methods may be considered:
 - Gabions (preferred method with geotextile material).
 - Retaining walls.
 - Stone pitching.
- » The slopes of all stream diversions must be protected. The following methods may be considered:
 - Reno mattresses (preferred method), ensure that the reno mattresses are buried deep into the subsurface, to avoid undercutting from the water.
 - Coarse rock (undersize rip-rap)
 - Sandbags.
 - Stone packing with geotextile
- » Where feasible use rubber dams as stream diversions when establishing water course crossings. Although (and considering that these are non-perennial watercourses) the recommendation is to construct watercourse crossings during dry periods (or no flow periods), where possible.
- » Any concentration of natural water flow caused by road works or hardstands areas will be treated as follows:
 - if water flow is sub-critical, nothing is required
 - if water flow is supercritical, the outlets will be provided with protection (either gabions or stone pitching – depending on the flows) to release water subcritical back into the watercourse at a low velocity.

6.3. Engineering Specifications

A detailed Stormwater Management Plan describing and illustrating the proposed stormwater control measures must be prepared by the Civil Engineers and this includes erosion control.

Requirements for project design:

- » Erosion control measures to be implemented before and during the construction period, including the final stormwater control measures (post construction).

- » The location, area/extent (m²/ha) and specifications of all temporary and permanent water management structures or stabilisation methods.
- » A resident Engineer to be responsible for ensuring implementation of the erosion control measures on site during the construction period.
- » The Developer holds ultimate responsibility for remedial action in the event that the approved stormwater plan is not correctly or appropriately implemented and damage to the environment is caused.
- » Concrete lined drains placed adjacent to road to transfer the water to the existing water courses.
- » Frequent gravel drains hydroseeded placed on permanent roadway edges.
- » At the point where stormwater is discharged, energy dissipaters to be constructed to reduce the flow rate of run-off.
- » All cut and fill banks will be seeded with an approved seed mix (as per the rehabilitation specifications) to ensure bank stabilisation and the elimination of potential erosion. Reno mattresses may be used to ensure that the area remains stable.

6.4. Rehabilitation Specifications

- » Employ a Horticultural Landscape Contractor to fulfil the rehabilitation of disturbed areas post-construction.
- » A detailed Rehabilitation Plan describing and illustrating the proposed rehabilitation activities on site must be prepared i.e. areas of top soiling, seeding and replanting of vegetation; species mix; requirements for fertilisation; seed sowing rates; watering etc. (i.e. bill of quantities).
- » The following document should be consulted for further support with respect to information regarding rehabilitation, namely: The Department of Water Affairs and Forestry, February 2005. Environmental Best Practice Specifications: Construction Integrated Environmental Management Sub-Series No. IEMS 1.6. Third Edition. Pretoria.
- » These specifications may be modified by the Horticultural Landscape Contractor on consideration of site conditions.

6.5. Post- and during construction rehabilitation activities

- » Correct and appropriate stockpile management of topsoil will be required during the construction phase.
- » Rehabilitation of disturbed areas will be implemented as these areas become available for rehabilitation.
- » Disturbed areas will include, for example: construction camp site, areas where underground cabling has been layed/buried, roadsides of new access roads.

7. Rehabilitation steps to mitigate the eroded areas

- » Stockpiled topsoil must be spread over disturbed areas (150 – 200mm thick) just prior to planting/seeding.
- » Rip and scarify along the contours of the newly spread topsoil prior to watering and seeding.
- » Organic fertilizers or compost shall be used if site conditions require it and can be applied as part of hydro-seeding applications.
- » Seed should be sown into weed-free topsoil that has been stockpiled (i.e. original topsoil from the site).
- » Indigenous plants shall be used to rehabilitate disturbed areas.
- » Applying the seed through hydromulching (hydro-seeding) is advantageous (or organic mulching after seeding).
- » Watering is essential and rehabilitation should ideally occur during the wet season.
- » The topsoil in the area is vulnerable to erosion therefore the hydro-seeded surfaces must be covered with a shade cloth material or natural fibre (hessian material) to reduce the loss of soil while the plants establish.

7.1. 'Watering' to avoid erosion

- » Movement of livestock in newly rehabilitated areas must be restricted, where possible, while taking into consideration drinking areas/paths.
- » Watering the rehabilitated areas should be undertaken in the wet/rainy season essential but if this is not possible, an initial watering period (supplemental irrigation) will be required to ensure plant establishment (germination and established growth).
- » Generous watering during the first two weeks, or until the seeds have germinated, is required (unless adequate rainfall occurs) i.e. seed beds will need to be kept moist for germination to occur.
- » For grass to establish (once germination has occurred), rainfall or irrigation is needed at regular intervals, ideally every few days and possibly every day if weather conditions require it.
- » During dry periods, with no rainfall, 100 litres per m² (or 100mm of rain) over a month or more, may be necessary to establish plants capable of surviving dry weather (or otherwise specified by the Horticultural Landscape Contractor).

7.2. Seeding

The developer should make use of an appropriate mix of grass species for rehabilitation (to be determined in consultation with a suitably qualified ecologist) and they must be mixed for sowing either in summer or in winter. Grass species application (Rutherford, 2006) is at the rate specified as kg/ha.

7.3. Steep slopes

- » Areas that have a steep gradient and require seeding for rehabilitation purposes should be adequately protected against potential run-off erosion e.g. with coir geotextile netting or other appropriate methodology.
- » Provision for wind should also be made on these slopes to ensure the fine grained soil is not removed.

7.4. Maintenance and duration

- » Rehabilitation will occur during construction, as areas for plant rehabilitation become available.
- » The rehabilitation period post construction is estimated to be over a period of 6 (minimum) to 12 months (maximum), or a time period specified by the Horticultural Landscape Contractor, particularly if planting of trees and shrubs occurs.
- » The rehabilitation phase (including post seeding maintenance) should be at least 6 months (depending on time of seeding and rainfall) to ensure establishment of plants with a minimum 80% cover achieved (excluding alien plant species).
- » If the plants have not established and the 80% is not achieved within the specified maintenance period, maintenance of these areas shall continue until at least 80% cover is achieved (excluding alien plant species).
- » Additional seeding may be necessary to achieve 80% cover.
- » Any plants that die during the maintenance period must be replaced.
- » Succession of natural plant species should be encouraged.

8. Conclusion

The Erosion Management Plan is a document to assist the contractor, the Developer and the ECO with guidelines on how to manage erosion. The implementation of management measures is not only good practice to ensure minimisation of degradation, but also necessary to ensure comply with legislative requirements. This document forms part of the EMP, and is required to be considered and adhered to during the design, construction, operation and decommissioning phases of the project.

9. References

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APPENDIX D:
OPEN SPACE MANAGEMENT PLAN

OPEN SPACE MANAGEMENT PLAN

OVERALL OBJECTIVE

The purpose of the Open Space Management Plan is to provide a framework for the integrated management of the natural and semi-natural areas within the Wind Energy Facility.

PROBLEM OUTLINE

The Zen Wind Farm facility consists of wind turbines distributed over approximately 3 542 ha. As the actual footprint of the facility is approximately 31 ha, the majority of the property will remain undeveloped. The construction and presence of the facility within the site, will however pose several novel threats to the area that should be managed in order to promote the maintenance of biodiversity within the site and to ensure that the facility operates in a biodiversity compatible manner and does not have a long-term negative impact on the local environment.

RELATION TO OTHER SUBPLANS

Given that the goal of the Open Space Management plan is to ensure the biodiversity compatible management of the facility, it cannot be considered independently of the other environmental management subplans at the site. In particular the Erosion Management plan and Alien Invasive Management plan should be closely aligned with the Open Space Management plan.

OPEN SPACE MANAGEMENT SUBPLAN

The following elements are considered part of the Open Space Management Subplan

Access Control:

- Access to the facility should be strictly controlled.
- All visitors and contractors should be required to sign-in.
- Signage at the entrance should indicate that disturbance to fauna and flora is strictly prohibited.

Prohibited Activities:

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

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

Fire Risk Management:

Although fires are not a regular occurrence at the site, particularly within the higher-lying areas with a high grass cover, fires may occasionally occur under the right circumstances. Ignition risk sources in the area include the following:

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

The National Veld and Forest Fires Act places responsibility on the landowner to ensure that the appropriate equipment as well as trained personnel are available to combat fires. Therefore, the management of the facility should ensure that they have suitable equipment as well as trained personnel available to assist in the event of fire.

Firebreaks

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

Grazing Management

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

- A grazing management plan for the site should be developed in cooperation with Agricultural Extension services.
- The stocking rate applied should be within the recommended limits as identified by the Department of Agriculture.
- Livestock should be rotated through the different paddocks at the site in a manner which allows for the growth and recovery of the vegetation between grazing events.

- Precautions should be taken to ensure that the development of the site does not increase the risk of stock theft within the facility. These include access control as previously described, as well as security patrols.

Alien Plant Control

Alien invasive plants should be controlled according to the Alien Invasive Management Plan.

EROSION MANAGEMENT

The facility should be inspected every 6 months for erosion problems or more frequently in the event of exceptional rainfall events. All erosion problems should be rectified according to the Erosion Management Subplan.

INTEGRATED MANAGEMENT

The management of the facility should meet with the landowner and other relevant local managers to review the management of the facility on a regular basis. Records of such meetings should be maintained including decisions and management outcomes resulting from such meetings.

APPENDIX E:
GRIEVANCE MECHANISM FOR PUBLIC
COMPLAINTS AND ISSUES

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GRIEVANCE MECHANISM / PROCESS

AIM

The aim of the grievance mechanism is to ensure that grievances / concerns raised by local landowners and or communities are addressed in a manner that is:

- Fair and equitable;
- Open and transparent;
- Accountable and efficient.

It should be noted that the grievance mechanism does not replace the right of an individual, community, group or organization to take legal action should they so wish. However, the aim should be to address grievances in a manner that does not require a potentially costly and time consuming legal process.

Proposed generic grievance process

- Local landowners, communities and authorities will be informed in writing by the proponent (the renewable energy company) of the grievance mechanism and the process by which grievances can be brought to the attention of the proponent.
- A company representative will be appointed as the contact person for grievances to be addressed to. The name and contact details of the contact person will be provided to local landowners, communities and authorities.
- Project related grievances relating to the construction, operational and or decommissioning phase must be addressed in writing to the contact person. The contact person should assist local landowners and or communities who may lack resources to submit/prepare written grievances.
- The grievance will be registered with the contact person who, within 2 working days of receipt of the grievance, will contact the Complainant to discuss the grievance and agree on suitable date and venue for a meeting. Unless otherwise agreed, the meeting will be held within 2 weeks of receipt of the grievance.
- The contact person will draft a letter to be sent to the Complainant acknowledging receipt of the grievance, the name and contact details of Complainant, the nature of the grievance, the date that the grievance was raised, and the date and venue for the meeting.
- Prior to the meeting being held the contact person will contact the Complainant to discuss and agree on who should attend the meeting. The people who will be required to attend the meeting will depend on the nature of the grievance. While the Complainant and or proponent are entitled to invite their legal representatives to attend the meeting/s, it should be made clear that to all the parties involved in the process that the grievance mechanism process is not a legal process. It is therefore recommended that the involvement of legal representatives be limited.

- The meeting will be chaired by the company representative appointed to address grievances. The proponent will provide a person to take minutes of and record the meeting/s. The costs associated with hiring venues will be covered by the proponent. The proponent will also cover travel costs incurred by the Complainant, specifically in the case of local, resource poor communities.
- Draft copies of the minutes will be made available to the Complainant and the proponent within 4 working days of the meeting being held. Unless otherwise agreed, comments on the Draft Minutes must be forwarded to the company representative appointed to manage the grievance mechanism within 4 working days of receipt of the draft minutes.
- In the event of the grievance being resolved to the satisfaction of all the parties concerned, the outcome will be recorded and signed off by the relevant parties. The record should provide details of the date of the meeting/s, the names of the people that attended the meeting/s, the outcome of the meeting/s, and where relevant, the measures identified to address the grievance, the party responsible for implementing the required measures, and the agreed upon timeframes for the measures to be implemented.
- In the event of a dispute between the Complainant and the proponent regarding the grievance, the option of appointing an independent mediator to assist with resolving the issue should be discussed. The record of the meeting/s will note that a dispute has arisen and that the grievance has not been resolved to the satisfaction of all the parties concerned;
- In the event that the parties agree to appoint a mediator, the proponent will be required to identify three (3) mediators and forward the names and CVs to the Complainant within 2 weeks of the dispute being declared. The Complainant, in consultation with the proponent, will identify the preferred mediator and agree on a date for the next meeting. The cost of the mediator will be borne by the proponent. The proponent will provide a person to take minutes of and record the meeting/s.
- In the event of the grievance, with the assistance of the mediator, being resolved to the satisfaction of all the parties concerned, the outcome will be recorded and signed off by the relevant parties, including the mediator. The record should provide details on the date of the meeting/s, the names of the people that attended the meeting/s, the outcome of the meeting/s, and where relevant, the measures identified to address the grievance, the party responsible for implementing the required measures, and the agreed upon timeframes for the measures to be implemented.
- In the event of the dispute not being resolved, the mediator will prepare a draft report that summarizes the nature of the grievance and the dispute. The report should include a recommendation by the mediator on the proposed way forward with regard to the addressing the grievance.
- The draft report will be made available to the Complainant and the proponent for comment before being finalised and signed by all parties. Unless otherwise agreed, comments on the draft report must be forwarded to the company representative appointed to manage the grievance mechanism within 4 working days.

The way forward will be informed by the recommendations of the mediator and the nature of the grievance. As indicated above, the grievance mechanism does not replace the right of an individual, community, group or organization to take legal action should they so wish. In the event of the grievance not being resolved to the satisfaction of Complainant and or the proponent, either party may be of the opinion that legal action may be the most appropriate option.

APPENDIX F:
CONSTRUCTION WASTE GUIDELINES

GUIDELINE FOR INTEGRATED MANAGEMENT OF CONSTRUCTION WASTE

Waste is defined in the National Environmental Management: Waste Act (Act No 59 of 2008) as follows:

“any substance, whether or not that substance can be reduced, re-used, recycled and recovered:

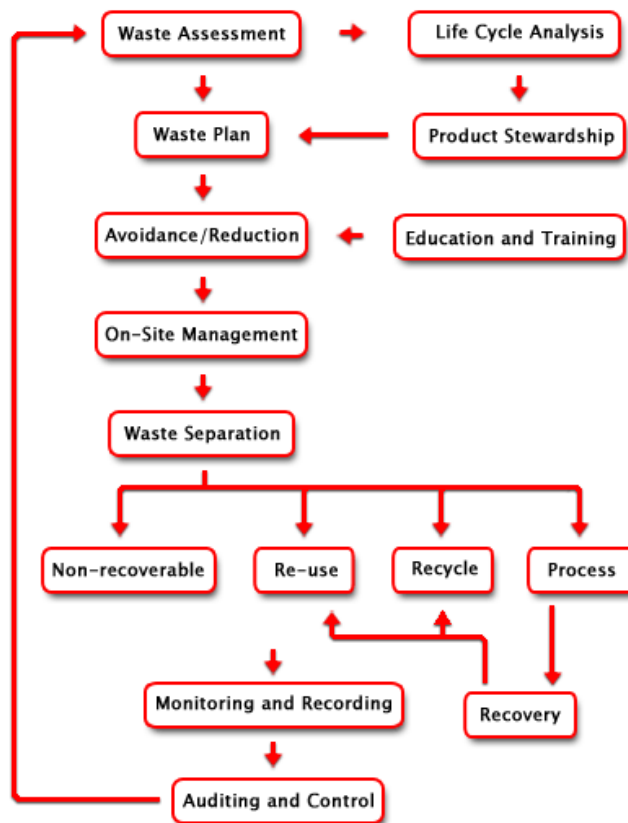
- (a) that is surplus, unwanted, rejected, discarded, abandoned or disposed of;*
- (b) which the generator has no further use of for (he purposes of production;*
- (c) that must be treated or disposed of; or*
- (d) that is identified as a waste by the Minister by notice in the Gazette,*

and includes waste generated by the mining, medical or other sector, but—

- (i) a by-product is not considered waste; and*
- (ii) any portion of waste, once re-used, recycled and recovered, ceases to be waste”*

An integrated approach to waste management on site is needed. Such an approach is illustrated in the figure below.

The Integrated Waste Management Approach to Waste



Source: <http://www.enviroserv.co.za/pages/content.asp?SectionId=496>

1. Waste Assessment

A detailed waste assessment is necessary to understand the waste types and volumes being produced. In order to achieve this, construction practices must be measured and analysed.

2. Waste Plan

A waste plan must be developed to provide appropriate solutions for managing the entire waste stream on site. The objective of the plan should be to reduce the volumes of waste to disposal and thereby to reduce the cost of management of the waste stream without compromising environmental standards. The plan should include recovery, re-use and recycle recommendations.

Construction Waste Management is the practice of reducing the actual waste that goes to the landfill site. Waste reduction is best met by recycling, and construction wastes offer several opportunities in this regard. In fact, 80% of the wastes found in construction waste piles are recyclable in some form or another. Wood, concrete, bricks, metals, glass and even paint offer several options for recycling.

There are three basic steps for construction waste management, i.e. Reduce, Reuse, and Recycle. **Reduce** is the prevention of the waste from arising and optimising material usage. Waste avoidance and waste reduction can be achieved through improved education and training - by improving efficiencies and by making staff environmentally aware.

Reuse is using existing materials instead of throwing these away. Reusing does not mean that it needs to be reused on the same construction site. Selling or donating waste materials to a third party is one option of construction waste management.

Recycle is somewhat limited since it only allows for those items that can be used on-site. The most important step for recycling of construction waste is on-site separation. Initially, this will take additional effort and training of construction personnel. Targets should be set for the levels of recycling. Once separation habits are established, on-site separation can be done at little or no additional cost.

3. What to Recycle

Before recycling construction waste, identify who will accept it. This is important in designating type of waste to separate, and in making arrangements for drop-off or delivery of materials. Materials that can be recycled include:

- » Cardboard and Paper
- » Wood

- » Metals
- » Plastics
- » Glass
- » Paints, Stains, Solvents and Sealants
- » Oil

4. Materials Separation

Successful recycling requires good clean uniform collections of single waste types. This is most effectively achieved by separating the waste streams close to source rather than at the landfill site. Containers for material recycling must be set up on site and clearly labelled. Construction personnel must be trained in material sorting policy, and bins must be monitored periodically to prevent waste mixing as a result of construction employees throwing rubbish into the bins.

Some materials will require bins or storage that protect these from rain. Other bins may be locked to prevent tampering.

5. Recycling and Waste Minimisation Guidelines

- » *Wood*
 - * Optimise building dimensions to correspond to standard wood dimensions in order to reduce the need for cutting.
 - * Store wood on level blocking under cover to minimize warping, twisting and waste.
- » *Metals*
 - * During construction, separate metals for recycling, including copper piping, wire, aluminium, iron and steel, nails and fasteners, galvanized roofing. It is critical to keep lead out of landfills because it could leach into groundwater.
- » *Cardboard and Paper*
 - * Avoid excessively packaged materials and supplies. However, be sure packaging is adequate to prevent damage and waste.
 - * As far as possible, use recyclable packaging.
 - * Separate cardboard waste, bundle, and store in a dry place.
 - * Minimise the number of blueprints and reproductions necessary during the design and construction process.
- » *Plastic*
 - * Avoid excessively packaged materials and supplies. However, be sure packaging is adequate to prevent damage and waste.
 - * As far as possible, use recyclable packaging.

Since more than 60 different types of plastic resins exist, the Plastics Federation of South Africa has adopted a voluntary number coding system for each category of plastics to aid in their sorting by material type for recycling (Bruyns et al, 2002). The most common resin types are itemised in Table 1.

Table 1: Identification System for Plastic

Id Number	Plastic Resin Type
1	PET (polyethylene terephthalate)
2	HDPE (high-density polyethylene)
3	PVC (polyvinyl chloride) or V (vinyl)
4	LDPE (low-density polyethylene)
5	PP (polypropylene)
6	PS (polystyrene)
7	Other (laminates, etc.)

» *Paints, Stains, Solvents and Sealants*

* Unused materials should be taken to a hazardous waste collection facility.

6. On-site Management

Good supervision of the waste management programme on site is critical to success. Management of the entire on-site program is critical to ensure smooth operations.

7. Auditing and Control

The success of the waste plan is determined by measuring criteria such as waste volumes, cost recovery from recycling, cost of disposal. Recorded data can indicate the effect of training and education, or the need for education. It will provide trends and benchmarks for setting goals and standards. It will provide clear evidence of the success or otherwise of the plan. Finally, good record keeping and control, becomes a continuous waste assessment process, allowing the waste plan to be improved and adjusted as required.

8. Useful contacts:

<http://www.transpaco.co.za/page5.htm>

Transpaco, a manufacturing and distribution company operating extensively in the plastics and packaging industries, conducts plastic reclamation and recycling.

<http://www.jclenterprises.co.za/>

JCL Enterprises for plastic sales of quality recycled plastic materials as well as the recycling of plastic.

<http://www.rosefoundation.org.za/>

The Rose Foundation specialises in the collection and recycling of used motor (engine) oil.

Information Sources:

<http://www.greenbuilder.com/sourcebook/ConstructionWaste.html#Guidelines>

<http://www.enviroserv.co.za/pages/Content.asp?SectionID=587>

<http://www.enviroserv.co.za/pages/content.asp?SectionId=496>

Programme for the Implementation of the National Waste Management Strategy. DEAT, May 2000

Residential Construction Waste Management Demonstration and Evaluation. Prepared for U.S. Environmental Protection Agency by NAHB Research Center, May 2, 1995