

Bayview Wind Farm

REHABILITATION PLAN

Prepared for:

Bayview Wind Power (Pty) Ltd

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2191.

Prepared by:



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ACRONYMS AND ABBREVIATIONS

DEA	Department of Environmental Affairs
DEDEAT	Department of Economic Development, Environmental Affairs and Tourism of the Eastern Cape
ECO	Environmental Control Officer
EMPr	Environmental Management Programme
GIS	Geographical Information System
NEMBA	National Environmental Management: Biodiversity Act
PNCO	Provincial Nature Conservation Ordinance
SA	South Africa
SANBI	South African National Biodiversity Institute
SCC	Species of Conservation Concern
TOPS	Threatened and Protected Species
WEF	Wind Energy Facility

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1. INTRODUCTION

1.1. PURPOSE OF THE REHABILITATION PLAN

The objective of the Bayview Wind Farm Rehabilitation Plan is to re-establish, manage and maintain indigenous vegetation units and plant communities in the study area, by rehabilitating degraded areas or areas impacted on during construction that are not needed during the Operational Phase.

1.2. EXISTING VEGETATION TYPES PRESENT AT THE SITE

The project site and powerline corridor is comprised of Bontveld and Thicket.

The Bontveld (classified as Vulnerable by the Nelson Mandela Bay Metropolitan Open Space System) is comprised of a matrix of thicket bushclumps, grassland and succulent patches. Some areas have been described in the ecological report as being in moderate condition with some infestation of invasive alien plant (IAP) species such as *Acacia cyclops* and *Opunita ficus-indica*. Other areas are more heavily impacted by over-grazing, game farming and other agricultural practices.

The Thicket found on site is a combination of Sundays Thicket with smaller patches of Spekboom Thicket (both classified as Vulnerable by the Nelson Mandela Bay Metropolitan Open Space System). The Thicket vegetation is characterised by small spinescent trees and shrubs, succulents and an understorey of graminoids (grass). The vegetation was generally in a moderate to poor condition, with a number of Species of Conservation Concern (SCC) observed. However, along sections of the powerline corridor, thicket vegetation was in pristine condition and inaccessible and dense, specifically near drainage lines and slopes.

2. REHABILITATION PLAN

2.1. WHAT IS REHABILITATION?

Rehabilitation refers to the return of a damaged ecosystem to its original state (restoration) or functional state (replacement). The general aim of this Rehabilitation Plan is to recreate the natural ecosystem, which means the form of rehabilitation applied to the Bayview Wind Farm will be restoration. The restoration strategy will only strive to restore diverse, ecologically important and conservation-worthy patches of indigenous vegetation. This is required as cognizance must be taken of the conservation value of the area and its environs, and rehabilitation must be centred on the principles of conservation. The easiest approach to achieving the desired botanical diversity will be to simulate natural succession and, if possible, allow for spontaneous restoration, which is aided by the addition of selected successional woody species grown in a nursery.

In order to establish a sustainable indigenous vegetation cover it is necessary to:

- Establish cover vegetation to stabilise the area;

- Establish pioneer species to provide shade, and provide habitats for insects, birds and other animals that play an important role by bringing in seeds of additional species, thus increasing diversity; and
- Establish secondary species, namely trees and herbs, which make up the compliment of the natural ecosystem. Species specific to the vegetation types directly affected by the project must be used.

This should provide the necessary habitat and ecosystem with the potential for other biota to colonise.

2.2. REHABILITATION OF THE BAYVIEW WIND ENERGY FACILITY

Re-vegetating and rehabilitating the site through a comprehensive landscaping effort will benefit the potential faunal species that may find refuge on the site. Linked to this, is the creation, preservation and maintenance of tracts of natural vegetation in all stages of ecological succession, interconnected by corridors or green belts for escape, foraging, breeding and exploratory movements. In terms of the scope of the construction activities, landscaping and rehabilitation will be minimal; many instances will require clean-up activities together with planting ground stabilizing vegetation (refer to section 2.2.3 below regarding the re-vegetation procedure to be followed). If extensive rehabilitation is required then the approved site EMPr will be consulted for further assistance.

The Rehabilitation Plan will rehabilitate the following areas:

- Road verges after road construction is completed;
- Stormwater soak away features and landscaped areas; and
- Areas where large patches of IAP species have been removed.

The transformed portions of the site not developed must be rehabilitated by planting indigenous plant species occurring in the area. Only plants on the approved list (Appendix A) may be used for landscaping purposes in gardens and/or rehabilitation.

Rehabilitation starts at the beginning of the project i.e. when clearing for construction begins and is not applied retrospectively. The steps outlined in the sections below must therefore be applied during the construction phase.

2.2.1. VEGETATION CLEARING

- Prior to vegetation clearing, the Contractor should ensure that all litter and non-organic material is removed from the area that is to be cleared.
- All seed bearing (IAP) species vegetation should be removed from construction sites as per the Invasive Alien Plant Monitoring, Control and Eradication Plan.
- Removed vegetation should not be dumped on or adjacent to intact vegetation or within 50m from any rivers, wetlands or drainage lines.
- Topsoil and vegetation should be removed and stored separately to ensure that there is no IAP species vegetation stockpiled in or near topsoil.

- All indigenous plant material that has been removed from cleared areas should be stockpiled for mulching or temporarily stockpiled in a demarcated area, which meets the satisfaction of the Resident Engineer (RE) and/or Environmental Control Officer (ECO), before disposal at an approved registered landfill site.
- The use of herbicides is prohibited unless approved by the RE and ECO.
- The Contractor should submit a site clearing Method Statement to the RE and/or ECO. This Method Statement should clearly detail how the clearing is to be done, where and how cleared material will be stored or disposed of, and how vegetation will be used during rehabilitation, etc.

2.2.2. TOPSOIL CLEARING

- Topsoil, a layer of approximately 200 mm, should be removed from areas that are going to be disturbed during construction and safely stockpiled for landscaping purposes.
- Topsoil stockpiles should be convex and no more than 2 m high.
- Topsoil must be stored separately from subsoil and spoil stockpiles.
- Stockpiles should be located in areas agreed to by the RE and/or the ECO. Stockpiles must not be located within 50 m of any rivers, drainage lines or wetlands.
- Topsoil stockpiles must not be subject to compaction greater than 1 500 kg/m² and should not be pushed further than 50 m by a bulldozer.
- Topsoil stockpiles should be monitored regularly to identify any IAP species, which must be manually removed when they germinate to prevent contamination of the seed bank.
- Appropriate measures, as agreed upon by the RE and/or the ECO, should be taken to protect topsoil stockpiles from erosion by wind or water by providing suitable storm-water and cut off drains, containment using hessian or similar material and/or by establishing suitable temporary vegetation.
- Stockpiles should not be covered with materials such as plastic that could kill the seed bank or become compost.
- The Contractor should submit a site clearing Method Statement to the RE and/or the ECO. This Method Statement should clearly detail how the clearing will be done, where and how cleared material will be stored or disposed of, and how topsoil will be used during rehabilitation, etc.
- The Contractor will be held responsible for the replacement, at his/her own cost, for any unnecessary loss of topsoil due to his failure to work according to the requirements of this Management Plan and Method Statements.
- Topsoil must only be handled twice; once during soil removal and once during rehabilitation.

2.2.3. RE-VEGETATION PROCEDURE

The re-vegetation process will focus on all soil that has been exposed by the project, transformed areas and areas where IAP species have been removed within the site. To rehabilitate transformed and invaded areas, plots must be prepared as follows:

- All remnants of foreign debris must be removed from the site.

- All plots will be covered first with 1m deep subsoil and then with topsoil (minimum of 10cm deep). Soils will be manually spread evenly over the surface. Topsoil must be spread to the original depth (10cm), and deeper where sufficient top soil remains.

Once the plots have been prepared, all plants that will be transplanted must be prepared as follows:

- Plants must undergo a period of 'hardening-off' during which they have been exposed to full, direct sunlight and been under a reduced watering regime.
- The individual plants destined for each plot will be grouped into plot-specific, marked baskets, before they leave the nursery. Each plant will be labelled with an aluminium label, giving species code, and a specific numeral identifying the plot.
- Before the out-planting commences, the equipment necessary for the proper handling and placing of all required materials shall be on hand, in good condition and to acceptable approved standards.
- Planting should preferably be done during the rainy season.
- Unless otherwise specified by the EO / ECO, excavate square holes of 800mm x 800mm x 800mm on average for trees and 500mm x 500mm x 500mm on average for shrubs.
- Backfill planting holes with topsoil. As much of the soil from container plants as possible must be retained around the roots of the plant during planting.
- The soil must cover all the roots and be well firmed down to a level equal to that of the surrounding in situ material.
- After planting, each plant must be well watered, adding more soil upon settlement if necessary.
- Stake all trees and tall aloes using three weather resistant wooden or steel stakes anchored firmly into the ground. Two of the three stakes are to be located on the windward side of the plant. Galvanised wire binding, 3 mm thick, covered with a 20mm diameter plastic hosepipe must be tied tightly to the stakes, half to two thirds the height of the tree above the ground and looped around the trunk of the tree.
- Place stakes at least 500mm apart and away from the stem and roots of the tree, so as not to damage the tree or its roots.
- Thoroughly water plants as required until the plants are able to survive independently (i.e. depending on the rainfall).
- A raised circular 200mm high subsoil berm, placed 500mm (shrubs) to 750mm (trees) from the plant's stem must be provided for the watering. Do not simply leave the excavated plant hole partially backfilled for this purpose – the berm must be raised above the natural soil level.
- Water aloes and bulbs once directly after transplanting to settle the soil.
- Remove stakes and wire binds over time as required, as plants become established.

Once planted the following maintenance measures must be implemented:

- Water all transplanted, plants as specified.
- Watering must commence and continue immediately after transplanted.
- Check all plants for pests and diseases on a regular basis and treat the plants accordingly, using approved method and products as per manufacturers specifications.
- Control weeds by means of extraction, cutting or other approved methods.
- For planted areas that have failed to establish, replace plants with the same species as originally specified, unless otherwise specified by the EO / ECO.

To rehabilitate transformed and invaded areas, the following landscaping techniques will be employed:

- Clearing of vegetation should take place in accordance with the construction programme, instead of exposing large tracts of land simultaneously.
- Clearing of invaded areas should be undertaken as per the Invasive Alien Plant Monitoring, Control and Eradication Plan.
- No re-useable topsoil should be removed from the site.
- Sods used in re-vegetation should be obtained directly from the veld, but not from the sensitive areas on site. Veld sods shall contain at least a 50 mm topsoil layer and the roots shall be minimally disturbed. They shall be obtained either from the near vicinity of the site from an area selected by the Site Engineer or ECO, or from areas of the proposed development site that are earmarked for development. The soil shall be compatible with that removed from the area to be re-vegetated and shall not have been compacted by heavy machinery.
- Indigenous seeds may be harvested for purposes of re-vegetation in areas that are free of IAP species vegetation, either at the site prior to clearance or from suitable neighbouring sites.
- The stockpiled vegetation from the clearing operations should be reduced to mulch.
- Indigenous plant material must be kept separate from IAP species material. The indigenous vegetative material shall be reduced by either mechanically means (chipper) or by hand-axing to sticks no longer than 100 mm. The chipped material should be mixed with the topsoil at a ratio not exceeding 1:1.
- Mulch is to be harvested from areas that are to be denuded of vegetation during construction activities, provided that they are free of seed-bearing IAP species.
- No harvesting of vegetation may be done outside the area to be disturbed by construction activities.
- Mulches shall be collected in such a manner as to restrict the loss of seed.
- Brush-cut mulch shall be stored for as short a period as possible, and seed released from stockpiles shall be collected for use in the rehabilitation process.
- Re-vegetated areas should be monitored every 2 months for the first 12 months and every 6 months thereafter until re-vegetation is deemed successful.
- Re-vegetated areas showing inadequate surface coverage (less than 30% within 9 months after re-vegetation) should be prepared and re-vegetated from scratch.
- The Contractor will be responsible for maintaining the desired level of moisture necessary to maintain vigorous and healthy growth in re-vegetated areas. The quantity of water applied at one time should be sufficient to penetrate the soil to a minimum depth of 800 mm, where appropriate, and at a rate that will prevent saturation of the soil.
- Water used for the irrigation of re-vegetated areas should be free of chlorine and other pollutants that might have a detrimental effect on the plants.
- All seeded, planted or sodded grass areas and all shrubs or trees planted are to be irrigated at regular intervals.
- Where herbicides are used to clear vegetation, species-specific chemicals should be applied to individual plants only. General spraying should be strictly prohibited.
- All horticultural activities should meet the following requirements:
 - Activities must be limited to the building environs and certain landscaped areas;
 - Fertiliser, pesticide and herbicide use should be strictly controlled; and

- Invertebrate pests should be controlled using the least environmentally damaging insecticides. Pyrethroids and Phenylpyrazoles are preferable to Acetylcholines. Insecticides that are specific to the pest (species specific) should be favoured. The lowest effective dosages must be applied. Supplier's advice should be sought. Fungal pathogens should be used in preference to chemical insecticides; and no dumping of any materials in undeveloped open areas and buffer strips (biological corridors) should be permitted. Activities in the surrounding open undeveloped areas must be strictly regulated.

3. MONITORING SUCCESS RATES AND REPORTING

The ECO must monitor and report on the following:

- Clearing of vegetation is in line with the rehabilitation plan
- Stockpiling of soil is in line with the methods stated in rehabilitation plan and subsoil is stored separately from topsoil
- Only approved species are being used for rehabilitation
- Sites are being prepared properly for planting out of species
- Plants are being watered regularly to assist with their establishment
- The success rate of the rehabilitation

Fixed point photographs should be taken and included in the report to illustrate clearing, topsoil management and rehabilitation success rate.

As mentioned above, once species have been planted out, these sites must be monitored regularly every 2 months for 12 months to ensure that the rehabilitation of the site was successful. Successful rehabilitation in this instance will be returning the site to a functional, self-sustaining site i.e. indigenous plant cover that resembles the lost vegetation type that will continue to grow without human interference.

The ECO must include monthly reports on the rehabilitation program during the construction phase followed by quarterly reports until the site has been signed off as successfully rehabilitated by an external botanist.

4. REFERENCE LIST

SANBI, 2018. *Guidelines for Environmental Impact Assessments (EIAs)*.
<http://redlist.sanbi.org/eiaguidelines.php>. Accessed: 9 July 2018.

APPENDIX A

FAMILY	SPECIES NAME	SANBI RED LIST	IUCN	PNCO	NEMBA	CARA	PROTECTED TREES
ACANTHACEAE	<i>Barleria obtusa</i>	Least Concern	-	-	-	-	-
AIZOACEAE	<i>Carpobrotus sp.</i>	-	-	Possibly Schedule 4	-	-	-
AIZOACEAE	<i>Delosperma sp.</i>	Least Concern		Possibly Schedule 4			
AIZOACEAE	<i>Drosanthemum sp.</i>	-	-	Possibly Schedule 4	-	-	-
AIZOACEAE	<i>Lampranthus spectabilis</i>	-	-	Schedule 4	-	-	-
AIZOACEAE	<i>Mesembryanthemum aitonis</i>	Least Concern	-	-	-		
AIZOACEAE	<i>Phyllobolus sp.</i>	-	-	-	-	-	-
AIZOACEAE	<i>Trichodiadema bulbosum</i>	Least Concern	-	-	-	-	-
AMARILLYDACEAE	<i>Boophane disticha</i>	Least Concern	-	Schedule 4	-	-	-
ANACARDIACEAE	<i>Searsia crenata</i>	Least Concern	-	-	-	-	-
ANACARDIACEAE	<i>Searsia glauca</i>	Least Concern	-	-	-	-	-
ANACARDIACEAE	<i>Searsia longispina</i>	Least Concern	-	-	-	-	-
APOCYNACEAE	<i>Carissa bispinosa</i>	Least Concern	-	Schedule 4	-	-	-
APOCYNACEAE	<i>Pachypodium bispinosum</i>	Least Concern	-	Schedule 4	-	-	-
APOCYNACEAE	<i>Pachypodium succulentum</i>	Least Concern	-	Schedule 4	-	-	-
ASPHODELACEAE	<i>Aloe ferox</i>	Least Concern		-	-	-	-
ASPHODELACEAE	<i>Gasteria disticha</i>	Endangered B1ab(ii,iii,v)+2ab(ii,iii,v)	-	-	-	-	-
ASPHODELACEAE	<i>Aloe striata</i>	Least Concern	Least Concern	Schedule 4	-	-	-
ASPHODELACEAE	<i>Bulbine asphodeloides</i>	Least Concern	-	-	-	-	-
ASTERACEAE	<i>Cotula sericea</i>	Rare	-	-	-	-	-
ASTERACEAE	<i>Chrysanthemoides monilifera</i>	Least Concern	-	-	-	-	-
ASTERACEAE	<i>Chrysocoma ciliata</i>	Least Concern	-	-	-	-	-

ASTERACEAE	<i>Disparago ericoides</i>	Least Concern	-	-	-	-	-
ASTERACEAE	<i>Euryops ericifolius</i>	Least Concern	-	-	-	-	-
ASTERACEAE	<i>Felicia filifolia</i>	Least Concern	-	-	-	-	-
ASTERACEAE	<i>Felicia muricata</i>	Least Concern	-	-	-	-	-
ASTERACEAE	<i>Gazania rigida</i>	Least Concern	-	-	-	-	-
ASTERACEAE	<i>Osteospermum imbricatum</i>	Least Concern	-	-	-	-	-
ASTERACEAE	<i>Pteronia incana</i>	Least Concern	-	-	-	-	-
ASTERACEAE/ COMPOSITAE	<i>Senecio sp.</i>	-	-	-	-	-	-
BIGNONIACEAE	<i>Rhigozum obovatum</i>	Least Concern	-	-	-	-	-
BORAGINACEAE	<i>Ehretia rigida</i>	Least Concern	-	-	-	-	-
BRASICACEAE	<i>Cadaba aphylla</i>	Least Concern	-	-	-	-	-
BRASICACEAE	<i>Heliophila sp.</i>	-	-	-	-	-	-
CACTACEAE	<i>Opuntia sp.</i>	-	-	-	-	-	-
CELASTRACEAE	<i>Gymnosporia capitata</i>	Least Concern	-	-	-	-	-
CELASTRACEAE	<i>Pterocelastrus tricuspidatus</i>	Least Concern	-	-	-	-	-
CONVOLVULACEAE	<i>Falkia repens</i>	Least Concern	-	-	-	-	-
CRASSULACEAE	<i>Cotyledon orbiculata</i>	Least Concern	-	-	-	-	-
CRASSULACEAE	<i>Crassula capitella</i>	Least Concern	-	-	-	-	-
CRASSULACEAE	<i>Crassula mesembryanthemoides</i>	Least Concern	-	-	-	-	-
CRASSULACEAE	<i>Crassula muscosa</i>	Least Concern	-	-	-	-	-
EBENACEAE	<i>Euclea undulata</i>	Least Concern	-	-	-	-	-
ELATINACEAE	<i>Bergia sp.</i>	Least Concern	-	-	-	-	-
ERICACEAE	<i>Erica sp.</i>	-	-	Schedule 4	-	-	-
EUPHORBIACEAE	<i>Clutia alaternoides</i>	Least Concern	-	-	-	-	-
EUPHORBIACEAE	<i>Euphorbia barnadii</i>	-	-	-	-	-	-
EUPHORBIACEAE	<i>Euphorbia bubalina</i>	Least Concern	-	-	-	-	-
EUPHORBIACEAE	<i>Euphorbia caput-medusae</i>	Least Concern	-	-	-	-	-
EUPHORBIACEAE	<i>Euphorbia clavarioides</i>	Least Concern	-	-	-	-	-

EUPHORBIACEAE	<i>Euphorbia mauritanica</i>	Least Concern	-	-	-	-	-
EUPHORBIACEAE	<i>Euphorbia stellata</i>	Least Concern	-	-	-	-	-
GERANIACEAE	<i>Pelargonium sp.</i>	-	-	-	-	-	-
HYACINTHACEAE	<i>Albuca batteniana</i>	Least Concern	-	-	-	-	-
HYACINTHACEAE	<i>Ledebouria ensifolia</i>	Least Concern	-	-	-	-	-
HYACINTHACEAE	<i>Massonia hirsuta</i>	Least Concern	-	-	-	-	-
IRIDACEAE	<i>Freesia corymbosa</i>	Least Concern	Least Concern	Schedule 4	-	-	-
LAMIACEAE	<i>Becium burchellianum</i>	Least Concern	-	-	-	-	-
MALVACEAE	<i>Grewia robusta</i>	Least Concern	-	-	-	-	-
MALVACEAE	<i>Grewia robusta</i>	Least Concern	-	-	-	-	-
MALVACEAE	<i>Hibiscus pusillus</i>	Least Concern	-	-	-	-	-
PORTULACACEAE	<i>Portulacaria afra</i>	Least Concern	-	-	-	-	-
RUSCACEAE	<i>Sansevieria hyacinthoides</i>	Least Concern	-	-	-	-	-
SANTALACEAE	<i>Osyris compressa</i>	Least Concern	-	-	-	-	-
SAPOTACEAE	<i>Sideroxylon inerme</i>	Least Concern	-	-	-	-	Protected
SCROPHULARIACEAE	<i>Anastrabe integerrima</i>	Least Concern	-	-	-	-	-
SCROPHULARIACEAE	<i>Jamesbrittenia microphylla</i>	Least Concern	-	-	-	-	-
SOLANACEAE	<i>Lycium sp.</i>	-	-	-	-	-	-
THYMELAEACEAE	<i>Passerina corymbosa</i>	Least Concern	-	-	-	-	-
ZYGOPHYLLACEAE	<i>Zygophyllum divaricatum</i>	Least Concern	-	-	-	-	-