

## Albany Wind Farm Rehabilitation and Landscape Management Plan



DRAFT



**Western Power**

Western Power Corporation  
Landscape Management Plan

March 2001



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## 1.0 Introduction and Scope

This Landscape and Rehabilitation plan addresses construction works being carried out as part of the Albany Wind Farm Project. The wind farm is currently under construction in Sandpatch Reserve, south-west of Albany. Western Power Corporation is the proponent for the project and the works are being completed under a contract arrangement with PowerCorp.

Works on site have progressed to the point where all access roads have now been cleared and earthworks formations complete. Mulched vegetation has also been respread over batters where sufficient material has been available. Stockpiled topsoil and mulched vegetation have also been stored adjacent to cleared hardstand areas for use once foundation and turbine erection works are completed. The procedures followed for this, and the principles applied in this rehabilitation plan generally, are based on the approved Environmental Management Plan (EMP) for the project (Halpern Glick Maunsell, 1999).

Vegetation clearing controls and procedures have been the subject of a previous works package. This plan addresses topsoil, surface treatments and other procedures required for completion of landscaping works on the project.

The procedures and measures presented in this document are currently in draft form only for discussion by members of the Albany Wind Farm Advisory Group.

## 2.0 Specific Area Treatments

### 2.1 Introduction

In order to develop appropriate landscaping finishing treatments, the project area has been categorised into a range of areas requiring different treatment. These broad categories are:

1. **Closed tracks** – Historical access tracks within the reserve in the vicinity of the wind farm that will be closed down to public access.
2. **Smaller cut and fill batters** – Most areas of cut and fill within the project access roads fall into this category.
3. **Large cut and fill batters** – Limited to a few areas within the project where major batter slopes occur, such as the approach to turbine number three.
4. **Road margins** – At the completion of the works access road widths will be reduced, requiring rehabilitation of the current shoulders of the formation.
5. **Turbine areas** – Similar to road margins, the current extent of the turbine areas will be reduced once construction works are complete.
6. **Slashed areas** – this includes some areas adjacent to access tracks and turbine pads, as well as some earlier track alignments which were subsequently modified.
7. **Visitor facilities area** - special rehabilitation consideration is required for the visitor facilities area, to ensure that revegetation occurs quickly and that visual amenity in the area is maximised.

A more detailed discussion of the landscape and rehabilitation treatments for these categories follows. An overall Draft Masterplan has been prepared, identifying where these treatments apply both generally across the site and specific actions for particular locations (see Figure 1).

### 2.2 Closed Tracks

Western Power has agreed with the City of Albany to carry out preliminary rehabilitation works on historical access tracks in the immediate area of the wind farm. Treatment for these tracks will comprise slashing of vegetation overhanging the edges of these tracks. Mulched material generated in this way will then be spread across the track surface. The entrance points to the tracks will then be closed with large boulders to discourage any further public access.

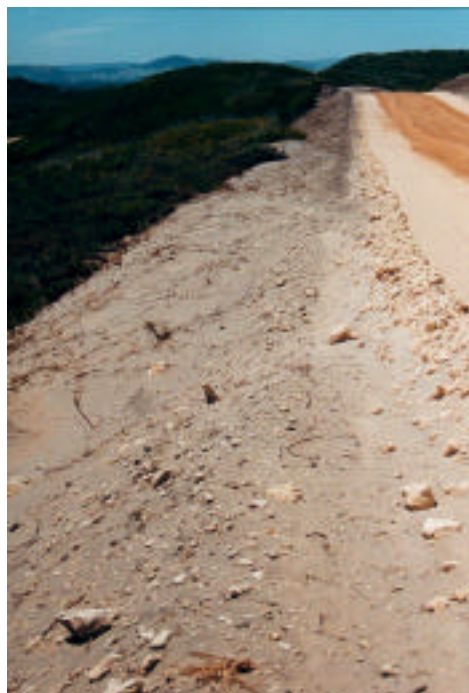
As these tracks have been used for recreational vehicles in the past, additional measures and maintenance may be required to ensure that access controls are not bypassed and rehabilitation affected. Several measures were outlined in the EMP for the project in this respect, including community information campaigns, signage and liaison with recreational clubs and associations (Halpern Glick Maunsell, 1999). Additional provenance collected seed could also be hand broadcast on closed tracks to accelerate revegetation if sufficient quantities are available (see Section 3.0).

### 2.3 Smaller Cut and Fill Batters

Currently, all cut and fill batters have been spread with topsoil and mulched vegetation material where this was available. In some areas however, there has been a shortfall of material and batters are not adequately covered (see Plate 1; Figure 1). These will require some additional treatment both to stabilise the surface and to ensure that rehabilitation takes place in a reasonable timeframe.

Additional mulch or brushing material will need to be sourced to cover these slopes. To minimise the risk of weed introduction to the area, this should ideally be sourced from within the reserve. If other areas within the reserve require clearing then any excess mulched material from these locations could be transported for use on these batters. Any other excess mulch material that is currently not being utilised on site could also be relocated and used on these batters.

Should these approaches not prove feasible, then mulch could be sourced externally and brought into site from a location approved by the City of Albany and CALM. If this approach is adopted, then weed hygiene will need to form an important consideration to ensure that novel weed introductions do not arise.



**Plate 1: Exposed batter at Chainage 1628**

### 2.4 Large Cut and Fill Batters

There are a small number of locations on site where construction of the access roads has required substantial areas of cut and fill. These include batters at Chainages 1254, 1375 and 1944 (see Figure 1). At present most of these have been well mulched and this appears to have stabilised the surface adequately for the short term (see Plate 2). However, some of the larger batters only have a sparse coverage and this may not prove adequate for surface stabilisation or revegetation in an acceptable timeframe (see Plate 3).



**Plate 2: Well mulched batter at Chainage 1375**



**Plate 3: Partially exposed batter at Chainage 2000**

The suggested approach is to fully mulch areas where major batters are lacking adequate coverage and to monitor their progress in respect of stability and revegetation progress (see Section 4.0).

Winter storms and heavy rains may mobilise surface material or generate significant erosion on these large exposed surfaces. If this occurs, then the surface will need to be physically stabilised, seeded and possibly also planted with tubestock of selected locally occurring species. This would consist of hand broadcasting a bulked seed mix on to the batters comprising a selection of low species with spreading, sand-binding root systems (see Section 3.0; Appendix 1). Brushing using locally occurring tree and shrub species could then be applied to provide sand stabilisation and wind protection for establishing seed. Peppermint *Agonis flexuosa* would probably provide the most appropriate source of brush material. Brushing should be laid vertically on the slope to provide uniform cover and then secured by means of wire strands attached to stakes every few metres.

Alternative stabilisation treatments such as jutte or straw matting could also be considered instead of brushing. These materials have the advantage of providing complete surface protection, provide a visually neater finish, and also enhance water retention for establishing seedlings. Depending on the state of the batters, tubestock planting could then also be considered to deliver more rapid revegetation and stabilisation. The requirement to implement this type of management will be discussed with the City of Albany and CALM as on-site monitoring proceeds.

## 2.5 Road Margins

The current access road widths will be reduced by approximately 4 m at the completion of construction works on the site. The road margins in these areas will require ripping to break up compaction caused by heavy crane equipment, followed by mulching and seeding. In some areas of the site, there may be sufficient mulch and topsoil coverage on the adjacent batters to drag this up to cover the rehabilitated road margins. However, this is unlikely to be the case for most areas, where mulch and topsoil coverage is only adequate for the batters themselves. In areas where there is not sufficient adjacent material, the margins are to be spread with clean sand material from turbine foundations to a minimum depth of 70 mm. These areas are then to be ripped to a minimum depth of 400 mm using a dozer mounted winged tyne or similar. If sufficient mulch is available or can be externally sourced (see Section 2.3), then the treated areas should be completed by mulching and then direct seeded with appropriate provenance seed mixes (see Section 3.0).

## 2.6 Turbine Areas

All turbine areas currently have stockpiled topsoil and mulched vegetation material stored adjacent to the work area (see Plate 4). On completion of the construction work, the disturbance area for the turbine pad will be substantially reduced. The stored material will be respread and the reclaimed areas deep-ripped to a minimum depth of 400 mm. For most turbines, there is likely to be some shortfall in material to provide adequate coverage of mulch and/or topsoil.



**Plate 4: Turbine pad showing stockpiled topsoil and mulch**

In these areas, additional mulch could be sourced as outlined in Section 2.3 for minor shortfalls. If there is substantial area requiring additional treatment, then this should be managed via the techniques outline for the reclaimed road margins in Section 2.5.

## 2.7 Slashed Areas

Most slashed areas within the site are old alignments of access tracks that were subsequently modified on consideration of grade and other issues. These areas are already beginning to show significant epicormic regrowth (see Plate 5) and no additional treatment is likely to be required. Access points to these tracks from the main access network will need to be permanently closed off with large boulders where this has not already been done.



**Plate 5:**  
**Revegetation under way on**  
**slashed track alignment in the**  
**vicinity of turbine number 12**

These sites will be included in the ongoing monitoring programme which will identify the need for additional remedial action if any (see Section 4.0).

## 2.8 Visitor Facilities Area

As detailed design work for the visitor facilities is currently being prepared by a local Albany architect, this section is limited to revegetation and soil management issues only. A specific species mix has been developed for the visitor facilities area, with a bias toward more visually attractive locally occurring plants (see Section 3.0; Appendix 1). As this area is likely to receive the most public scrutiny in the short and long term, a high standard of rehabilitation is important. To this end tubestock planting of selected species should also be carried out in the carpark and approach areas to enhance revegetation arising from mulching and seeding. This will ensure the most rapid revegetation possible for the area. Suggested planting densities are provided in Appendix 1 and the spatial distribution of treatments is shown in Figure 1.

In addition, the degraded steep track that has been historically used to access the main viewing point will need to be rehabilitated. Given that this area is highly visible from the visitor's first point of arrival, special treatment is warranted to minimise the visual impact of the current scar. The suggested approach is to mulch the steep track, seed it with the batter slope mix (mix number 5 in Section 3.0), and then apply jutte matting or frogmat to fully stabilise the slope. Tubestock can then be planted through this matting to provide a neater appearance and more rapid revegetation than brushing methods.

## 3.0 Seed and Tubestock

### 3.1 Provenance Seed Collection and Application

Provenance seed collecting has been carried out within the site over the past several months. Seed has now been cleaned and is currently being stored under controlled conditions at a local nursery. Specific measures such as seed scarification or treatment with smoke water are currently being identified to enhance germination.

Given the relatively small quantities of seed available, the seed mixes are to be bulked and manually broadcast on to batters and other disturbed areas. Total application rates should be in the order of 5 kg / ha for the bulked seed mixes, comprised of proportional contribution by different species consistent with adjacent vegetation (see Section 3.3). For areas where there is little topsoil or mulch, such as reclaimed road margins, this rate may need to be increased to 10 kg / ha for successful rehabilitation. This specification will be refined once final seed quantities and availability have been established. Seed from the Priority flora species *Thomasia quercifolia* requires special treatment and is only to be broadcast in the areas from which it was collected (see Section 3.3). Seed is to be broadcast approximately one month before the commencement of significant winter rainfall to ensure maximum germination and establishment.

### 3.2 Tubestock Supply and Planting

At present tubestock supply has not been commissioned for the project. A specialist tubestock supplier should be identified to culture tubestock from provenance seed and cuttings from the site. Tubestock will only be supplied for the visitor facilities area in the first instance, but may also be required for other areas within the site (see Section 2.4). All tubestock supplied for the project must be free of deformity and disease and generally in healthy condition on delivery.

Tubes should be thoroughly watered prior to installation. Tubestock are to be individually hand-planted by grubbing a hole sufficient for the tube, with soil securely tamped down around the seedling in a saucer-shaped depression on installation. Locally sourced mulch is then to be spread about the base of the seedling to enhance water retention. Planted tubestock are also to be fitted with tree guards to minimise risk of grazing by rabbits. Planting of tubestock should be carried out approximately one month before the commencement of significant winter rainfall.

### 3.3 Species Mixes

Species mixes have been developed with the intention of ensuring that revegetated areas blend as naturally as possible with adjoining undisturbed vegetation. Six different species mixes have been identified, based on specific area requirements and the vegetation mapping carried out as part of the environmental assessment for the project (Halpern Glick Maunsell, 1999). Detailed species lists for each mix are supplied in Appendix 1, with a summary given below. Areas for application of the various seed mixes are shown in the landscape masterplan (see Figure 1).

**1. Coastal heath complex**

This general mix will be used for most of the project area and represents the common low coastal heath of the site. The mix is weighted towards *Acacia littorea*, *Banksia praemorsa*, *Scaevola nitida*, *Leucopogon parviflorus* and *Dryandra nivea*.

**2. Inland heath complex**

Similar to the coastal heath mix, this application matches more inland heaths in the northern parts of the study area, where *Agonis flexuosa*, *Acacia littorea* and *Eucalyptus angulosa* are more dominant.

**3. Sedgeland**

In sections where access roads pass through low lying areas a mix more suitable for wetter areas has been planned, including *Desmocladius flexuosus*, *Lyginia barbata*, *Anarthria prolifera* and *Cyathochaeta clandestina*.

**4. Visual amenity mix**

This mix is intended for use in the vicinity of the tourist facilities and species selection has focussed on more visually attractive flowering species that occur locally. Dominants include *Acacia littorea*, *Banksia praemorsa*, *Pimelea rosea*, *Hibbertia racemosa*, *Isopogon formosus* and *Conostylis aculeata*. *Eucalyptus angulosa* tubestock could also be used in the vicinity of the carpark as a shade and feature tree.

**5. Sand-binding species for use on batters**

Species selection for batters has focussed on flora which do not attain a great height and which tend to have spreading root systems or a stoloniferous habit to bind sands. Species weighted in the mix include *Dryandra nivea*, *Kennedia prostrata*, *Tetragonia implexicoma*, *Dampiera linearis* and *Hakea prostrata*. Depending on the state of the batters, application rates for this mix may need to be increased to ensure sufficient vegetation establishment.

**6. *Thomasia quercifolia* seed**

*Thomasia quercifolia* seed has been collected from three locations within the works area; the access road and turbine areas for turbines 6 and 8 and the tourist facilities area. Seed from these location is to be hand-broadcast back on to batters and other completed formations in these locations only.

## 4.0 Monitoring and Maintenance

### 4.1 General

Monitoring and follow-up maintenance will be an important aspect of successful rehabilitation of the site. It is suggested that this monitoring be on a quarterly basis for the first year after practical completion, with a change in frequency to biannual or annual thereafter. The decision on the frequency and requirement for ongoing monitoring and maintenance will be agreed between Western Power, the City of Albany and CALM. Parameters to be monitored will include vegetation establishment, weeds and erosion. A brief monitoring report would be produced, including recommendations for any remedial action.

### 4.2 Vegetation Establishment

Permanent reference points will be established at twenty representative locations around the wind farm works area to monitor vegetation establishment. Data collected at each location will include percentage cover, species richness and notes on successfully established flora species. A reference photograph will be taken of each site as a baseline record. In addition to these locations, observations will be made on revegetation success generally around the wind farm area. Annual acquisition of aerial photography of the site would also provide a good overall assessment of rehabilitation progress and success.

In areas where revegetation is not establishing successfully, additional seeding and infill planting with tubestock will be considered. The requirement to undertake such remedial work will be discussed with the City of Albany and CALM.

### 4.3 Weed Control

A general search of the works area associated with the wind farm for weed species will be undertaken during each monitoring phase. This assessment will focus on areas that have been subject to ground disturbance during the construction works.

Control of any weed infestations will comprise physical removal where the infestation is small. For more widespread weed occurrences, chemical control using spot applicators will be undertaken. Chemicals used for this purpose are to comply with the Agriculture WA recommended treatment for the weed species in question.

### 4.4 Erosion

It is possible that road batters and other areas may develop areas of scour or erosion over time. The risk of this will be minimal once revegetation is advanced. Any areas of erosion will be identified during the routine monitoring exercises and a decision taken as to the need for remedial works. If required, scoured surfaces should be stabilised by re-mulching or brushing. The use of jute matting or geotextile could be considered for more serious erosion damage. Armouring using limestone or sheeted gravel could also be considered in extreme cases. If such materials are brought into the site, they must be sourced from a dieback free location.

## Suggested Species Mixes

**1. Coastal heath complex**

<b>Species</b>	<b>Life form</b>	<b>Proportion</b>	<b>Rate (kg/ha)</b>
<i>Acacia littorea</i>	Shrub	0.22	
<i>Adenanthos cuneatus</i>	Shrub	0.01	
<i>Adenanthos sericeus</i>	Shrub	0.02	
<i>Agonis flexuosa</i>	Shrub	0.04	
<i>Banksia praemorsa</i>	Shrub	0.02	
<i>Bossiaea linophylla</i>	Shrub	0.10	
<i>Desmocladius flexuosus</i>	Sedge	0.02	
<i>Dryandra nivea.</i>	Low shrub	0.04	
<i>Dryandra sessilis</i>	Shrub	0.02	
<i>Kennedia coccinea</i>	Creeper	0.01	
<i>Leucopogon parviflorus</i>	Shrub	0.20	
<i>Olearia axilaris</i>	Shrub	0.02	
<i>Patersonia occidentalis</i>	Sedge	0.01	
<i>Phyllanthus calycinus</i>	Low shrub	0.02	
<i>Pimelea ferruginea</i>	Low shrub	0.02	
<i>Rhagodia baccata</i>	Shrub	0.01	
<i>Scaevola nitida</i>	Low shrub	0.18	
<i>Spyridium globulosum</i>	Shrub	0.02	
<i>Thomasia triphylla</i>	Creeper	0.01	
<i>Westringia dampieri</i>	Low shrub	0.01	
<b>Total:</b>		1.00	

**2. Inland heath complex**

<b>Species</b>	<b>Life form</b>	<b>Proportion</b>	<b>Rate (kg/ha)</b>
<i>Acacia littorea</i>	Shrub	0.18	
<i>Acacia cochlearis</i>	Shrub	0.02	
<i>Adenanthos sericeus</i>	Shrub	0.02	
<i>Agonis flexuosa</i>	Shrub	0.25	
<i>Clematis pubescens</i>	Climber	0.02	
<i>Desmocladius flexuosus</i>	Sedge	0.02	
<i>Dryandra nivea.</i>	Low shrub	0.04	
<i>Eucalyptus angulosa</i>	Mallee	0.04	
<i>Hibbertia cuneiformis</i>	Shrub	0.02	
<i>Hibbertia racemosa</i>	Shrub	0.04	
<i>Kennedia coccinea</i>	Creeper	0.02	
<i>Leucopogon parviflorus</i>	Shrub	0.14	
<i>Leucopogon obovatus</i>	Shrub	0.05	
<i>Myoporum oppositifolium</i>	Shrub	0.01	
<i>Patersonia occidentalis</i>	Sedge	0.01	
<i>Phyllanthus calycinus</i>	Low shrub	0.02	
<i>Pimelea ferruginea</i>	Low shrub	0.04	
<i>Rhagodia baccata</i>	Shrub	0.01	
<i>Scaevola nitida</i>	Low shrub	0.04	
<i>Spyridium globulosum</i>	Shrub	0.01	
<b>Total:</b>		1.00	

### 3. Sedgeland

Species	Life form	Proportion	Rate (kg/ha)
<i>Acacia cochlearis</i>	Shrub	0.10	
<i>Acacia littorea</i>	Shrub	0.05	
<i>Agonis flexuosa</i>	Shrub	0.25	
<i>Allocasuarina humilis</i>	Shrub	0.05	
<i>Anarthria prolifera</i>	Shrub	0.08	
<i>Clematis pubescens</i>	Climber	0.02	
<i>Cyathochaeta clandestina</i>	Creeper	0.25	
<i>Desmocladius flexuosus</i>	Sedge	0.10	
<i>Dryandra nivea</i>	Low shrub	0.02	
<i>Eucalyptus angulosa</i>	Mallee	0.01	
<i>Leucopogon parviflorus</i>	Shrub	0.01	
<i>Lyginia barbata</i>	Shrub	0.04	
<i>Melaleuca thymoides</i>	Shrub	0.01	
<i>Phyllanthus calycinus</i>	Low shrub	0.01	
<b>Total:</b>		1.00	

### 4. Visual amenity mix

Species	Life form	Proportion	Rate (kg/ha)
<i>Acacia littorea</i>	Shrub	0.20	
<i>Adenanthos cuneatus</i>	Shrub	0.02	
<i>Adenanthos sericeus</i>	Shrub	0.02	
<i>Agonis flexuosa</i>	Shrub	0.02	
<i>Banksia praemorsa</i>	Shrub	0.06	
<i>Bossiaea linophylla</i>	Shrub	0.10	
<i>Conostylis aculeata</i>	Low shrub	0.02	
<i>Isopogon formosus</i>	Low shrub	0.05	
<i>Scaevola nitida</i>	Low shrub	0.04	
<i>Kennedia coccinea</i>	Creeper	0.05	
<i>Leucopogon parviflorus</i>	Shrub	0.20	
<i>Olearia axilaris</i>	Shrub	0.02	
<i>Phyllanthus calycinus</i>	Low shrub	0.02	
<i>Pimelea ferruginea</i>	Low shrub	0.05	
<i>Pimelea rosea</i>	Low shrub	0.05	
<i>Hibbertia racemosa</i>	Shrub	0.04	
<i>Hibbertia cuneiformis</i>	Shrub	0.04	
<b>Total:</b>		1.00	

### 5. Sand-binding species for use on batters

Species	Life form	Proportion	Rate (kg/ha)
<i>Conostylis aculeata</i>	Low shrub	0.05	
<i>Dampiera linearis</i>	Low shrub	0.05	
<i>Desmocladius flexuosus</i>	Sedge	0.10	
<i>Dryandra nivea</i>	Low shrub	0.15	
<i>Hakea prostrata</i>	Low shrub	0.05	
<i>Kennedia coccinea</i>	Creeper	0.05	
<i>Kennedia prostrata</i>	Creeper	0.05	
<i>Scaevola nitida</i>	Low shrub	0.35	
<i>Tetragonia implexicoma</i>	Creeper	0.10	
<b>Total:</b>		1.00	