



NATURAL AREAS: REHABILITATION AND REVEGETATION GUIDELINES

1. Introduction

These guidelines support the City of Gosnells Policy No. 6.2.2 - Rehabilitation and Revegetation of Natural Areas.

The guidelines are designed to provide clear direction as to the City's requirements regarding the planning and implementation of rehabilitation and revegetation activities associated with Natural Areas in the City.

The guidelines have been prepared specifically to assist the land development industry, whose members are from time to time required by condition(s) of planning approval to undertake rehabilitation and/or revegetation activities on land that will eventually come under the City's control and management.

The guidelines are also designed to provide detail to assist others who may undertake rehabilitation and/or revegetation activities in the City.

The guidelines detail the City's minimum requirements and specifications for these activities. The objective of the policy and guidelines is to ensure the provision of consistent, quality rehabilitation and revegetation outcomes.

In all instances, it is critical that Natural Areas rehabilitation and revegetation planning, implementation and maintenance are undertaken by suitably qualified and experienced ecological restoration and management contractors.

2. Definitions

2.1 Rehabilitation

Rehabilitation involves the restoration of elements of vegetation structure or function to a disturbed ecological system in an attempt to return it to its pre-disturbance or natural state in terms of abiotic (non-living) conditions, community structure and species composition.

2.2 Revegetation

Revegetation is the replanting of native vegetation. It may be part of a rehabilitation program, and is an important tool for nature conservation used commonly to:

- buffer remnants of native bushland or wetland against edge effects that may include wind, dust, noise, visual intrusion and shallow groundwater influences
- create completely new habitat where degradation has resulted in the removal of habitat
- connect patches of vegetation to facilitate fauna movement



As a general rule, revegetation will only be necessary in bushland of degraded, or lesser, vegetation condition. Where planting occurs, local provenance species must be used.

2.3 Natural Regeneration

Natural Regeneration refers to the ability of a disturbed area to naturally regenerate from its seed bank or vegetative parts. It should be assisted by weed management, erosion control and/or trampling control (eg fencing, bollards, and signage) before revegetation is attempted. Revegetation or rehabilitation should take account of natural regeneration.

2.3 Practical Completion

Practical completion refers to the stage when revegetation/rehabilitation work has been implemented in accordance with the schedule of works (year 1) provided in the Revegetation/Rehabilitation Plan.

2.4 Handover

Handover occurs at the conclusion of the Developer's mandatory maintenance period. Staff from the Parks and Environmental Operations section and the Environmental Management section meet on-site with representatives of the Developer to inspect the site and assess the satisfaction of completion criteria. If the City is satisfied that the criteria have been met, the City agrees to assume management of the site. If criteria have not been satisfied, the Developer is advised of works required to address shortcomings and render the site acceptable for the City's management.

3. Project Planning

A project plan is required to be lodged with and approved by the City prior to the initiation of rehabilitation and/or revegetation works. The project plan must include a detailed scope of works informed by adequate mapping and design drawings that demonstrate a good understanding of the site and its issues.

The Plan should map and describe the area(s) that will be rehabilitated and/or revegetated, including as appropriate existing vegetation (native and non-native), soil, topography, areas of inundation, adjacent current and future land uses and ownership, and any other relevant factors which may affect revegetation activities.

The Plan should describe any site conditions that may constrain or otherwise influence the rehabilitation and/or revegetation work.

The Plan should be prepared to address *Guidance No.6 Rehabilitation of Terrestrial Ecosystems* (EPA, 2006).

3.1 Key Planning Approaches

Key approaches that should underpin the Rehabilitation and/or Revegetation Plan are:

- a) Retain and protect remnant vegetation on site (eg control access, prevent rubbish dumping, prevent weed invasion).



- b) Regenerate native vegetation. Where there is site resilience and native vegetation remains but is degraded, regeneration should be the main goal (eg remove and suppress weeds, remove rubbish, restabilise degraded areas, protect natural regeneration).
- c) Where natural processes or assisted regeneration techniques are not appropriate, or where there is no potential, then revegetation is an option.

3.2 Key Management Issues and Areas

The Plan should contain a clear statement of objectives and include guidelines for the key management issues that need to be considered in achieving the Plan's objectives.

The Plan should list the skills required for specific activities, including specialists such as botanists, erosion control specialists, ecosystem restoration specialists and other consultants and contractors. The Plan should describe the activities to be undertaken by each specialist.

Guidelines should direct tasks that can be implemented. They should be as specific and quantitative as possible. The following matters are examples of elements that require documentation in the Project Plan:

- Measures for controlling access and encroachments
- Site evaluation
- Weed removal and management (eg whether chemical, mechanical or hand removal methods will be used, timing, weed disposal, etc)
- Pathogen management (eg managing the presence and spread of pathogens such as Phytophthora)
- Feral animal management (particularly grazing animals)
- Donor topsoil areas
- Use of machinery (eg where machinery is to be excluded, machinery hygiene)
- Vegetation species composition, planting layout and densities - to reproduce and extend remnant vegetation communities where present (e.g. a table showing number and species type of tubestock)
- Seed/plant sources
- Details of planting priorities, rehabilitation methods and staging
- Habitat augmentation (eg type and location of nest boxes and/or terrestrial hollows or cover to be installed)
- Declared Rare and/or Priority Flora and Threatened Ecological Communities
- Maintenance program
- Vegetation monitoring program
- Fire management
- Neighbour relations and community education (e.g. interpretive signs, formation of a "Friends" group)



- Maintenance requirements (a minimum of 2 years maintenance after practical completion or until such time as a minimum 70% survival rate for each species in all plantings and a maximum 5% weed cover is achieved for the site)
- Minimum standards for contractors and personnel
- Cost estimate
- Summary table of actions, timeframes and responsibilities

3.3 Rehabilitation and/or Revegetation Plan Elements

3.3.1 Project Goals and Timeline

The Plan should describe what is to be accomplished - the desired long-term outcomes of the Plan. Goals should be general, easily understood, and flexible enough to adapt to changing situations (e.g. to maximise wildlife habitat, long-term goals could include providing a multi-levelled structure of vegetation from small shrubs to tall trees to provide habitat and food resources).

A timeline should also be prepared with detailed tasks laid out by months or quarters. The schedule of tasks should also list the responsible person/organisation. A spread sheet is the simplest way to accomplish this.

3.3.2 Statutory and Policy Aspects

The Plan should describe and address any statutory or policy aspect that will influence the rehabilitation and/or revegetation work. This could include appropriate actions to protect and ensure no disturbance to Declared Rare or Priority Flora or Threatened Ecological Communities, and aspects of the Plan relating to Conservation Category Wetlands and their buffers, and Bush Forever Sites.

3.3.3 Access Management

The Plan should describe any identified access or encroachment issues and provide for measures to appropriately manage the issues. The Plan should address both undesirable and desired access.

Access issues may be addressed, as relevant, through measures including fencing, provision of gates (note that gates may be selective – eg “kissing gates” that exclude all but pedestrian access), decommissioning and rehabilitation of pathways and/or redundant fire access tracks, formalisation of existing or new pathways, and signage.

The Plan must consider access for fire management and fire suppression and provide, as appropriate, access for these functions.

3.3.4 Site Evaluation

The following works are required to be undertaken prior to, and in preparation for, project planning:



- a) The site is to be assessed to provide a description in the context of adjacent land use, anticipating issues that might arise.
- b) A vegetation survey is to be undertaken to clearly identify and map native vegetation to be retained and protected on the site. The Floristic Community Type (FCT) (Gibson et al 1994 and DEP 1996) currently occurring on the site or believed to have occurred on the site in the absence of remnant vegetation needs to be identified. FCT's are to directly inform revegetation species list. Vegetation survey to include current vegetation condition and key weed species.
- c) Areas of natural regeneration that may require protection and/or in-fill planting are to be clearly identified.
- d) Soil type(s) at the site are to be identified, as necessary, and any issues that arise from this aspect noted.
- e) Areas of the site required to undergo revegetation and/or rehabilitation works are to be clearly identified and recorded/mapped.
- f) Any existing issues requiring attention at the site prior to revegetation and/or rehabilitation works, including environmental weeds, soil compaction, altered contours, rubbish removal, fencing, access, are to be clearly identified and recorded/mapped.
- g) An initial assessment of the site is to be undertaken for dieback disease, *Phytophthora cinnamomi*, and a response appropriate to the results provided in the project plan.
- h) The identification of any fauna issues or aspects that should be considered or addressed in the Plan.

3.3.5 Site Preparation

Preparation of the site prior to rehabilitation/revegetation activities will be informed by a number of results from the site evaluation (see 3.3.4).

Site preparation may include:

- deep ripping to alleviate soil compaction or to intercept sheet runoff and reduce erosion potential
- initial weed control to reduce weed biomass and competition with future rehabilitation/revegetation works
- restoration of natural contours
- removal of rubbish and other foreign materials
- fencing and access management infrastructure
- dieback hygiene and quarantine measures



3.3.6 Disease Management

The Plan will provide measures to avoid the introduction and/or spread of dieback disease to and within the rehabilitation/revegetation area. The Plan will include a Dieback Management section that provides robust measures to prevent the introduction and/or spread of the disease.

Should the presence of dieback disease be identified in the initial assessment of the site for the pathogen, it will be necessary to undertake a more detailed survey to accurately describe the presence of the disease, producing maps to inform hygiene and quarantine initiatives.

If dieback is not detected within the site the Plan will provide measures to prevent the disease being introduced in the course of rehabilitation/revegetation works.

Practical measures will be provided in the Plan to avoid the introduction and/or spread of the disease through rehabilitation works and associated activities.

3.3.7 Rehabilitation and/or Revegetation

The site evaluation and vegetation survey tasks (see 3.3.4) will be fundamental to informing rehabilitation/revegetation planning and programming.

Mapping

Site evaluation will produce clear mapping to provide the foundation for the Rehabilitation/Revegetation Plan, identifying:

- areas requiring revegetation and/or rehabilitation
- areas of native vegetation retention
- areas of natural regeneration requiring protection and/or in-fill planting

The vegetation survey will inform species requirements. The intent of the rehabilitation/revegetation process is to match and reproduce to the highest standard possible existing and/or pre-existing vegetation assemblages.

Rehabilitation/revegetation planning will produce accurate mapping of vegetation assemblages to inform a rehabilitation/revegetation schedule that provides for rehabilitation, restoration and/or extension of assemblages based on soil type and topography.

Species selection, acquisition and installation

The Rehabilitation/Revegetation Plan will identify individual vegetation assemblages, and within those assemblages a species list to match. This process should be informed by the evaluation of adjacent vegetation or nearby reference sites. Species diversity should seek to achieve 60-80% of pre-existing taxa, based on adjacent or nearby intact vegetation or other reference sites.



The species list will be comprehensive and will provide the following to inform installation:

- means by which to maximise local provenance
- recommended planting densities and/or spacings
- recommended direct seeding mix proportions and installation detail if using direct seeding
- whether or not tree guards or similar will be installed to reduce predation
- whether or not mulch will be installed to suppress weed growth and assist in soil moisture retention
- schedule for planting

Note: the use of tubestock is the preferred method for rehabilitation/revegetation projects.

As a guide, a planting density of no less than 2 plants per square metre is to be achieved. A ratio of trees, shrubs and ground covers, based on the evaluation of existing, adjacent or reference vegetation assemblages, is to be provided to guide installation. Densities for sedge plantings will be greater than for other plantings.

Note: species selection may be influenced by the confirmed presence of dieback disease, in which case dieback-susceptible species may be removed from the species list.

The Rehabilitation/Revegetation Plan will provide a schedule relating to the acquisition of seed and/or greenstock that will ensure that the maximum species diversity can be achieved in the planting program. The consideration of substitute species will not be considered an appropriate response to the unavailability of seed and/or greenstock.

Areas of rehabilitation/revegetation will not be irrigated.

The use of “brushing” to assist rehabilitation/revegetation and protect soil is supported where appropriate. The use of large woody debris is encouraged to provide fauna habitat, and to enhance the success of plantings.

In-Fill Planting

In the case where the rehabilitation/revegetation works are undertaken in order to clear a condition of planning approval, the Developer will be required to undertake maintenance of the site for a two-year period from the date of practical completion. This will include follow-up plantings to achieve required vegetation diversity and density.

The Rehabilitation/Revegetation Plan will accommodate anticipated mortalities of approximately 30%, to be addressed through in-fill planting in the winter following the first planting/seeding and, if determined as necessary through monitoring, in the second winter following the first planting/seeding in order to achieve specifications.



The in-fill program will be informed by monitoring of the rehabilitation/revegetation areas, which will more precisely prescribe species and numbers to be installed in the in-fill process. The objective of in-fill planting is to ensure the achievement of prescribed vegetation diversity and density.

Appropriate contingencies will be provided to address under-achievement of performance criteria, should monitoring identify such shortfalls.

3.3.8 Minimum Standards for Planting

All planting contractors and personnel should be made aware of the following minimum standards before starting work:

- on-ground work must follow details provided in the approved Rehabilitation/Revegetation Plan
- sub-standard greenstock must not be installed
- planting conditions should be monitored: planting should cease if there has been no rain for 3-4 days and the forecast predicts no rain for another 3-4 days; rain a short time after planting to set the plants in is important to their survival
- hand-watering may be considered, but is to only occur by mutual agreement between the contractor and the City
- there is to be no physical damage to greenstock at breaking out
- root-bound stock is not to be supplied and will not be accepted
- tubestock should be nominally planted with the top of the root ball 5cm below ground level; in sandy soils, where there is little risk of collar rot it may be advantageous to plant deeper than this; it is critical to ensure that the root ball is covered with soil
- greenstock must be well heeled in, planted firmly enough that they cannot be lifted out by the foliage
- all personnel are to be made aware of different vegetation assemblage zones and the need to ensure relatively random installations to achieve a more natural outcome

3.3.9 Maintenance

The Rehabilitation/Revegetation Plan will provide a maintenance schedule to ensure the correct management of the site.

The maintenance schedule will nominate key personnel who will be contactable should there be a need for queries to be made on the maintenance of the site.

Site maintenance will include normal maintenance associated with a revegetation site. In addition to any maintenance of a normal revegetation site, maintenance will include rubbish removal, repair of erosion, repair/reinstatement of any damage to the site (i.e. via vandalism). The site will be maintained in good condition, meeting success criteria outlined within the Plan at handover to the City.



In the case where the rehabilitation/revegetation works are undertaken in order to clear a condition of planning approval, the Developer will be required to undertake maintenance of the site for a two-year period from the date of practical completion.

3.3.10 Weed Management

Further to weed management associated with site preparation (see 3.3.5), a weed management program will be provided in the Rehabilitation/Revegetation Plan.

In the case where the rehabilitation/revegetation works are undertaken in order to clear a condition of planning approval, the Developer will be required to undertake maintenance of the site for a two-year period from the date of practical completion.

The weed management program will be prepared and implemented by a suitably qualified and experienced environmental weed manager. The program will provide for an appropriate level of flexibility so as to accommodate weather-driven variations in weed germination, growth and flowering, in order to maximise the effectiveness of the program.

Weed management success criteria and contingencies will be included in the monitoring schedule for the site. The City's success criteria are outlined below:

- contractors must hold a current Pesticide Operators licence and be endorsed to supply and apply herbicides for reward
- contractors must be able to demonstrate an understanding of natural environmental and ecosystem issues and considerations
- contractors must be fully aware of relevant State and Federal legislation with regard to protected species, environmental harm, pollution and other issues pertinent to the carrying out of chemical weed control in natural areas
- all chemical agents are to be used strictly in accordance with the manufacturer's recommendations and in accordance with licencing provisions for that chemical
- any materials derived from manual control methods are to be removed from site by the contractor unless the City agrees to alternative arrangements
- the contractor shall effect control of the target weed species at a level of not less than 95% kill

3.3.11 Monitoring and Success Criteria

The Rehabilitation/Revegetation Plan will provide a monitoring schedule appropriate to the site and rehabilitation/revegetation works.

Monitoring of rehabilitation/revegetation works will assess the survival of plantings and/or germination of seed, as well as the success of the weed management program. Success criteria will be established to ensure the achievement of the Rehabilitation/Revegetation Plan's vegetation diversity and density objectives.



As a guide, a planting density of no less than 2 plants per square metre is to be achieved. Densities for sedge plantings will be greater than for other plantings.

Alternatively, the City will consider completion criteria based on relative cover (% of area) of native plants, weeds and bare ground measured in permanent plots or transects.

Monitoring will be undertaken on a six-monthly basis. It is anticipated that a successful rehabilitation project will only require 4 monitoring events, the final to occur immediately prior to handover.

Additional monitoring, to address site-specific issues, may be provided if required by the Plan. The monitoring schedule will be such that it allows sufficient time for in-fill stock to be grown and/or ordered for the subsequent winter planting season, and for identified weed management issues to be promptly addressed.

Monitoring results will be communicated to the City for information and advice on a six-monthly basis, unless otherwise agreed.

Any group mortality, related either to species or area, should be noted and investigated prior to in-fill planting of the same species. It may be necessary to vary the planting/seeding schedule in such circumstances, particularly where a pathogen is understood to be responsible.

A general monitoring schedule will provide for the evaluation of vandalism or other damage to, or failure of, any infrastructure or other installation created as part of the Rehabilitation/Revegetation Plan. This will include, but not be limited to, fences, gates, signs and tree guards.

3.3.12 Handover

At the conclusion of the Developer's mandatory maintenance period, City staff will meet on-site with representatives of the Developer to inspect the site and assess the satisfaction of success criteria. If the City is satisfied that the criteria have been met, the City will agree to assume management of the site. If criteria have not been satisfied, the Developer will be advised of works required to address shortcomings and render the site acceptable for the City's management.

3.3.13 Fire Management

The Rehabilitation/Revegetation Plan will consider fire management aspects of the site in its own context and that of its surrounding land uses.

The Plan will accommodate, where appropriate, the principles and requirements of:

- Planning for Bush Fire Protection Guidelines (Edition 2) (WAPC, 2010)
- Plant Guide within the Building Protection Zone for the Swan Coastal Plain of Western Australia (FESA, 2011)



3.3.14 Cost Estimate

The Rehabilitation/Revegetation Plan will provide a costed schedule of works. Rehabilitation/revegetation costs are highly variable depending on the needs of the site, the intensity of planting, size of the area planted, and the labour source. The Plan will provide costs for the following types of activities/needs, including materials:

- site preparation
- rehabilitation/revegetation works
- maintenance
- monitoring
- overheads/administration

3.3.15 Summary Table

The Rehabilitation/Revegetation Plan will provide a summary table that details:

- rehabilitation/revegetation activities
- timing and/or frequency of activities
- responsibility for implementing the activities

3.3.16 Professional Standards

It should be noted that ecosystem restoration and revegetation projects require specialist skills and competence. The use of suitably qualified and experienced ecosystem restoration specialists for rehabilitation/revegetation project design, implementation and maintenance is strongly recommended.

The Plan should list the skills required for specific activities, including specialists such as botanists, erosion control specialists, ecosystem restoration specialists and other consultants and contractors.

It is expected that the professional skills applied to the planning and implementation of the rehabilitation/revegetation project include:

- knowledge and understanding of ecosystem restoration
- knowledge and understanding of local native ecosystems and fauna habitat
- awareness of the importance of local provenance
- understanding of the need for timely and planned greenstock propagation and acquisition
- knowledge and understanding of weed management, issues and best practice
- knowledge and understanding of Phytophthora Dieback disease management, issues and best practice



- knowledge and understanding of erosion management, issues and best practice
- knowledge and understanding of government statutory and policy aspects of conservation issues
- a high level of competence in the management, implementation and maintenance of such projects