SHIRE OF DENMARK

TOWN PLANNING SCHEME POLICY NO. 1

FOR

DIEBACK DISEASE MANAGEMENT

Adopted on 23rd September, 1997 in accordance with Clause 8.2 of Town Planning Scheme No. 3

CONTENTS

FOREWORD

In November 1996 Denmark Shire Councillor Chappelle tabled a discussion paper, *An Approach to Controlling the Spread of Dieback Disease in the Denmark Shire,* which proposed that Council investigate the control and management of dieback caused by the fungus *Phytophthora cinnamomi.*

This proposal was well received and Council resolved to forward the paper to relevant government departments for comment. Subsequently comments were recieved from the Department of Environmental Proetction, Water and Rivers Commission, Shire of Albany and the Ministry for Planning. They congratulated Council on taking such a positive step, commending the comprehensive nature of the paper and offering in-principle support.

Coincidentally, in January 1997, a working party of the Canning Catchment Coordination Group produced a *Dieback Disease Management Policy for Local Government Authorities.*

Representatives on the Canning Group's working party were from the East Metropolitan Regional Council, the Cities of Armadale, Canning and Gosnells; the Shires of Serpentine-Jarrahdale and Swan, the Water and Rivers Commission, Department of Conservation and Land Management, Ministry for Planning and Department of Land Administration. The Shire of Capel sent a representative, and three other Councils expressed an interest in becoming involved.

It was identified in the devlopment of the Canning Group's draft policy that a number of goals common to many Councils – for example, reducing drain silt-up – could be achieved by applying dieback disease control measures, thereby reducing the cost of maintenance operations.

The Canning Group has invited various local and government agencies to adopt its policy, including Optus, Telstra, Main Roads WA and Western Power.

The Shire of Denmark considered that if it combined the information in Cr Chappelle's paper with the Canning Catchment Group's report, a unilateral approach to dieback management could help achieve a long-term benefit for the Denmark community, through improved protection of the district's environment and its economic base.

1.0 EXECUTIVE SUMMARY

The responsibilities of the Shire of Denmark include the protection and management of vegetation on road and other reserves managed by and vested in the Shire. It is aware of the need to identify infected areas and prevent the spread of dieback disease on private and public lands.

The Shire is conscious of the impact its own operations have upon adjacent land holdings, and the desire by the Denmark community to protect valuable forests and their associated plant communities for future generations.

It recognises that dieback disease poses a significant threat to the conservation, cultural and economic values of land within its boundaries, and in neighbouring municipalities – including impacts on horticulture, native fauna, tourism and biodiversity.

The Shire of Denmark is now seeking to implement a comprehensive policy to manage the dieback disease problem. This policy recommends:

- Adopting a step by step action plan to identify and manage the spread of dieback.
- Contacting interested and affected parties.
- Developing a Code of Practice for all affected stakeholders.
- Preparing and implementing a Dieback Disease Management Plan, which will cover training, work practises, the creation of a remnant vegetation database, signage and media.

The policy contains a series of seven actions, together with a range of management strategies and management tactics to provide guidance on identifying the problem and controlling it.

The policy will be applied to all operations for which the Shire of Denmark is responsible or has an interest in, and will be made freely available to other interested parties.

Pascoe Durtanovich
Chief Executive Officer

2.0 DIEBACK DISEASE

In Western Australia dieback disease is caused by root rotting fungi belonging to the genus *Phytophthora*. Of the five known species of the fungus the most insidious is *P. cinnamomi* (PC) and this is generally acknowledged to be the prime cause of 'dieback disease'.

PC is known to be a threat to about 1800 species of WA's native flora, with some plant communities so seriously affected that local extinctions of plants and the animals that depend on them may have already occurred.

Dieback disease is now widespread throughout the Southwest and is affecting parts of forest, heathland and woodland communitieis. At present there is no practical cure for broadscale infection and every attempt must be made to confine its spread until such time as a cure may become available.

New outbreaks are primarily caused by human activity in infected soil, root material or water. Road works are one of the most effective means of spreading the disease.

Many other activities, such as fire access/break construction and maintenance, earthmoving, dirty vehicles and machinery lead to disease spread. Fencing, introduced green stock and landscaping materials, drilling and the use of off-road vehicles can spread the disease. The installation and maintenance of services such as power, gas, telephone and water are likely vectors for spreading the disease.

To reduce the risk of spreading dieback disease the Shire of Denmark and its community must ensure that all operations likely to spread the disease are closely scrutinised, and appropriate hygiene practises planned and implemented. Personnel involved in implementing these practises must be appropriately trained.

Research has shown that the spread of dieback disease increased dramatically after the widespread introduction of mechanical earthmoving equipment in the mid 1940's. At present there is no restriction to the movement of earthmoving equipment throughout the Shire, and no requirement for hygiene measures, such as washing of machinery and vehicles.

In addition, clearing and burning result in higher soil temperatures, which encourage fungal activity. This can lead to an expansion of existing dieback infections and introduce dieback to uninfected lands. Fauna which depend on plant communities for food, shelter and protection are adversely impacted when their habitats are degraded by dieback infection.

Commercial crop species known to be susceptible to *Phytophthora* species include asparagus, potatoes, soya beans, peaches, plums, avocadoes, apples, cranberries and other berry fruits, as well as azaleas and camellias. With intensive horticulture being actively promoted in the Denmark Shire, knowledge about and control of dieback is increasingly important.

The opportunity exists for the Shire of Denmark to make a successful stand against the further spread of dieback, if a high level of willingness exists in the community to provide resources, ongoing commitment and assistance in implementing the proposed code of practice and management tactics.

3.0 ACTIONS AND STRATEGIES

ACTION ONE

The Shire of Denmark recognises that dieback disease is a threat to conservation, cultural and economic values on lands managed by the Shire and vegetation on adjacent lands

The Shire of Denmark will develop and implement a dieback disease management programme to minimise the risk of introducing or spreading dieback disease

STRATEGY ONE

The Shire will prepare a comprehensive dieback disease management programme including:

- This policy and strategy statement.
- A Code of Practice
- Formal procedures assigning responsibility to Shire staff for planning, implementation and control.
- A manual of dieback disease hygiene procedures.
- Certified Staff training programmes.
- Performance Assessment procedures for the LGA and contractors.

ACTION TWO

The Shire will identify priority areas through a dieback mapping and risk assessment process, for the application of the resources available to manage dieback disease.

STRATEGY TWO

A system of assigning priorities will be developed. The highest priority will be given to areas:

- Not having the disease.
- Having high conservation values, such as adjacent to National Park and Nature Reserves, containing rare plants and valuable remnant vegetation.
- Where there is expected to be a serious impact if dieback disease is introduced (high hazard areas).
- Where a planned operation creates a high risk of introducing or spreading the dieback disease.
- Where dieback disease can be controlled by realistic procedures.
- Where there are no other activities which would render action by the Shire of Denmark ineffective.

ACTION THREE

The Shire of Denmark will liaise with:

- **Other agencies using land managed and/or owned by Council**
- **Other agencies, groups and individuals using or having management over other land within the municipality.**
- **Neighbouring Shires to ensure that the programme is extended to all activities.**

STRATEGY THREE

Dieback disease control by the Shire is greatly affected by adjacent land uses and via service corridors managed by other agencies.

It will be necessary for all agencies to follow consistent procedures, if the disease control measures carried out by the Shire are to become and remain effective.

The Shire will identify and liaise with all relevant agencies to ensure the integrity of the Shire management objectives.

ACTION FOUR

The Shire of Denmark will ensure staff have training in dieback disease control, and prior to any operation on Shire managed land, ensure that all staff and any private operators or contractors involved in the operation know the conditions and procedures required to be implemented.

STRATEGY FOUR

To ensure a consistent implementation of dieback disease measures the Shire of Denmark will:

Identify the training needs of its personnel.
Encourage through WAMA or similar avenue, the development of training curriculum to satisfy this Policy's objectives.
Implement appropriate training where necessary and certify trainees as competent.
Train appropriate shire staff and community individuals in soil and vegetative sampling techniques.
Monitor personnel performance against training objectives.

ACTION FIVE

The Shire of Denmark will review its procedures and performance regularly; and will incorporate new information and technologies into the Code of Practice as it becomes available, and will adapt its procedures accordingly.

STRATEGY FIVE

The Shire will monitor and review its procedures regularly for the first three years and thereafter as required or directed. This review will consider advances in disease management made by other organisations eg Dept of Conservation and Land Management and Main Roads WA.

It will also consider and where relevant incorporate suggestions from Council Staff and community groups and individuals involved in dieback disease management on how procedures could be improved and the success or failure of current practices.

ACTION SIX

The Shire of Denmark will ensure that dieback management measures are incorporated into the acquisition of materials and services for Council works and operations.

STRATEGY SIX

The Shire of Denmark will:

- Ensure contract and tender documents recognise dieback management as a requirement through appropriate clauses, and that contractors be required to adhere to the Dieback Policy and Code of Practice.
- Ensure that the acquisition of goods and materials outside the tender and contract process recognises dieback management requirements.
- Ensure that contract staff have an adequate understanding of dieback and its management.
- Ensure that development and management of Shire owned sources of road and construction materials are in accordance with the Code of Practice for dieback.
- Establish the PC status of shire gravel and sand pits.
- Require the use of dieback free gravel for roadworks in known or potentially sensitive areas and some infected areas.
- Purchase a mobile cleandown facility, or encourage a private contractor(s) to do so, and set up a permanent facility at the shire works deport.
- Require cleandown of all shire and private earthmoving and associated equipment, in and out of new siteworks and infected sources of basic raw materials used for road and construction purposes.

ACTION SEVEN

The Shire will ensure that the risk of introducing and/or spreading dieback from development sites to adjacent areas is minimised through conditions applied to subdivision and development approval process.

STRATEGY SEVEN

The Shire will:-

- Request the WA Planning Commission to impose dieback testing and hygiene measures as conditions of subdivision in known or potentially sensitive areas, or infected areas, where roadworks are required.
- Require dieback testing of gravel and sand pits on private property if material is to be removed from the property.

4.0 MANAGEMENT STRATEGIES

4.1 Introduction

This section illustrates a process which can help determine whether dieback disease is an issue associated with any particular operation. It also deals with practical strategies and tactics that can be used to achieve dieback disease control.

When determining a hygiene strategy for any operation several integrated and mutually supportive tactics should be built into the operation to ensure successful hygiene.

4.2 Dieback Disease

The following factors should be considered when planning an operation to determine the relative importance of dieback disease and its management.

(a) What kind of operation is planned? Do any parts of the operation involve the possible transfer of infected soil, plant material or water?

(b) Is the state of knowledge about dieback disease on the site such that the project should be deferred until more information is available?

(c) Are there areas of susceptible vegetation that could be placed at risk by the operation?

(d) Are the land use values on site or adjacent to the operation likely to be effected by dieback disease? Conservation values or production values such as water quality, wildflower growing, avocado production etc are examples of vulnerable land uses.

(e) Is dieback already present?

(f) Is dieback disease so widespread that any attempts at control within the project are likely to be futile? If the answer is yes, then no further consideration within the project is required. Preventing the spread to other sites will need to be considered.

(g) If dieback disease is not present, or present but not widespread, what is the risk of introducing or spreading dieback disease?

(h) What resources are currently available to implement disease management? If resources are limiting and the potential for disease impact is high it may be appropriate to defer the operation until sufficient resources are available.

(i) Is there some other factor present on the site or on adjacent land which precludes any effective management solely by the Shire?

4.3 Recognition and Mapping of Dieback Disease Symptoms

Identification and mapping of dieback disease can be difficult. It should be carried out by a specialist, particularly if it is to be used as the basis for a detailed strategy involving considerable resources. Dead plants of susceptible species can be an indication of PC. A sound knowledge of susceptible plants and their reliability as indicators in each locality is required.

The time taken for a new infection to be expressed as visible symptoms varies, depending on local site and climatic factors. This time lag can vary from less than 6 months on susceptible sites in the jarrah forest to several years on more hostile sites, where dieback disease may be present but cannot be visibly detected. Many other agents can be responsible for plant death – insects, salt, old age, frost, mechanical damage, fire, herbicides etc. Care must be taken to discount these other agents.

A single dead susceptible plant (eg: a Banksia) could indicate dieback. It is best to assume it is dieback if two or more dead plants are seen, or dead plants of two or more different species are present, or there is evidence of a progression of deaths over time or soil disturbance nearby from a vehicle which could have introduced the infection. Presence of dieback disease can sometimes be determined by laboratory testing of samples of soil or root material from dying or recently dead plants.

Dieback disease is difficult to detect in areas which have been recently burnt, due to foliage being consumed by fire, destroying visible symptoms of the disease. It is difficult to determine the presence or absence of disease on some sites. Other areas are uninterpretable because there are too few indicator plant species present.

Spring and Autumn or periods after heavy summer rain are the best time to identify and map dieback disease symptoms. Soil moisture and temperature at these times favours the activity of the fungus.

- If dieback disease is evident in a water course then it must be assumed the water course is infected and dieback disease will be present downstream from the infection. Therefore it is important to identify the furthest upstream infection in the water course.

- If dieback disease occurs on a ridge or upper slope, then areas downslope will become infected in time.

- Dieback disease is most likely to occur in moisture-gaining sites such as gullies, creeks, drains and culverts.

The interpretation and integration of all these factors is what makes it difficult to routinely identify and map dieback with a high degree of accuracy.

The end result is to classify areas within the Shire of Denmark as:

- dieback free,

- suspect - which means confirmation of the disease's presence is not possible, but where other factors such as position in the landscape, adjacent infections etc give rise to a reasonable suspicion of the diseases presence,

- uninterpretable - which means it is not possible to say whether dieback is present or not, and

- area at risk from natural spread down slope from disease.

4.4 Assessing the Risk of Introduction and Spread of Dieback Disease

One of the fundamental questions which must be addressed in determining any hygiene strategy is:

"What is the risk of this operation introducing or spreading dieback disease?" This question can be approached by considering three factors:

1. Is the type of operation likely to introduce or spread soil, roots and water? For example, are tracked or rubber tyred machines to be used; is earthmoving likely; will the operation be in muddy or sticky soils?

2. Are soil conditions such that soil is likely to stick to machinery and be moved around on and off-site (moist)?

3. Are soil conditions such that the fungus will survive if delivered to a new site (moist)?

The risk of introducing or spreading dieback due to the nature of the proposed operation:

Highest Risk	**Lowest Risk**
Operation over large area	Operation over small area
Complex operation	Simple operation
Much machinery	Little machinery
Much movement of soils	Little movement of soils
Untrained personnel	Well trained personnel
Inexperienced personnel	Experienced personnel

The risk of introducing or spreading dieback due to the nature of the site:

Highest Risk	**Lowest Risk**
Wet conditions	Dry conditions
Sticky soils	Non-sticking soils
Low lying site	Elevated site
Dieback known nearby	Dieback not known nearby

4.5 Assessing the Dieback Disease Hazard

Dieback disease hazard is a term which describes the final impact of the disease on a site if the disease were introduced. The final impact of dieback disease on a site depends on:

- The susceptibility and abundance of plant species present;
- the fertility, chemical and physical properties of the soils;
- the lateral and vertical drainage characteristics of the site;
- topography;
- climate; and
- any proposed works.

These factors should be considered by a person skilled and experienced in the determination of hazard ratings. The hazard rating is a prediction of the consequences of introducing dieback disease to a site. It allows the project manager to assess cost/benefit, risk/consequence relationships.
This information helps to determine the importance or priority for applying hygiene techniques to an

operation and determining the amount of effort and resources that should be allocated to hygiene management.

4.6 Setting Priorities for Applying Dieback Disease Hygiene Controls

Disease management requires the expenditure of resources which could be used elsewhere. Obtaining the most benefit from scarce resources expended requires the allocation of priorities. To establish these priorities the following criteria may be applied:

i) **Land Use:**

What are the land use values on and surrounding the site of the operation? For example: conservation, water production, wildflower plantation, aesthetic. What is their value and current condition?

ii) **Hazard:**

What are the likely consequences of disease in terms of the designated land use values? For example, the impact on a banksia woodland may be severe but the impact on a grassed recreation oval will be negligible.

iii) **Risk:**

What is the risk of introducing or spreading the disease by:
- carrying out the operation;
- any subsequent maintenance operations
- any activity not directly under the control of the Shire of Denmark eg: public access, other utilities or adjacent land management practices.

There are no set answers after considering these criteria. An area with a high conservation value but already badly infected with dieback disease could be regarded as in urgent need of dieback disease management because of the conservation values; or as having a low priority because the existing infections pre-empt any effective management.

A final criterion is the regional disease context. If dieback disease is rare within the region then there is a strong case for adopting dieback control measures regardless of other factors. Alternately, if dieback is prevalent, the conservation value of the un-infested remnants may be significant.

In the final analysis a value judgement will have to be made and this can be done by the proposed sub-committee established by Council. The best judgement will always be one that is based on reliable, accurate information and clear logic.

Priority 1: HIGHEST PRIORITY

All sites within, upslope of or upstream of existing or proposed National Parks, Nature Reserves and other reserves with conservation as a purpose, any site having Declared Rare Flora at risk, and any site of regional and/or local significance. The only reason such sites should be removed from this category is where the application of dieback control is pre-empted by existing infections or other adjacent activities. Cost or difficulty would not normally be reasons to exclude sites from this category.

Priority 2: HIGH PRIORITY

All sites having vegetation in good condition and at least partly susceptible to damage by dieback, and any site having important remnant vegetation at least partly susceptible to damage from dieback, even where it is not in good condition. Again, these sites are subject to the condition that dieback control is realistic and has not been pre-empted. Cost or difficulty may not be reasons to exclude sites from this category.

Priority 3: MODERATE PRIORITY

Sites with vegetation of moderate value and at least partly susceptible, and sites where dieback control may be difficult or expensive.

Priority 4: LOW PRIORITY

Sites with vegetation of low value (or low susceptibility), and where dieback control is judged to be too difficult or too expensive with present methods.

Priority 5: LOWEST PRIORITY

Sites with no native vegetation or vegetation not affected by dieback, and sites where dieback control is impossible or has been effectively pre-empted by other actions on or adjacent to the site.

5.0 MANAGEMENT TACTICS

5.1 Introduction

Dieback disease management should be considered in the planning phase of every operation. The incorporation of very simple tactics in the planning phase is usually easier, cheaper and a more reliable means of involving disease management than implementing haphazard tactics at the operational phase.

The following points should be considered in planning hygiene tactics:

- Consider changing from grading or ploughing for vegetation control and firebreaks to mowing, slashing, herbiciding or paving where dieback is a problem. Methods which do not disturb the soil are always preferable.

- Consider the application of a strategic fire access trail approach to reduce the number of duplicated or redundant fire access tracks: Consider modifying local laws to allow flexibility in maintaining fire access trails in seasons with late rains or early summers.

- Consider the type of machinery used in maintenance works. Vehicles which do not readily pick up soil are preferred. Vehicles such as front end loaders with large rubber tyres could be used in preference to tracked vehicles. Vehicles which can be cleaned readily will be an advantage. Tracked vehicles are the most difficult to clean.

- Where possible, operations should be carried under dry soil conditions. This is particularly important for high risk operations such as drain cleaning and batter grading. Consider using contract machinery to increase the amount of work carried out within the dry period of the year. Works schedule should prioritise work in dieback free areas first.

- Develop a network of known dieback-free basic raw material sources which can be used for unscheduled repair works. If the sources are known to be dieback free they can be used by trained personnel without prior approval or supervision. This method removes the need for many dieback controls in repair work. Special effort should be made to ensure these resources remain dieback free.

- Consider upgrading drainage systems so that they require less maintenance and are less likely to flood, particularly where the drains are in close proximity to remnant vegetation. Maintenance of wet drains is a high risk activity, and sites prone to flooding are favourable to the establishment of dieback infections.

- Only access and work dieback-free borrow pits and quarries from the downslope edge up so that any dieback introduced does not infect the whole resource.

- If preventing access to reserves is not possible then controlled access with a minimal number of tracks is preferred. Where new access points are being considered they should be located low in the landscape and desirably in dieback-infected areas rather than dieback-free.

- If possible sterilise water used in operations such as fire control or road binding with an appropriate fungicide or utilise sources free of dieback disease (treated scheme water).

- Minimise the area put at risk of infection by an operation, by segmenting the operation into discrete, small areas separated by a cleandown or hygiene barrier and minimising the area of susceptible vegetation downslope of the operation.
- Greenstock for landscaping or revegetation purposes should be from nurseries accredited by

the Nursery Industry Association of WA as having used recommended dieback control measures. Organic materials for landscaping or similar use should consider only well composted materials which will be less likely to harbour the dieback fungus.

- Ensure staff have adequate training and demonstrated understanding of dieback disease and its management.

- Inform residents in dieback susceptible areas of the disease and how to minimise its impact.

5.2 Dieback Management Procedures

In broadscale and linear areas (roads, tracks etc.) the following four principles should apply to any works:-

(1) In interpretable areas (unburnt for 4-5 years and with sufficient indicator species). Boundaries between dieback, dieback-free, suspect and uninterpretable, areas will be marked on the ground (pegs, survey tape, paint etc) before any operation involving the use of machinery.

(2) Where vehicle movement is involved, boundaries will be signposted to inform the operator of the need to clean the vehicle.

(3) The coloured markings on dieback boundaries will use the conventions established by CALM.

(4) Dieback boundaries on roads and tracks used by vehicles will have signposts to inform users of the boundary and need for clean down.

The following pages are illustrated examples of appropriate hygiene tactics which can be applied to common operations by staff, contractors and private landholders within the Shire of Denmark. (It is desirable that these procedures are applied throughout the Rainbow Coast Regional Councils and the Shire of Manjimup, to avoid cross infection from neighbouring shires.)

5.3 Cleaning Down

NOTE: Use brush or compressed air rather than washing, if soil is dry it can be removed by this method.

AT WORKS DEPOT:

DO	DON'T
• Use designated ramps or plads to washdown vehicles. • Keep the ramp or pad clean of mud.	Don't forget to remove mud & soil from cleats and underside of protection plates on track vehicles.
• Ensure run-off flows into a sump where it can be treated with fungicide or sites already infested with dieback.	Don't drive vehicle through washdown effluent.
• Use high pressure spray to remove caked-on mud and soil. Use spade or bar to assist removal.	Don't let washdown effluent flow into healthy vegetation.

IN THE FIELD:

DO	DON'T
• Washdown at designated washdown point or on bridges, rocky crossings or hard well drained surfaces, within dieback areas. Keep the washdown point clean of mud.	Don't washdown in dieback-free areas.
• If cleaning down in dieback free areas treat washing down water in tankers with fungicide (sodium hypochlorite, 2 lts per 3000 lt tank). (Renew sodium hypochlorite dosage every time additional water is added within a 24 hour period.)	Don't fail to clean any machine capable of carrying dieback disease from infected to uninfected areas. Don't drive vehicles through washdown effluent.
• Use a brush, bar or spade to help remove compacted soil where necessary.	Don't use excessive quanties of sodium hypochlorite as it is corrosive.
• Washdown before moving to the next job.	Don't use treated water for drinking.

Comment: treating water with sodium hypochlorite is only required if the water is to be transported and used in dieback free areas. The effectiveness of the fungicide is considerably decreased if the water contains any organic or colloidal material. At the recommended rates the fungicide is effective in killing zoospores but requires at least 24hrs to effectively kill all fungal propagates in the water.

5.4 Road and Firebreak Selection (including Bridle Trails, Dual-Use Paths, Walk Trails)

DO	DON'T
• Access existing road and firebreak systems for adequacy using relevant criteria (strategic effectiveness, block size, ease of hygienic maintenance, erosion, other)	Don't duplicate existing access.
• Determine known and suspect dieback along the intended route, using dieback plans, air photos and field check on foot, where possible.	Don't use vehicles, bulldozers, tractors in initial selection of roads.
• Avoid crossing dieback-infected to dieback-free boundaries.	
• Demarcate dieback-infected/dieback-free boundaries.	
• Select roads low in the landscape.	
• Prioritise works in dieback-free areas during dry periods.	

5.5 Road and Fire Break Construction (including Bridle Trails, Dual-Use Paths and Walk Trails)

DO	DON'T
• Programme earthmoving work for months when soil is dry (usually December-March).	Don't commence road or firebreak construction unless correct selection procedure has been followed.
• Segregate machine work, in interpretable areas, so that machines do not travel from dieback to dieback-free areas, as identified, without cleaning down before leaving dieback.	Don't assume machinery is clean. Always inspect before allowing entry, or commencement of work.
• Segregate machine work, in uninterpretable areas, so that machines do not cross sub-catchment boundaries, or move uphill from gullies, without cleaning down before crossing such boundaries.	Don't construct turn-off drains which result in ponding.
• Construct roads and fire access trails to shed water and dry quickly.	Don't forget to write dieback specifications into contracts.
• Construct drainage to minimise ponding of water within channels and prevent movement of water • into roadside vegetation.	Don't remove infected soil and plant material resulting from clearing from site.
• Use slashed or mown fire access trails if possible, particularly in heath country.	
• Use dieback-free materials on dieback-free suspect or uninterpretable areas.	
• Manage topsoil resources so that disease status is identified, separated and replaced in appropriate positions.	

5.6 Road and Firebreak Maintenance (including Bridle Trails, Dual-Use Paths and Walk Trails)

DO	DON'T
• Ensure dieback specifications are written into maintenance contracts and are strictly adhered to.	Don't grade deeper or wider than prescribed. Don't grade or move soil from dieback-infected into dieback-free areas as demarcated in interpretable areas, or across sub-catchment boundaries or uphill from gullies in uninterpretable areas.
• Use herbicide or slashing in preference to soil moving operations.	
• Design a works programme for regular maintenance of roads and firebreaks.	
• Demarcate roads before maintenance commences in interpretable areas.	
• Segregate machine work.	
• As much maintenance as possible in dry weather.	
• Clean out table drains when soil is dry.	
• Clean machinery before leaving dieback-infected areas.	
• Include general specification on grading method and operation of the machine (angle of blade etc) to avoid carrying infected earth long distances into dieback-free areas.	
• Include specification applicable to the individual job.	
• Ensure fire tender vehicles going off-road are equipped with yard broom & small tank, pump and fungicide.	
• Use dieback-free materials on dieback-free, suspect or uninterpretable sites.	

5.7 Shoulder and Batter Grading

DO	DON'T
• Clean down the machine before it is shifted to a new area.	Don't assume a machine is clean on arrival - always inspect it and clean it if necessary.
• Clean down machinery every time an infection or uninterpretable area is exited.	Don't grade from infected areas into suspect or uninterpretable areas without cleaning down as the uninterpretable area may be uninfected.
• Clean down machinery before leaving a micro catchment in an area where disease location is not known.	Don't grade from dieback suspect or uninterpretable areas into dieback-free areas without cleaning down. The uninterpretable area may be infected.
• Work from ridge to valley in areas where disease distribution is not known, as disease is more likely to occur in lower parts of the landscape.	Don't increase the surface area graded by going beyond the areas previously graded.

5.8 Road Building Materials

DO	DON'T
• Programme work for months when soil is dry (usually December-March).	Don't use infected gravel on roads and firebreaks except where specified in diseased areas.
• Select gravel, sand and other basic raw materials from pits at least 100m away and upslope from nearest visible dieback symptoms, unless job is entirely in dieback.	Don't allow water to pond in gravel pit.
• Clean down incoming plant before commencement of gravelling.	Don't leave dieback-free pits open. Secure them against infection and ensure their future disease free status.
• Plan haul routes from pit to job to avoid crossing dieback areas, unless job is entirely in dieback.	Don't allow run-off to enter a dieback-free pit.
• Remove or stockpile vegetation and stumps from gravel pit before carting commences.	Don't allow any contaminated vehicle to enter a dieback-free pit, either during or after the operation.
• Arrange for sampling & testing of gravel prior to work beginning where there is any doubt whether the disease is present.	
• Ensure dieback hygiene specifications are included in contracts and are strictly adhered to.	
• Use gravel 'in situ' whenever possible.	
• Use gravel from uninterpretable areas for uninterpretable forest, provided it is used 'in situ' (within the same micro catchment).	
• Lay gravel from the pit out, so that trucks run on a mattress of clean gravel.	
• Use split phase operations in the gravel pit to ensure that dieback soils are not transported into the working pit area.	

NOTE: Testing of soils and gravel for the presence of the disease organism has a relatively low level of reliability because of the large volume of material and the small sample which is tested. Emphasis should be on identifying dieback-free areas for gravel pits, using more reliable dieback mapping procedures and implementing appropriate dieback control measures to ensure that the gravel remains dieback-free.

5.9 Drain Construction and Cleaning

The same rules apply as used in grading, with the addition of:

DO	DON'T
• Construct and maintain drains & culverts in summer when soils are dry. • Work from ridge to valley. • Clean down between drains or culverts. • Identify drainage adjacent priority areas for inspection in dry for maintenance prior to winter.	Don't allow drains to pond water.

5.10 Emergency Road Repair

Emergency works are dangerous because the urgency often leads to poor planning. Where materials must be used the following points should be considered:

DO	DON'T
• Ensure machinery is clean before leaving headquarters. • Use materials of appropriate disease status, e.g. dieback contaminated material to a dieback site, dieback-free material to a dieback-free, suspect or uninterpretable sites should only be used in dieback-free sites in the same micro catchment. • Establish and maintain in a dieback-free status stockpiles of material at strategic locations.	Don't move machinery between sites without cleaning down. Don't allow untrained personnel to be involved in unsupervised, unscheduled work.

5.11 Fire Management

DO	DON'T
• Observe other sections for hygiene use & operation of machines.	Don't travel through boggy creeks, wetlands, etc.
• Select burn boundaries on well formed hard surfaced roads.	Don't move machinery from diseased to dieback-free areas without cleaning.
• Travel vehicles only on hand surfaced roads.	Don't grade roads unless absolutely necessary.
• Consider alternatives to grading (i.e. sweeping, slashing, handraking).	Don't use bulldozers if fire can be suppressed with hand tools.
• Divide for fire management in accordance with hygiene catergories; for fuel reduction prescribed burning.	Don't mop-up with water from creeks or water points unless sodium hypochlorite is added.
• Encourage the use of herbicides or slashing to provide breaks.	
• Ensure plant and vehicles are clean before entry to dieback-free areas.	
• Nominate clean down points for incoming and outgoing plant and vehicles.	

5.12 Landscaping, Rehabilitation and Similar Works

DO	DON'T
• Acquire greenstock from nurseries accredited by the Nursery Industry Association of WA as having used recommended dieback control measures.	Don't apply non composted organic mulches. Don't transplant from dieback-infected, uninterpretable or suspect areas to non-infected sites. Avoid transfer of soils from one-site to another on equipment and handtools.
• Acquire only well composted mulches.	
• Transplant from dieback-free.	
• Ensure vehicle hygiene procedures as per previous sections.	
• Ensure equipment and handtool hygiene by cleaning with sodium hypochlorite solution prior to commencement of work on new site.	
• Take cuttings from high in plants if propagating from natural area.	
• Stay in same hygiene category when transplanting greenstock.	

5.13 Development adjacent to High Priority Reserves

DO	DON'T
• Have dieback management plans. • Prevent entry of surface runoff and dewatering into reserves during and after development. • Prevent soil transfer into reserves. • Monitor runoff control during construction. • Write dieback management procedures with all contracts. • Develop standard conditions. • Control access to reserves.	Don't direct or dewatering effluent into areas of natural vegetation.