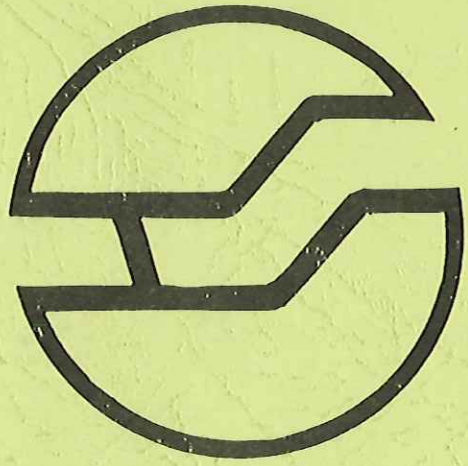
DIEBACK HYGIENE MANUAL



Conservation and
Land Management

DIEBACK HYGIENE MANUAL

Dieback is a disease which destroys much of the flora in the forests, woodlands, and coastal heathlands of W.A. It is caused by a microscopic fungus which lives in the soil and roots. In many cases it is spread by man transporting soil particles containing the fungus from infected to healthy areas or by spores of the fungus carried in groundwater.

This booklet contains the rules which must be followed to minimize the spread of dieback.

You can help to prevent the spread of dieback disease by following these hygiene rules whenever you enter or work in areas of W.A. which are susceptible to the disease.

For further explanation of the disease and the effects, refer to the publications listed in this manual.

Department of Conservation and Land Management

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50 Hayman Road
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Revised 1st July, 1986

CONTENTS

SECTION 1 RECOGNITION OF DIEBACK

1. The fungus lives in the soil and some plant roots. It cannot be seen with the naked eye.

2. The presence of dieback can be detected from the death of susceptible plants.

3. Better known susceptible species (plants usually killed by dieback) include: banksias, blackboys, zamia palms, snoddy-gobble, emubush, sheoak, hakeas, dryandras, heath and jarrah. It can take several years from infection before visible symptoms (i.e., plant deaths) occur. This delay can vary from 3 to 10 years depending on site characteristics. This can mean dieback is present, but cannot be visibly detected.

4. Deaths of the following plants are NOT due to dieback: marri, karri, blackbutt, wandoo, peppermint, ti-tree, mallet, yate, salmon gum.

5. A single dead susceptible plant (e.g., A dead Banksia) could be dieback. It is best to assume it is dieback if two or more dead plants are seen, or dead plants of two different species are present, or there is evidence of recent soil disturbance nearby from a vehicle which could have produced an infection.

6. Presence of dieback can sometimes be determined by laboratory testing of samples of soil or root material from dying or recently dead plants. Refer to Appendix I.

7. Dieback is difficult to detect in areas which have been recently burnt due to dead foliage being consumed by the fire, destroying visible symptoms of the disease. Other areas are uninterpretable because there are too few indicator species present.

8. Autumn is usually the best time to map dieback as plants die after summer drought stress and dead foliage can be photographed from aircraft.

9. If dieback is evident in a watercourse then it must be assumed the water course IS infected and dieback WILL be present downstream from the infection. Therefore it is important to identify the furthest upstream infection in the water course.

10. If dieback occurs on a ridge or upper slope, then areas downhill will be infected in time.

11. The information on the recognition of dieback has been summarised in the table on the next page.

Relative Importance of Observable Factors

Associated with the Interpretation for Presence or Absence of P. cinnamomi

Observable factor indicating high likelihood of P. cinnamomi presence ⟷ Observable factor indicating low likelihood of P. cinnamomi presence

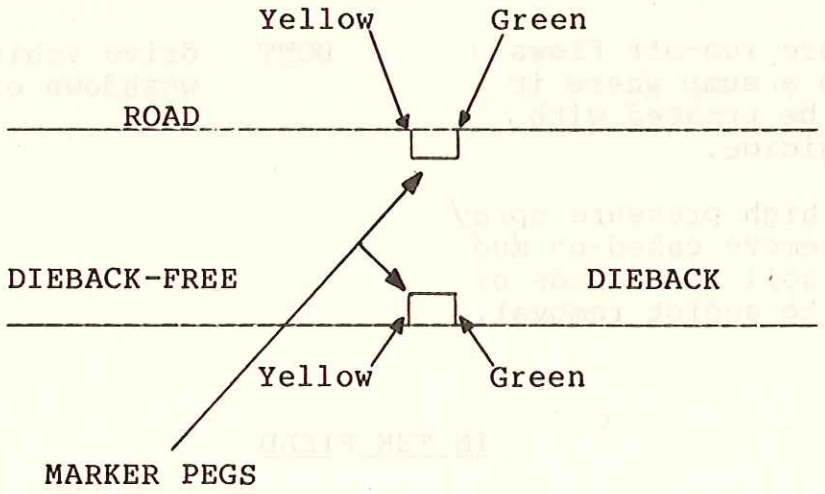
Observation Factors				
ISD	Multiple ISD'S	Cluster	Scattered	Isolated
SPECIES	Some or most indicator plants	Any one indicator	Any indicator plant	Any indicator plant
PATTERN DEVELOPMENT	Obvious			Not obvious
TOPOGRAPHIC SITUATION	Gully/Flat	Lower to Midslope	Midslope to Upper Slope	Ridge
CAUSAL AGENT	Obvious			Not obvious
INTERPRETATION RESULTING FROM OBSERVATION:	High likelihood of P. cinnamomi Presence			Low likelihood of P. cinnamomi presence.
REQUIREMENT FOR SOIL AND TISSUE SAMPLE	Low Requirement For soil and Tissue Sample	High requirement for Soil and Tissue Sample	High requirement for Soil and Tissue Sample	Low requirement for Soil and Tissue Sample

SECTION 2

GROUND DEMARCATION OF DIEBACK AREAS

1. In interpretable areas (unburnt for 4-5 years and with sufficient indicator species) boundaries between dieback and dieback-free areas will be marked on the ground (pegs, survey tape, paint etc) before any operation involving use of machinery. Where earthmoving operations are involved boundaries will be pegged. See section 11 for uninterpretable areas.

2. Pegs will indicate to machine operators where dieback patches start and finish.



3. Pegs will be 1m in length (0.7m above ground), 75mm in width.

   Side visible when entering dieback painted yellow.

   Side visible when leaving dieback painted green.

4. Pegs to be located 5 to 20m uphill from visible symptoms.

5. Where there are no evident symptoms, creeks or shallow flats are to be pegged if dieback occurs upstream from the crossing. Pegs to be located 5 to 20m each side of watercourse, or edge of flat, depending on slope.

SECTION 3

CLEANING DOWN

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

AT HEADQUARTERS

DO	use designated ramps or pads to washdown vehicles. Keep the ramp or pad clean of mud.	DONT	forget to remove mud and soil from cleats and underside of protection plates on track vehicles.
DO	ensure run-off flows into a sump where it can be treated with fungicide.	DONT	drive vehicle through washdown effluent.
DO	use high pressure spray to remove caked-on mud and soil. Use spade or bar to assist removal.		

IN THE FIELD

DO	washdown at designated washdown point or on bridges, rocky crossings or hard well drained surfaces, within dieback areas. Keep the wash-down point clean of mud.	DONT	washdown in dieback-free areas.
		DONT	fail to clean any machine capable of carrying dieback disease from infected to uninfected areas.
DO	treat washing down water in tankers with fungicide (Sodium hypochlorite, 2 litres per 3000 litre tank, 250ml per 500 litre tank).	DONT	drive vehicles through washdown effluent.
		DONT	use excessive quantities of Sodium hypochlorite as it is corrosive and DONT use treated water for drinking.
DO	renew NaOCl dosage every 24 hours.		
DO	use a brush, bar or spade to help remove compacted soil where necessary.		

SECTION 4

ROAD AND FIREBREAK SELECTION

DO assess existing road and firebreak systems for adequacy using relevant criteria (strategic effectiveness, block size, ease of hygienic maintenance, erosion, other).

DO determine known and suspect dieback along the intended route, using dieback plans, air photos and field check on foot, where possible.

DO avoid crossing dieback to dieback-free boundaries.

DO demarcate by pegging dieback/dieback-free boundaries.

DO select roads low in the lanscape.

DONT duplicate existing access.

DONT use vehicles, bulldozers, tractors in initial selection of roads.

NO MACHINE OR TRACTOR MOVEMENT ON ALIGNMENT ALLOWED

TO THIS PAGE

SECTION 5

ROAD AND FIREBREAK CONSTRUCTION

DO programme earthmoving work for months when soil is dry. (usually December-March).

DO segregate machine work, in interpretable areas, so that machines do not travel from dieback to dieback-free areas, as pegged, without cleaning down BEFORE leaving dieback.

DO segregate machine work, in uninterpretable areas, so that machines do not cross sub-catchment boundaries, or move up-hill from gullies, without cleaning down BEFORE crossing such boundaries (see Appendix II for details).

DO construct roads and fire-breaks to shed water and dry quickly.

DO construct deep table drains to carry run-off swiftly and directly into nearest natural watercourse.

DO use slashed or mown fire-breaks in heath country if possible.

DONT commence road or firebreak construction unless correct selection procedure has been followed.

DONT assume machinery is clean. Always inspect before allowing entry, or commence-ment of work.

DONT construct turn-off drains which result in ponding.

DONT forget to write dieback specifications into contracts.

SECTION 6

ROAD AND FIREBREAK MAINTENANCE

DO design a works programme for regular maintenance of roads and firebreaks.

DO peg roads before maintenance commences in interpretable areas. Check previous pegging.

DO 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 (see Appendix II for details).

DO as much maintenance as possible in dry weather.

DO clean out table drains when soil is dry.

DO clean machinery before leaving dieback affected areas.

DO ensure dieback specifications are written into maintenance contracts and are strictly adhered to.

DO 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.

DO include specification applicable to the individual job.

DO provide tender vehicle with yard broom and small tank, pump and fungicide.

DONT grade deeper or wider than prescribed.

DONT grade or move soil from dieback into dieback-free areas as pegged in interpretable areas, or across sub-catchment boundaries or uphill from gullies in uninterpretable areas.

SECTION 7

GRAVELLING

DO programme work for months when soil is dry. (usually December to March).

DO select gravel pits at least 100m away and upslope from nearest visible dieback disease symptoms, unless job is entirely in dieback.

DO wash incoming plant before commencement of gravelling.

DO plan haul routes from pit to job to avoid crossing dieback areas, unless job is entirely in dieback.

DO remove vegetation and stumps from gravel pit before carting commences.

DO arrange for sampling and testing of gravel prior to work beginning where there is any doubt whether the disease is present.

DO ensure dieback hygiene specifications are included in contracts and are strictly adhered to.

DO use gravel 'in situ' whenever possible.

DO use gravel from uninterpretable areas for uninterpretable forest, provided it is used 'in situ' (within the same microcatchment).

DONT use infected gravel on roads and firebreaks except where specified in diseased areas.

DONT allow water to pond in gravel pit.

DONT leave infected pits open. Programme them for rehabilitation.

NOTE: The above rules should be applied to other materials such as shale and sand.

SECTION 8

SITE DEVELOPMENT

DO select sites, wherever possible, dominated by dieback tolerant tree and understorey species.

DO determine known and suspect dieback in the areas proposed for development, using dieback plans, aerial photographs, or field check on foot.

DO avoid crossing from dieback to dieback-free boundaries.

DO select sites on free draining soils and access roads low in the landscape.

DO program earthmoving work for the months when soil is dry (usually December to March).

DO construct site to shed water and dry quickly.

DO ensure control of vehicle movement through careful siting and demarcation of parking areas and internal access tracks.

DO channel pedestrian traffic through the provision of walk tracks located so as to minimise the risk of disease spread.

DO provide the public with on-site information about dieback and the control measures being taken.

DONT duplicate existing access.

DONT use any machinery or vehicles in initial site selection.

DONT assume machinery is clean. Always inspect before allowing use.

DONT construct drains which result in ponding.

DONT forget to write dieback specifications into contracts.

SECTION 9

PRESCRIBED BURNING

DO observe other sections of this manual for hygiene use and operation of machines.

DO select burn boundaries on well formed hard surfaced roads.

DO travel vehicles only on hard surfaced roads.

DO consider alternatives to grading (i.e., sweeping, slashing, handraking).

DO divide sectors of fire in accordance with hygiene categories.

DO ensure all water used for mopping up is disinfected.

DONT travel through boggy creeks.

DONT move bulldozers from diseased to dieback-free areas without cleaning.

DONT grade roads unless absolutely necessary.

SECTION 10

FIRE SUPPRESSION

DO complete Controller's Fire Suppression Guide (Dieback) F.D. Form 613.

DO despatch forces along hard-surfaced roads.

DO ensure plant and vehicles are clean before entry to dieback-free areas.

DO use hand tools to suppress fire where this method will succeed.

DO plan firelines to avoid crossing dieback boundaries if bulldozers are used.

DO nominate cleandown points for incoming and outgoing plant and vehicles.

DO ensure cleandown on fire-line where vehicles are likely to move infected earth into dieback-free areas.

DONT use bulldozers if fire can be suppressed with hand tools.

DONT mop up with water from creeks or water points unless sodium hypo-chlorite is added.

SECTION 11

UNINTERPRETABLE AREAS

1. In uninterpretable areas, boundaries between dieback, dieback-free and uninterpretable will be marked on the ground (pegs, survey tape, paint etc.) before any operation involving use of machinery. Where earthmoving operations are involved the boundaries will be pegged.

2. Other details are as for Section 2, except that purple is the recommended colour for uninterpretable areas.

3. Firebreak construction and maintenance will be as shown in Appendix II of this booklet.

4. Remember that uninterpretable areas may be diseased but not show the symptoms.

DO clean machinery when it is to operate in an uninterpretable area.

DO clean machinery when it has completed its work and before it is transferred to other areas.

DONT use gravel from uninterpretable areas in areas which are secure dieback-free.

SECTION 12

FURTHER READING

1. Forest Focus Nos. 14 and 31.
2. Landscope No. 2.
3. Forests Department Information sheet No. 4.
4. Forests Department Research Papers Nos. 3, 10, 40 and 65.
5. Forests Department Bulletins 84 and 85.
6. Forest Department miscellaneous publication No. 1 "Jarrah Root Rot".
7. Forests Department Tech. Papers Nos. 2 and 3.

APPENDIX I

SAMPLING FOR PHYTOPHTHORA CINNAMOMI AND ASSESSMENT OF SITES

1. Select plants showing early symptoms of disease, (yellow to orange leaves) or recently killed plants thought to be near the front of the infection.

2. Ensure the mattock or spade has been sterilized with an approved sterilizing agent (60% alcohol or superquat).

3. Dig around plant and select roots from greatest depth possible. Include tissue from the collar region in Banksia. Place roots and soil (about 2 cupfuls) from 20-40cm depth in plastic bag. Irrigate samples with a little deionised water if soil is dry. Include an aluminium tag showing date and sample number or sample identification in the bag. Seal the bag tightly with tie.

4. Label outside of the bag with permanent marker showing sample identification and/or number and the date.

5. If plant identity is unknown, collect 2 small branches with flowers or fruits. Place one in a separate bag and makr the bag with the sample number. This can then be sent to the West Australian Herbarium or Woodvale for identification. The second specimen should have the sample number attached and be retained for future reference.

   Samples should be pressed or refridgerated as soon as possible to ensure they are maintained in good condition.

6. Fill in Dieback Assessment Sheet. (See sheet for definitions).

7. Mark the site sampled in the field by attaching an aluminium tag (with the date and the sample identification and sample number). This is necessary for future reference.

8. Despatch. Samples should be sent to the Detection Service, Dwellingup Research, C.A.L.M. Dwellingup, as soon as possible. Samples should not be left in hot vehicles. Always keep the samples in shade.

   Send samples in a box labelled "Soil/Tissue samples for P.cinnamomi analysis". Include a sheet that states origin the origin of the samples, collecting Officer's name and postal address and a list of the samples and the date collected.

   e.g., South Coast Region, Fitzgerald River National Park
   M. Lloyd, P.O. Box 33, Jerramungup 6337.
   Bell Track No. 1 6/5/86
   Bell Track No. 2 6/5/86
   Telegraph Track No. 1 7/5/86

9. Records: File the completed field sheets for future reference.

   Mark the location of the samples on a wall plan as an open circle. Mark the field sheets as +ve or -ve when results are known and colour in the circles on the wall plan (red +ve, green -ve).

ADDITIONAL NOTES

1. SELECTION OF PLANT MATERIAL

A list of species which are known to be susceptible to P.cinnamomi has been prepared. Species of the Proteaceae such as the Banksias and Dryandras are amongst the most susceptible hosts to P.cinnamomi. Root material or sections of the collar region of dying plants is best for recovery of P.cinnamomi.

Xanthorrhea spp. are also good indicators of disease. Small radiating brittle roots and sections of the pithy core should be samples.

2. EQUIPMENT

Trowel
Mattock or axe
Strong plastic bags
Permanent marking pen
Distilled water if available.
Aluminium tags and ties for bags
60% alcohol or suitable sterilizing agent
Dieback Assessment sheets
Pen/pencil

3. STERLILIZING METHOD FOR TOOLS

3.1 Wipe off all excess soil with a twig adjacent to the plant sampled.

3.2 Completely wet the tool blades with approved sterilizing agent.

4. COMPLETING SAMPLE INFORMATION SHEETS

The information recorded must provide the reader with a brief, but detailed insight to the forest within close proximity, i.e., the site characteristics - the factors that determined why the sample was taken; perhaps a comment about what the disease might do in the future, i.e., R.O.S., impacts; and what type of activity has taken place in the past - where this can be determined.

4. THE DETECTION SERVICE

Sample analysis takes a minimum of 5 days after initial processing. Plants and cups which show no P.cinnamomi are kept for a further 5 days and re-examined. If P.cinnamomi is not evident after 10 days the process is repeated. Thus the minimum time from receipt of sample to a negative result being sent back is 20 days. Positive results may be advised sooner. All results will be forwarded in writing back to the Officer who sampled.

DIEBACK ASSESSMENT SHEET

FIELD OBSERVATIONS AND SAMPLE INFORMATION
(To Be Retained By Officer Sampling)

NAME:_____ LOCATION:_____DATE:_____

1. Sample Identification & Number: _____

2. Sample Location: _____

_____

_____

3. Name of Species Sampled: _____

4. Community Type: _____

5. Most Abundant Species Present: _____

_____

6. Topography: _____

7. Soil Type: _____

8. Species Dead or Dying: _____

9. Pattern of Deaths:_____ 10. Vector: _____

11. Site Description:

_____

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DIEBACK ASSESSMENT SHEET

FIELD OBSERVATIONS AND SAMPLE INFORMATION
(To Be Retained By Officer Sampling)

NAME:_____ LOCATION: Beaton Fores Block DATE: 6/5/86

1. Sample Identification & Number: Beaton Block No. 1
2. Sample Location: 1.2km South of Emu Road, Gold Gully Road junction, along Emue Road. 200m to the east of Emu Road along an old overgrown track
3. Name of Species Sampled: Banksia grandis
4. Community Type: Forest
5. Most Abundant Species Present: Banksias, Persoonias, Emu Bush Jarrah, Marri
6. Topography: Midslope
7. Soil Type: Sandy gravel
8. Species Dead or Dying: Banksia, Persoonia, Emu Bush
9. Pattern of Deaths: Multiple 10. Vector: Track
11. Site Description:

Include a note as to the depth of roots and soil sampled. Then include a description of the site: e.g., The site shows a clear pattern of deaths with multiple indicator species deaths including Persoonia, Banksia, Emu Bush. Deaths range from old and rotten stumps to recent deaths - some plants still dying - changing colour of leaves indicates this. There is no evidence to suggest drought as the stand of jarrah is quite vigorous. The most probable disease vector is an old track upslope from the site. Disease extension will be slow due to the dense canopy cover and thick understorey. Disease impact is low and probably will remain so resulting in the death of a few Banksias only. There is not apparent effect on the jarrah.

DEFINITION SHEET FOR FILLING OUT DIEBACK ASSESSMENT SHEETS

Point:

3. Name of Species	If unsure of identification collect plant specimen.	
4. Community Type:	Forest, Woodland, Heath.	
5. List Species dominant or common at the site.		
6. Topography:	"w"	- water gaining depressions and creeks
	"f"	- flats
	"m"	- mid slope
	"u"	- upper slopes
	"n"	- ridge top/plateau
7. Soil Type:	"s"	- sand
	"c"	- clay
	"gs"	- gravelly sand
	"gl"	- gravelly loam
8. Species Dead or Dying:	List genera at least e.g., Dryandra, Banksia, Epacridaceae.	
9. Pattern of Deaths:	"i"	- single, isolated death
	"s"	- unrelated single deaths, scattered
	"c"	- cluster or group of plants of one species
	"m"	- group of plants, different families.
10. Possible Vectors:	Roadside, track, animal, water or none apparent.	

LIST OF SPECIES FROM THE SOUTH COAST NATIONAL PARKS KNOWN TO BE HIGHLY SUSCEPTIBLE TO *P. CINNAMOMI*

PROTEACEAE:

Adenanthos cuneata
sericea

Banksia attenuata
baxteri
brownii
coccinea
gardneri
grandis
ilicifolia
nutans
quercifolia
repens
solandri
speciosa
sphaerocarpa

Dryandra armata
cirsiodes
cuneata
longifolia
mucronulata
nivea
plumosa
pteridifolia

Hakea ambigua
baxteri
cucullata
trifurcata

Isopogon attenuatus
baxteri
buxifolius
formosus
latifolius
teretifolius

Lambertia ericifolia

Petophile longifolia
seminuda
squamata

Synaphaea polymorpha
petiolaris

EPACRIDACEAE:

Andersonia aristata
caerulea
echinocephala
simplex

Lysinema ciliatum

Leucopogon conostephioides
distans var. contractus
elegans
gibbosus
oppositifolius

LEGUMINOSAE:
==========

Daviesia incrassata
oppositifolia
pectinata

Jacksonia horrida
spinosa

Latrobea genistoides
hirtella

MYRTACEAE:
=========

Agonis hypericifolia
marginata
obtussissima
spathulata

Calytrix angulata
flavescens

Melaleuca thymoides

Beaufortia anisandra
decussata

Calothamnus quadrifidus

OTHER:
=====

Hibbertia desmophylla

Casuarina humilis

Xanthorrhea spp.

Please note: 10 species names on this list were provided by Mark Dudzinski, C.S.I.R.O., Division of Forest Research Canberra.

APPENDIX II

HYGIENE PRESCRIPTION FOR FIREBREAK CONSTRUCTION AND MAINTENANCE IN UNINTERPRETABLE AREAS

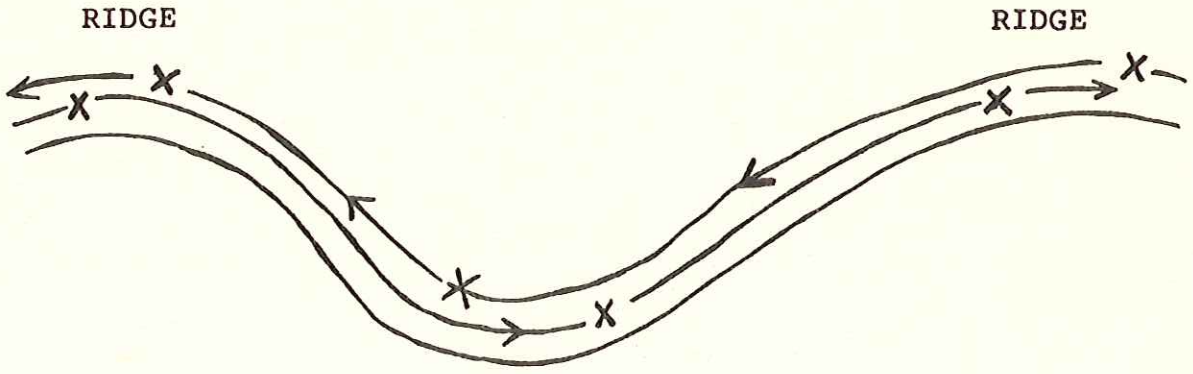
1. All works should be carried out under dry soil conditions.

2. All machines to be clean prior to work commencing and cleaned down as required. Refer point 4.

3. Firebreaks should be adequately drained to ensure there is minimum ponding of water on road surface.

4. Works should be separated so that soil is not carried across ridgelines or upslope from gullies,

   i.e.:



 direction of work

X cleandown required

5. If gravelling is required, only dieback-free gravel should be used unless it is obtained from same mini-catchment upslope of the area to be gravelled. Pits should be sampled prior to use.