



Government of Tonga

Code of Harvesting Practice for the 'Eua Forestry Plantations 2009



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2009

Ministry of Agriculture, Food, Forestry and Fisheries

ACKNOWLEDGEMENTS

This Code was produced by the Ministry of Agriculture, Food, Forestry and Fisheries in consultation with stakeholders within the forestry sector and with financial and technical assistance of the Secretariat of the Pacific Community (SPC) Land Resources Division. The modification of illustrations from the following documents is gratefully acknowledged: Forest Practices Code of Tasmania (2000); Code of Practice for Forest Harvesting in Asia-Pacific (1999) and the draft Fiji Forest Harvesting Code of Practice (2008).

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PREFACE

The forestry plantations on the island of ‘Eua are Tonga’s major source of domestic plantation timber. The ‘Eua forestry plantations comprise approximately 500 hectares of predominantly *Pinus caribaea*, with minor plantings of red cedar (*Toona australis*) and other species.

The forestry plantations occupy over 70% of the watershed for the ‘Eua water supply. The careful management of the plantations is therefore of the upmost importance for the supply of good quality water to the people of ‘Eua.

The plantations are also an important part of the scenic landscape and they provide access to the national park and other outstanding natural attractions that are popular with local people and international tourists.

The ‘Eua forestry plantations have an important role to play in the economic, environmental and social well-being of the small community of ‘Eua and the broader economy of Tonga. It is therefore important that they are managed in a sustainable manner for both current and future generations.

This Code of Harvesting Practice for the ‘Eua forestry plantations provides practical guidelines for the conduct of forest operations within the plantations. The Code has been developed through a consultative process with stakeholders, including Tonga Timber, the Tonga Water Board, and the local community of ‘Eua. It will be reviewed and revised on a regular basis to ensure that it provides a framework for continuing improvement.

I have great pleasure in releasing this Code on behalf of the Government of Tonga.

HRH Prince Tu’ipelehake

Minister for Agriculture, Food, Forestry and Fisheries

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1. SCOPE

This Code of Harvesting Practice (the 'Code') shall apply to all forest operations within the 'Eau forestry plantations.

The Code prescribes the manner in which forest operations shall be conducted in order to provide environmental, economic and social benefits from the sustainable management of the forests.

2. FOREST MANAGEMENT PLANS

- All forest operations must be in accordance with the Forest Management Plan that is in force at the time.
- The Forest Management Plan shall identify the values of the forest, including –
 - Inventory of commercial species, wood volumes and product classes
 - Soils, drainage systems and hydrological features, including sinkholes
 - Native flora and fauna, including any rare or threatened species and species that have important traditional and cultural use
 - Any features that have significant scientific, recreational or amenity value.
- The Forest Management Area will be classified into management zones and management objectives will be prescribed for each zone, including-
 - Wood production
 - Watershed protection
 - Scenic/recreational protection
- An Annual Allowable Cut (AAC) will be prescribed for the Forest Management Area, based on the analysis of forest inventory and predicted growth. Harvesting shall not exceed the AAC unless approved by the Minister responsible for Forests.

3. TIMBER HARVESTING PLANS

- Timber Harvesting Plans shall be prepared for all harvesting operations. The plans will cover the operational area expected to be harvested and prepared for reforestation each year.
- Harvest areas should take account of factors such as operational efficiency, watershed protection and minimisation of adverse impacts on scenic and recreational values. Individual harvesting units should not exceed 10 hectares in area.
- Field surveys will be conducted to produce a Timber Harvesting Plan map that shows the location of the following-
 1. the boundary of the harvesting area
 2. areas protected from harvesting, such as streams, sinkholes, steep land and any sites with special values, such as habitat for protected species
 3. roads and landings.

- The Plan will provide details on the silvicultural prescriptions for harvesting and reforestation and any other special measures to be taken.
- Timber Harvesting Plans shall be submitted for approval to the Forestry Division, which must ensure that the plans are in accordance with the Forest Management Plan.
- Boundaries and protected areas must be marked in the forest before operations commence.
- Any variations to an approved Timber Harvesting Plan must be approved in advance by the Forestry Division.
- No harvesting shall occur in the absence of a Timber Harvesting Plan.
- Responsibility for the supervision of the harvesting operation should be clearly stated in the Timber Harvesting Plan. The Harvesting Supervisor should inspect operations on a regular basis, preferably at least weekly, to ensure that any problems are identified and that corrective action is taken in a timely manner.

4. ROAD ACCESS

4.1 Road Location, Clearing and Construction

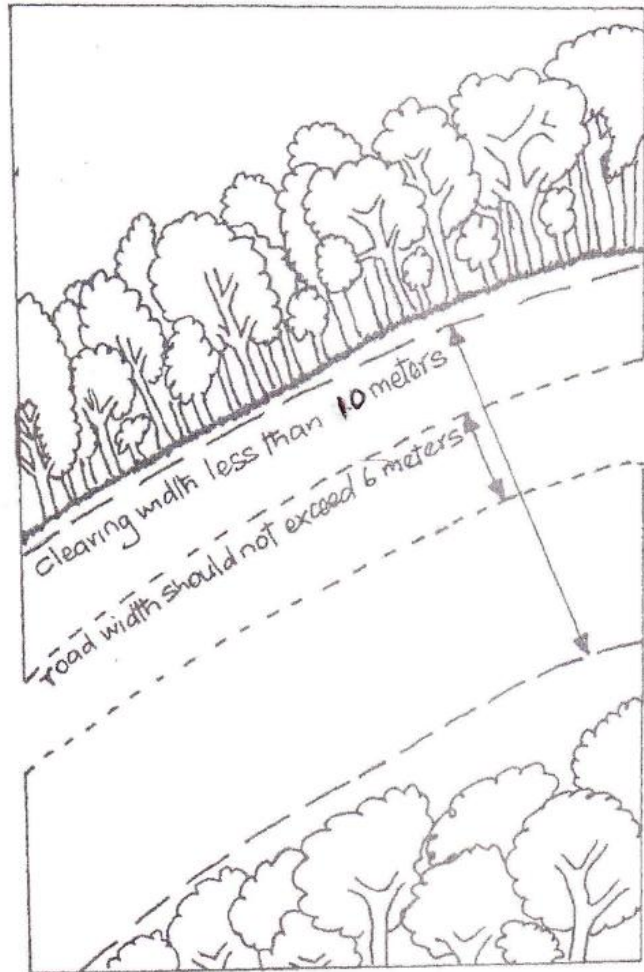
- Construction of haulage roads must be confined to the road alignment shown in the Timber Harvesting Plan.
- The width of major haulage roads should not exceed 6 m and minor roads 3.7 m. The road clearing width should be minimised and should not exceed 10 metres (including width of road) unless approved by the Forestry Division where necessary for safety reasons and to enhance the drying of constructed road surfaces.
- Road construction, maintenance and drainage works must only be conducted during dry weather.
- Roads should be located on or along ridge tops or on moderate side slopes wherever possible. The alignment should be designed to-
 - minimise the earthworks
 - ensure good drainage
 - minimise the proximity of roads to streams and minimise the number of stream crossings. Roads should be at least 20 metres from the edge of the closest stream buffer zone and care must be taken to prevent any side-cast material from entering the stream buffer.
- Roads should be constructed and compacted well in advance of proposed haulage operations to allow the road to dry out and 'bed-in' before heavy use.

4.2 Road Grades and Cambers

- Road grades should generally be 8° (14%) or less, although sections steeper than 8° may be approved by a Forestry Officer in order to reduce overall construction lengths or reduce earthworks, provided that adequate drainage can be installed (see section 4.5 - Road Drainage).
- Camber and super-elevation of the road surface should be properly formed to allow for water runoff.

Figure 4.1 –

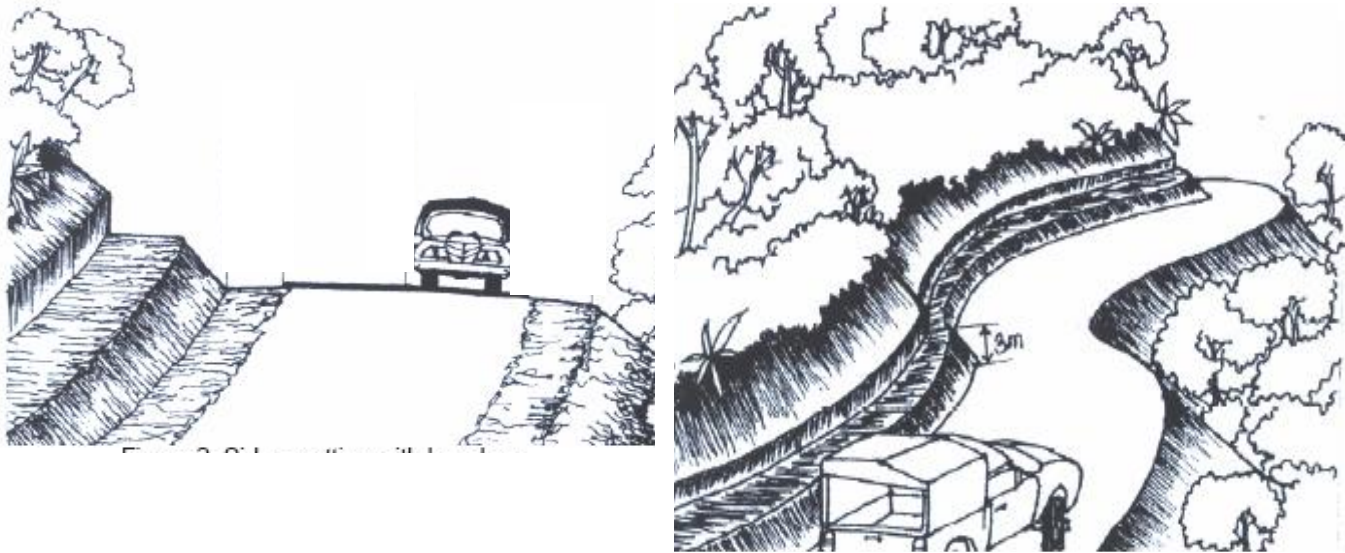
Clearing beyond the width of the road formation should be minimised and should be done by manual felling and by avoiding the blading of soil where possible.



4.3 Box and Side Cuts

- Box cuts must be avoided wherever possible and may only be constructed in short sections where adequate road drainage can be achieved.
- Side cut roads should generally not be located on slopes greater than 25° (46%).
- Benches must be constructed to avoid erosion or batter slumping where batters (either cut or fill) are in excess of 3 metres.

Figure 4.4 – Construction of benches to improve sight distance and the stability of road batters.



4.4 Road Visibility

- At road intersections, a minimum visibility of 30 metres along all roads should be maintained where practicable.
- Road intersections, wherever possible, should always be at right angles or as near as feasible, even though it may be necessary to introduce a curve prior to the intersection to achieve it.

4.5 Road Drainage

- All roads and tracks must be adequately drained to minimise erosion and to avoid the movement of sediment into streams.
- Cross drains and turnout drains should be constructed at regular intervals as required to reduce surface flow, particularly in steep country where frequent diversions are necessary to reduce the volume and velocity of run-off.
- Cross-drains should be installed at the spacing indicated in Table 4.5, using spoon drains or pipes (culverts). Culverts must be constructed of durable material with a design opening adequate to cope with a 1 in 20 year rainfall event.
- Roads should have adequate camber and side drains (V drains) to direct water off the road surface towards dispersal points.
- Drainage on roads approaching a watercourse should be prevented from entering the watercourse by diverting it through cross drains or turnouts into the adjacent vegetation as close as possible to the watercourse while maintaining an

effective filter strip (one that ideally allows a minimum of 30 m of drainage over vegetated ground before entering the watercourse).

- Silt traps should be used where necessary to prevent sediment entering streams.
- During road maintenance, machine blades must not be used to remove road surface material other than for minor repair work that will not further excavate the road. Any fill must be deposited in locations that avoid the entry of sediment into streams.

Figure 4.5.1 - Use turnout drains or culverts to divert runoff into vegetation and away from streams.

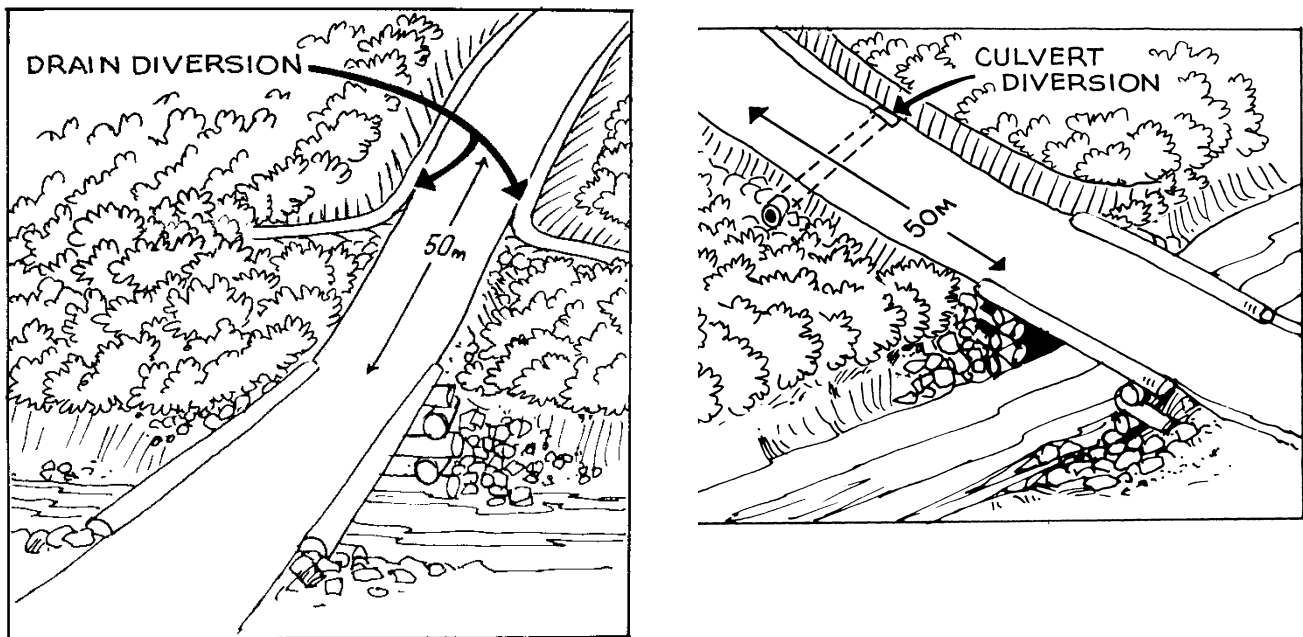
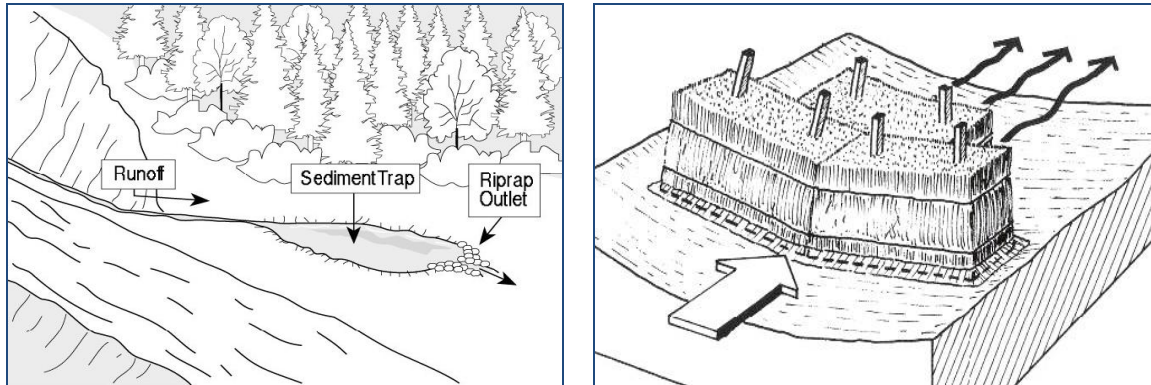


Table 4.5 Maximum spacing between cross-drains for roads

Gradient of road	Maximum distance between drains (metres)
0 – 9° (0 – 16%)	150
>9° (>20%)	50

Note: drains should also be installed at major changes of slope and within 50 metres of watercourse crossings.

Figure 4.5.2 - Silt traps can be constructed as sediment ditches (left) or barriers made of straw or other vegetation (right) to filter run-off from roads.



4.6 Stream Crossings

- Stream crossings are potentially the most hazardous sources of stream sediment.
- The number of crossings must be minimized.
- Crossings should be carefully located to minimise disturbance to stream banks.
- All crossing locations and types should be shown on the Timber Harvesting Plan.

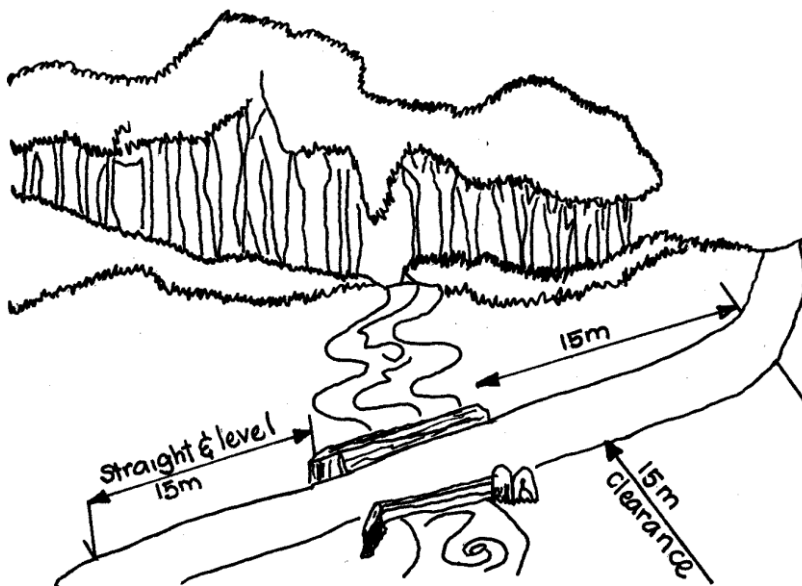


Figure 4.6.1 - Roads should be located to avoid steep side cuts and approach stream crossings at right angles where possible.

4.6.1 Permanent Crossings

- Bridges must be constructed to allow for free flow of water underneath during normal (1 in 20 year) flood events.
- Construction and maintenance activities must be planned and conducted so as to minimise the risk of sediment entering streams.
- Where possible, crossings of designated streams should be located at right angles where stream channels are straight and have well defined stream banks
- Approaches to a bridge should be of straight alignment with level gradient for a minimum distance of 15 metres either side wherever possible.
- Large rocks, sandbags or logs must be placed on the upstream side of the foundation to reduce erosion. All fill must be similarly stabilised or re-vegetated to minimise slumping and erosion.
- Where earth and gravel is used for paving bridges, kerbs should be installed to contain such material.
- Culverts with adequate fill may be used on small streams where peak flows are not extreme. The culvert size must be designed to cope with watershed flow for a 1 in 20 year flood and should be no less than 300mm diameter.
- Where the road is constructed using the 'cut and fill' method, culverts should not discharge over fill material unless flumes or non-erosive materials are used below the outlet to prevent erosion.
- The use of hydraulic excavators is encouraged during the construction of bridges, permanent crossings and culverts to avoid soil erosion and the collapse of the stream banks.

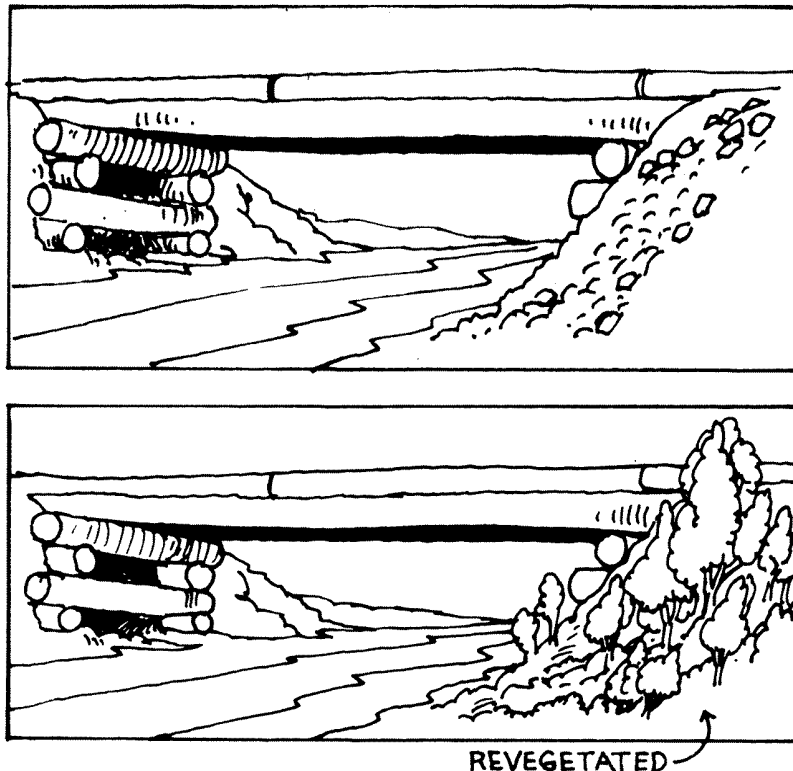


Figure 4.6.2 -
Bridge
embankments
should be
protected and
stabilised with
vegetation or
heavy duty
materials such
as rock or logs

4.6.2 Temporary Crossings

- Approaches to temporary crossings should be adequately drained to prevent runoff flowing directly into the stream (see Figure 4.5.1).
- Crossings should be located on sites with stable streambed material and where bank restoration will be possible.
- Construction activities should be timed to coincide with dry weather and low stream flows.
- Ford crossings should only be constructed over stable gravel material.
- Log crossings must be constructed as a temporary log bridge allowing free flow of water.
- Log clusters with soil fill are not permitted as crossings.
- Temporary crossings must be removed to allow unimpeded stream flow as soon as operations over the crossing are completed or before the wet season if operations are not completed. The streambed and banks must be restored as near as possible to its natural condition.

4.7 Road Metalling

- The ultimate aim of metalling is to provide a durable, all weather surface that will provide an acceptable level of travelling comfort and safety and have sufficient inherent strength to withstand expected loads and weather conditions.
- Before any metalling is carried out adequate grading of the road must be undertaken to ensure that:
 - the prescribed construction widths and drainage systems are maintained;
 - a suitable and even surface is formed to accommodate the metal;
 - the camber and super-elevation (if required) are formed correctly.

4.8 Road Closure

- Roads should be closed to haulage vehicles when damage to the road formation or its structures may occur.
- The logger and cartage contractor must take reasonable precautions to avoid causing damage to the road infrastructure and must cease haulage before major damage occurs (see Section 10 – weather restrictions).

4.9 Road Maintenance & Repair

- During harvesting and haulage operations, the harvesting contractor(s) will be responsible for the maintenance and repair of roads and associated infrastructure, including bridges and signs.

- Road edges, drains and silt traps must be cleared of harvesting debris and maintained in good working order at all times during operations.

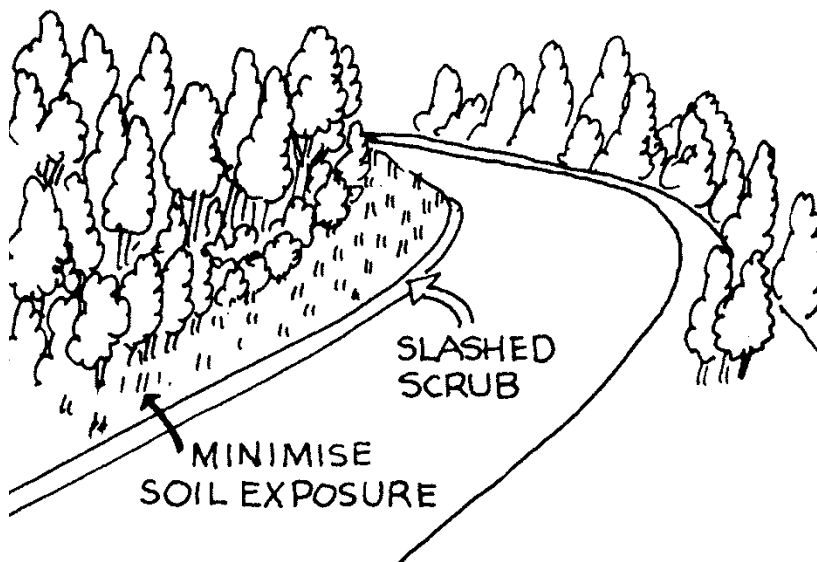


Figure 4.9 -

Control roadside vegetation only to the extent necessary to keep the road surface dry, to permit good visibility and for weed and fire control purposes. Soil disturbance on batters should be avoided.

5. SILVICULTURAL PRESCRIPTIONS

- The Timber Harvesting Plan will prescribe the harvesting and reforestation systems that are to be used within a harvesting area.
- The silvicultural prescriptions must be in accordance with the Forest Management Plan.
- Where thinning systems are prescribed, the THP will specify the number and type of trees to be thinned and how the trees are to be marked in the forest.

6. BUFFERS

- Harvesting will be restricted in buffer areas to protect streams, sink holes, steep slopes and other special management zones.
- Buffers will be marked in the field and on the Timber Harvesting Plan map.
- The minimum widths of buffers are given in Table 6. The widths specified are horizontal distances. The Forestry Division may prescribe wider buffer widths in a Timber Harvesting Plan where additional protection is required.

Table 6 – Minimum buffer widths

Feature	Minimum buffer width for felling	Minimum buffer width for machinery
Watercourses that have a defined channel	Trees can be felled but disturbance of the understorey vegetation and soil surface must be avoided. Consideration should be given to replanting buffers with native species that provide protection of the watercourse and habitat for protected species.	No machinery within 20m of the watercourse
Slopes >20 ⁰	Clearfelling should be avoided. Thinning may remove 50% of the basal area. Felling should be conducted in a manner that avoids disturbance of the understorey vegetation and soil surface.	No machinery
Sinkholes	Trees can be felled but damage to the understorey vegetation and soil surface must be avoided. Sinkholes should not be replanted with plantation trees. Regeneration with native species should be encouraged within the sinkhole and within a 20m buffer from the outer perimeter of the sinkhole.	No machinery within 20m of the outer perimeter of the sinkhole.
Designated tourist roads and walking tracks	No clearfelling within 20m of the designated road or track. Thinning may remove 50% of the basal area. The aim will be to encourage regeneration with native species.	No machinery within 20m of the road or track, except at approved crossing sites.

- Trees in forest adjacent to buffers must be directionally felled or retained where necessary to avoid damage to buffers.
- Machines must not enter any buffer or stream (except at approved crossing points). Skid tracks should be kept at least 40 m away from streams except at approved crossing points.
- Tree crowns are not to be felled into streams. Any harvesting debris in streams is to be removed immediately, whilst ensuring that machines do not enter the buffer.

7. FELLING

- Trees must be directionally felled using safe techniques.
- Damage to the merchantable bole and to retained trees must be avoided.

- Suitable signboards and precautions must be taken, such as the temporary closure of roads and walking tracks, to warn other workers and the public of potential hazards.
- The stump height should be as low as practicable (less than 15 cm) to maximize merchantable volume providing that appropriate health and safety requirements are met (Figure 7.1).
- Where a tree is 'hung up' it must be brought to the ground as soon as possible.
- Where 'hung up' trees cannot be safely taken down manually, a machine with winch must be used. When winching, the distance from the tree to the machine must be at least one and a half times the height of the tree. The chainsaw operator and all other persons must remain as far away as possible until the tree is safely on the ground and winching has ceased.

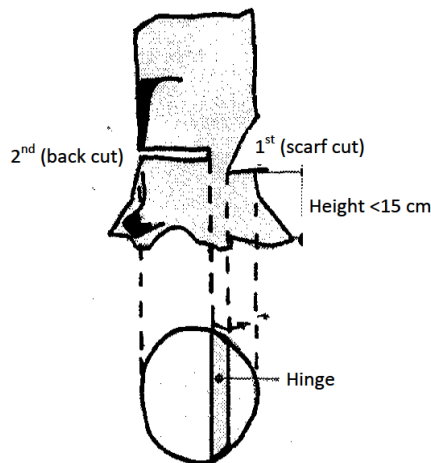


Figure 7.1 – Trees must be directionally felled to minimise damage to the log and to the retained trees

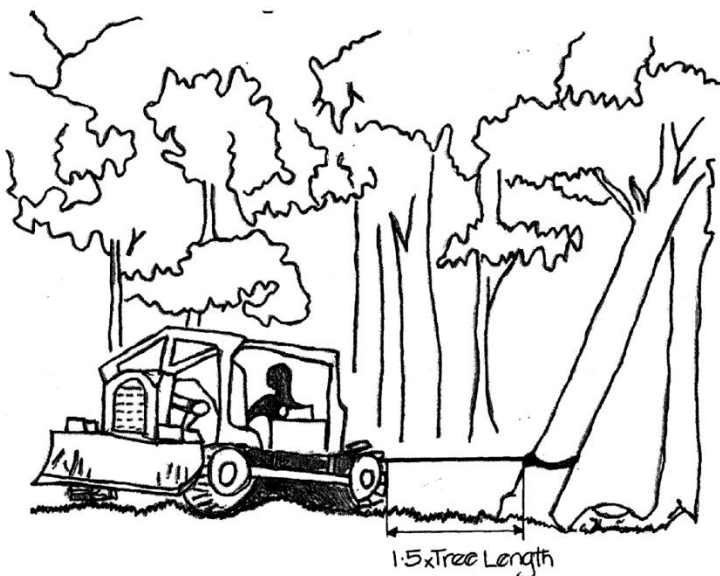


Figure 7.2 – Hung up trees must be brought to the ground using a winch

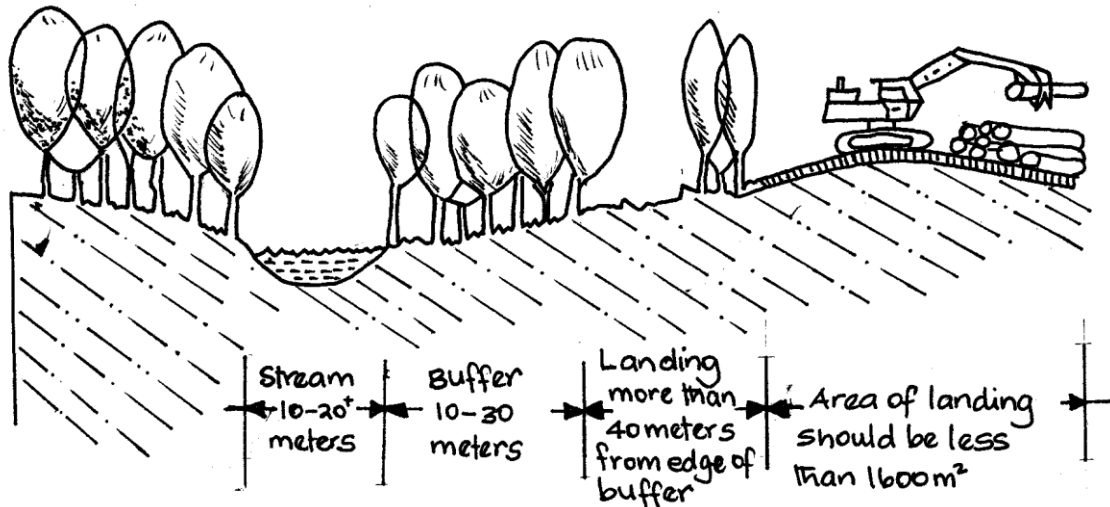
8. SKID TRACKS

- Skid tracks must be planned and operated to:
 - Minimize the area covered by skid tracks, reduce skid track grades and avoid box cuts and excessive side cuts.
 - Maximise the volume of logs that can be skidded safely and efficiently.
 - Eliminate unnecessary stand damage by the skidding machine.
- Low ground impact skidding machinery, such as rubber-tyred skidders and excavators, should be used to minimise soil disturbance. Any skid track that involves earthworks must be shown on the Timber Harvesting Plan and marked in the forest prior to the commencement of harvesting.
- Where necessary, logging slash should be evenly distributed on major skid tracks to protect the soil surface from rutting.
- Blading after initial construction is not permitted. Machines must walk along the constructed tracks with blades lifted unless the lowering of the blade is essential for safety on steep slopes.
- All logs must be raised at the front during skidding to minimise soil disturbance and skid track damage caused by the ploughing effect of logs during extraction.
- Skidding of logs is not permitted along or across haulage roads and streambeds.

9 LANDINGS

- Landings should be located as far as practical on a slight slope (up to 6° or 10.5%) on a ridge, and they should be at least 40 metres from the closest buffer, or further if on steep terrain.
- The number and size of landings should be minimised, consistent with providing safety and efficiency for the movement of machines and workers. As a general guideline, landings should not exceed 1,600m² (e.g. 40m x 40m).
- All landings must be shown on the Timber Harvesting Plan and marked in the forest prior to the commencement of harvesting.
- Landings should be constructed in a manner that minimises soil damage and allows for rapid revegetation after the completion of harvesting operations.

Figure 9 – Landings should be located well away from streams and buffers



10. OCCUPATIONAL HEALTH AND SAFETY STANDARDS

All harvesting operators must comply with relevant OH & S requirements, including the following:

- All persons must wear the relevant Personal Protective Equipment (as listed in Annex 2) at all times whilst working within a harvesting area.
- All chainsaws must have required safety features (e.g. chain-breaks) in working order.
- All machines are to be fitted with seat belts, which must be worn during the operation of the machine.
- All machines must be fitted with a fully charged fire extinguisher and a First Aid Kit.
- All machines must be fitted with a safety cabin, which conforms to the standard of the Roll Over Protection Structure (R.O.P.S). The cabin of the machine must have a safe and securely mounted seat.
- The machine must be fitted with an efficient spark arrestor and this must be maintained in working order.
- All pulleys, shafts, belts and fan blades must be securely guarded.
- Machines must not have any fuel or oil leaks.

11. WEATHER RESTRICTIONS

- Guidelines for stopping and starting work according to weather are provided in Table 11.

11.1 Wet weather

- Harvesting and haulage operations should cease during the wet season, unless the harvest area and access roads are specifically approved for wet weather operations. The commencement and ending of the wet season shall be declared each year by the Forestry Division in consultation with the harvesting contractor.
- The harvesting contractor should ensure that an adequate stockpile of timber is available prior to the onset of the wet season. The stockpile should be maintained at the sawmill site or at a suitable site with all-weather road access.
- It is the responsibility of all operators to cease work when adverse weather conditions are likely to cause an increased risk of personal injury or damage to roads or the environment.

11.2 Fire precautions

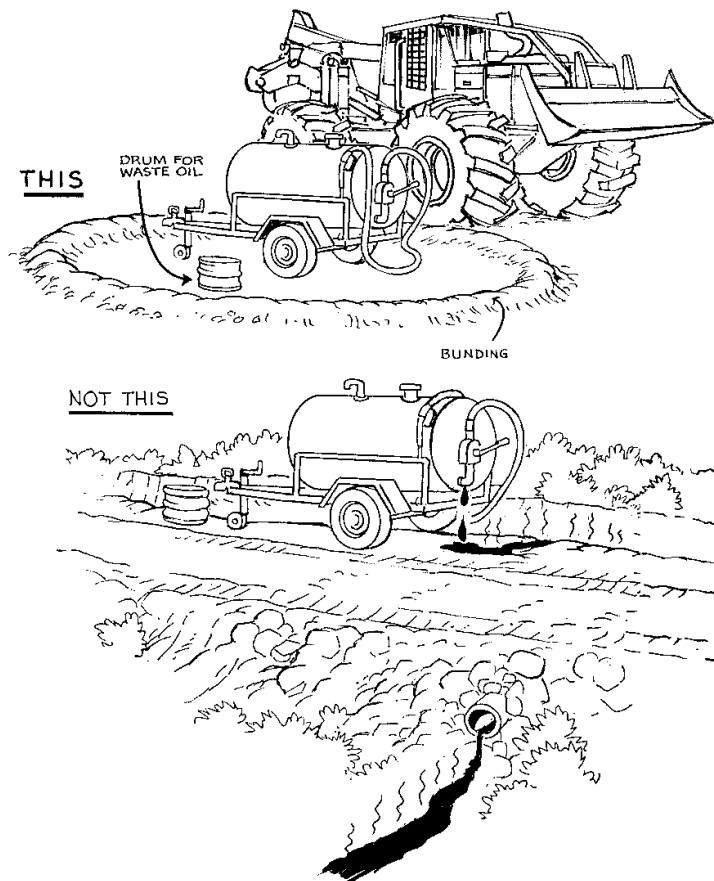
- The harvesting contractor shall cease work during periods of very high fire danger.
- No smoking is permitted within a forest during high fire danger periods, except on a roadway cleared of inflammable material.
- All cigarette butts and matchsticks are to be properly extinguished before being discarded.
- Fires for preparing meals, boiling water or for any other purposes must be not less than 5m from any log, stump or tree and the ground must be cleared of all flammable materials within 2m of the fire. Any such fire during the dry season should be completely extinguished when being left, either temporarily or otherwise.
- No fire shall be lit or maintained in the open during a fire period equal to or in excess of High Fire Rating.
- All harvesting machinery and trucks must be fitted with a serviceable fire extinguisher.
- During the dry season the harvesting contractor must have basic fire fighting equipment (rake and 20 L knapsack) within 50 m of each chainsaw operator and refuelling area.
- The forest owner must keep and maintain fire fighting equipment, including a water tank and pump that can be mounted on a four wheel drive vehicle for rapid response to any fire fighting requirement.
- The forest owner must maintain fire breaks and water access points within the forest.

Table 11 - Guidelines for stopping and starting operations

Operation	Stop when	Start when
Felling	Wind prevents accurate directional felling	Wind drops and accurate directional felling is possible
	Ground conditions are too slippery to allow the chainsaw operator to move safely	The ground dries to allow the operator to move without slipping
Skidding or road construction and maintenance	Water is seen flowing on any length of skid track or road	<p>Water has stopped flowing and the soil is no longer saturated. This can be seen as the soil surface becomes solid enough to operate on without causing rutting.</p> <p>Note:</p> <ul style="list-style-type: none"> • skid tracks must not be bladed off • New skid tracks must not be opened up to by-pass an old skid track
Landings	Water starts to pond on the surface of the landing	The soil is no longer saturated. This can be seen as the soil surface becomes solid enough to operate on without causing rutting.
Haulage of logs	<p>Trucks cannot move unassisted along the road because of slippery conditions; or</p> <p>Muddy water is running in wheel ruts which are more than 10cm below the road surface for a distance greater than 50 m.</p>	<p>The surface dries and trucks can move without assistance along the road and water is no longer running in wheel ruts.</p> <p>Note: Other machines must not be used to move trucks.</p>
Felling and skidding	Fire danger is very high due to very dry forest fuels, high temperatures and strong winds	Fire danger eases due to more moderate weather conditions or rain.

12. FUELS, CHEMICALS AND RUBBISH

- Spillage during refuelling or machine maintenance must be avoided by locating maintenance areas on level ground well away from streams and drains. All storage and use of fuels must be contained within bunded areas.
- Spills arising from the operation of any machinery must not be allowed to enter any streams or sinkholes. Contaminated soil must be immediately excavated and removed to a disposal area outside of the watershed as approved by the Forestry Division.
- Used oil filters, empty grease gun cartridges, drums, spray paint cans, etc. should be removed to a disposal area approved by a Forestry Officer.
- No pesticides or herbicides shall be applied unless authorised in writing by the Forestry Division. No containers are to be left or disposed of within the forest.
- The forest owner shall take measures to avoid the dumping of rubbish within the forest. The control measures should include public information and education programs and restrictions on vehicular access to sensitive areas such as sinkholes and streams.



**Figure 12.1 –
Re-fuelling and
storage sites must
be located away
from drains and
streams and
surrounded by a
bund of soil**



**Figure 12.2 –
All rubbish should be
placed within
containers and
removed to approved
disposal sites**

13. REHABILITATION OF HARVEST AREA

- Rehabilitation measures should be undertaken as harvesting operations are completed to ensure that infrastructure such as roads, tracks, stream crossings and landings are properly drained and revegetated so as to minimise the risk of erosion or other environmental harm. Whether ever possible, rehabilitation measures should be undertaken in a manner that permits the infrastructure to be re-used during the next harvesting cycle.
- Rubbish (including oil drums, grease cartridges, hydraulic hoses etc) must be removed to an approved disposal site.

13.1 Skid Tracks

- Skid tracks must be adequately drained after harvesting and before the wet season to minimise the risk of erosion.
- Cross-drains with turnouts must be constructed on skid tracks at locations where the surface water can be diverted into undisturbed vegetation or silt traps.
- Cross-drains must be constructed at an angle ($50^{\circ} - 70^{\circ}$) across the track.
- Place cross-drains at a change in slope or at other locations so that the spacing between drains is equal to or less than the maximum allowed in Table 13.1.
- Cross-drains may not be necessary where the topsoil and surface vegetation are intact and the risk of erosion is low.
- Tracks must not be widened by blading material from the side in order to cover the track surface.

Figure 13.1 – Cross drains must divert run-off into adjacent vegetation

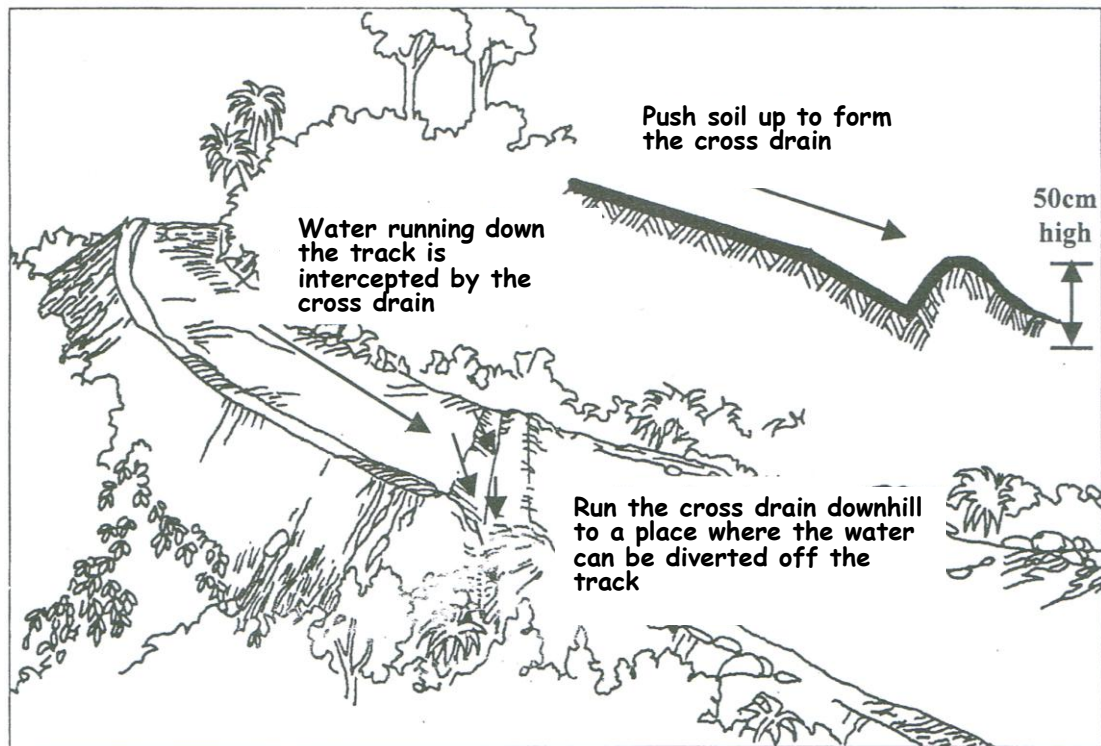


Table 13.1 – Maximum distance apart for cross-drains on skid tracks (metres)

Slope		Spacing of cross-drains (m)
0 to 4 ⁰	(0 to 7%)	nil
5 to 9 ⁰	(8 to 16%)	50 m
10 to 19 ⁰	(17 to 34%)	30 m
>19 ⁰	(>34%)	20 m

13.2 Landings

- Wood residues must be removed from the landing and returned to the forest or be neatly stacked to facilitate collection for fuel wood.
- Landings must be properly rehabilitated and drained to minimise erosion and encourage rapid revegetation.

14. REFORESTATION

- Reforestation activities should be carried out within one year after the completion of harvesting.
- The Timber Harvesting Plan shall prescribe the species to be planted, the stocking level to be achieved and the site preparation, weed control and tending activities that are to be undertaken.
- Stocking surveys will be conducted one year after planting.
- Further site preparation and planting will be done if necessary to ensure that the prescribed stocking levels are achieved.

15. CONTROL OF WEEDS AND PESTS

- The forest manager will conduct regular inspections and will take action as required to control weeds and pests.
- Wild pigs can be a major cause of soil disturbance and stream turbidity. Control measures should therefore be taken to minimise the damage to drainage areas (streams and sinkholes) caused by wild pigs.

16. MONITORING AND EVALUATION OF OPERATIONS

- Monitoring and evaluation programs provide forest managers with information about the standards that are being achieved in the forest and how those standards can be improved.
- Monitoring should be carried out in accordance with a standard Monitoring Checklist issued by the Forestry Division, as follows-
 - Regular (monthly) inspections during the course of forest operations to assess compliance with the Timber Harvesting Plan and this Code.
 - Final monitoring inspection upon the completion of harvesting areas and prior to the closure of the harvesting area. Final monitoring reports must be submitted to the Forestry Division and must include the following information-
 1. Results of the monitoring inspection
 2. Corrective actions that have been taken in relation to major non-compliances
 3. Other recommended actions to improve the standards of compliance with the Code of Harvesting Practice.
- The Forestry Division will prepare an annual report on the results and outcomes of the monitoring and evaluation programs.

ANNEX 1 - Glossary

The following definitions shall apply for the interpretation of the terms used in this Code.

Annual Allowable Cut – the volume of trees specified for removal from the forest area each year, based on sustained yield from inventory and increment data

Batter slope – the slope of the bank of cut earth or soil fill on either side of a constructed road or track

Benches - horizontal area constructed along the side slope of batters to provide a break in the slope and reduce erosion

Box and Side Cuts - portion of ridge or hillside cut away during road making. Side cuts occur when one side is cut and box cuts are made when both sides of the road are cut into the hill.

Buffer strip - (also known as a filter strip or streamside reserve) - within a harvesting coupe, a specified horizontal width of ground retained either a side of a designated stream and any associated saturated flat land in which indigenous trees must not be felled and machinery may not enter, except at crossings, which must be kept to a minimum and only where designated in a Timber Harvesting Plan. Minimum buffer widths are prescribed in section 10 of this Code.

Bund - a circular mound of soil that is constructed in the forest to surround fuel storage, re-fuelling and machine maintenance areas so that any spillage is contained and prevented from entering drains or streams

Camber - curvature of road carriageway; the amount of cross-fall on a road.

Coupe / compartment / stand / cutting permit area – an area of forest from which logs for sawmilling or other industrial processing are harvested.

Cross-drain – a drain constructed across a road or skid track to divert water towards a disposal point. Cross-drains may be either culverts under the surface of the road or open surface drains (see also Water bars).

Designated streams – all watercourses that have a defined stream channel, including all permanent streams and any intermittent streams which for reasons of water quality, erosion risk, wildlife habitat, or recreational value should be buffered from any impacts associated with forest harvesting

Forest operations – all activities associated with the harvesting of timber, the reforestation and tending of forests and the construction and maintenance of roads.

Harvesting – includes tree felling, extraction and the marking, sorting, loading and carting of forest produce within a forest

Timber Harvesting Plan – A plan of harvesting operations for a given area showing roads, skid tracks, protection areas, landings, etc

Haulage roads – the road network within areas of forest for the primary purpose of extracting of carting timber from the forest

Landing – place where sawlogs and residual roundwood are transported for sorting and loading for transport from the forest; or where roundwood is processed into sleepers, posts or miscellaneous products

Permanent crossing – a bridge or culvert structure that is constructed to provide access across a permanent or intermittent stream for harvesting traffic. The crossing must have an opening designed to permit natural flows, including floods to at least the 1 in 20 year frequency. Such a crossing may be subsequently used for other purposes after the completion of harvesting operations

Permanent road – a generally high standard road constructed initially for timber extraction, but permanently required for the continuing management of the forest

Pre-Harvest Inventory (PHI) - stock-take of trees carried out before harvesting. Data include tree species, diameter, height, log class, etc.

Road grades - gradient (incline) of road measured as a percentage or degree of angle from the horizontal and expressed as adverse (uphill) or favourable (downhill)

Reforestation – the establishment of a stand trees by planting or seeding with tree species on previous logged or poorly forested land for the purposes of establishing a tree cover, usually for timber production

Residual stand - trees still standing after a harvesting operation

R.O.P.S. – Roll Over Protection Structure

Turn-out (or diversion drain) – a short graded channel angled away from the edge of roads and tracks to divert run-off into undisturbed vegetation so that any sediment can be filtered and trapped before the water reaches a stream

Side drain - (v drain or table-drain) – a drain constructed along the side of a road to carry run-off towards culverts or turn-outs where the water can be discharged into vegetation for dispersal and filtration.

Silt Traps - Holes dug to catch sediment in run-off water flowing in drains. Other silt traps include hay bales or barriers made of hessian or other materials to trap sediment at the outlet of drains

Sinkhole- a natural depression formed by the collapse of an underground cavity or cave system. Sinkholes often direct surface water into the underground streams and it is therefore important to ensure that they are protected from disturbance and the entry of sediments and rubbish.

Skidder – all purpose built frame-steered wheeled machines used for the extraction of timber with load lifted at one end only

Skidding – the towing or winching of a log on the ground by a tractor or dozer from the stump to the landing site

Skid track – track along which a log is skidded

Special management zones – designated areas of scientific, recreational or landscape significance (e.g. water supply areas, fishing areas), erosion prone sites or particular steep sites which may require them to be excluded or harvested under special conditions or restrictions

Spoon drain – A shallow semi-circular open drain, normally traversable by vehicles, designed to carry water to the side of a road, access track or fire break.

Super Elevation - the cross-sectional gradient of a road, designed to improve road safety and drainage.

Temporary crossing – a road or skid track crossing constructed across an intermittent stream using corded logs, a culvert or ford for use for a limited period of less than three (3) months during the dry season only

Timber – standing trees or felled logs before their processing into forest produce

Tractor – harvesting machinery i.e. bulldozers. A variety of types and sizes are used depending on the type of forest being harvested.

Water bar – a cross-drain that is constructed by excavating a shallow depression and forming a mound of soil to divert water from a track or road into adjoining vegetation.

Watershed area – an area of land that provides natural drainage for rainfall run-off and seepage into streams for water supply purposes

Annex 2

Personal protective equipment (PPE) appropriate for forestry operations

(Adapted from the ILO Code of Practice: Safety and Health in Forestry Work)

Parts of the body to be protected	Trunk	Feet	Legs	Hands	Head	Eyes/ face	Hearing
Required PPE	High visibility clothing	Safety boots or shoes ¹	Safety trousers ²	Gloves	Safety helmet	Visor (mesh)	Eaf muffs ³
Manual Felling	✓	✓	✓	✓	✓	✓	✓
Extraction	✓	✓		✓ ⁴	✓		✓

Notes-

1. Safety boots or shoes with integrated steel toe for medium or heavy loads
2. In hot weather chain saw leggings or chaps may be used. Safety trousers and chaps contain fibres that are inflammable and will melt and should not be worn during fire fighting
3. Ear plugs and ear valves are not generally suitable for forestry because of the risk of infection
4. Gloves with heavy-duty palm required if handling wire chocker rope or tether line.