



Holiday Coast Bushfire Solutions

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BUSHFIRE HAZARD ASSESSMENT REPORT

REPORT PREPARED IN RELATION TO:	RESIDENTIAL SUBDIVISION
PROPERTY DESCRIPTION:	LOT 112 DP 1073791 off LYONS ROAD, TOORMINA, via SAWTELL.
REPORT COMMISSIONED BY: (my Client)	Utila Pty Ltd, c/- Mr Adrian Borsato
	DATE ISSUED:

IMPORTANT NOTICE

Site inspections, and the results found herein, are carried out in accordance with the methodology as set out in the document "***Planning for Bushfire Protection 2006***".

The results of the site inspections and their correlation with ***PBP-2006*** are based on information provided by the "Reference Documents" and information provided by the Client.

Holiday Coast Bushfire Solutions Pty Ltd will not be held liable for the omission to provide, or restrict access to, critical information (such as restrictions on property Title, easements, relevant consultant reports, etc) relevant to this development proposal.

The author of this Report, S. Ellis, is an Accredited Bushfire Consultant (through the National Certification Program administered by the Fire Protection Association of Australia), whose qualifications include Graduate Diploma in Design for Bushfire Prone Areas (UWS) and Certificate 2 & 3 in Firefighting Operations and Certificate 4 in Firefighting Supervision.

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Glossary

APZ	- Asset protection zone. An area surrounding a development managed to reduce the bush fire hazard to an acceptable level. The APZ, consisting of an area maintained to minimal fuel loads and, for subdivision, comprising a combination of perimeter road, fire trail, rear yard or a reserve, so that a fire path is not created between the hazard and the building.
AS 3959	- Australian Standard AS 3959 Construction of buildings in bushfire-prone areas, Standards Australia, 1999, that outlines construction standards applicable to residential developments in bush fire prone areas.
BCA-2007	- Building Code of Australia 2007.
BE	- Building Envelope. The foot print of a (proposed) structure.
BPM	- Bushfire protection measures. A range of measures (controls) available to minimise the risk arising from a bushfire. BPMs include APZs, construction standards, suitable access arrangements, water and utility services, emergency management arrangements and landscaping.
Bushfire hazard	- The potential severity of a bushfire. Usually measured in terms of intensity (kW/m), the factors that influence a bush fire hazard include climate and weather patterns, vegetation (fuel quantity, distribution and moisture) and slope.
Bushfire-prone area / land	- Is an area of land that can support a bushfire or is likely to be subject to bushfire attack. In general, a bushfire-prone area is an area mapped for a local government area that identifies the vegetation types and associated buffer zones. Bushfire prone land maps are prepared by local councils and certified by the Commissioner of the RFS.
Bushfire risk	Is the chance of a bushfire igniting, spreading and causing damage to assets of value to the community. Risk may be rated as being extreme, major, moderate, minor or insignificant and is related to the vulnerability of the asset.
COBA	- Category of Bushfire Attack. Either LOW, MEDIUM, HIGH, EXTREME, or FLAME ZONE. The degree to which a (proposed) building is subject to the modelled RHF from a potential bushfire. The COBA determines the construction standards applicable.
Contagious Ignition	- The ignition of one building by an adjoining flaming building (or material) <u>other than</u> by the direct ignition from the flaming bushfire hazard.
Defendable Space	- An area within the APZ that provides an environment in which a person can undertake property protection after the passage of a bushfire with some level of safety.
D-T-S	- Deemed to Satisfy (prescriptive requirements of either BCA-2007 or PBP-2006).
FFDI	- Forest fire danger index.
Flame Zone	- The distance from a bushfire at which there is significant potential for sustained flame contact to a building. Determined by the calculated distance at which the radiant heat of the design bushfire exceeds 29kW/m ² or calculated by the sustained flame length, whichever is the lesser.
IFEG-2005	- International Fire Engineering Guidelines (Edition 2005).



Infill Development	-	The development of land by the erection of or addition to a residential building (or buildings) which does not require the spatial extension of services including public roads, electricity, water or sewerage and is within an existing allotment.
Inner Protection Area	-	The inner component of an asset protection zone, consisting of an area maintained to minimal fuel loads and comprising a combination of perimeter road, fire trail, rear yard or reserve, so that a fire path is not created between the hazard and the building.
Outer Protection Area	-	The outer component of an asset protection zone, where fuel loads are maintained at a level (usually less than 8 t/ha) where the intensity of an approaching bushfire would be significantly reduced.
<i>Required</i>	-	Required by PBP-2006 or other legislative requirements.
Setback		The distance required through planning provisions to separate a building from the bushfire hazard, street frontage or from adjacent buildings. In most cases the land within the setback will also be within the Flame Zone.



0.0 EXECUTIVE SUMMARY

The purpose of this Report is to address the key issues and assessment requirements provided in the NSW Rural Fire Service in accordance with section 75F(4) of the Environmental Planning and Assessment Act 1979. The requirements were set out in the NSW Rural Fire Service's letter dated 21/5/2008, and have been reproduced below:

1. The NSW Rural Fire Service (RFS) notes that the subject site has significant bush fire issues and is identified as bush fire prone. The proposed Special Fire Protection Purpose and residential developments are to fully comply with the requirements of *Planning for Bush Fire Protection 2006*.
2. The impact of radiant heat and exposure to residents and occupants of the tourist facility is to be achieved by separating the development from the bushfire hazard. This is achieved by identifying the extent to which future development can provide for Asset Protection Zones in accordance with *Planning for Bush Fire Protection 2006*. Setbacks will depend on proximity to vegetation, vegetation type and slope.
3. The rate of heat output (intensity) of a bush fire close to a development is to be reduced through control of fuel levels.
4. The ability to provide for adequate egress/access to the proposed development as outlined within 4.1.3 and 4.2.7 of *Planning for Bush Fire Protection 2006*.
5. The ability to site and provide for adequate future water supplies for bush fire suppression operations in accordance with *Planning for Bush Fire Protection 2006*.
6. The vulnerability of buildings to ignition from radiation and ember attack is to be minimised by addressing the construction of assets in accordance with *Australian Standard AS3959-1999 'Construction of buildings in bushfire-prone areas'*.

The matters raised by the NSW Rural Fire Service have been addressed throughout this Report, specifically the proposed development has been assessed against the *Acceptable Solutions* contained within section 4.1 of *PBP-2006*, which are:

- Asset protection zones and appropriate separation from bushfire hazard vegetation;
- Water supplies;
- Public road access;
- Fire trails;
- Appropriate building construction standards;
- Additional protection measures such as maintenance.

Throughout section 7 of this Report it has been demonstrated that not only have the *required Acceptable Solutions* been provided, in some instances the *required* bushfire protection measures (BPM) have been augmented (such as fire trails and static water supplies).

All of the BPMs listed in *PBP-2006* that apply to residential subdivisions have been provided for this development project.



1.0 GENERAL DESCRIPTION OF LAND AND PROPOSAL

1.1 The Land

Site assessments were carried out by me on Friday 21st November 2008 and Tuesday 16th December 2008 for the purposes of preparing a Bushfire Hazard Assessment Report as required by clause 44 of the *Rural Fires Regulation 2008 – Application for a bush fire safety authority*.

The property is located on the south-western outskirts of Sawtell on the NSW mid north coast. The property has an area of approximately 38.5 hectares, with the proposed residential subdivision occupying approximately 18.8 hectares.

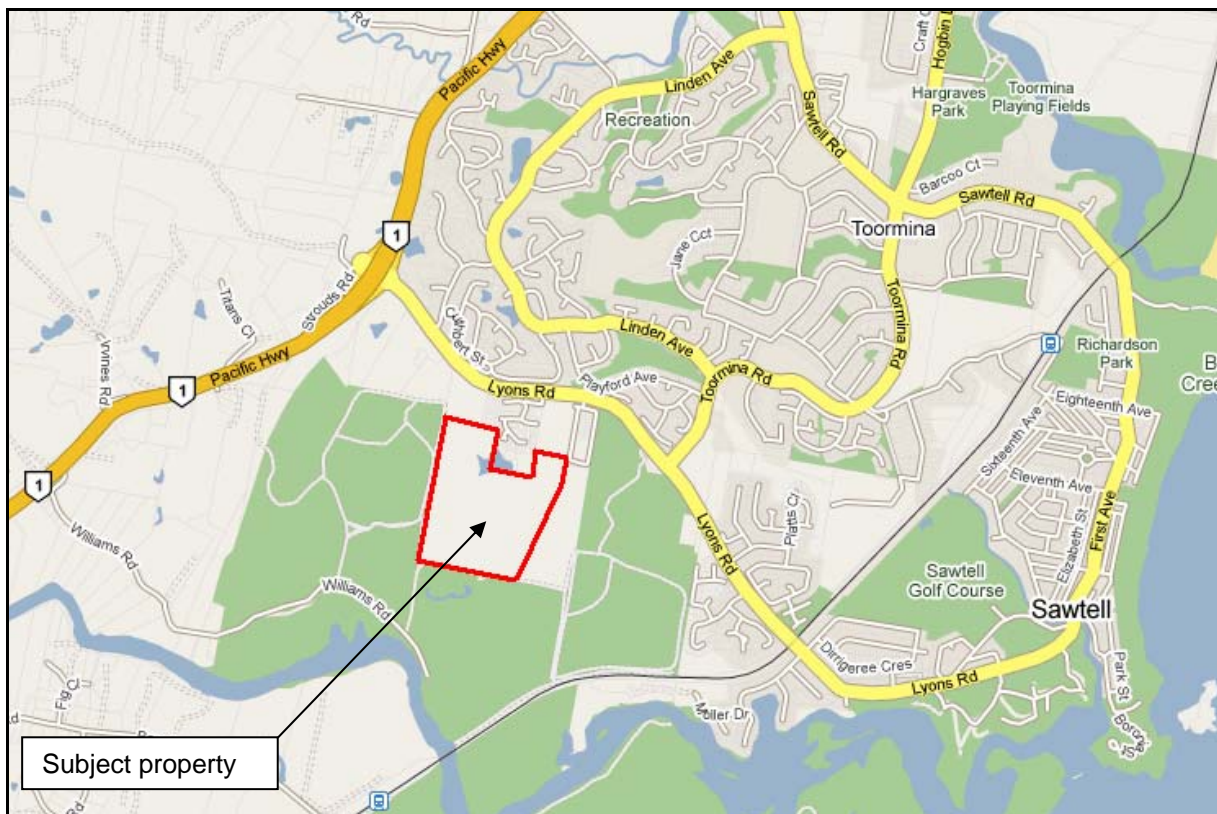


Figure 1: aerial image showing general location of subject properties (© Google maps 2008)

A large portion of the site (approximately the eastern $\frac{1}{3}$) is forested wetland, while a remnant of forested wetland occupies the east-west watercourse in the north of the site. The remainder of the site is grassed paddock and is presently being grazed by cattle.

The lands to the north of the site are residential developments. The Bongil Bongil National Park is located to the west, south and east of the property.



Figure 2: aerial image showing existing vegetation and land forms

The NP provides existing fire trails along the interface with the subject property for much of the common boundary. The NP to the west of the property was previously managed as hardwood plantation (Sydney Blue Gum and Blackbutt), but is undergoing rehabilitation to improve its ecological values and integrity. Most of the NP to the south-east and south-west of the property is forested wetland along the watercourses, merging to dry sclerophyll forest along the elevated areas.

1.2 The Proposal

This report refers to the proposed residential subdivision to create 196 x low density lots and 3 lots to potentially accommodate 55 x medium density dwellings under community title.

The subdivision layout will incorporate a perimeter road along the interface with the existing forested vegetation. In addition, the existing fire trails within the adjoining National Park will be linked with the perimeter road.

Access to and from the estate will be via a single access to Lyons Road, through existing residential developments to the north. Due to the existing development to the north of the site, access to and from the development has been constricted to a single urban road.

The northern precinct was originally proposed to accommodate a SEPP Seniors Living complex. As a result, the setbacks provided in this precinct are based on *Special Fire Protection Purpose* requirements rather than residential requirements.

Below is a copy of the latest layout proposal.

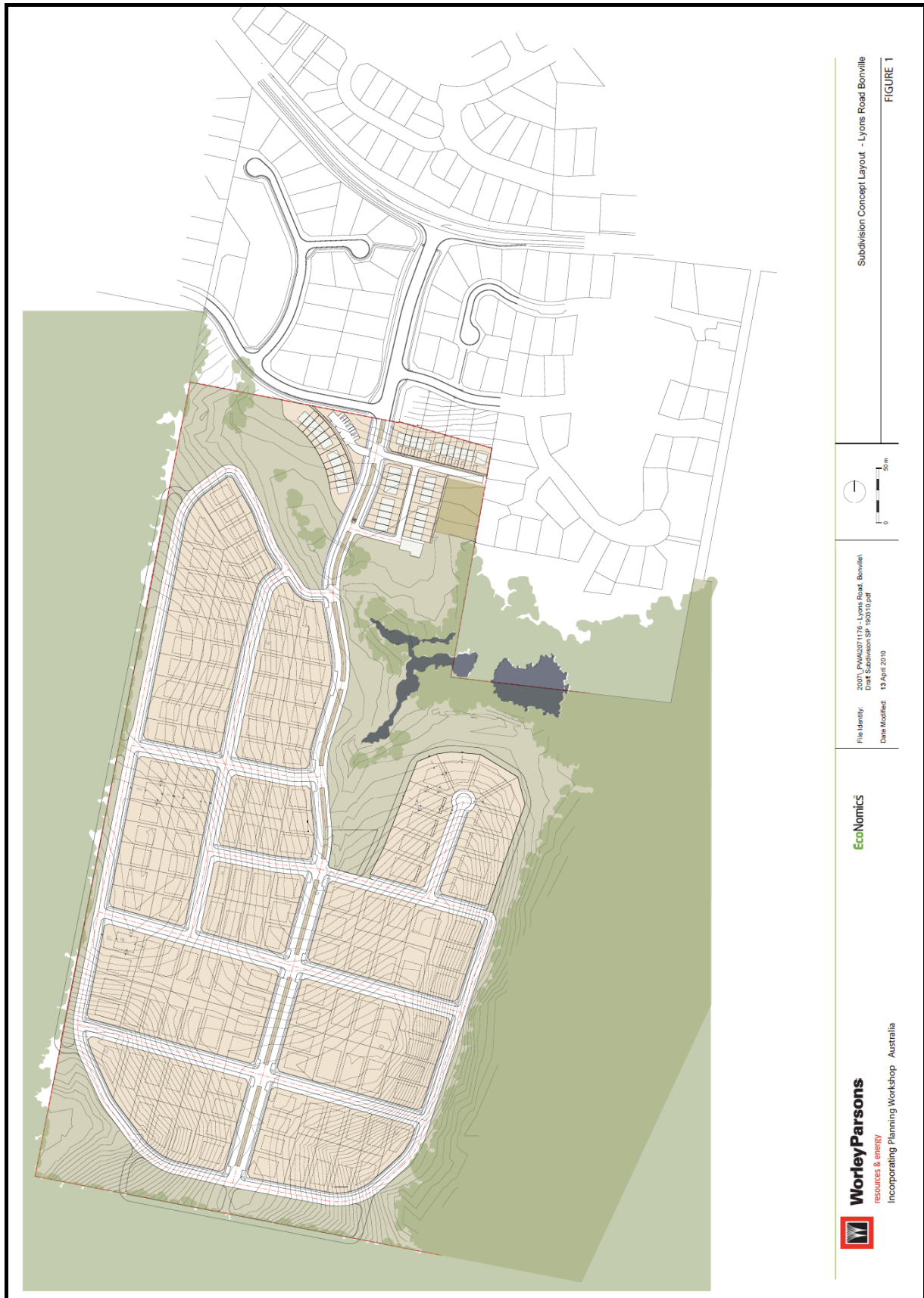


Figure 3: copy of proposed subdivision (Worley Parsons 2010)

2.0 VEGETATION ASSESSMENT

2.1 Vegetation Description

The procedure adopted for the site inspection followed the site assessment methodology of *PBP-2006*. The methodology is outlined below.

A2.3 Site assessment methodology for determining APZ

- (a) Determine vegetation formations, as follows:
 - (i) identify all vegetation in all directions from the site for a distance of 140 metres;
 - (ii) consult Table A2.1 to determine the predominant vegetation type; and
 - (iii) select the predominant vegetation formation as described in Table A2.1.
- (b) Determine the effective slope of the land under the Predominant Vegetation Class and the site.
- (c) Determine the appropriate fire (weather) area in Table A2.3 and note the relevant FDI.
- (d) Consult Tables A2.4 – 2.7 and determine the appropriate setback for the assessed land use, vegetation group and slope range.

A vegetation assessment was carried out to include a distance of 140 metres from the subject parcel boundaries, in all directions. It is determined that the general vegetation description is summarised as follows:

North - To the north-west of the property is lot 2 DP 1065589 which is currently being developed as a residential subdivision. Beyond this development is Lyons Road and existing established residential developments.

To the north of the property is existing established residential development. To the north-east of the property is a Melaleuca-dominant swamp sclerophyll forest. Along the east-west watercourse the forest has been modified due to previous farming practices. On the dryer areas the remnant trees are scattered with Broad Leaf Paspalum, ferns and Bladey Grass dominating the surface and near surface fuels. Along the wetter areas and adjacent to the dams the grasses give way to Twig Rush and reeds. Residential developments adjoin this watercourse immediately to the north.



Figure 4: looking east through forested wetland remnant

- East** - To the east and north-east of the proposed residential development is a continuation of the swamp sclerophyll forest described above. Although still dominated by *Melaleucas*, *Eucalypts* are scattered along the western perimeter of the swamp. There is a distinct lack of mid-storey stratum with the surface and near surface fuels dominated by Broad Leaf *Paspalum*, Bladey Grass, Saw Sedge and *Lomandra*.



Figure 5: looking east into forested wetland at north-eastern corner of paddocks



Figure 6: looking east into forested wetland at south-eastern corner of paddocks

- South** - The swamp sclerophyll forest, as described above, extends south along the eastern edge of the cleared development site, and south beyond the southern boundary.



Figure 7: *looking south into forested wetland at south-eastern corner*

Moving west along the southern boundary, the swamp sclerophyll forest merges to dry sclerophyll forest as elevation increases up to the ridge line. Moving west from the ridge line, the dry sclerophyll forest merges back to swamp sclerophyll forest at the south-western boundary.



Figure 8: *looking south into dry sclerophyll forest along southern boundary*



Figure 9: *looking west from southern boundary towards forested wetland in low area*

A fire trail is located along the southern boundary, within the NP.

- West - Moving north from the south-western corner the swamp sclerophyll forest merges to Sydney Blue Gum-dominant dry sclerophyll forest with an open woodland structure. This open structure is due to the area being previously used as a hardwood plantation.



Figure 10: looking west into Bongil Bongil NP, across fire trail to old hardwood plantation

Further north the open dry sclerophyll forest merges to a more closed arrangement for the remainder of the western boundary.



Figure 11: looking north-west into Bongil Bongil NP, along fire trail to old hardwood plantation

A fire trail is located along the western boundary, within the NP.



Figure 12: looking south along fire trail to west of western boundary

2.2 Vegetation Classification

PBP-2006 requires the various vegetation formations to be classified in accordance with the system adopted by Keith (*Ocean Shores to Desert Dunes, 2004*), and by the general description in Table A2.1 of *PBP-2006*. Following is a summary of the vegetation classification.

- North - *Managed lands*
- East - *Forested wetlands*
- South - *Forested wetlands and Forest*
- West - *Forested wetlands and Forest*

2.3 Past or Future Disturbance Factors (including extenuating circumstances)

A 6m wide fire trail has been identified along the southern and western boundaries of the site, within the NP. This fire trail has been identified in the North Bonville DCP held by Council, as well as the Bongil Bongil NP Fire Management Strategy. As this fire trail is subject to formal management regimes it will be used as part of the *required* APZ for the development site.

As mentioned earlier, the NP to the west of the property has undergone disturbance in association with past hardwood plantation operations and grazing. The natural structure associated with dry sclerophyll forests has been influenced by the previous disturbance to the effect that the canopy is open, creating a woodland-type structure, and the introduction of Broad Leaf Paspalum has resulted in the gradual elimination of a shrubby stratum. The NPWS (Martin Smith pers. comm. 14/12/08) advises that plantation and farming operations have ceased and the area is subject to ongoing rehabilitation/regeneration.

The finger of forested wetland occupying the east-west watercourse at the north-east of the development site is planned to be managed as an APZ. This management regime will render most of the watercourse being a non-hazard. This proposed vegetation management will be undertaken in close



consultation with the project Ecologist, James Warren and Associates. Therefore, the bushfire source will be the property boundaries rather than the existing tree line along the watercourse.

There are not considered to be any other past or future disturbance factors affecting the bushfire hazard vegetation impacting on the site.

3.0 SLOPE ASSESSMENT

A slope assessment was carried out to include a distance of 100 metres from the subject parcel boundaries, in all directions. Photographs were taken to verify my assessment. Slope was determined using a clinometer.

The gradient that would most significantly influence fire behaviour varied, and is summarised as follows:

North	<i>Managed lands</i>	N/A
East	<i>Forested wetlands</i>	0° – level ground
South	<i>Forested wetlands, and Forest</i>	0° – level ground >10° – 15° downslope
West	<i>Forested wetlands, and Forest, and Forest</i>	0° – level ground >10° – 15° downslope <5° upslope

4.0 SIGNIFICANT ENVIRONMENTAL FEATURES

The following environmental features are to be considered and assessed by the applicant in an Environmental Assessment:

- riparian corridors
- SEPP 14 – Coastal Wetlands
- SEPP 26 Littoral rainforests
- SEPP 44 – Koala Habitat
- areas of geological interest
- environmental protection zones or steep lands (>18°)
- land slip or flood prone areas
- National parks estate or various other reserves

5.0 THREATENED SPECIES, POPULATIONS, COMMUNITIES, HABITAT

These matters are to be considered and assessed by the applicant in an Environmental Assessment.



6.0 ABORIGINAL HERITAGE

Aboriginal heritage issues are to be considered and assessed by the applicant in an Environmental Assessment.

7.0 BUSHFIRE ASSESSMENT MATTERS

7.1 Asset Protection Zones / Separation Distances

Table 1 below sets out the *Performance Criteria* and *Acceptable Solutions* provided in *PBP-2006*, and the extent to which the proposal complies with the *Acceptable Solution*.

Table 1

PBP-2006 Performance Criteria	PBP-2006 Acceptable Solution	Complies / Does Not Comply
(1.1) radiant heat levels at any point on a proposed building will not exceed 29 kW/m ²	(1.1.1) an APZ is provided in accordance with the relevant tables/ figures in Appendix 2 <i>PBP-2006</i> . (1.1.2) the APZ is wholly within the boundaries of the development site. Exceptional circumstances may apply (see section 3.3 of <i>PBP-2006</i>).	Complies Complies
(1.2) APZs are managed and maintained to prevent the spread of a fire towards the building.	(1.2.1) in accordance with the requirements of Standards for Asset Protection Zones (RFS, 2005) <i>Note: A Monitoring and Fuel Management Program should be required as a condition of development consent.</i>	Complies
(1.3) APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is negated	(1.3.1) the APZ is located on lands with a slope less than 18°.	Complies

Below is Table A2.5 of *PBP-2006* which provides the *required* separation distance/APZ for subdivision developments. All of the *required* APZs (circled) are able to be accommodated within the boundaries of the subject property. Where the *required* APZs adjoin an existing fire trail within the Bongil Bongil NP, the fire trail will be incorporated into the *required* APZ.

Table A2.5 Minimum Specifications for Asset Protection Zones (m) for Residential and Rural Residential Subdivision Purposes (for Class 1 and 2 buildings) in FDI 80 Fire Areas (<29kW/m ²)					
Vegetation Formation	Effective Slopes				
	Upslope/Flat	>0°-5°	>5°-10°	>10°-15°	>15°-18°
Rainforests	10	10	15	15	20
Forests	20	20	30	40	45
Woodland	10	15	15	20	25
Plantations (Pine)	15	20	25	35	40
Tall Heath (Scrub)	15	15	20	20	20
Short Heath (Open Scrub)	10	10	10	15	15
Freshwater Wetlands	10	10	10	15	15
Forested Wetlands	15	20	20	30	35
Semi-Arid (Woodland)	10	10	10	10	15
Arid Shrubland	10	10	10	15	15

Figure 13: extract from *PBP-2006* (Table A2.5)



In relation to *Acceptable Solution 1.1.1*, the APZs / separation distances provided around the northern precinct of the proposed subdivision comply with those APZs *required* for *SFPP* developments. As discussed at section 1.2 of this Report, this portion of the development was originally designed to accommodate a SEPP Seniors Living development.

In relation to *Acceptable Solution 1.1.2*, the proposal satisfies the exceptional circumstances provisions of **PBP-2006**. The fire trails in the NP have been identified on the Fire Management Strategy for the NP, as well as on the Council's DCP for the locality. The fire trail has been identified as 6m wide on the DCP, and this 6m will be included in the *required* APZ.

In relation to *Acceptable Solution 1.2.1*, attached as Appendix A of this Report is a document incorporating the *Standards for Asset Protection Zones* (NSW 2005) and Appendix 5 of **PBP-2006** (*Bush Fire Provisions - Landscaping and Property Maintenance*).

- ✓ Therefore, having met the *Acceptable Solutions*, it is determined that the separation distance / APZs required by **PBP-2006** have been achieved.

7.2 Water Supplies

Table 2 below sets out the relevant *Performance Criteria* and *Acceptable Solutions* provided in **PBP-2006**, and the extent to which the proposal complies with the *Acceptable Solution*.

Table 2

PBP-2006 Performance Criteria	PBP-2006 Acceptable Solution	Complies / Does Not Comply
(2.1) Water supplies are easily accessible and located at regular intervals.	(2.1.1) Reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads.	Complies
	(2.1.2) Fire hydrant spacing, sizing and pressures comply with AS2419.1-2005. Where this cannot be met, the RFS will require a test report of the water pressures anticipated by the relevant water supply authority. In such cases, the location, number and sizing of hydrants shall be determined using fire engineering principles.	Complies
	(2.1.3) Hydrants are not located within any road carriageway.	Complies
	(2.1.4) All above ground water and gas service pipes external to the building are metal, including and up to any taps.	Complies
	(2.1.5) The provisions of parking on public roads are met.	Complies

In relation to *Acceptable Solution 2.1.5*, the parking provisions are covered at section 7.3 of this Report (below).



In addition, the client advises that the sediment retention ponds to be located along the eastern perimeter of the development will be able to be used as an additional static water supply in the event of a major bushfire emergency event. This does not negate the need to comply with the reticulated supply provisions, but rather is in addition to the requirements.

- ✓ Therefore, having met the *Acceptable Solutions*, it is determined that the supply of water provisions of *PBP-2006* have been complied with.

7.3 Capacity of Public Roads

Table 3 below sets out the relevant *Performance Criteria* and *Acceptable Solutions* provided in *PBP-2006*, and the extent to which the proposal complies with the *Acceptable Solution*.

Table 3

PBP-2006 Performance Criteria	PBP-2006 Acceptable Solution	Complies / Does Not Comply
(3.1) Firefighters are provided with safe all weather access to structures (thus allowing more efficient use of firefighting resources).	(3.1.1) Public roads are two-wheel drive, all weather roads.	Complies
(3.2) Public road widths and design that allow safe access for firefighters while residents are evacuating an area.	(3.2.1) Urban perimeter roads are two-way, that is, at least two traffic lane widths (carriageway 8m minimum kerb to kerb), allowing traffic to pass in opposite directions. Non-perimeter roads comply with Table 4.1 – Road widths for Category 1 Tanker (Medium Rigid Vehicle).	Complies
	(3.2.2) The perimeter road is linked to the internal road system at an interval of no greater than 500m in urban areas.	Complies
	(3.2.3) Traffic management devices are constructed to facilitate access by emergency services vehicles.	Complies
	(3.2.4) Public roads have a cross fall not exceeding 3°.	Complies
	(3.2.5) All roads are through-roads. Dead-end roads are not recommended, but if unavoidable, dead-ends are not more than 200m in length, incorporate a minimum 12m outer radius turning circle, and are clearly sign posted as a dead-end and direct traffic away from the hazard.	Complies
	(3.2.6) Curves of roads (other than perimeter roads) are a minimum inner radius of 6m and minimal in number, to allow for rapid access and egress.	Complies
	(3.2.7) The minimum distance between inner and outer curves is 6m.	Complies



	<p>(3.2.8) Maximum grades for sealed roads do not exceed 15° and an average grade of not more than 10° or other gradient specified by road design standards, whichever is the lesser gradient.</p> <p>(3.2.9) There is a minimum vertical clearance to a height of 4m above the road at all times.</p>	<p>Complies</p> <p>Complies</p>
(3.3) The capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles.	(3.3.1) The capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles (approximately 15 tonnes for areas with reticulated water, 28 tonnes or 9 tonnes per axle for all other areas). Bridges clearly indicate load rating.	Complies
(3.4) Roads that are clearly sign-posted (with easily distinguishable names) and buildings/properties that are clearly numbered.	<p>(3.4.1) Public roads greater than 6.5m wide to locate hydrants outside of parking reserves to ensure accessibility to reticulated water for fire suppression.</p> <p>(3.4.2) Public roads between 6.5m and 8m wide are “No Parking” on one side with the services (hydrants) located on this side to ensure accessibility to reticulated water for fire suppression.</p>	<p>Complies</p> <p>Complies</p>
(3.5) There is clear access to reticulated water supply.	<p>(3.5.1) Public roads up to 6.5m wide provide parking within parking bays and locate services outside of the parking bays to ensure accessibility to reticulated water for fire suppression.</p> <p>(3.5.2) One-way only public access roads are no less than 3.5m wide and provide parking within parking bays and locate services outside of the parking bays to ensure accessibility to reticulated water for fire suppression.</p>	<p>Complies</p> <p>Complies</p>
(3.6) Parking does not obstruct the minimum paved width.	<p>(3.6.1) Parking bays are a minimum of 2.6m wide from kerb edge to road pavement. No services or hydrants are located within the parking bays.</p> <p>(3.6.2) Public roads directly interfacing the bush fire hazard vegetation provide roll top kerbing to the hazard side of the road.</p>	<p>Complies</p> <p>Complies</p>

All of the *Acceptable Solutions* above are able to be incorporated into the design of the public road network for the proposed subdivision.

✓ Therefore, having met the *Acceptable Solutions*, it is determined that the public road provisions of *PBP-2006* have been complied with.



7.4 Access and Egress

Table 4 below sets out the relevant *Performance Criteria* and *Acceptable Solutions* provided in *PBP-2006*, and the extent to which the proposal complies with the *Acceptable Solution*.

Table 4

PBP-2006 Performance Criteria	PBP-2006 Acceptable Solution	Complies / Does Not Comply
(4.1) Access to properties is provided in recognition of the risk to fire fighters and/or evacuating occupants.	(4.1.1) At least one alternative property access road is provided for individual dwellings (or groups of dwellings) that are located more than 200m from a public through-road.	Not applicable
(4.2) The capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles.	(4.2.1) Bridges clearly indicate load rating and pavements and bridges are capable of carrying a load of 15 tonnes.	Not applicable
(4.3) All weather access is provided.	(4.3.1) Roads do not traverse a wetland or other land potentially subject to periodic inundation (other than a flood or storm surge).	Not applicable
(4.4) Road widths and design enable safe access for vehicles	(4.4.1) A minimum carriageway width of 4m for rural-residential areas, rural landholdings or urban areas with a distance of greater than 70m from the nearest hydrant point to the most external part of a proposed building (or footprint). <i>No specific access requirements apply in a urban area where a 70 metres unobstructed path can be demonstrated between the most distant external part of the proposed dwelling and the nearest part of the public access road (where the road speed limit is not greater than 70kph) that supports the operational use of emergency firefighting vehicles (i.e. a hydrant or water supply).</i>	Not applicable
	(4.4.2) In forest, woodland and heath situations, rural property access roads have passing bays every 200m that are 20m long by 2m wide, making a minimum trafficable width of 6m at the passing bay.	Not applicable
	(4.4.3) A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches.	Not applicable
	(4.4.4) Internal roads for rural properties provide a loop road around any dwelling or incorporate a turning circle with a minimum 12m outer radius.	Not applicable
	(4.4.5) Curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress.	Not applicable
	(4.4.6) The minimum distance between inner and outer curves is 6m.	Not applicable
	(4.4.7) The cross-fall is not more than 10°.	Not applicable



	<p>(4.4.8) Maximum grades for sealed roads do not exceed 15° and not more than 10° for unsealed roads.</p> <p><i>Note: Some short constrictions in the access may be accepted where they are not less than the minimum (3.5m), extend for no more than 30m and where the obstruction cannot be reasonably avoided or removed. The gradients applicable to public roads also apply to community style development property access roads in addition to the above.</i></p> <p>(4.4.9) Access to a development comprising more than 3 dwellings have formalised access by dedication of a road and not by right of way.</p>	<p>Not applicable</p> <p>Not applicable</p>
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PBP-2006 (s.4.1.3) provides the following concessions for urban subdivision developments:

No specific access requirements apply in a urban area where a 70 metres unobstructed path can be demonstrated between the most distant external part of the proposed dwelling and the nearest part of the public access road (where the road speed limit is not greater than 70kph) that supports the operational use of emergency firefighting vehicles (i.e. a hydrant or water supply).

From the details in Figure 3 provided by the proponent it appears that the lot layout proposal meets the concession provided in **PBP-2006**. Therefore no specific provisions apply in relation to property access roads.

- ✓ Therefore, it is determined that the property access road provisions of **PBP-2006** are not applicable to this development proposal.

7.5 Fire Trails

Table 5 below sets out the relevant *Performance Criteria* and *Acceptable Solutions* provided in **PBP-2006**, and the extent to which the proposal complies with the *Acceptable Solution*.

Table 5

PBP-2006 Performance Criteria	PBP-2006 Acceptable Solution	Complies / Does Not Comply
(5.1) The width and design of the fire trails enables safe and ready access for firefighting vehicles	(5.1.1) A minimum carriageway width of 4m with an additional 1m wide strip on each side of the trail (clear of bushes and long grass) is provided.	Not applicable
	(5.1.2) The trail is a maximum grade of 15° if sealed and not more than 10° if unsealed.	Not applicable
	(5.1.3) A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches is provided.	Not applicable
	(5.1.4) The cross-fall of the trail is not more than 10°.	Not applicable



	<p>(5.1.5) The trail has the capacity for passing by:</p> <ul style="list-style-type: none"> - reversing bays using the access to properties to reverse fire tankers, which are 6m wide and 8m deep to any gates, with an inner minimum turning radius of 6m and outer minimum radius of 12m; and/or - a passing bay every 200m, 20m long by 3m wide, making a minimum trafficable width of 7m at the passing bay. <p><i>Note: Some short constrictions in the access may be accepted where they are not less than the minimum (3.5m) and extend for no more than 30m and where obstruction cannot be reasonably avoided or removed.</i></p>	Not applicable
(5.2) Fire trails are trafficable under all weather conditions. Where the fire trail joins a public road, access shall be controlled to prevent use by non authorised persons.	<p>(5.2.1) The fire trail is accessible to firefighters and maintained in a serviceable condition by the owner of the land.</p> <p>(5.2.2) Appropriate drainage and erosion controls are provided.</p> <p>(5.2.3) The fire trail system is connected to the property access road and/or to the through road system at frequent intervals of 200m or less.</p> <p>(5.2.4) Fire trails do not traverse a wetlands or other land potentially subject to periodic inundation (other than a flood or storm surge).</p> <p>(5.2.5) Gates for fire trails are provided and locked with a key/lock system authorized by the local RFS.</p>	<p>Not applicable</p> <p>Not applicable</p> <p>Not applicable</p> <p>Not applicable</p> <p>Not applicable</p>
(5.3) Fire trails designed to prevent weed infestation, soil erosion and other land degradation.	<p>(5.3.1) Fire trail design does not adversely impact on natural hydrological flows.</p> <p>(5.3.2) Fire trail design acts as an effective barrier to the spread of weeds and nutrients.</p> <p>(5.3.3) Fire trail construction does not expose acid-sulphate soils.</p>	<p>Not applicable</p> <p>Not applicable</p> <p>Not applicable</p>

As stated at 7.3 above, the proposed subdivision is to be provided with a perimeter road, therefore the fire trail provisions are superfluous.

However, the NPWS have indicated (meeting held at Coffs Harbour 13/1/2010) that access from the proposed development to the existing fire trails should be provided. It is proposed to provide fire appliance access from the perimeter road to the fire trail at locations along the western and southern boundaries of the development site. The vehicular access gates are to be of a similar design and performance as the perimeter fencing (Koala friendly but restricting domestic pet access) but be lockable.

Refer to Figure 3 earlier in this Report for the locations of the proposed fire trails and access points.



- ✓ Therefore, it is determined that the fire trail provisions of *PBP-2006* are not applicable to this development proposal.

7.6 Bushfire Maintenance Plans

Landscaping of the individual allotments will be required to comply with the principles of Appendix 5 of *PBP-2006*, and "*Standards for Asset Protection Zones*" published by the NSW Rural Fire Service (refer to Appendix A of this Report), once an occupation certificate is issued for each dwelling constructed.

Vegetation management over vacant allotments and the residue of the development site should be carried out, by the property owner, in accordance with the principles for Outer Protection Areas to ensure that bushfire hazard vegetation does not regenerate on the subject lands. Generally this will require the grass to be kept short and green, tree canopies to be maintained <30% foliage cover, and 'crown lifting' to at least 2m above ground level.

These standards for APZs have been reproduced and attached as Appendix A of this Report.

This vegetation management regime should be monitored by the Consent Authority on a regular basis to ensure the standards required for APZ are maintained.

7.7 Building Construction Standards

As discussed at section 7.1 above, the *required* APZs can be provided between the proposed building line and the unmanaged vegetation. These minimum APZs are based on Level 3 construction requirements, as specified in *AS3959-1999 Construction of buildings in bushfire-prone areas*. Attached as Appendix B of this Report is a summary of the construction requirements provided in *AS3959*.

Where a lower Level of construction is planned, the required APZ will increase. The distances for the various Levels of construction are summarised in the following Figure and plan.

Vegetation Formation (class)	Categories of Bush Fire Attack (AS 3959-1999)				
	Flame Zone	Level 3 (Extreme)	Level 2 (High)	Level 1 (Medium)	No requirement
	Distance (m) of the site from the predominant vegetation class				
All upslopes and flat land (0 degrees)					
Forests (wet and dry sclerophyll)	<17	17-<25	25-<35	35 - 100	>100
Woodlands	<9	9-<14	14-<20	20 - 100	>100
Tall heath	<13	13-<19	19-<27	27 - 100	>100
Short heath	<9	9-<13	13-<19	19 - 50	>50
Low woodland (semi-arid)	<7	7-<10	10-<15	15 - 50	>50
Arid shrublands	<8	8-<12	12-<18	18 - 50	>50
Forested wetlands	<13	13-<19	19-<28	28 - 50	>100
Freshwater wetlands	<9	9-<13	13-<19	19 - 50	>50
Rainforest	<7	7-<11	11-<16	16 - 50	>50
Downslope > 0 to 5 degrees					
Forests (wet and dry sclerophyll)	<22	22-<31	31-<42	42 - 100	>100
Woodlands	<12	12-<17	17-<25	25 - 100	>100
Tall heath	<15	15-<22	22-<31	31 - 100	>100
Short heath	<10	10-<15	15-<22	22 - 50	>50
Low woodland (semi-arid)	<8	8-<11	11-<17	17 - 50	>50
Arid shrublands	<9	9-<14	14-<21	21 - 50	>50
Forested wetlands	<17	17-<24	24-<34	34 - 100	>100
Freshwater wetlands	<10	10-<15	15-<22	22 - 50	>50
Rainforest	<9	9-<14	14-<20	20 - 50	>50
Downslope > 5 to 10 degrees					
Forests (wet and dry sclerophyll)	<28	28-<38	38-<52	52 - 100	>100
Woodlands	<15	15-<22	22-<32	32 - 100	>100
Tall heath	<17	17-<24	24-<35	35 - 100	>100
Short heath	<10	10-<17	17-<25	25 - 50	>50
Low woodland (semi-arid)	<9	9-<14	14-<20	20 - 50	>50
Arid shrublands	<10	10-<16	16-<24	24 - 50	>50
Forested wetlands	<20	20-<31	31-<42	42 - 100	>100
Freshwater wetlands	<10	10-<17	17-<25	25 - 50	>50
Rainforest	<12	12-<18	18-<26	26 - 50	>50
Downslope > 10 to 15 degrees					
Forests (wet and dry sclerophyll)	<38	38-<47	47-<63	63 - 100	>100
Woodlands	<19	19-<28	28-<40	40 - 100	>100
Tall heath	<19	19-<28	28-<39	39 - 100	>100
Short heath	<13	13-<19	19-<28	28 - 50	>50
Low woodland (semi-arid)	<10	10-<17	17-<25	25 - 50	>50
Arid shrublands	<12	12-<18	18-<27	27 - 50	>50
Forested wetlands	<29	29-<39	39-<52	52 - 100	>100
Freshwater wetlands	<13	13-<19	19-<28	28 - 50	>50
Rainforest	<15	15-<23	23-<33	33 - 50	>50

Figure 14: extract from Table A3.4 of PBP-2006

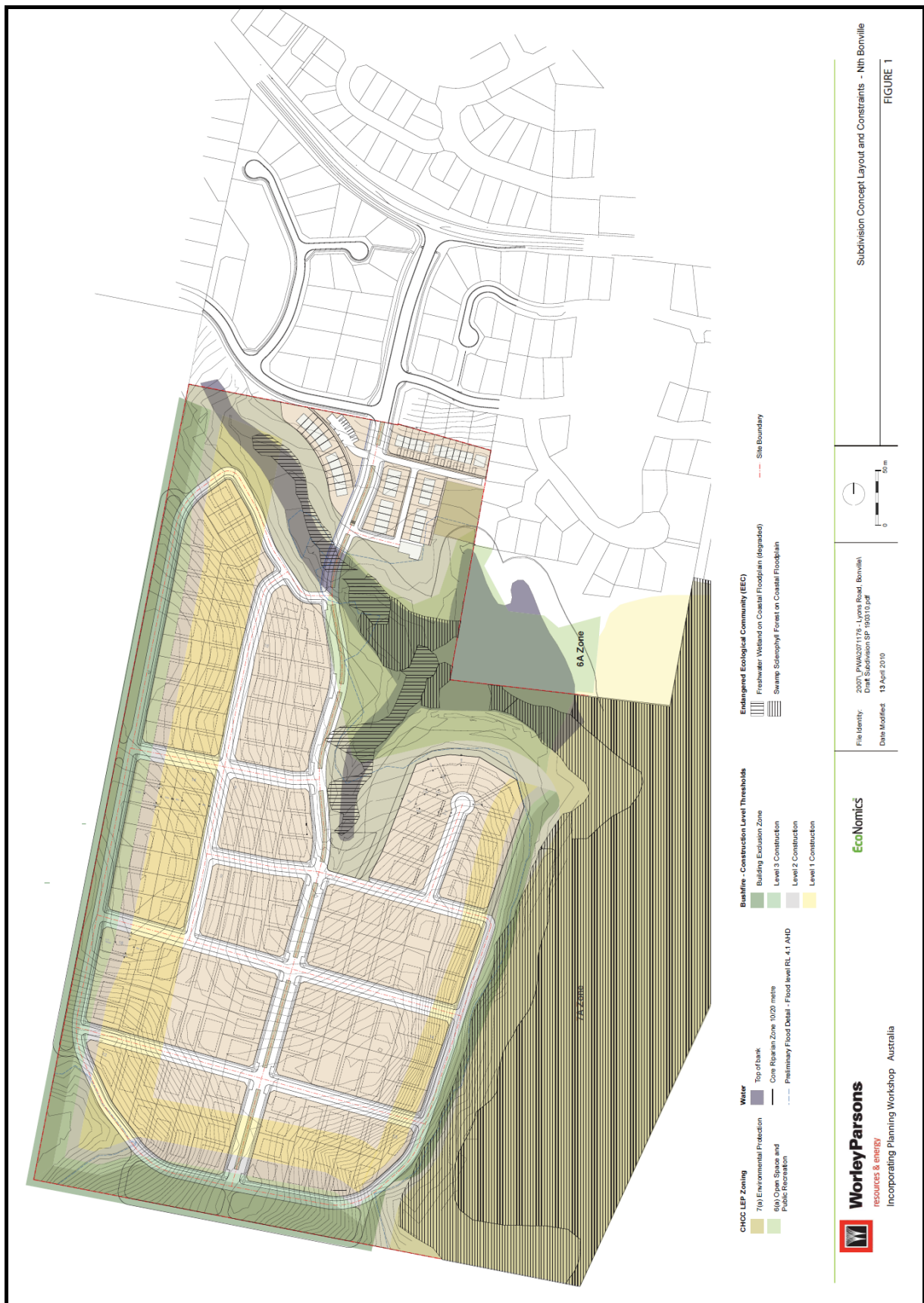


Figure 15: plan showing APZ and construction Level thresholds (Worley Parsons 2010)



7.8 Additional Bushfire Protection Measures

In addition to the bushfire protection measures discussed above, the following Table identifies the *PBP-2006 Performance Criteria* and *Acceptable Solution* for gas and electricity supplies, together with an assessment of the proposal's compliance.

Table 6

PBP-2006 Performance Criteria	PBP-2006 Acceptable Solution	Complies / Does Not Comply
<p>(6.1) Electricity Services</p> <ul style="list-style-type: none"> • location of electricity services limits the possibility of ignition of surrounding bushland or the fabric of buildings • regular inspection of lines is undertaken to ensure they are not fouled by branches. 	<p>(6.1.1) Where practicable, electrical transmission lines are underground.</p> <p>Where overhead electrical transmission lines are proposed:</p> <ul style="list-style-type: none"> - lines are installed with short pole spacing (30m), unless crossing gullies, gorges or riparian areas; and - no part of a tree is closer to a power line than the distance set out in accordance with the specifications in 'Vegetation Safety Clearances' issued by Energy Australia (NS179, April 2002). 	Complies
<p>(6.2) Gas services</p> <ul style="list-style-type: none"> • location of gas services will not lead to ignition of surrounding bushland or the fabric of buildings 	<p>(6.2.1) Reticulated or bottled gas is installed and maintained in accordance with AS 1596 and the requirements of relevant authorities. Metal piping is to be used.</p> <p>(6.2.2) All fixed gas cylinders are kept clear of all flammable materials to a distance of 10m and shielded on the hazard side of the installation.</p> <p>(6.2.3) If gas cylinders need to be kept close to the building, the release valves are directed away from the building and at least 2m away from any combustible material, so that they do not act as a catalyst to combustion. Connections to and from gas cylinders are metal.</p> <p>(6.2.4) Polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not used.</p>	<p>Not applicable (see note)</p> <p>Not applicable (see note)</p> <p>Not applicable (see note)</p> <p>Not applicable (see note)</p>

In relation to *Acceptable Solution 6.1.1*, the electricity supply services the proposed subdivision will be from Lyons Road. No transmission lines will be provided through any forest or woodland vegetation. Therefore the transmission lines may be provided above ground where the pole spacing and vegetation clearances are being maintained in accordance with "Vegetation Management Plan" (issued by Country Energy (2006), - reproduced as [Appendix C](#) of this Report).

In relation to *Acceptable Solutions (6.2.1) – (6.2.4)*, the installation of LPG services to future dwellings should be addressed at DA stage for the proposed structures on an individual basis.

Apart from the above matters, no other additional bushfire protection measures are considered necessary for this proposal.



8.0 SUMMARY / CONCLUSION / RECOMMENDATION

The proposal is a large urban subdivision development on land that is currently used for cattle grazing. The majority of the property is paddock, and it is on the paddock sections of the property that the subdivision development will be undertaken – no forest will need to be cleared to undertake the proposed development.

The development site is adjacent to the Bongil Bongil National Park on its western and southern boundary. The eastern perimeter of the proposed subdivision adjoins forested wetland located within the boundaries of the subject property.

All of the relevant *Acceptable Solutions* of **PBP-2006** relating to urban subdivisions have been addressed and complied with.

Some specific recommendations are provided below in an attempt to ensure appropriate bushfire protection measures are maintained:

- SR1 The *Acceptable Solutions* of **PBP-2006** in relation to road widths, road grades, water supply locations and pressures, and parking provisions are to be incorporated into the subdivision layout and construction.
- SR2 Landscaping of the individual allotments will be required to comply with the principles of Appendix A of this Report, once an occupation certificate is issued for each dwelling constructed.

Vegetation management over vacant allotments should be carried out by the property owner, in accordance with the principles for Outer Protection Areas of Appendix A of this Report.

This vegetation management plan should be monitored by the Consent Authority on a regular basis to ensure the standards required for APZ are maintained.
- SR3 The construction requirements of future dwellings are to comply with the provisions of *AS3959 Construction of buildings in bushfire-prone areas* as provided by the Table on page 25, and plan on page 26, of this Report.

Therefore, having satisfied the *Intent* and *Acceptable Solutions* of the **PBP-2006**, it is my recommendation that the proposal should be granted approval.

Steve Ellis

✓ Graduate Diploma in Design For Bushfire Prone Areas

✓ BPAD-A Certified Business and Practitioner – Fire Protection Association Australia “**Bushfire Planning and Design**” Certification Program



9.0 REFERENCES

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10.0 APPENDICES

- APPENDIX A - Standards for APZs (RFS 2005) and Appendix 5 of *PBP-2006*.
- APPENDIX B - Summary of construction requirements of *AS3959 Construction of buildings in bushfire-prone areas*.
- APPENDIX C - *Vegetation Management Plan* issued by Country Energy (2006)

Standards for Asset Protection Zones

INTRODUCTION

For thousands of years bushfires have been a natural part of the Australian landscape. They are inevitable and essential, as many Australian plants and animals have adapted to fire as part of their life cycle.

In recent years developments in bushland areas have increased the risk of bushfires harming people and their homes and property. But landowners can significantly reduce the impact of bushfires on their property by identifying and minimising bushfire hazards. There are a number of ways to reduce the level of hazard to your property, but one of the most important is the creation and maintenance of an Asset Protection Zone (APZ).

A well located and maintained APZ should be used in conjunction with other preparations such as good property maintenance, appropriate building materials and developing a family action plan.

WHAT IS AN ASSET PROTECTION ZONE?

An Asset Protection Zone (APZ) is a fuel reduced area surrounding a built asset or structure. This can include any residential building or major building such as farm and machinery sheds, or industrial, commercial or heritage buildings.

An APZ provides:

- a buffer zone between a bushfire hazard and an asset;
- an area of reduced bushfire fuel that allows suppression of fire;
- an area from which back-burning may be conducted; and
- an area which allows emergency services access and provides a relatively safe area for firefighters and home owners to defend their property.

Potential bushfire fuels should be minimised within an APZ. This is so that the vegetation within the planned zone does not provide a path for the transfer of fire to the asset either from the ground level or through the tree canopy.

WHAT WILL THE APZ DO?

An APZ, if designed correctly and maintained regularly, will reduce the risk of:

- direct flame contact on the asset;
- damage to the built asset from intense radiant heat; and
- ember attack on the asset.

WHERE SHOULD I PUT AN APZ?

An APZ is located between an asset and a bushfire hazard.

The APZ should be located wholly within your land. You cannot undertake any clearing of vegetation on a neighbour's property, including National Park estate, Crown land or land under the management of your local council, unless you have written approval.

If you believe that the land adjacent to your property is a bushfire hazard and should be part of an APZ, you can have the matter investigated by contacting the NSW Rural Fire Service (RFS).

There are six steps to creating and maintaining an APZ. These are:

1. Determine if an APZ is required;
2. Determine what approvals are required for constructing your APZ;
3. Determine the APZ width required;
4. Determine what hazard reduction method is required to reduce bushfire fuel in your APZ;
5. Take measures to prevent soil erosion in your APZ; and
6. Landscape and regularly monitor in your APZ for fuel regrowth.

SPECIFICATIONS OF APZs

Inner Protection Area (IPA) and **Outer Protection Area (OPA)** for forest and woodland vegetation. The IPA is critical to providing a defensible space and managing heat intensities at the building surface. The OPA serves to reduce the potential length of flames by slowing the ROS, filtering embers and reducing the likelihood of crown fire. The IPA may be increased at the expense of OPAs.

For other vegetation types (such as heaths, rainforests, arid shrublands and semi-arid woodlands), it is not feasible to distinguish between IPAs and OPAs and therefore all such APZs should be managed as IPAs.

An IPA should provide a tree canopy cover of less than 15% and should be located greater than 2 metres from any part of the roofline of a dwelling. Garden beds of flammable shrubs are not to be located under trees and should be no closer than 10 metres from an exposed window or door. Trees should have lower limbs removed up to a height of 2 metres above the ground.

An OPA should provide a tree canopy cover of less than 30% and should have understorey managed (mowed) to treat all shrubs and grasses on an annual basis in advance of the fire season (usually September).

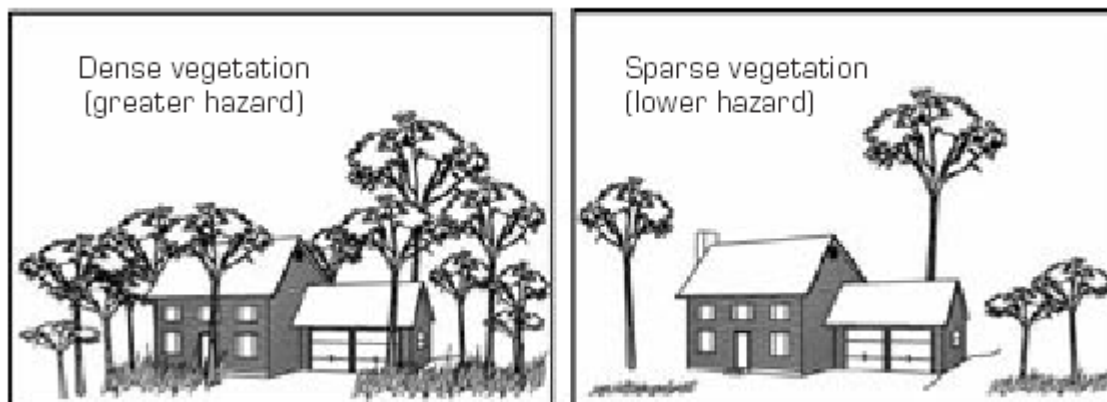
STEP 1. DETERMINE IF AN APZ IS REQUIRED

Recognising that a bushfire hazard exists is the first step in developing an APZ for your property.

If you have vegetation close to your asset and you live in a bushfire prone or high risk area, you should consider creating and maintaining an APZ.

Generally, the more flammable and dense the vegetation, the greater the hazard will be. However, the hazard potential is also influenced by factors such as slope.

- A large area of continuous vegetation on sloping land may increase the potential bushfire hazard.
- The amount of vegetation around a house will influence the intensity and severity of a bushfire.
- The higher the available fuel the more intense a fire will be.



Isolated areas of vegetation are generally not a bushfire hazard, as they are not large enough to produce fire of an intensity that will threaten dwellings. This includes:

- bushland areas of less than one hectare that are isolated from large bushland areas; and
- narrow strips of vegetation along road and river corridors.

If you are not sure if there is a bushfire hazard in or around your property, contact your local NSW Rural Fire Service Fire Control Centre or your local council for advice.

STEP 2. DETERMINE WHAT APPROVALS ARE REQUIRED FOR CONSTRUCTING YOUR APZ

If you intend to undertake bushfire hazard reduction works to create or maintain an APZ you must gain the written consent of the landowner.

Subdivided land or construction of a new dwelling

If you are constructing an APZ for a new dwelling you will need to comply with the requirements in *Planning for Bushfire Protection*. Any approvals required will have to be obtained as part of the Development Application process.

Existing asset

If you wish to create or maintain an APZ for an existing structure you may need to obtain an environmental approval. The RFS offers a free environmental assessment and certificate issuing service for essential hazard reduction works. For more information see the RFS document *Application Instructions for a Bushfire Hazard Reduction Certificate* or contact your local RFS Fire Control Centre to determine if you can use this approval process.

Bear in mind that all work undertaken must be consistent with any existing land management agreements (e.g. a conservation agreement, or property vegetation plan) entered into by the property owner.

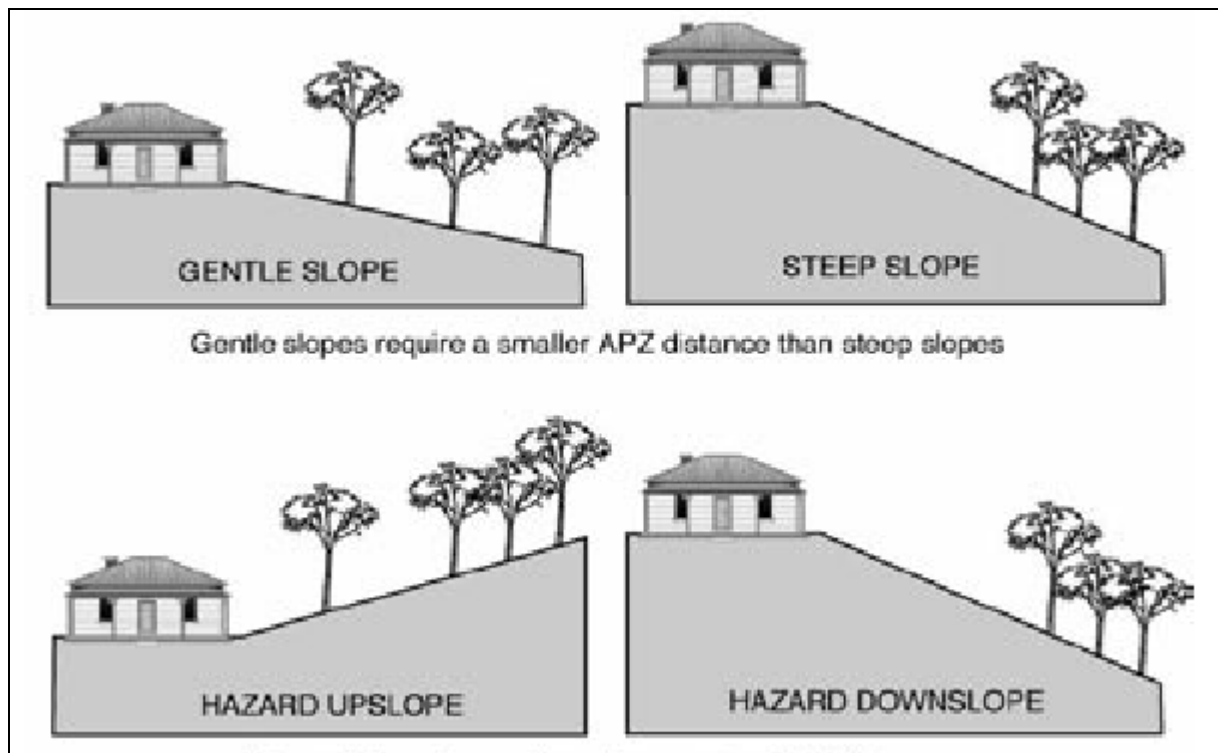
If your current development consent provides for an APZ, you do not need further approvals for works that are consistent with this consent.

If you intend to burn off to reduce fuel levels on your property you may also need to obtain a Fire Permit through the RFS or NSW Fire Brigades. See the RFS document *Before You Light That Fire* for an explanation of when a permit is required.

STEP 3. DETERMINE THE APZ WIDTH

The size of the APZ required around your asset depends on the nature of the asset, the slope of the area, the type and structure of nearby vegetation and whether the vegetation is managed.

Fires burn faster uphill than downhill, so the APZ will need to be larger if the hazard is downslope of the asset.



Different types of vegetation (for example, forests, rainforests, woodlands, grasslands) behave differently during a bushfire. For example, a forest with shrubby understorey is likely to result in a higher intensity fire than a woodland with a grassy understorey and would therefore require a greater APZ width.

A key benefit of an APZ is that it reduces radiant heat and the potential for direct flame contact on homes and other buildings. Residential dwellings require a wider APZ than sheds or stockyards because the dwelling is more likely to be used as a refuge during bushfire.

Subdivided land or construction of a new dwelling

If you are constructing a new asset, the principles of *Planning for Bushfire Protection* should be applied. Your Development Application approval will detail the exact APZ distance required.

Existing asset

If you wish to create an APZ around an existing asset and you require environmental approval, the Bushfire Environmental Assessment Code provides a streamlined assessment process. Your Bushfire Hazard Reduction Certificate (or alternate environmental approval) will specify the maximum APZ width allowed.

For further information on APZ widths see *Planning for Bushfire Protection* or the *Bushfire Environmental Assessment Code* (available on the RFS website), or contact your local RFS Fire Control Centre.

STEP 4. DETERMINE WHAT HAZARD REDUCTION METHOD IS REQUIRED TO REDUCE BUSHFIRE FUEL IN YOUR APZ

The intensity of bushfires can be greatly reduced where there is little to no available fuel for burning. In order to control bushfire fuels you can reduce, remove or change the state of the fuel through several means.

Reduction of fuel does not require removal of all vegetation, which would cause environmental damage. Also, trees and plants can provide you with some bushfire protection from strong winds, intense heat and flying embers (by filtering embers) and changing wind patterns. Some ground cover is also needed to prevent soil erosion.

Fuels can be controlled by:

1. Raking or manual removal of fine fuels

Ground fuels such as fallen leaves, twigs (less than 6 mm in diameter) and bark should be removed on a regular basis. This is fuel that burns quickly and increases the intensity of a fire.

Fine fuels can be removed by hand or with tools such as rakes, hoes and shovels.

2. Mowing or grazing of grass

Grass needs to be kept short and, where possible, green.

3. Removal or pruning of trees, shrubs and understorey

The control of existing vegetation involves both selective fuel reduction (removal, thinning and pruning) and the retention of vegetation.

Prune or remove trees so that you do not have a continuous tree canopy leading from the hazard to the asset. Separate tree crowns by two to five metres. A canopy should not overhang within two to five metres of a dwelling.

Native trees and shrubs should be retained as clumps or islands and should maintain a covering of no more than 20% of the area.

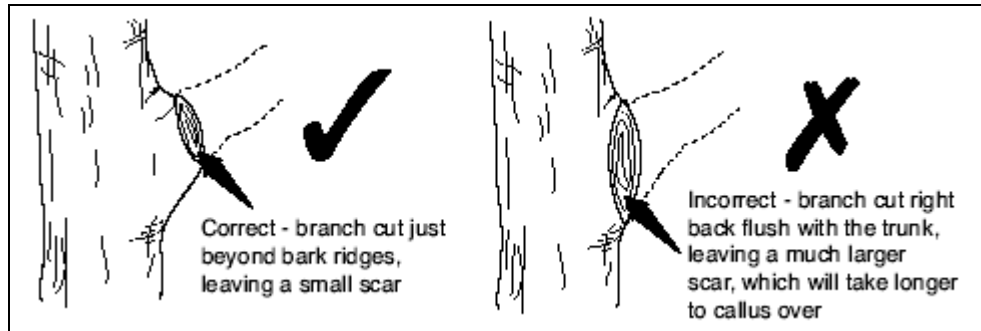
When choosing plants for removal, the following basic rules should be followed:

1. Remove noxious and environmental weeds first. Your local council can provide you with a list of environmental weeds or 'undesirable species'. Alternatively, a list of noxious weeds can be obtained at www.agric.nsw.gov.au/noxweed/;
2. Remove more flammable species such as those with rough, flaky or stringy bark; and
3. Remove or thin understorey plants, trees and shrubs less than three metres in height

The removal of significant native species should be avoided.

Prune in accordance with the following standards:

- Use sharp tools. These will enable clean cuts and will minimise damage to the tree.
- Decide which branches are to be removed before commencing work. Ensure that you maintain a balanced, natural distribution of foliage and branches.
- Remove only what is necessary.
- Cut branches just beyond bark ridges, leaving a small scar.
- Remove smaller branches and deadwood first.



There are three primary methods of pruning trees in APZs:

1. Crown lifting (skirting)

Remove the lowest branches (up to two metres from the ground). Crown lifting may inhibit the transfer of fire between the ground fuel and the tree canopy.

2. Thinning

Remove smaller secondary branches whilst retaining the main structural branches of the tree. Thinning may minimise the intensity of a fire.

3. Selective pruning

Remove branches that are specifically identified as creating a bushfire hazard (such as those overhanging assets or those which create a continuous tree canopy). Selective pruning can be used to prevent direct flame contact between trees and assets.

Your Bushfire Hazard Reduction Certificate or local council may restrict the amount or method of pruning allowed in your APZ.

See the *Australian Standard 4373 (Pruning of Amenity Trees)* for more information on tree pruning.

4. Slashing and trittering

Slashing and trittering are economical methods of fuel reduction for large APZs that have good access. However, these methods may leave large amounts of slashed fuels (grass clippings etc) which, when dry, may become a fire hazard. For slashing or trittering to be effective, the cut material must be removed or allowed to decompose well before summer starts.

If clippings are removed, dispose of them in a green waste bin if available or compost on site (dumping clippings in the bush is illegal and it increases the bushfire hazard on your or your neighbour's property).

Although slashing and trittering are effective in inhibiting the growth of weeds, it is preferable that weeds are completely removed.

Care must be taken not to leave sharp stakes and stumps that may be a safety hazard.

5. Ploughing and grading

Ploughing and grading can produce effective firebreaks. However, in areas where this method is applied, frequent maintenance may be required to minimise the potential for erosion. Loose soil from ploughed or graded ground may erode in steep areas, particularly where there is high rainfall and strong winds.

6. Burning (hazard reduction burning)

Hazard reduction burning is a method of removing ground litter and fine fuels by fire. Hazard reduction burning of vegetation is often used by land management agencies for broad area bushfire control, or to provide a fuel reduced buffer around urban areas.

Any hazard reduction burning, including pile burns must be planned carefully and carried out with extreme caution under correct weather conditions. Otherwise there is a real danger that the fire will become out of control. More bushfires result from escaped burning off work than from any other single cause.

It is YOUR responsibility to contain any fire lit on your property. If the fire escapes your property boundaries you may be liable for the damage it causes.

Hazard reduction burns must therefore be carefully planned to ensure that they are safe, controlled, effective and environmentally sound. There are many factors that need to be considered in a burn plan. These include smoke control, scorch height, frequency of burning and cut off points (or control lines) for the fire. For further information see the RFS document *Standards for Low Intensity Bushfire Hazard Reduction Burning*, or contact your local RFS for advice.

7. Burning (pile burning)

In some cases, where fuel removal is impractical due to the terrain, or where material cannot be disposed of by the normal garbage collection or composted on site, you may use pile burning to dispose of material that has been removed in creating or maintaining an APZ.

For further information on pile burning, see the RFS document *Standards for Pile Burning*.

In areas where smoke regulations control burning in the open, you will need to obtain a Bushfire Hazard Reduction Certificate or written approval from Council for burning. During the bushfire danger period a Fire Permit will also be required. See the RFS document *Before You Light that Fire* for further details.

STEP 5. TAKE MEASURES TO PREVENT SOIL EROSION

While the removal of fuel is necessary to reduce a bushfire hazard, you also need to consider soil stability, particularly on sloping areas.

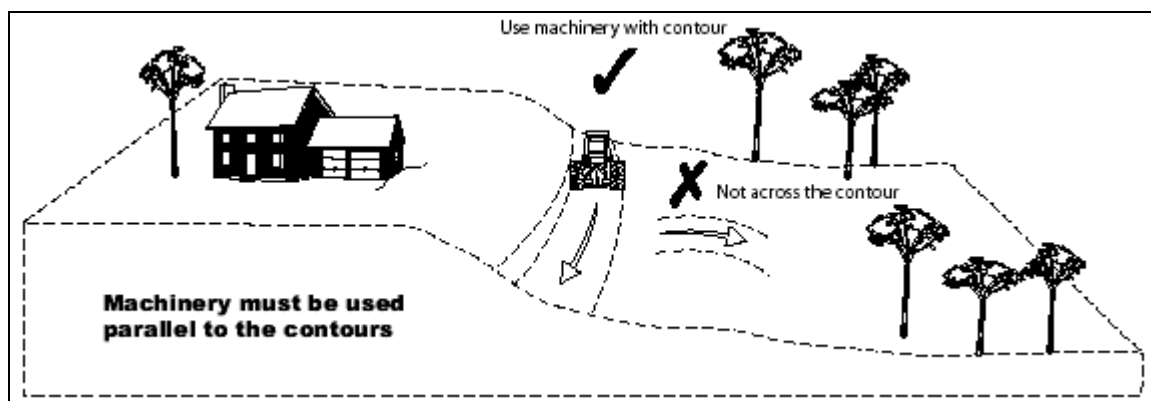
Soil erosion can greatly reduce the quality of your land through:

- loss of top soil, nutrients, vegetation and seeds
- reduced soil structure, stability and quality
- blocking and polluting water courses and drainage lines

A small amount of ground cover can greatly improve soil stability and does not constitute a significant bushfire hazard. Ground cover includes any material which directly covers the soil surface such as vegetation, twigs, leaf litter, clippings or rocks. A permanent ground cover should be established (for example, short grass). This will provide an area that is easy to maintain and prevent soil erosion.

When using mechanical hazard reduction methods, you should retain a ground cover of at least 75% to prevent soil erosion. However, if your area is particularly susceptible to soil erosion, your Hazard Reduction Certificate may require that 90% ground cover be retained.

To reduce the incidence of soil erosion caused by the use of heavy machinery such as ploughs, dozers and graders, machinery must be used parallel to the contours. Vegetation should be allowed to regenerate, but be managed to maintain a low fuel load.



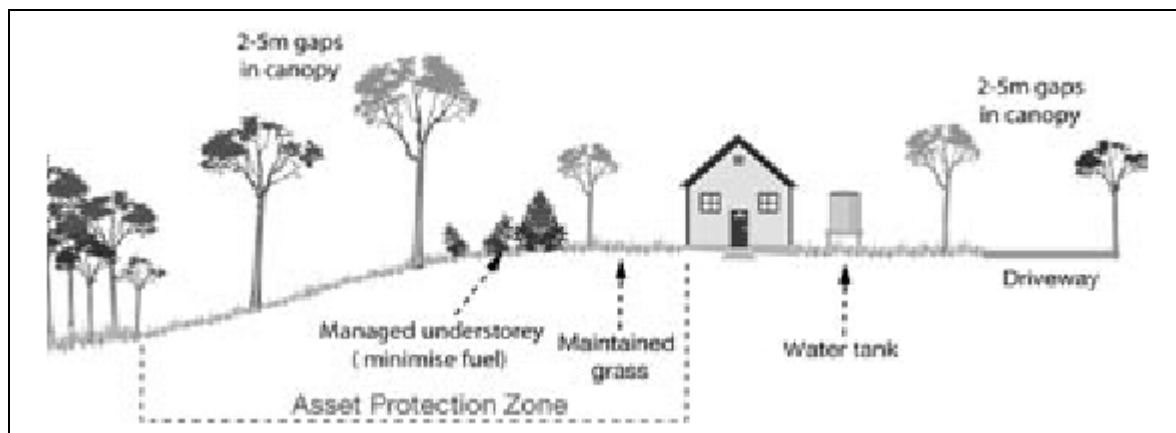
STEP 6. ONGOING MANAGEMENT AND LANDSCAPING

Your home and garden can blend with the natural environment and be landscaped to minimise the impact of fire at the same time. To provide an effective APZ, you need to plan the layout of your garden to include features such as fire resistant plants, radiant heat barriers and windbreaks.

Layout of gardens in an APZ

When creating and maintaining a garden that is part of an APZ you should:

- ensure that vegetation does not provide a continuous path to the house;
- remove all noxious and environmental weeds;
- plant or clear vegetation into clumps rather than continuous rows;
- prune low branches two metres from the ground to prevent a ground fire from spreading into trees;
- locate vegetation far enough away from the asset so that plants will not ignite the asset by direct flame contact or radiant heat emission;
- plant and maintain short green grass around the house as this will slow the fire and reduce fire intensity. Alternatively, provide non-flammable pathways directly around the dwelling;
- ensure that shrubs and other plants do not directly abut the dwelling. Where this does occur, gardens should contain low-flammability plants and non flammable ground cover such as pebbles and crush tile; and
- avoid erecting brush type fencing and planting “pencil pine” type trees next to buildings, as these are highly flammable.



Removal of other materials

Woodpiles, wooden sheds, combustible material, storage areas, large quantities of garden mulch, stacked flammable building materials etc. should be located away from the house. These items should preferably be located in a designated cleared location with no direct contact with bushfire hazard vegetation.

Other protective features

You can also take advantage of existing or proposed protective features such as fire trails, gravel paths, rows of trees, dams, creeks, swimming pools, tennis courts and vegetable gardens as part of the property's APZ.

PLANTS FOR BUSHFIRE PRONE GARDENS

When designing your garden it is important to consider the type of plant species and their flammability as well as their placement and arrangement.

Given the right conditions, all plants will burn. However, some plants are less flammable than others.

Trees with loose, fibrous or stringy bark should be avoided. These trees can easily ignite and encourage the ground fire to spread up to, and then through, the crown of the trees.

Plants that are less flammable have the following features:

- high moisture content
- high levels of salt
- low volatile oil content of leaves
- smooth barks without “ribbons” hanging from branches or trunks; and
- dense crown and elevated branches.

When choosing less flammable plants, be sure not to introduce noxious or environmental weed species into your garden that can cause greater long-term environmental damage.

For further information on appropriate plant species for your locality, contact your local council, plant nurseries or plant society.

If you require information on how to care for fire damaged trees, refer to the Firewise brochure *Trees and Fire Resistance; Regeneration and care of fire damaged trees*.

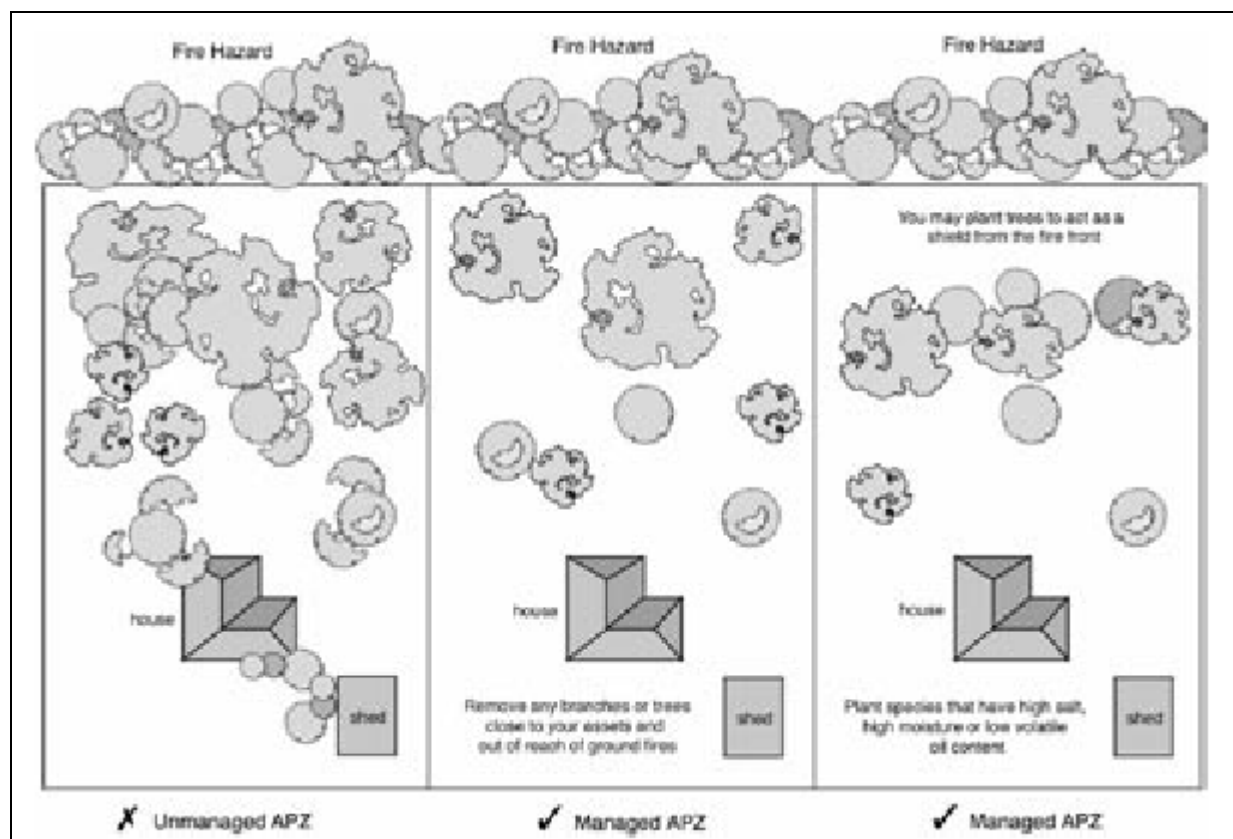
WIND BREAKS

Rows of trees can provide a wind break to trap embers and flying debris that could otherwise reach the house or asset.

You need to be aware of local wind conditions associated with bushfires and position the wind break accordingly. Your local RFS Fire Control Centre can provide you with further advice.

When choosing trees and shrubs, make sure you seek advice as to their maximum height. Their height may vary depending on location of planting and local conditions. As a general rule, plant trees at the same distance away from the asset as their maximum height.

When creating a wind break, remember that the object is to slow the wind and to catch embers rather than trying to block the wind. In trying to block the wind, turbulence is created on both sides of the wind break making fire behaviour erratic.



PBP-2006 Appendix 5

Bushfire Provisions - Landscaping

A5.1 Introduction

Bushfires are a natural and periodic event in the Australian landscape. Many Australian plants and animals have adapted to fire over thousands of years and require fire as part of their life cycle.

However, development adjacent to bushland areas has increased the risk of fire impacting on people and their assets. Fire management needs to strike a balance between the protection of life and property and the maintenance of ecological processes and systems.

In Australia, bushfires are inevitable and an essential aspect of the Australian landscape.

However, the impact on property and life can be reduced with responsible preparation and management of bushfire hazards. This is the responsibility of all land managers, as well as communities and individuals taking responsibility for their own fire safety.

The level of protection for life or whether or not a house or other assets survive a bushfire ultimately depends on the landowner and their level of preparedness against bushfire attack.

The planning system can be used to better effect in protecting human life, property and environmental values from the impacts of bushfire events.

In some cases this will involve land-use planning and development controls, construction standards, APZs and subdivision layout, siting, design and provision of services. It also involves careful and deliberate consideration of the environmental impacts of these and how we can recognise the need to protect our wetlands, rainforests, koala habitat and other biodiversity and cultural values.

However, the best planning can be undone by poor maintenance and lack of forethought when landscaping a development. Therefore house survival ultimately depends on the householder.

Some maintenance also depends upon adjoining neighbours and upon fuel management in adjacent bush land areas by the owners, occupiers or managers of that land. General housekeeping and maintenance of the grounds by the householder is equally important and, in some cases, may even be more so.

Experience from the Canberra 2003 fires suggests that house losses are greatest in the area up to 250 metres from the bush interface. Distances of less than 100 metres are particularly vulnerable to flame contact, radiant heat and ember attack.

Hence it is within this distance that efforts should be made to prepare for the onslaught of major bushfire events.

While other legislation provides the impetus for planning objectives, the RF Act provides the legislative vehicle to achieve bushfire management objectives.

In this appendix consideration will be given to the principles for landscaping and management, and the role of property maintenance during the fire event.

A5.2 Principles of Protection

Bushfire attack takes essentially five forms;

- wind,
- smoke,
- ember,
- radiant heat and
- flame,

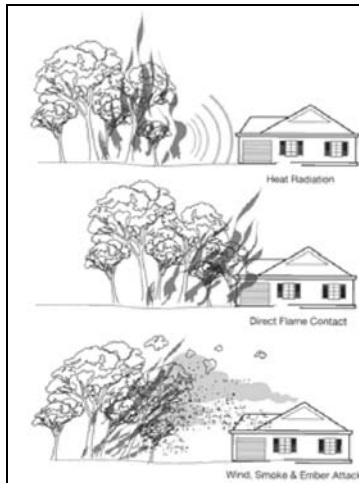
and evidence indicates ember attack is responsible for most bushfire related house fires. Strong winds resulting from severe bushfires will drive embers into vulnerable areas of a building, preheat and dry fuel ahead of a fire, lift roofing and extend flames along a more horizontal plane closer to building elements. Embers can also cause spotting in advance of the bushfire and provide piloted ignition to building elements. To effectively protect a building, strategies must be implemented that separate it

from the hazard and reduce the intensity of bushfires to minimise the impact of ember, wind, flame and heat attack.

While smoke will cause minimal damage to property, it can severely affect the health of residents. Smoke is a significant factor in areas in which aged or disabled persons reside – hospitals and nursing homes - and more so where residents are susceptible to respiratory disorders.

Radiant heat (measured in kW/m^2) can severely impair firefighting operations, the health of residents and the integrity of building elements. Radiant heat in excess of 10kW/m^2 can prevent emergency services personnel assisting residents of SFPP developments.

Flame attack will severely restrict firefighting operations, provide piloted ignition to building elements and threaten the health of residents and their capacity to evacuate the area.



Overall the intention of bushfire protection measures should be to prevent flame contact to a structure, reduce radiant heat to below the ignition thresholds for various elements of a building, to minimise the potential for wind driven embers to cause ignition and reduce the effects of smoke on residents and firefighters.

A5.3 Principles of Landscaping Properties for Bushfire Protection

The principles of landscaping for bushfire protection should aim to:

- Reduce wind speed;
- Reduce fire spread;
- Deflect and filter embers;
- Provide shelter from radiant heat;
- Prevent flame impingement on the dwelling;
- Provide a defensible space for property protection.

(a) Vegetation choices

All vegetative material can burn under the influence of bushfire.

With this in mind, careful attention must be paid to species selection, their location relative to their flammability, avoidance of continuity of vegetation (horizontally and vertically), and ongoing maintenance to remove flammable fuels.

In the paper *"Landscape and Building Design for Bushfire Areas"* G.C. Ramsay and L. Rudolph have provided 14 attributes of vegetation which affect bushfire attack. In summary these attributes are:

- Moisture content of leaves;
- Volatile oil content of leaves;
- Mineral content of leaves;
- Leaf fineness;
- Density of foliage;
- Continuity of plant form;
- Height of lowest foliage above ground;

-
- Size of plant;
 - Dead foliage on the plant;
 - Bark texture;
 - Quantity of ground fuels;
 - Fineness of ground fuels;
 - Compaction ability of ground fuels; and
 - Mineral content of ground fuel.

What is clear is that the higher moisture content of leaves (mesic), the less bark that will be available and the lower the leaf drop, all of which will assist with maintenance of the understorey will also assist in reducing bushfire attack.

Work in the USA and elsewhere has also suggested that in addition to removal of understorey species, the trimming of lower limbs of trees also assists in reducing fire penetration into the canopy. Trees such as 'pencil pines' and African olive have been attributed with high fire propagation due to the high fine fuel captured within the canopy.

This leads to significant flame height. Avoid such species in favour of rainforest species such as figs and szygium.

When choosing plants, be sure not to introduce weed species into an area. Fire events may provide the opportunity for weed species to spread and may contribute fuel to an area of otherwise lower fuel loads.

Contact local councils, plant nurseries and plant societies to determine appropriate species for your area.

(b) Trees as Windbreaks/Firebreaks

The use of trees as windbreaks is a common practice but trees also provide a more than useful firebreak, trapping embers and flying debris, which would otherwise reach the house. The tree crown will rarely carry fire unless there is a significant fuel loading on the ground.

By reducing the wind speed, a row of trees also slows the rate of spread of a bushfire and a dense foliage traps radiant heat, lowering bushfire radiant heat.

Because of the effect of turbulence, a balance has to be struck between a high density of trees (that maximises the trapping of embers and radiant heat but also maximises turbulence) and a lower density (that allows more embers and radiant heat to pass through but minimises turbulence). A windbreak that allows 50–60% of the wind to pass through is ideal.

To be effective a windbreak/firebreak must:

- be located on the side of the lot from which fire weather normally approaches
- be of sufficient length (generally 100 metres minimum length)
- be located at a distance of one to three times the height of fully grown trees but not within the IPA
- use smooth barked eucalypts, rainforest trees or deciduous trees
- make sure there are no breaks of sufficient size to allow winds to funnel through.

A5.4 Vegetation Management

Where APZs have been incorporated as part of the development approval for subdivision or for dwelling construction, the environmental aspects of the development should have already been taken into account.

In general, it is expected that APZs will be maintained by the owner of the land including maintenance of any fire trail constructed as part of the development.

It is accepted practice that after construction of a dwelling, gardens will be established and landscaping of the grounds will be undertaken. It is essential that efforts to reduce fuels on adjoining properties are therefore not negated by actions within the immediate curtilage of the building.

In terms of priorities of addressing bushfire attack, priority should be given to preventing flame impingement by not allowing fine debris to accumulate close to the building. Secondly, removal of understorey fuels aids in the reduction of flame heights and likely canopy fire which will reduce overall radiant heat. Removal of loose bark and fine fuels reduces both heat output and ember generation. While the retention of taller trees with canopies will also assist in filtering out embers.

To maintain a garden that does not contribute to the spread of bushfires, it is necessary to plan the layout of the garden beds and take an active decision to minimise certain features in favour of other features. These should include:

- maintaining a clear area of low cut lawn or pavement adjacent to the house;
- keeping areas under fences, fence posts and gates and trees raked and cleared of fuel;
- utilising non-combustible fencing and retaining walls;
- breaking up the canopy of trees and shrubs with defined garden beds;
- organic mulch should not be used in bushfire prone areas and non flammable material should be used as ground cover, e.g. Scoria, pebbles, recycled crushed bricks;
- planting trees and shrubs such that:
 - the branches will not overhang the roof;
 - the tree canopy is not continuous; and
 - there is a windbreak in the direction from which fires are likely to approach.

The RFS has developed its document “Standards for Asset Protection Zones” which should be consulted for APZ specific terms. This is also available on the RFS web page at www.rfs.nsw.gov.au.

A5.5 Maintenance of Property

Sensible arrangements for landscaping and maintenance of the property are critical in the prevention of losses.

In considering property maintenance the following items should therefore be considered:

- removal of material such as litter from the roof and gutters;
- ensure painted surfaces are in good condition with decaying timbers being given particular attention to prevent the lodging of embers within gaps;
- check pumps and water supplies are available and in working order;
- driveways are in good condition with trees not being too close and forming an obstacle during smoky conditions;
- check tiles and roof lines for broken tiles or dislodged roofing materials;
- screens on windows and doors are in good condition without breaks or holes in flyscreen material and that frames are well fitting into sills and window frames;
- drenching or spray systems are regularly tested before the commencement of the fire season;
- hoses and hose reels are not perished and fittings are tight and in good order;
- doors are fitted with draught seals and well maintained;
- mats are of non combustible material or in areas of low potential exposure; and
- woodpiles, garden sheds and other combustible materials are located well away from the house.

Trees and other vegetation in the vicinity of power lines and tower lines should be managed and trimmed in accordance with the specifications in “Vegetation Safety Clearances issued by Energy Australia (NS179, April 2002).

CONSTRUCTION OF BUILDINGS IN BUSHFIRE PRONE AREAS

(summary of AS 3959-1999)

<u>3.3 Flooring</u>	3.3.1 Level 1 One or a combination of the following: (a) concrete slab on ground, (b) a suspended floor, which may be one or a combination of the following, supported by posts/columns/stumps/piers/poles complying with clause 3.4, or walls complying with clause 3.5: (i) a concrete floor, (ii) a framed floor where the underside of any bearer at any point is greater than 600mm above finished ground level. (c) a suspended timber floor, framed with timber or metal, where the underside of any bearer at any point is not greater than 600mm above finished ground level and which has: (i) the subfloor space unenclosed and any timber flooring, bearers and joists of fire-retardant-treated timber; or (ii) the subfloor space fully enclosed, either by a wall that complies with clause 3.5.1(a), or by the use of non-combustible sheet material which extends for at least 400mm above finished ground level. Where non-combustible fibre-reinforced cement sheets are used to enclose the subfloor space, the material shall have a minimum thickness of 6mm and all joints shall be covered or sealed. The non-combustible sheet material shall meet the bottom of the cladding material to ensure there are no gaps on the exterior face of the building.	3.3.2 Level 2 The requirements for Level 2 construction shall be as for Level 1 construction (clause 3.3.1).	3.3.3 Level 3 The requirements for Level 3 construction shall be as for Level 2 construction (clause 3.3.2) except that in the case of a framed floor, where any bearer or joist is greater than 600mm above ground level and the floor is not enclosed as described in clause 3.3.1(c)(ii), the bearer, joists and flooring shall be of fire-retardant-treated timber or sheeted underneath with non-combustible material.
<u>3.4 Supporting Posts, Columns, Stumps, Piers, and Poles</u>	3.4.1 Level 1 One or a combination of the following:	3.4.2 Level 2 The requirements for Level 2 construction	3.4.3 Level 3 Except in enclosed subfloor spaces, as for

	<p>(a) non-combustible</p> <p>(b) fire-retardant-treated timber for a minimum of 400mm above finished ground level</p> <p>(c) timber mounted on galvanised metal shoes with a clearance of not less than 75mm above finished ground level or paving level etc.</p> <p>The above do not apply where the subfloor space is totally enclosed as described in clause 3.3.1(c)(ii).</p>	<p>shall be as for Level 1 construction (clause 3.4.1).</p>	<p>Level 2 construction (clause 3.4.2) except that all timber shall be fire-retardant-treated to full height.</p>
<p>3.5 External Walls</p>	<p>3.5.1 Level 1</p> <p>(a) One or a combination of the following:</p> <p>(i) a wall having an external leaf or masonry, concrete, pise, rammed earth or stabilised earth.</p> <p>(ii) a framed wall that incorporates either:</p> <p>(A) breather-type sarking complying with AS/NZS 4200.1 and with a flammability index of not more than 5 (AS 1530.2) installed immediately behind the external cladding; or</p> <p>(B) an insulation material conforming to the appropriate AS for that material.</p> <p>(NOTE: no restrictions apply to the cladding material)</p> <p>(iii) a wall of timber logs that have the butting faces of adjacent logs, gauge-planed, and the space between the logs sealed in a manner that prevents the entry of burning debris and which allows for building movement.</p> <p>(b) Where the external leaf or cladding is of a combustible sheet material and is less than 400mm above finished ground level, the cladding shall be protected for not less than 400mm above the adjacent finished ground level:</p>	<p>3.5.2 Level 2</p> <p>The requirements for Level 2 construction shall be as for Level 1 construction (clause 3.5.1) except that PVC cladding is not permitted and all external timber wall cladding shall be fire-retardant-treated timber.</p>	<p>3.5.3 Level 3</p> <p>The requirements for Level 3 construction shall be as for Level 2 construction (clause 3.5.2).</p>

	<p>(i) by covering it with a suitable non-combustible material, or fire-retardant-treated timber suitably sealed to the existing cladding so as to prevent the entry of burning debris;</p> <p>(ii) by substituting with a suitable non-combustible sheet material, or fire-retardant-treated timber; or</p> <p>(iii) where the external cladding is timber, by using fire-retardant-treated timber.</p>		
<u>3.6 Windows</u>	<p>3.6.1 Level 1 All openable windows, including louvres, shall be screened with corrosion-resistant steel, bronze or aluminium mesh with a maximum aperture size of 1.8mm in such a way that the entire opening remains screened when the window is open.</p>	<p>3.6.2 Level 2 The requirements for Level 2 construction shall be as for Level 1 construction (clause 3.6.1) except that aluminium mesh shall not be used. In addition to the above, the following applies: (a) Where timber is used it shall be fire-retardant-treated timber except where protected by non-combustible shutters. (b) Where leadlight windows are used they shall be protected by non-combustible shutters or of toughened glass.</p>	<p>3.6.3 Level 3 The requirements for Level 3 construction shall be as for Level 2 construction (clause 3.6.2) except that where the windows are not protected by non-combustible shutters, they shall be glazed with toughened glass.</p>
<u>3.7 External Doors</u>	<p>3.7.1 Level 1 External doors shall be fitted with: (a) weather strips or draught excluders to prevent the penetration or build-up of burning debris beneath the door; and (b) tight fitting door screens fitted with corrosion-resistant steel, bronze or aluminium mesh with a maximum aperture size of 1.8mm.</p>	<p>3.7.2 Level 2 The requirements for Level 2 construction shall be as for Level 1 construction (clause 3.7.1) except that aluminium mesh shall not be used. If leadlight glazing panels are incorporated in the doors they shall be protected by non-combustible shutters or of toughened glass.</p>	<p>3.7.3 Level 3 The requirements for Level 3 construction shall be as for Level 2 construction (clause 3.7.2) except that: (a) timber doors shall be fire-retardant-treated timber or shall have a non-combustible covering on the exterior surface; or (b) doors shall be protected by non-combustible shutters; or (c) doors shall be solid-core having a thickness of not less than 35mm.</p>
<u>3.8 Vents and Weepholes</u>	<p>3.8.1 Level 1 Shall be protected with spark guards made from corrosion-resistant steel, bronze or aluminium mesh with a maximum aperture</p>	<p>3.8.2 Level 2 The requirements for Level 2 construction shall be as for Level 1 construction (clause 3.8.1) except that aluminium mesh shall not</p>	<p>3.8.3 Level 3 The requirements for Level 3 construction shall be as for Level 2 construction (clause 3.8.2).</p>

	size of 1.8mm.	be used.	
3.9 Roofs	<p>3.9.1 Level 1</p> <p>3.9.1.1 General</p> <p>(a) Timber shakes or shingles shall not be used.</p> <p>(b) The roof/wall junction shall be sealed either by the use of fascias and eave linings, or by sealing the gaps between the rafters with suitable non-combustible material.</p> <p>(c) Sarking shall have a flammability index of not more than 5 (AS1530.2).</p> <p>3.9.1.2 Tiled roofs</p> <p>Tiled roofs shall be fully sarked. The sarking shall be located directly below the tiling battens and shall cover the entire roof area including the ridge.</p> <p>3.9.1.3 Sheeted roofs</p> <p>(a) Only metal or fibre-cement sheet shall be used.</p> <p>(b) All gaps under corrugations or ribs of the roof material where it meets the fascia or wall line shall be sealed or protected:</p> <p>(i) by fully sarking the roof; or</p> <p>(ii) by providing corrosion-resistant steel or bronze mesh with a maximum aperture size of 1.8mm, profiled metal sheet, neoprene seal compressed mineral wool or similar material.</p> <p>(c) Rib caps and ridge capping shall be sealed in accordance with clause 3.9.1.3(b), or pre-formed rib caps or ridge capping shall be used.</p> <p>3.9.1.4 Rooflights</p> <p>The requirements for Level 1 construction are as follows:</p> <p>(a) All penetrations of the roof space for the installation of rooflights and associated</p>	<p>3.9.2 Level 2</p> <p>As for Level 1 construction (clause 3.9.1) except that all roof sheeting shall be non-combustible and sarked, and rooflight glazing shall be of wired glass. Thermoplastic material or toughened glass shall not be used for the glazing for rooflights. The case of the evaporative cooler shall be of non-combustible material.</p>	<p>3.9.3 Level 3</p> <p>As for Level 2 construction (clause 3.9.2) except that no fibre-reinforced cement or aluminium sheet shall be used.</p>

	<p>shafts shall be sealed with a non-combustible sleeve or lining. Thermoplastic sheeting a metal frame may be used for a rooflight, but a diffuser installed at ceiling level shall be of wired- or toughened glass in a metal frame.</p> <p>(b) Vented rooflights shall be provided with corrosion-resistant steel or bronze mesh having a maximum aperture size of 1.8mm.</p> <p>3.9.1.5 Roof ventilators All components of roof ventilators in Level 1 construction, including the rotary type, shall be constructed of non-combustible material and shall be sealed against the entry of sparks and embers with corrosion-resistant steel or bronze mesh having a maximum aperture size of 1.8mm.</p> <p>3.9.1.6 Roof-mounted evaporative cooling units Shall only be used if the openings to the cooling unit are encased in a corrosion-resistant steel or bronze mesh with a maximum aperture size of 1.8mm.</p>		
<u>3.10 Eaves</u>	<p>3.10.1 Level 1 All eaves shall be enclosed, and the fascia or the gaps between the rafters shall be sealed.</p>	<p>3.10.2 Level 2 As for Level 1 construction (clause 3.10.1) except that all timber eaves lining and jointing strips shall be of fire-retardant-treated timber.</p>	<p>3.10.3 Level 3 As for Level 2 construction (clause 3.10.2) except that aluminium shall not be used.</p>
<u>3.11 Fascias</u>	<p>3.11.1 Level 1 No requirements</p>	<p>3.11.2 Level 2 All materials shall be either non-combustible or of a fire-retardant-treated timber.</p>	<p>3.11.3 Level 3 As for Level 2 construction (clause 3.11.2) except that no fibre-reinforced cement or aluminium sheet shall be used.</p>
<u>3.12 Gutters and Downpipes</u>	<p>3.12.1 Level 1 Any materials or devices used to stop leaves collecting in gutters shall have a flammability index of not greater than 5 (AS1530.2).</p>	<p>3.12.2 Level 2 As for Level 1 construction (clause 3.12.1).</p>	<p>3.12.3 Level 3 As for Level 2 construction (clause 3.12.2).</p>

<u>3.13 Verandas and Decks</u>	3.13.1 Level 1 Shall comply with one or more of the following: (a) <i>Slab</i> - A reinforced suspended concrete slab floor, supported by posts or columns complying with clause 3.4, or wall complying with clause 3.5, or a slab-on-ground floor complying with clause 3.3. (b) <i>Sheeted or tongued-and-grooved solid flooring</i> - The requirements for flooring are as follows: (i) Compliance with the flooring requirements shall be in accordance with clause 3.3. (ii) Where the clearance between the finished ground level and the underside of the floor is not greater than 400mm above finished ground level, all joints in the flooring shall be covered (above the floor level) or shall be sealed. (c) <i>Spaced decking</i> - The requirements for spaced decking are as follows: (i) The decking timbers shall be fixed with a clearance of not less than 5mm between adjacent timbers. (ii) The external perimeter beneath the decking shall not be enclosed nor shall access to the space beneath the decking be impeded. (iii) Any supports for the decking shall be treated as set out in clause 3.4. (iv) Decking timbers shall not be allowed to connect with the remainder of the building unless measures are used to prevent the spread of fire into the building.	3.12.2 Level 2 As for Level 1 construction (clause 3.12.1) except that if spaced decking is used, fire-retardant-treated timber shall be used for the decking material.	3.12.3 Level 3 As for Level 2 construction (clause 3.12.2) except that all materials shall be non-combustible or where timber is used it shall be fire-retardant-treated (including balustrades).
<u>3.14 Service Pipes</u>	3.14.1 Level 1 All exposed piping, for water and gas supplies, shall be of metal. Pipes of other materials shall be buried to a depth of at least 300mm below finished ground level.	3.14.2 Level 2 As for Level 1 construction (clause 3.14.1).	3.14.3 Level 3 As for Level 2 construction (clause 3.14.2).



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Vegetation Management Plan

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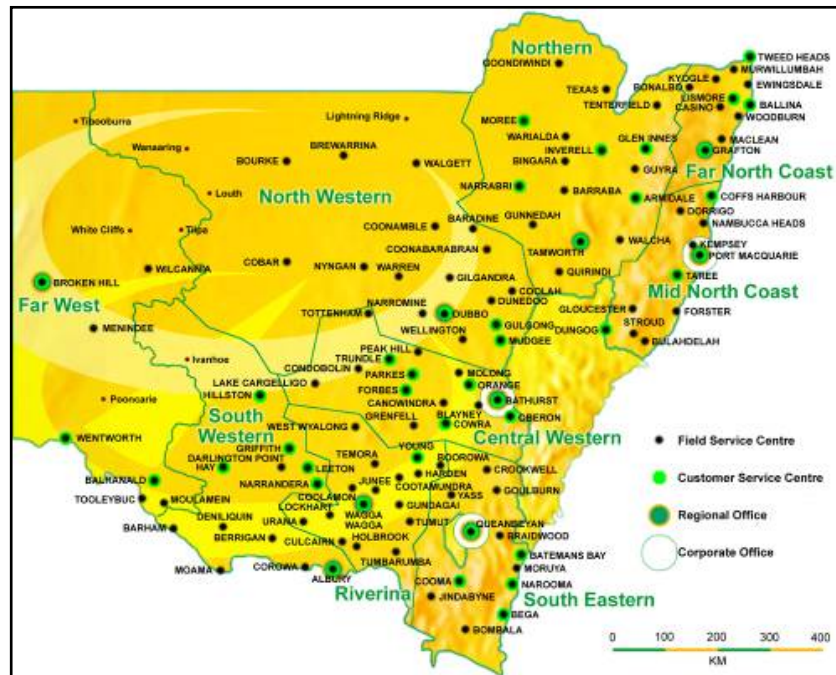
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Country Energy's Regions



1 CORPORATE STATEMENT

Country Energy recognises the amenity value of trees and other vegetation and their importance to our environment. However, vegetation must be managed near powerlines to maintain safety to individuals and the environment whilst maintaining the quality and reliability of the electricity supply. This is a difficult task to achieve while maintaining safety requirements, protecting or minimising harm to the environment, preventing damage to property and to satisfy all concerned.

'Trees for life' – Country Energy's Vegetation Management Plan has therefore been compiled to detail all relevant details of vegetation control near powerlines.

2 INTRODUCTION

Country Energy is a leading Australian energy services corporation owned by the New South Wales Government, with 3,300 employees in 140 customer and field service centres, nine regional offices and four business centres in Sydney, Melbourne, Brisbane and Newcastle.

Country Energy operates under a decentralised regional structure which helps Country Energy respond to local priorities in serving more than 800,000 customers.

Country Energy manages Australia's largest power supply network across 95 per cent of New South Wales' land mass, spanning mountains, plains and deserts, with climates ranging from snow to extreme heat. Our network assets include around 195,000 kilometres of powerlines, 1.4 million power poles, 113,000 distribution substations and 120,000 street lights.

Country Energy's Vegetation Management Plan 'trees for life' has been prepared in accordance with the NSW Electricity Supply (General) Regulation 2001.

To obtain a copy of this Plan:

- Visit the Country Energy web-site at www.countryenergy.com.au
- Phone Country Energy's Customer Service Centre on 13 23 56; or
- Send an email to: info@countryenergy.com.au

3 OBJECTIVES

The objective of this Vegetation Management Plan is to establish the manner in which vegetation near powerlines will be managed in order to:

- Minimise danger to the public;
- Improve system reliability by reducing vegetation related interruptions to the electricity supply;
- Reduce the risk of fires caused by trees coming into contact with electricity wires;
- Minimise environmental harm including minimising damage or destruction of trees; and
- Reduce the risk of vegetation causing damage to, or interfering with powerlines.

4 PURPOSE

The purpose of this Vegetation Management Plan is to:

- Ensure proper guidelines and methodology are in place to promote Best Practice in the maintenance of vegetation under or near powerlines;
- Ensure that those guidelines and methodology minimise the dangers to the public, vegetation management workers and electrical maintenance workers;
- Detail responsibilities for maintaining clearance between powerlines and vegetation; and
- Ensure compliance with appropriate legislation.

5 KEY TERMS AND DEFINITIONS

In this document the following terms have the meanings, as listed below:

Aerial Bundled Conductor: A covered multi-core cable used in substitution for multiple bare single conductors.

Authorised: Refers to be authorised by Country Energy.

Clearance Space: The space surrounding a powerline, which must be kept clear of vegetation at all times.

Council: The Council of a local government area.

HACCP: Hazard Analysis Critical Control Point is a pro-active process control system by which food quality is ensured.

Heritage Listed: Refers trees listed singly, in groups, avenues, streetscape plantings or conservation areas on the State Heritage Register under the NSW Heritage Act 1977, covered by tree protection orders, listed on significant tree registers, heritage schedules or in “Special Character Areas” on local and regional environmental plans (LEPs and REPs) and development control plans (DCPs) prepared under the Environmental Protection and Assessment Act, listed on the Register of the National Estate by the Australian Heritage Commission and classified by the National Trust of Australia.

Inspection Space: The area outside the clearance space that also may need clearing to maintain safety and electricity supplies.

Naturally Propagated: Vegetation that has been naturally propagated, including by birds or animals.

Occupier: The person(s) who is in actual occupation of the land.

Overhead: In relation to a powerline, means a powerline that is above ground level.

Powerline: An electric line, structures and equipment used for or in connection with the supply of electricity, which ordinarily operates at voltages up to 132 kilovolts but does not include telecommunication cables.

Private Electric Line: Any overhead electric line that is the responsibility of the landowner/occupier. This typically includes overhead mains beyond the metering point.

Regrowth: means saplings, suckers and other vegetation which has grown or regrown after previous control works.

Rural Area: Any area that is not an urban area.

Sapling: An immature tree.

Service Line: An overhead or aerial powerline between Country Energy's distribution mains and the customer's consumer terminals used to supply low voltage electricity to the customer.

Sensitive Areas: Includes riparian areas, threatened species habitat, wetlands, cultural heritage sites, etc.

Threatened Species: A species specified in the Threatened Species Conservation Act

Tree: A plant taller than 3 metres, or having a canopy more than 3 metres in diameter or having a trunk with a circumference at a height of 1 metre from the ground of more than 0.3 metres. May include shrubs and other plants for the purposes of the Electricity Supply Act 1995 (NSW).

Vegetation: All plant life including, but not limited to, trees, palms, vines, shrubs, grasses such as bamboo but not lawns.

6 SAFETY

Safety is Country Energy's number one core value. Country Energy's Health and Safety Policy, Attachment A, details the broad guidelines for Country Energy's safety requirements and objectives. One of the biggest threats to safety near powerlines is trees. The dangers include:

- Falling branches or trees bringing down live power lines;
- Ignition of bushfires with subsequent damage to property, individuals and the environment;
- Children climbing trees near powerlines;
- Electric shocks from vegetation touching live powerlines; and
- Damage to property and people.

Therefore vegetation near powerlines must be managed or serious consequences may result.

6.1 COUNTRY ENERGY'S SAFETY RESPONSIBILITIES

Country Energy must ensure that trees are kept clear of powerlines to ensure a safe and reliable electricity supply is delivered. This is not to say that Country Energy must carry out the work, but it is

Country Energy's responsibility to ensure the work is carried out.

6.2 LANDOWNER/OCCUPIER'S SAFETY RESPONSIBILITIES

The landowner/occupier should monitor the clearance between powerlines and vegetation to ensure the clearance space is free of vegetation at all times. Attachment C shows these minimum clearances.

Country Energy should be contacted for advice if the clearance space is compromised. Where the landowner/occupier is responsible for the management of the vegetation, Country Energy should be contacted to advise of an authorised contractor who can carry out the work.

Trimming or removal of trees near powerlines is extremely dangerous and should not be attempted by untrained persons. If unauthorised people are to do any trimming or removal works near powerlines, then their equipment, all persons and the tree should be at least 3 metres away from powerlines, even from insulated low



voltage powerlines.

Adequate risk control measures must be employed when working outside the 3 metre limit. If trees are closer than 3 metres to powerlines then only authorised vegetation management workers may carry out work on these trees.

A list of authorised vegetation management contractors can be obtained by contacting Country Energy.

6.3 VEGETATION MANAGEMENT WORKER'S SAFETY RESPONSIBILITIES

Vegetation management workers must be appropriately qualified and authorised to carry out vegetation control work where the tree, the workers or the equipment is to come within 3 metres of any powerlines. While carrying out management measures vegetation maintenance workers must not endanger themselves or members of the public. All appropriate Legislation, Codes of Practice and Country Energy Safety Procedures shall be followed.

6.4 PLANTERS' SAFETY RESPONSIBILITIES

Those planting trees and other tall growing vegetation should realise their safety responsibilities and not create a potential safety problem. Planting near powerlines could have devastating consequences in the future. Refer to Section 8 for planting guidelines.

7 ENVIRONMENTAL

Country Energy's Environmental Management System, which includes Country Energy's Environmental Policy, Appendix 2, has been implemented on a whole of business approach, involving all functional areas including vegetation management. The associated environmental aspects of vegetation management have been identified by a risk assessment process to determine their environmental effects and significance. This Vegetation Management Plan takes these aspects into account.

Vegetation management must be carried out to protect the environment from damage caused by such things as bush fires ignited by powerlines and the electrocution of animals climbing tall growing vegetation near powerlines.

Country Energy is committed to carrying out all phases of vegetation management in an environmentally responsible manner whilst supporting the principles of ecologically sustainable development.

Environmental best practice in relation to vegetation management must consider a number of factors to meet legislative requirements, community expectations and to minimise environmental harm. Vegetation management works must be carried out to comply with these requirements whilst using the most appropriate cost-effective measures. This Vegetation Management Plan details these measures.

Country Energy will carry out vegetation management near powerlines in compliance with applicable statutory obligations and in accordance with this Plan. Land owners/occupiers when carrying out any vegetation management work near powerlines should do so in accordance with this Plan.

7.1 HERITAGE SITES

Country Energy seeks to preserve natural and cultural heritage features including aboriginal sites, and non-aboriginal historic structures and memorial gardens, parks, tree plantings and landscapes including those heritage listed. It is recognised that it is illegal to remove, disturb or destroy any archaeological site or material.

Works shall cease where there are finds of aboriginal artefacts or other archaeological artefacts. They shall be reported to Country Energy, National Parks and Wildlife Service and the Heritage Office for the appropriate action.

Council trees could be protected under Tree Protection Orders, Significant Tree Registers, heritage schedules as either items or in conservation areas, in "Special Character Areas", in bushland or scenic protection zones on LEPs. They could also form a key part of areas controlled by development control plans (DCPs).

Significant, memorial and heritage trees may require an annual trim to minimise potential dangers or damage or the consideration of alternative solutions as detailed in Section 14 is also recommended.

Consent is required from the relevant body to prune or remove protected trees or to excavate in areas where archaeological relics are known or likely to be disturbed or damaged.

7.2 THREATENED SPECIES

Country Energy's aim is to protect species listed as threatened or endangered by Threatened Species Conservation Legislation including species protected by the Threatened Species Conservation Act 1997 (NSW) and the Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth). Where powerline corridors contain threatened species of flora and fauna, non-threatened tall growing species will generally be trimmed or removed. Previous vegetation management practices beneath powerlines (especially high voltage lines with wide easements) have in certain instances, served to enhance native flora and fauna. Such corridors prove to be valuable ecological areas. Tall growing threatened species will be trimmed to the minimal amount necessary or other management options considered.

7.3 PROTECTION OF FLORA AND FAUNA

Country Energy vegetation management workers shall follow the following conditions to protect flora and fauna:

- Firearms are not permitted on work sites;
- Dogs and other domestic animals are not permitted on work sites;
- All native fauna (including snakes) are protected. Animals shall not be unnecessarily disturbed;
- Feeding of native animals is prohibited;
- The picking or possession of protected native plants is prohibited;
- Minimise movement of vehicle through sensitive areas; and
- Minimise soil compaction or disturbance.

7.4 BUSH FIRE PREVENTION

Bush fires can cause death and damage to the environment and property. Country Energy undertakes vegetation management control to prevent the ignition of bush fires from electricity lines. Country Energy does not control fuel build up

under powerlines that is the responsibility of the landowner other than to meet the objectives of this Plan.

Landowners and rural brigades often use powerline corridors as fire breaks.

7.5 EROSION AND SEDIMENT CONTROL

Vegetation management works will be carried out to minimise disturbance to low growing species, vegetative ground covers and topsoil, to prevent or minimise erosion.

If there is the possibility of erosion, the stumps and the root structures of vegetation to be controlled should be retained.

Where the site is left exposed and has the potential to erode then appropriate measures will be implemented in accordance with recognised mitigation practices, this may include re-seeding the area.

It is recognised that the disturbance of acid sulphate soils can be an issue and vegetation management works shall be carried out to minimise soil disturbance.

7.6 ROADSIDE MANAGEMENT

Country Energy will endeavour to support and follow the principles and guidelines of the NSW Roadside Environment Committee, as roadside vegetation is often the only quality remnant native vegetation in many areas.

7.7 NOISE

Vegetation management works should be carried out in a manner that will minimise any nuisance or annoyance to members of the public whilst achieving the objectives of the works.

7.8 USE OF HERBICIDES

Herbicides will be used to prevent the further growth of selected saplings and trees. This will be done in accordance with the manufacturer's requirements and appropriate recognised techniques. See Section 15.3.

7.9 POLLUTION CONTROL

Disposal of any material by Country Energy's vegetation management workers must be in accordance with legislative requirements.

Watercourses and water bodies shall not be polluted by rubbish, felled or cut vegetation, toilet waste, silt, fuel spillage, herbicide, herbicide containers, etc. Refuelling operations or decanting of herbicides should be conducted at least 30 metres away from watercourses.

Spillage of herbicides or fuels should be avoided, but where a spillage or leakage has occurred, the applicable Country Energy Procedure shall be followed to ensure adequate control measures are implemented and the appropriate notifications are carried out.

7.10 WASTE

All waste generated from vegetation management works shall be recycled wherever possible. Debris may be left in rural situations, where it will not pose a safety risk, to decompose naturally. The mulching of or removal of debris may be required in other situations. The mulch generated may be left on site to stabilise the site. The burning of debris is to be used as a last resort and the requirements of bush fire regulations need to be followed. Where debris from exotic and/or invasive weed species is likely to self propagate then the resultant debris should be removed to the local landfill site or treated to prevent propagation.

Country Energy will generally not remove trees or branches that are blown down or where a tree falls over from natural causes.

7.11 ANIMAL AND CROP DISEASES/PATHOGENS

Country Energy will endeavour to prevent or minimise the spread of organisms that cause crop or animal diseases when carrying out vegetation management works.

7.12 WEEDS

Country Energy aim is to prevent or minimise the spread of noxious weeds (NSW) and declared plants (QLD) when carrying out vegetation

management works. Country Energy's Noxious Weeds Procedure will be followed to achieve this aim.

7.13 MANGROVES

Country Energy shall follow the requirements of its permit to trim mangroves; the Department of Fisheries issues the permit under the Fisheries Management Act 1994. All trimmings will be removed from the tidal zone. Machinery is not permitted to enter the intertidal zone unless with the consent of the District Fisheries Officer. Trimming shall otherwise be carried out in accordance with the requirements of this Vegetation Management Plan.

7.14 VEGETATION AT RIVERS, LAKES AND CREEKS

Tall growing saplings up to 3 metres that are likely to cause interference or damage to powerlines in the future are to be removed and/or treated with an appropriate herbicide to prevent regrowth, whilst root structures are to be retained.

The Department of Land and Water Conservation may give approval for the removal of mature trees if the surrounding vegetation is sufficient to prevent erosion. Otherwise the tree must be trimmed. Where trimming of any tree is too dangerous to do so the tree shall be topped to chest height and treated with an appropriate herbicide. It may be necessary to establish low growing vegetation to stabilise the area prior to the removal of mature trees.

7.15 STATE ENVIRONMENTAL PLANNING POLICY (SEPP) AND COMMONWEALTH PROTECTED AREAS

Country Energy's aim is to carry vegetation management works in these areas in accordance with this Vegetation Management Plan and appropriate legislation.

The following are those NSW SEPP's that apply:

- SEPP 14 Coastal Wetlands;
- SEPP19 Bushland in Urban Areas;
- SEPP 26 Littoral Rainforests;

- SEPP 44 Koala Habitat Protection;
- SEPP 71 Coastal protection.

Areas of national environmental significance protected by Environmental Protection and Biodiversity Conservation Act 1999 (Commonwealth) include Commonwealth lands, RAMSAR wetlands and World Heritage sites.

7.16 NATIONAL PARKS

Vegetation control in lands reserved and dedicated National Parks will be carried out in accordance with this Vegetation Management Plan and in accordance with the agreement “NSW Electricity Association - Procedures for Power Line Maintenance in National Parks”.

7.17 STATE FORESTS

Vegetation control in State Forests will be carried out in accordance with this Vegetation Management Plan and in NSW in accordance with Country Energy’s Occupation Permit.

7.18 DEAD TREES

Where dead trees are in the immediate vicinity of power lines, they should be lopped to a height at which if they fell would not cause a potentially dangerous situation and damage the power line. This will allow the remainder of the tree to stand for any fauna that may wish to inhabit it. If any fauna already inhabit branches that are to be removed then work should be delayed until the fauna has moved, unless there is an immediate threat to the power line. Timber removed by lopping may be left on site for habitat depending on property owner requirements.

7.19 MAINTENANCE OF LOCAL AESTHETIC QUALITIES

It is recognised that maintaining the local aesthetics of an area is important. However, many trees do not lend themselves to trimming in a manner that is visually pleasing. Similarly what is pleasing to one person may be unattractive to another. Also further trimming of most species to make them aesthetically pleasing will result in accelerated growth and a dangerous situation. Therefore vegetation management works should be carried out to minimise any disturbance to local aesthetics while

considering the individual situation at hand. Trimming is to be carried out in accordance with the requirements of Section 12.

The priority of all tree pruning is to minimise the risk of contact between trees and overhead powerlines and to do as little damage to the tree as possible.

7.20 PRUNING METHOD

Country Energy will use arboricultural techniques recognised as best practice for the control of vegetation types under or near powerlines. This will include trimming to comply with Australian Standard AS4373 – Pruning of Amenity Trees wherever possible. This is discussed further in Section 12.

8 PLANTING GUIDELINES

There is an increasing public awareness of environmental issues and the need to grow more trees. This can lead to the planting of inappropriate trees in a variety of situations. Directly relevant to Country Energy are those planted under or near powerlines.

Planting of inappropriate species can jeopardise public safety when powerlines are knocked down by trees or when the public trim or remove trees near powerlines. Under NSW legislation, the planting of inappropriate species will also make the planter responsible for future trimming and/or removal costs, and could lead to legal liability for damages caused by the planting. It is therefore in everybody’s interests to reduce these costs and the associated dangers by reducing the number of inappropriate plantings.

Planting the wrong tree in the wrong place can also have environmental consequences. Bush fires have started because of vegetation coming into contact with powerlines resulting in a loss of flora, fauna, life and property.

Therefore, Country Energy encourages the planting of trees and other tall growing vegetation away from powerlines. This allows them to grow to their full potential and be of benefit in the environment and the natural aesthetics of trees can then be fully appreciated as ‘trees for life’. Country Energy recommends that the Planting Guide 8.5 be followed when planting and that trees should not be planted under or near power lines. Section 8.5.1 provides a list of some trees that are unsuitable to be planted near powerlines.

The following planting guidelines will assist to prevent further inappropriate plantings.

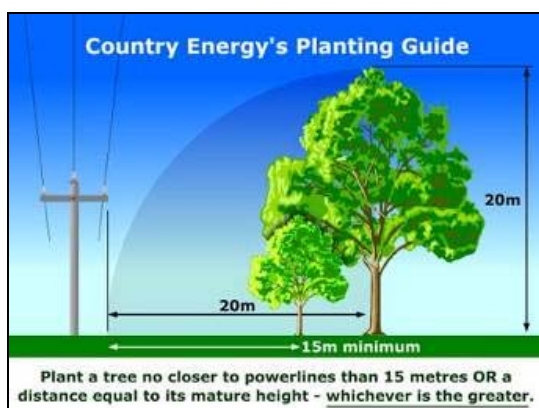
8.1 RURAL

The property owner and councils are encouraged to plant all species, other than grasses, away from powerlines in rural areas as access to powerlines is required by Country Energy crews for routine maintenance and repairs. LandCare and others planting to connect habitats should do so in the best possible location such as deep gullies where planting will have no effect on power lines.

The planting of low growing species near powerlines is permissible provided they do not and will not interfere with powerlines or pose a risk of bush fire or to public safety and will not restrict access to powerlines for maintenance or repairs.

8.2 URBAN

In most urban areas power lines are accessible from the street pavement. This allows low growing plants to be planted under or near power lines. These plants should never grow within 3 metres of any powerline. As the mature height of individual plants can vary significantly it is best to plant away from powerlines -“trees for life”. Accordingly, Country Energy encourages the public to seek Council approval when wishing to plant on streets.



8.3 STATE FORESTS AGRO FORESTRY VENTURES

A minimum agreed corridor width of 32 metres applies. Country Energy's Planting Guide should be followed outside this zone.

8.4 ORCHARDS

Orchards should be planted using the Planting Guide in Section 8.5. This will allow access for maintenance and repairs of the powerlines as well as access for orchard operations.

8.5 COUNTRY ENERGY'S PLANTING GUIDE

Simple Tips:

- Look up before you plant.
- Consider how big the tree or vegetation will grow and what will be affected.
- Plant taller varieties furthest away from the powerlines using the below Planting Guide.
- Planting on streets should not be carried out without Council approval.
- When planting, remember that access to powerlines is required for maintenance and repairs in the future.
- It is recommended to plant species that are native to the area.
- Do not plant species that could invade the surrounding environment.
- It is recommended to plant away from the underground pits, pillar boxes and padmount transformers so roots don't become a problem.
- This guide also applies to planting trees near Aerial Bundled Conductor (ABC) powerlines.
- Country Energy can provide guidance when planting. Local nurseries should also be consulted.
- Country Energy considers the trees listed in Section 8.5.1 and other tall growing species as unsuitable under or near powerlines.

TREES UNSUITABLE FOR PLANTING UNDER/NEAR POWERLINES

The majority of trees are unsuitable for planting under or near powerlines due to the dangers involved and insufficient room for the tree to grow. Table 1 provides a list of some common species that are unsuitable under or near powerlines.

TABLE 1 – TREES UNSUITABLE FOR PLANTING UNDER/NEAR POWERLINES			
Botanical Name	Common Name	Botanical Name	Common Name
<i>Acacia species (large)</i>	Wattle	<i>Jacaranda mimosifolia</i>	Jacaranda
<i>Acer species</i>	Maples – not Japanese	<i>Ligustrum species</i>	Privet
<i>Acmena species (large)</i>	Lillypilly or Bush Cherry	<i>Liquidamber species</i>	Liquidamber
<i>Alnus species</i>	Black & Evergreen Alder	<i>Lophostemon confertus</i>	Brush Box
<i>Araucaria species</i>	Bunya-Bunya, Hoop or Norfolk Island Pine	<i>Magnolia grandiflora</i>	Bull Bay Magnolia
<i>Bambusa species</i>	Bamboo	<i>Melaleuca species (large)</i>	Paper barks
<i>Banksia species (large)</i>	Banksia	<i>Melia azedarach</i>	White Cedar
<i>Betula species</i>	Birch	<i>Palm species</i>	Palm
<i>Brachychiton species</i>	Lace-Dark, Flame & Kurrajong	<i>Pinus species</i>	Pine
<i>Caesalpinia ferrea</i>	Leopard tree	<i>Platanus species</i>	Plane tree
<i>Casuarina species</i>	She-Oaks	<i>Populus species</i>	Poplar
<i>Cedrus species</i>	Cedar, also Fir & Spruce	<i>Quercus species</i>	Oak
<i>Celtis species</i>	Nettle-tree	<i>Salix species</i>	Willow
<i>Cinnamomum camphora</i>	Camphor Laurel	<i>Schinus species</i>	Pepper-corn tree
<i>Cupressus species</i>	Cypress trees	<i>Stenocarpus spinuatus</i>	Qld. Firewheel tree
<i>Delonix rigia</i>	Poinciana or Flamboyant	<i>Syncarpia glomulifera</i>	Turpentine
<i>Erythrina species</i>	Coral-tree	<i>Syzygium species</i>	Lillypilly or Bush Cherry
<i>Eucalyptus species</i>	Gum trees	<i>Tamarix aphylla</i>	Athel pine
<i>Ficus species</i>	Fig trees	<i>Tilia species</i>	Linden or Lime tree
<i>Fraxinus species</i>	Ash	<i>Tipuana tipu</i>	Race-horse tree
<i>Gleditsia species</i>	Honey Locust	<i>Ulmus species</i>	Elm
<i>Grevillea robusta</i>	Silky Oak	<i>Zelkova serrata</i>	Japanese Elm
<i>Hymenosporum flavum</i>	Native Frangipani		Tall growing fruit and nut trees

9 UNDERGROUND POLICIES, NEW AND AUGMENTED CONSTRUCTION WORK

Councils are encouraged to ensure that electrical services in new urban developments are undergrounded to prevent interference with vegetation in the future.

Whenever arrangements for new construction are made, power supply routes should avoid tall growing vegetation or the initial clearing should be sufficient to minimise future maintenance problems. Trees, saplings and undergrowth shall be removed by ground-line cutting to ensure specified corridor widths. Engineering/planning representatives should be conversant with and understand Country Energy's clearing requirements. Aerial bundled conductor should, wherever possible, be the type of conductor used when Country Energy replaces low voltage overhead mains.

10 PUBLIC EDUCATION

Country Energy will continue to develop increased customer awareness of safety issues mentioned in this Plan in relation to the planting and control of vegetation near powerlines.

In this regard Country Energy's education program may include:

- Planting guidelines;
- Posters;
- Newspaper articles;
- Tips on Country Energy accounts;
- Liaison with landowners/occupiers, State Government bodies, Bush Fire Management Committees, LandCare, Garden Clubs, Progress Associations, Tidy Towns, Koala Societies, Beautification Committees, etc as appropriate;
- Attendance at community or other groups meetings;
- Attendance at field days e.g. AgQuip, tree fairs etc;

- Qualified employees to assist the community with any problems or inquiries they may have in relation to vegetation control near powerlines; and
- Any other opportunity to educate the community.

11 METHODOLOGY OF VEGETATION CONTROL

11.1 QUALIFICATION OF EMPLOYEES

For those positions involved directly with the management of vegetation either by Country Energy or by contractors working for the landowner/occupier, pre-requisites should include the following:

- Formal qualifications in either horticulture or arboriculture attained from an accredited institution. The "Tree Care for Electricity Workers" course as taught by Ryde TAFE College or equivalent shall be the minimum acceptable standard. This applies to positions that manage and oversee trimming crews in the field and to those carrying out the work.
- All necessary qualifications as required by contractual, statutory or safety requirements to carry out the work safely and in a tradesman like manner.

11.2 PROCEDURE

Many factors have an influence on the vegetation management option selected for any particular location and tree or group of trees. Qualified personnel will carry out management works in accordance with this Vegetation Management Plan to ensure that appropriate management options are carried out.

Where alternative electrical options (see Section 14.1) are not feasible, including economically feasible, vegetation can be managed either by pruning or by complete removal.

11.3 PRUNING OR CLEARING CYCLES

The frequency of clearing cycles is based on practical factors including regrowth rates, fire risk, climate, type of vegetation, recurrent costs, conservation considerations etc. Typically a two to three-year cycle is considered as reasonable industry practice. Country Energy will vary this as required depending on species, climate, location etc.

11.4 EMERGENCY

Trees and other vegetation may need to be controlled or removed under emergency conditions to maintain safety and to maintain or restore the electricity supply. Where possible trees in this category shall be assessed individually to determine the appropriate action. Heritage listed trees should still involve the relevant approval prior to action.

When assessing trees under emergency conditions, environmental factors that increase the likelihood of failure of the tree shall be considered. Examples of these conditions would be storm events, wind, bushfires, saturated soils, diseased or weakened branches, and restricted area of root and crown development.

Trees that are trimmed under emergency conditions may not receive the correct pruning techniques so remedial pruning may be required at some time in the future.

The land owner/occupier should be notified as soon as practical when Country Energy removes vegetation under emergency conditions.

11.5 CONSULTATION WITH PROPERTY OWNERS

Country Energy will liaise with and notify landowners/occupiers about impending works. Country Energy will endeavour to resolve Vegetation Management issues, particularly regarding trimming or removal of vegetation, on a cooperative basis with the landowner/occupier in order to comply with its statutory responsibilities. If owners decline permission Country Energy may need to use its legislative powers to carry out vegetation management if it considers the work necessary to maintain safety and avoid threat to

power supplies. The work will be done in accordance with this plan and the owner may be held responsible for the associated costs.

12 PRUNING PRACTICES

Trees are to be pruned to acceptable arboricultural standards set forth by Australian Standard AS 4373 "Pruning of Amenity Trees", and as trained by TAFE – "Tree Care for Electricity Workers" Course or equivalent. Where these methods prove inappropriate, e.g. species that require pruning more frequently than is practical or acceptable, alternatives to pruning shall be considered (see Section 14.0).

Pruning is defined as the selective removal of branches from a tree to obtain a desired end, i.e. to provide the required clearance from powerlines. The aim of the pruning methods should be to work with the natural habit of each tree. The techniques described in this section detail the basic techniques and methods employed when pruning trees beneath or near powerlines.

The industry accepted minimum clearance distances are contained in Appendix 3. An extra 0.5 metre clearance is required for bush fire prone areas. Extra clearance distance must be made for regrowth, the type of vegetation, the climate, the whip of the tree in the wind, the sway of the powerline, the sag of the powerline on a hot day, the heating of the powerline from the current it carries, etc.

The branches to be trimmed will generally be taken back to branch collars therefore clearance distances will generally be in excess of those specified in Appendix 3.

12.1 EXPERTISE

All vegetation management workers undertaking pruning and felling work must have arboricultural knowledge and experience as detailed in Section 11.1, in addition to the required electrical knowledge. This knowledge and practical experience allows the trained personnel to determine the most appropriate method of trimming the tree. Knowledge of the tree's response to pruning will assist the worker in achieving the goal of a healthy tree.

It is recognised that some trees are not suitable for pruning due to a variety of reasons including previous poor pruning practises or their location (under or near powerlines). In this case, the vegetation management worker can do little with this type of tree to make it aesthetically pleasing.

12.2 BIOLOGY

12.2.1 Apical Dominance

Apical dominance is the principal biological factor that influences pruning methods. The compact shoots from which growth occurs are found at the tips of branches and at the base of leaves. The bud at the tip of the tallest 'leader' shoot produces a growth hormone called auxin, which inhibits lower lateral buds from developing into branches. The effect of this hormone decreases over distance from the apical bud. As the effect of the hormone decreases, the lateral buds will develop into shoots. However, each one of these branches will also have a terminal bud, which will produce auxin and limit the development of the lower buds. This creates a hierarchy of shoots.

This phenomenon is known as apical dominance, and produces the triangular shape of most young trees. Natural growth is under the influence of a number of plant hormones as well as light and gravity and the genetic make up of the individual species. The result is a very orderly arrangement of leaves, buds, and branches which are characteristic of a certain species. Some trees such as many conifers and poplars stay apically dominant for their entire lives. We also refer to them as single leader trees. Other trees start with apical dominance but at a certain stage, the leading shoot loses its control

and other branches grow to fill the canopy. This is known as co-dominance and produces dome shaped trees.

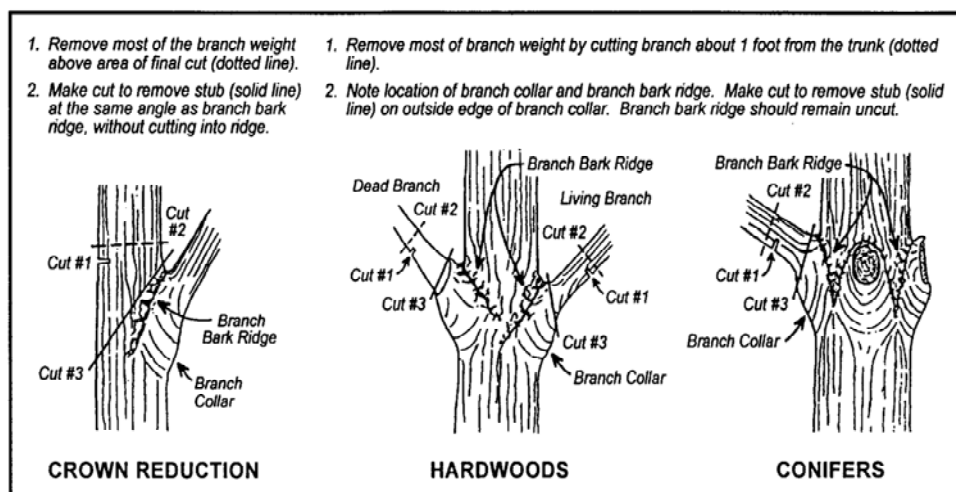
12.3 BASIC THREE CUT BRANCH REMOVAL AND NATURAL TARGET PRUNING

The first cut undercuts the limb at a certain distance from the parent branch or trunk, depending on the size and weight of the branch. A properly made under cut will eliminate the chance of the branch peeling or tearing bark as it is removed. The second cut is the top cut which is usually made slightly further out on the limb than the undercut. This allows the limb to drop smoothly when the weight is released. The third cut is to remove the stub using natural target pruning.

Natural target pruning is the correct 'final' cut after the main weight of a branch has been removed. The correct position of a final pruning cut works with the natural defence of the tree. The pruning techniques used by vegetation management workers are based on the biology of the tree.

A perfect target cut is indicated by subsequent even growth of wound wood around the wound. The cut should be made outside the branch collar and must not damage the branch bark ridge. Figure 1 illustrates this and the basic three cut branch removal.

Figure 1 – Principle of Natural Target Pruning and Basic Three Cut Branch Removal (Copied with permission from Environmental Consultants International).



12.4 REDUCTION PRUNING AND DIRECTIONAL PRUNING

Reduction pruning is a method of pruning whereby branches are cut back to a 'growth point', i.e. a branch fork or lateral branch in a manner consistent with natural target pruning. Ideally, the lateral branch should be at least one-third the diameter of the portion being removed to gain full advantage of the method.

Reduction pruning has many benefits including maintaining the tree shape, the prevention of rapid growth of shoots and a tree structure that ultimately increases the length of the pruning cycle.

If reduction pruning is carried out correctly the energy of the tree will be directed into the lateral branch. When the lateral branch grows down and/or away from an object this is called directional pruning. This method of pruning is an essential technique around powerlines.

Directional pruning techniques should be employed at all times to direct growth away from the powerline and to minimise growth back toward the powerline. Pruning cuts should be made with this concept in mind to minimise the potential for re-growth back into the powerline.

12.5 CUTTING TECHNIQUES

Arborists should be familiar with and experienced in approved tree cutting methods. The common types of saw cuts used for removing branches include hinge cuts, jump and drop cuts, and notch cuts. The basic 3 cut method of branch removal is the most popular technique as previously described in Section 12.3.

All final cuts should comply with the requirements of the Australian Standard AS 4373 – Pruning of Amenity Trees.

12.6 INAPPROPRIATE TECHNIQUES

The following techniques are considered inconsistent with best practice for the reasons stated, and are to be avoided:

- Stub cuts – promote die back and other diseases or may increase regrowth.
- Flush cuts – slow wound wood development and create large wounds.

- Tear cuts – promote insect attack and diseases; and
- Topping and lopping – promote insect attack and diseases and greatly increase growth rates.

The use of spikes in amenity trees wounds the tree and allows for insect attack and diseases.

13 LINE CLEARANCE PRUNING STANDARDS

13.1 SIDE PRUNING

Side pruning is defined as the removal of lateral branches growing toward the conductor, and is illustrated in Figure 2.

Side prunes to be carried out following the principles of directional pruning in order to minimise the re-growth of branches toward the powerline.

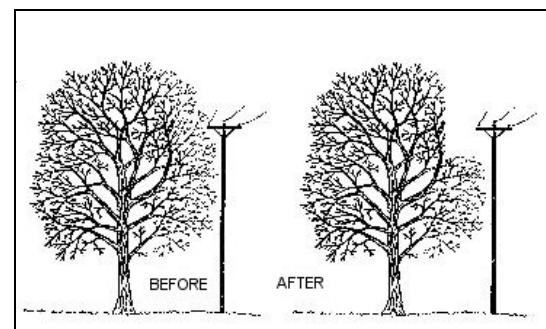


Figure 2 - Diagram illustrating the correct method of side pruning to provide the required clearance to the powerline.

13.2 THROUGH PRUNING

Through pruning is where conductors pass through the crowns of trees and pruning is such that the tree grows away from the powerlines as shown in Figure 4. This maintains the integrity of the shape of the crown when viewed from the sides. Care should be taken that this does not significantly alter the aerodynamics of the crown such that whipping or breakage of branches occur. Pruning back to growth points of the sides may be required to minimise contact with energised powerlines during periods of high winds and storms.

Through pruning is to be completed following the principles of directional pruning in order to minimise the re-growth of branches toward the powerline.

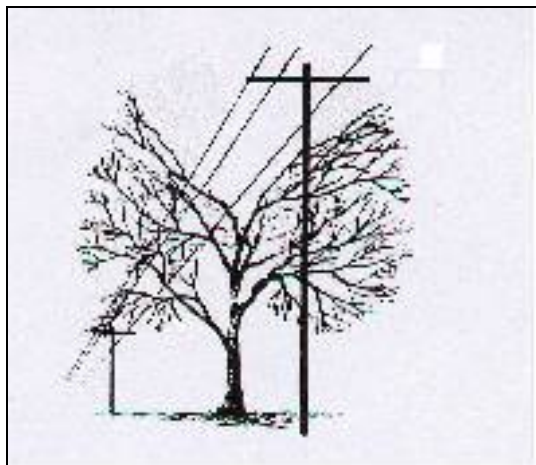


Figure 3 – Diagram of Through Pruning.

13.3 TOP PRUNING (CROWN REDUCTION)

Top pruning is defined as the removal of branches growing up toward the conductors from trees directly beneath the conductors. An example of correct top pruning is illustrated in Figure 3.

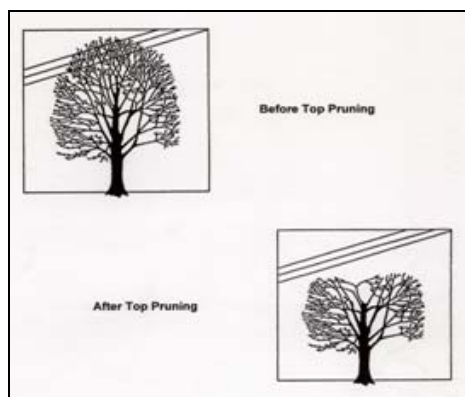


Figure 4 – Diagram of the correct method of top pruning (Copied with permission from Environmental Consultants International).

13.4 SIDE PRUNING WITH OVERHANG

Side pruning with overhang is defined as the removal of those branches on the side of a tree that grows toward and over the powerline. This is shown in Figure 5. All live branches should be removed to a height as indicated in Appendix 3 above the conductors.

All dead branches that overhang the conductors shall be removed, regardless of the species or height above the powerline.

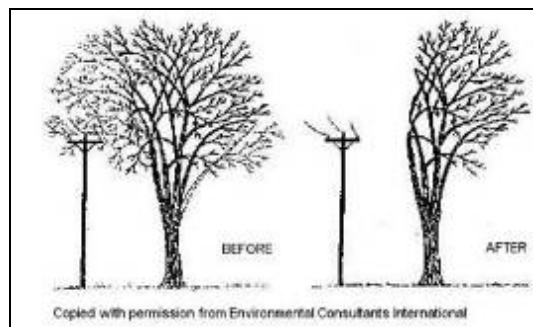


Figure 5 – Diagram illustrating the correct method of pruning to provide sufficient clearance to overhanging branches.

13.5 UNSTABLE AND HAZARDOUS TREES

Trees of any species and diameter originating from fallen decaying logs, stumps or other unstable rooting positions, any trees with obvious symptoms of advanced decline, i.e. excessive dieback; sparse leaf cover; major decay fungi in evidence etc., within the inspection space that could otherwise damage the powerline shall be removed.

In general unstable/hazardous branches or trees in close proximity to, or capable of threatening safety and the integrity of the powerline, shall be removed. See also Appendix 3 and Section 7.19.

14 ALTERNATIVES TO PRUNING

There are a number of methods of maintaining clearance between powerlines and vegetation; the most common method used is pruning. Alternative methods should be considered if they are economically feasible or where the vegetation concerned is of significance or heritage value or listing. Likewise prior to removing a tree other options must be considered. Owners of trees are encouraged to consider alternatives to pruning or removal. Country Energy may also benefit by considering alternatives to pruning to decrease maintenance costs and increase reliability of supply.

14.1 ELECTRICAL OPTIONS

The following electrical options may be considered as alternatives to pruning or removal:

- The use of conductors such as aerial bundled cable to minimise the amount of trimming;
- Relocating powerlines to avoid vegetation;
- Under grounding mains to eliminate the problem;
- Offsetting crossarms to one side to increase clearances; and
- Using taller poles.

Where landowners or Councils seek to implement any electrical options, Country Energy should be consulted. Country Energy may give consideration to contributing to the cost of the work if it reduces the cost of future vegetation control and improves the reliability of the electricity supply.

14.2 NON-ELECTRICAL OPTIONS

14.2.1 Tree Transplanting

Tree transplanting is an option that can be implemented in addition to tree replacement. Certain species lend themselves very well to being transplanted. Small plants that are planted near powerlines should be transplanted away from powerlines at the earliest opportunity.

14.2.2 Removal

Trees may be removed when necessary to protect the safety of persons and powerlines, or property. Where there is no immediate threat to safety alternative strategies need to be considered and where these alternatives are not feasible in the circumstances (including economically feasible) the tree may be removed. It is not necessary for Country Energy seek permission from the local Council for the removal of trees on private property when the removal is necessary for electrical safety reasons or to protect the electricity supply system. This will generally be with the landowner/occupier's permission and may be at their expense. Consultation and statutory approval from appropriate bodies will be required where dangerous trees are protected by Legislation.

Country Energy may issue a notice to the landowner/occupier to remove a tree if the tree is or may be a continual threat to the safety and the integrity of the powerline. A landowner acting on a Country Energy request or notification does not require permission from Council to remove a tree.

14.3 REMOVING TREES

If Country Energy has reasonable cause to believe that a tree could destroy, damage or interfere with its electricity works, or make its works a potential cause of bush fire or cause risk to public safety, it must take appropriate action.

Therefore, Country Energy will seek the removal of trees where:

- Other options including undergrounding of powerlines, replacement with ABC, relocation of powerlines, or transplanting the tree are not economically feasible;
- Safety is compromised;
- The electricity works and supplies are threatened;
- There is an inappropriate species eg. those listed in Section 8.5.1;
- The trees do not respond to directional pruning;
- The trees can not be maintained for appropriate periods of time due to their growth characteristics;
- The health of the tree is such that to leave it would pose a threat to the power line and to the safety of the community; and
- The aesthetics of the tree are such that continued trimming irreparably damages it.

Council and/or Country Energy may carry out consultation with adjoining landowner/occupiers and/or the community where street trees are to be removed.

The tree owner's, who may include Council, permission should be sought when any tree is to be removed by Country Energy. Country Energy should give the owner notice where the land owner/occupier is to remove the tree. The requirements of Threatened Species Legislation shall be considered in this process. Notice is not required in an emergency; Country Energy may remove the tree and do so at its own expense.

Owners are encouraged to seek Council permission before removing their trees near powerlines to ensure the requirements of Tree Preservation Orders are fulfilled unless acting on a Country Energy request or notification. Appropriately authorised contractors must be used, as this work is extremely dangerous. Refer to Section 6.2 for safety requirements when carrying out this type of work.

Protected trees or other vegetation must not be removed unless the appropriate consultation and statutory approval, where required, has been sought.

Where trees are removed the stump shall be appropriately treated as per 15.3.1.

14.3.1 Unsuitable Species

Saplings, whose mature height will infringe the clearance space, are best removed or relocated at an early stage of their growth to minimise the safety risks, cost and disruptions to the area in the future. Country Energy considers the trees listed in Section 8.5.1 and other tall growing species as unsuitable under or near powerlines.

14.3.2 Strategies for Removals

The following are strategies that may be used to facilitate the removal process:

- Replanting with a suitable species prior to removal of the inappropriate species;
- For a group of trees a staged removal with staged replacement is preferable as this reduces the visual impact;
- Removal of the tree and subsequent replacement;
- Replant on the other side of the street prior to any removals; and

- Country Energy encourages Council and other groups to consult with the local community when removals of trees are being considered.

14.3.3 Replacement of Trees

Country Energy encourages the replacement of trees that are removed provided that the trees are planted away from powerlines. Country Energy endeavours to work with property owners and Councils to formulate action plans to identify and replace inappropriate trees.

Tree replacement arrangements should not perpetuate the problem, but solve it. Replacement plants shall be planted in accordance with Country Energy's Planting Guide.

Country Energy will assist with the supply and replacement of trees that have been inappropriately planted after the powerline was first constructed. Any replacement will generally be of a small size as these plants generally establish better, faster, and after several years will outgrow in size an initial larger plant.

Country Energy encourages the replacement of trees with species that are native to the area; this will assist in the preservation of the ecological integrity of the area.

15 PROCESS FOR SAPLINGS AND REGROWTH CONTROL

It is essential that saplings and regrowth of tall growing species are controlled to maintain the security and viability of the electricity supply.

Vegetation should be retained in the following situations wherever practical:

- Low growing species, particularly at creek or river crossings. However the requirements for access for maintenance or repairs may take precedence;
- Low growing species for the habitat for threatened species;

15.3 HERBICIDES

- In steep gullies, (particularly where the connectivity of wildlife habitat and erosion prevention are of major importance) where the power line will be well above the maximum height of the prevailing mature vegetation and the clearance space will not be compromised; and
- If there is no immediate threat to safety or the powerline, vegetation may be retained temporarily where the vegetation is being used for the rearing of young fauna.

Sapling/regrowth control shall be carried out in accordance with this Vegetation Management Plan. Landowners are encouraged to complete this work themselves.

Methods generally used for the reduction of saplings and regrowth are:

- Slashing/Mulching;
- Hand cutting;
- Herbicide treatment; and
- Biological (eg, grazing, retention of low growing native plant species for ground coverage).

Dozing, mulching equipment and other methods may be used following appropriate site assessment.

15.1 HAND CUTTING

Hand cutting without the application of a herbicide is usually ineffective. The use of herbicides in this process is covered in Section 15.3. Landowners who desire that herbicides not be used on their property are encouraged to control any vegetation affecting powerlines themselves, on a regular basis.

15.2 SLASHING/MULCHING

Slashing/mulching may be used in areas of Country Energy's system that are dominated by medium to high-density saplings. In such areas slashing/mulching is generally more practical and cost effective than hand cutting the vegetation. However, this technique is restricted by steep slopes, rocky terrain and wet sites. A mixture of hand cutting and herbicide use will be used in these areas. Grassed areas will generally not be controlled using slashing/mulching.

The use of herbicides will result in reductions of sapling density and provide a long-term solution to tall growing vegetation conflicts with powerlines. An important consideration is that the herbicide program be environmentally safe and supervised. Those personnel who are applying herbicides shall be qualified in compliance with legislative requirements and follow the manufacturer's recommendations for application. All herbicides must be used in a manner consistent with the labelling on the container.

Those, including organic growers, who do not wish to have herbicides used on their property, are encouraged to control vegetation themselves or look at alternative solutions as listed in Section 14.

Herbicide use may not be appropriate for all portions of Country Energy's system, but there are many opportunities for herbicide use to limit future conflicts with vegetation and powerlines. The following methods detail the manner in which herbicides may be utilised:

15.3.1 Cut Stump Treatment

Hand cutting of target vegetation followed by stump herbicide treatment will be used where appropriate. All unsuitable vegetation is to be cut to a stump, herbicide is then immediately applied to the outer edge (cambium) of the cut stump and any exposed bark. The cut stump treatment is very selective and, will generally not damage adjacent vegetation. This is the preferred method where aesthetic appearance is to be preserved such as where the vegetation is directly on the side of main roadways or adjacent to residences. This method is also used to prevent regrowth where mature trees are removed.

15.3.2 Selective Low-Volume Basal Treatment

Low-volume basal treatments can be applied with backpack pump sprayers and low-volume spray wands. The herbicide mixture should be evenly applied to all exposed bark on the lower 18 cm. of each stem. Due to the high selectivity of this technique, compatible species can be retained and encouraged. Diesel is often mixed with the herbicide.

15.3.3 Foliar Application

Foliar application can be used on vegetation generally less than 2.5 metres in height and the application is to be directed at the target, but not to the point of run off. The selectivity of the foliar spray technique is achieved through application of the non-compatible species while not applying to compatible species or by the use of selective herbicides.

15.3.4 Stem Injection

Stem injection is the application of herbicide to growing saplings and trees where the plant is left to stand and die in its growing position. Only those plants that are to be prevented from growing are treated.

15.3.5 Special Requirements for Herbicide Use

Special requirements for herbicide use include:

- Near Creeks, Dams, Sensitive Crops and Other Sensitive Areas - Trees or sapling regrowth to be treated near creeks, dams, sensitive crops and other sensitive areas shall be treated with a suitably registered herbicide and generally by cut stump application or stem injection methods, or as otherwise agreed by the landowner or management agency.
- In Paddocks Containing Livestock - Stem injection shall be the preferred method of herbicide application where stock are grazing or as otherwise agreed by the landowner.
- Cattlecare, HACCP and other Quality Controlled Properties - Cattlecare and HACCP property owners and vegetation management workers will need to liaise where herbicides are to be used. Herbicides will be used in accordance with label and MSDS requirements.

15.4 BIOLOGICAL CONTROL

Many of Country Energy's powerlines run through rural areas where grazing or cropping provides a natural means of keeping naturally sown tall growing saplings away from powerlines.

The retention of low growing species also discourages the growth of tall growing species. Therefore the retention of low growing species is desirable in many locations where access is not a

problem. However, the requirement for access must take precedence over the requirement to retain low growing species.

Where feasible, biological control is the preferred control method for saplings and other regrowth.

16 RAILWAYS

Country Energy is required to liaise with Rail Access Corporation to obtain access to the rail corridor prior to performing vegetation management to ensure safety requirements are met.

17 TREE GROWTH REGULATORS

Tree growth regulators may be used to control the growth of trees so as to minimise the pruning required and thereby retaining some trees that would otherwise require removal. New techniques for the application of tree growth regulators have been developed including the application by soil injection. This will only be carried out by the tree owner or with the tree owner's authority and may be at the tree owner's expense.

18 CORRIDOR WIDTH

In order to comply with bushfire mitigation regulations and create a safe and reliable supply of electricity, Country Energy needs to maintain an adequate corridor width, particularly in rural areas. Country Energy therefore controls vegetation resulting from regrowth, self-sown trees, or planted trees.

Original corridors cut through timbered areas may not have been cleared to the proper width. The distances specified in Table 2 will be used as a guide where corridors are assessed as requiring widening. An additional allowance for conductor movement from wind loading may also be required.

Table 2 may not provide adequate clearance in situations with very tall growing species, as the trees will close in over the top of the power lines. Many corridors are already wider than the requirements in Table 2; it is in Country Energy's interest to maintain these corridor widths to prevent future problems. Tall trees should be at a distance from the powerline at least equal to their potential height.

TABLE 2 - GUIDE FOR CORRIDOR WIDTH	
Voltage	Minimum Corridor Width
LV	20m
11kV	20m
19.1kV	20m
22kV	20m
33kV	30m
66kV	30m
132kV	45m

At each site consider span length, blow out of conductor from wind loading, potential tree height and spread.

19 ACCESS FOR MAINTENANCE OR REPAIRS

Heavy vehicle access is required to powerlines to allow for routine and emergency maintenance. It is a requirement of The Electricity Supply Acts and Country Energy's Customer Contract that access shall be provided for these purposes. If crops are planted in the immediate vicinity of powerlines then the grower risks damage to these crops if access is required. Tall growing crops should not be grown near powerlines.

20 AUDITING PROCESS

Vegetation Management carried out by Country Energy will generally be subject to audit by Country Energy Vegetation Management Supervisors or Environmental Auditors. These are conducted to ensure compliance with this Vegetation

Management Plan and other requirements. Particular attention should be paid to compliance with the pruning and removal of trees and the criteria for determining the extent of trimming or removal.

For trees that have been pruned, the auditor will consider:

- Arboricultural techniques (quality of pruning);
- Clearances;
- Debris disposal and tidiness of sites;
- Environmental considerations;
- Sapling and regrowth removal; and
- Herbicide use.

21 EVALUATION OF CONTRACTORS AND TENDERING PROCESS

Under some circumstances Country Energy may decide to let vegetation management to private contractors. The tendering process is competitive and contracts will be let using the most cost-effective process available to Country Energy, whilst achieving the requirements of this Vegetation Management Plan.

A standard evaluation of these contractors is utilised to ensure works are carried out in a professional and tradesman like manner with due consideration for safety and the environment.

This evaluation includes but is not limited to:

- Appropriate insurances;
- Appropriate employee qualifications;
- Health and Safety Policy/Procedures;
- Environmental Policy and Procedures;
- Risk Assessment;
- Quality Assurance; and
- Previous Utility Work.

22 RESPONSIBILITIES/ ALLOCATION OF COSTS

22.1 COUNTRY ENERGY

Country Energy will endeavour to ensure that vegetation is kept clear of its network of power lines. Trimming or removal is required where the vegetation could destroy, damage or interfere with its electricity works, or could make its electricity works become a potential cause of bush fire or potential risk to public safety. Country Energy will also carry out clearing of vegetation to provide safe clearance to streetlight conductors and lanterns in overhead powerline areas.

This does not mean that Country Energy is responsible for all the costs involved in this work. In NSW Country Energy is responsible for trimming or removal costs for naturally propagated trees, those trees that are older than the power line and areas detailed as protected in the Electricity Supply Act 1995 (NSW).

In Queensland Country Energy carries out vegetation management affecting all Country Energy network assets at its own cost.

22.2 NEW SOUTH WALES COUNCILS

Country Energy seeks to work with Councils in a cooperative manner to ensure effective vegetation management in the best interests of the community as a whole. It will endeavour to enter into "In Principle" agreements regarding vegetation management near power lines or continue with existing arrangements with Councils, when these have proven effective.

Under NSW legislation, Councils are responsible for control costs for vegetation, on land under their control (including road reserves and parks) that has been planted and allowed to grow directly under or along side powerlines and where the vegetation could destroy, damage or interfere with Country Energy's electricity works, or could make Country Energy's electricity works become a potential cause of bush fire or potential risk to public safety.

Where Councils carry out vegetation control works near powerlines then this work should be carried out

in accordance with this Vegetation Management Plan.

22.3 NEW SOUTH WALES PRIVATE LANDOWNERS/OCCUPIERS

Country Energy also seeks to work in a cooperative manner with private landowner/occupier's to resolve Vegetation Management issues.

Under NSW legislation, private landowners are responsible for trimming and removal costs for vegetation on their property where the vegetation has been planted and allowed to grow directly under or along side powerlines and could destroy, damage or interfere with Country Energy's electricity works, or make the electricity works become a potential cause of bush fire or a potential risk to public safety.

Country Energy contractors and employees may provide a quotation to the landowner/occupier for all work required on service lines affected by planted vegetation. The landowner/occupier is at liberty to engage an appropriately authorised independent contractor to carry out this work.

Landowners/occupiers should be aware that the optimum time to have vegetation works carried out at a cost-effective price is when Country Energy's contractors or employees are working in the area. If the landowner/occupier wishes to implement alternative solutions to prevent future vegetation and powerline conflicts then these solutions will be at the landowner/occupier's cost.

Where landowners carry out vegetation control works near powerlines, then this work should be carried out in accordance with this Vegetation Management Plan.

22.4 QUEENSLAND COUNCILS AND PRIVATE LANDOWNER/OCCUPIERS

Any vegetation affecting private powerlines is the responsibility of the owner.

Health and Safety Legislation requires that dangerous situations are not created. Planting trees near powerlines can create a dangerous situation; therefore trees should be planted away from powerlines.

23 REVIEW OF TREE MANAGEMENT PLAN

Periodical reviews will be conducted to promote opportunities for continual improvement of the Vegetation Management Plan.

Interested parties may provide relevant comment to assist in the continual improvement of this Vegetation Management Plan. This comment will be considered in subsequent reviews of the Plan.

Major changes in the Vegetation Management Plan will only be made after consultation with the appropriate entities and the community.

ATTACHMENT A – COUNTRY ENERGY'S HEALTH AND SAFETY POLICY

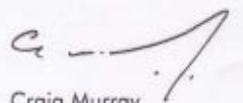
Health and Safety Policy

Country Energy is Australia's largest regional utility business. The health, safety and well-being of our employees, customers, contractors, visitors, labour hire employees and the public is our highest priority.

Our aim is to integrate health and safety into all that we do.

To demonstrate our commitment to health and safety, we will:

- Strive for an incident free workplace.
- Provide a safe and healthy working environment through the effective implementation of this policy.
- Apply a risk management approach to our activities, products and services, consistent with the health and safety risk they pose.
- Comply with relevant legislation, regulations, standards, codes and licences.
- Ensure all employees are trained and have the knowledge and skills they need to undertake their work in a healthy and safe manner.
- Require supervisors, employees, contractors, labour hire employees and visitors to abide by all health and safety policies, procedures and other requirements.
- Engage in effective consultation and open communication about health and safety with our employees, contractors, and labour hire employees.
- Conduct incident investigations fairly, with a focus on implementing preventative actions.
- Continually measure and improve our health and safety objectives and targets.
- Promote a 'Safety First' culture where everyone watches out for their workmates, families and local communities.


Craig Murray
MANAGING DIRECTOR
APRIL 2006



ATTACHMENT B – COUNTRY ENERGY'S ENVIRONMENTAL POLICY

Environmental Policy

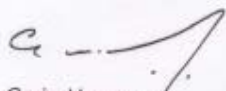
Country Energy is Australia's largest regional utility business. As an environmentally conscious and responsible company we are committed to caring for and protecting our natural environment.

Our aim is to integrate responsible environmental management into all that we do.

To demonstrate our commitment to the environment, we will:

- Strive to be an incident free organisation.
- Use best practice options to reduce and prevent pollution.
- Apply a risk management approach to address environmental impacts arising from our activities, products and services.
- Comply with applicable legislation, regulations, standards, codes and licences which relate to our environmental aspects.
- Ensure supervisors, employees and contractors are trained and have the knowledge and skills they need to undertake their work in an environmentally responsible manner.
- Require our people and visitors to abide by all environment policies, procedures and other requirements.
- Engage in effective consultation and open communication about environmental issues.
- Conduct incident investigations fairly, with a focus on implementing preventative actions.
- Establish measurable objectives and targets based on our significant environmental aspects to continually review and improve our environmental performance.
- Secure renewable energy from greenhouse friendly sources to address the impacts of electricity generation.

This policy applies to all employees, agents, and contractors of Country Energy and to any person or organisation that acts for, or represents it.



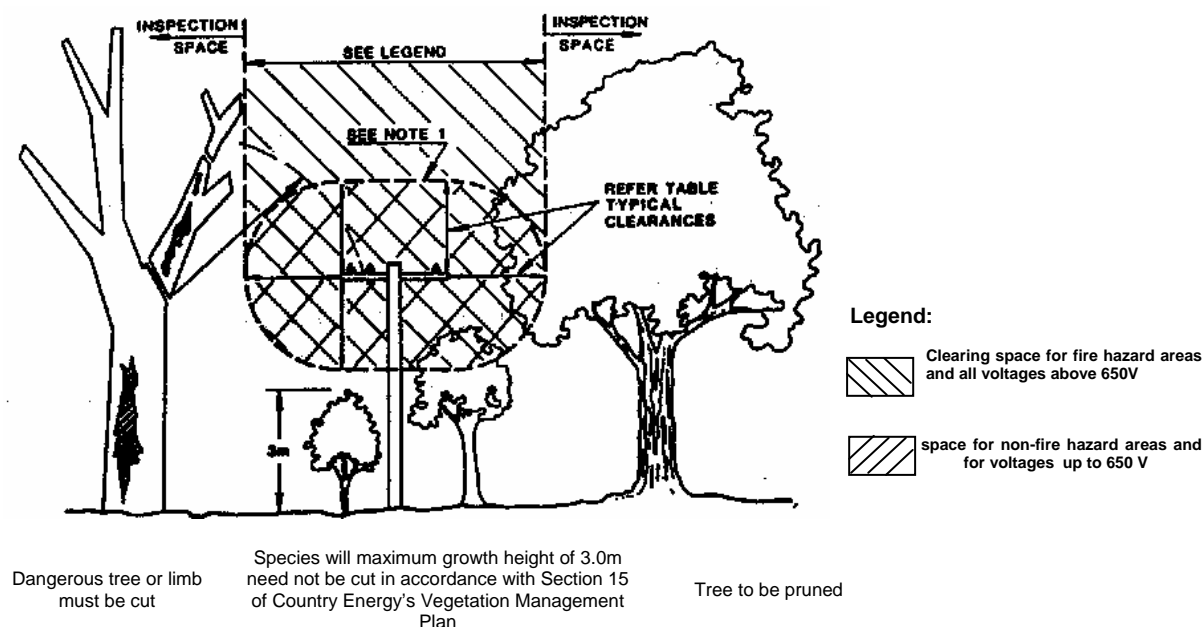
Craig Murray
MANAGING DIRECTOR
April 2006



ATTACHMENT C – MINIMUM VEGETATION CLEARANCE DIAGRAMS

ATTACHMENT C1 – BARE CONDUCTORS AND INSULATED SERVICE LINES TREE PRUNING – TYPICAL CLEARANCE

Voltage	Clearance at Pole to Nearest Conductor in Rest Position	Clearance Along Middle 2/3 of Span to Nearest Conductor in Rest Position
Insulated Service Wires	0.5m	0.5m
Up to 650V See Note 3	1.0m	1.0m
>650V to 22 kV	1.5m	1.5m
>22 kV up to 66 kV	2.25m	2.25m
>66 kV up to 132 kV	3.0m	3.0m

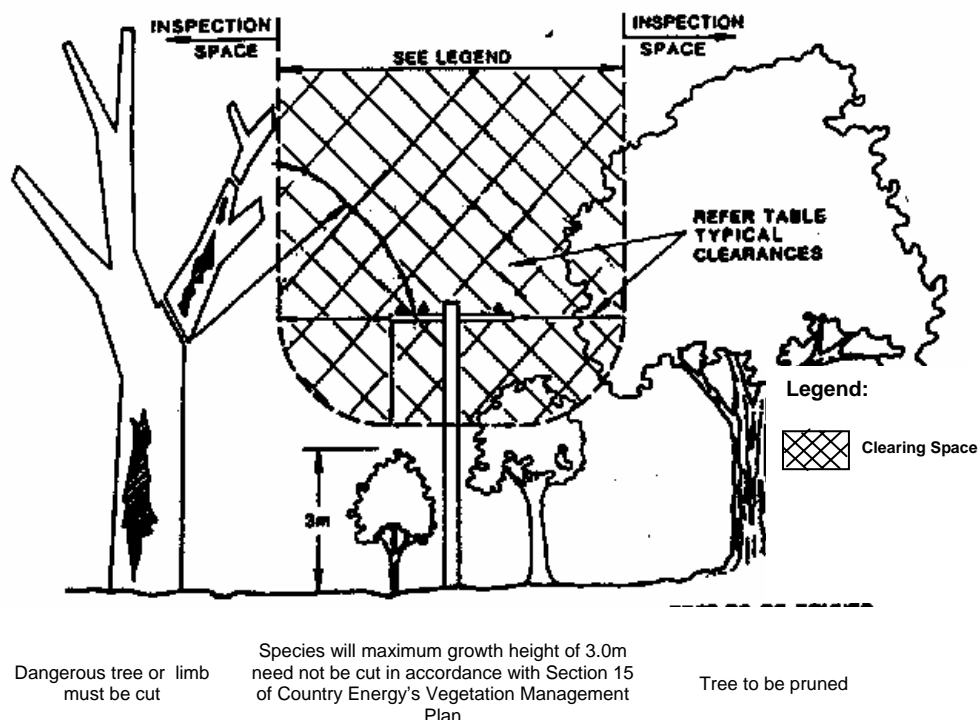


NOTES:

- The extent of the clearing space may be limited as shown where in the opinion of the delegated Country Energy Officer part of a tree in the clearing space does not constitute a serious hazard to such conductors. This shall only apply in the case of conductors operating at voltages up to 650V.
- Additional clearance shall be allowed for regrowth.
- An additional clearance of 0.5 m shall be added to the nominated clearances for fire hazard areas. Some clearing in the inspection space may also be appropriate.
- The appropriate clearance in each situation will vary depending on local circumstances (eg, type of vegetation, climate, locality, etc). In all cases the most appropriate clearance is a matter for determination by the delegated Country Energy Officer.
- Attachment C3 can be used for insulated service wires known to be XLPE systems.
- These clearances allow for normal whip by trees in high winds. However, additional allowances may have to be made for very slender trees. No limb should be permitted to overhang the clearing space or any conductor in any fire hazard area.

ATTACHMENT C2 – COVERED CONDUCTOR (CC) VOLTAGES ABOVE 650V AND UP TO AND INCLUDING 22 KV TREE PRUNING – TYPICAL CLEARANCES

Voltage	Clearance at Pole to Nearest Conductor in Rest Position	Clearance Along Middle 2/3 of Span to Nearest Conductor in Rest Position
>650V and <= 22 kV	1.0 m	1.0 m or sag of 50°C plus 0.5 m (whichever is the greater)



NOTES:

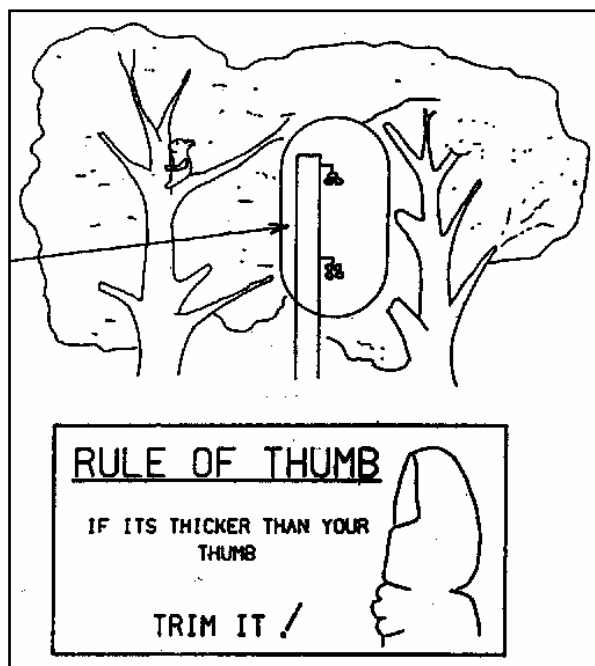
- 1 Where the original insulation material has been removed, the clearance for Attachment C1 will apply. This requirement applies even if some form of covering is in place.
- 2 Additional clearance shall be allowed for regrowth.
- 3 An additional clearance of 0.5 m shall be added to the nominated clearances for fire hazard areas. Some clearing in the inspection space may also be appropriate.
- 4 The appropriate clearance in each situation will vary depending on local circumstances (eg, types of vegetation, climate, locality, etc). In all cases the most appropriate clearances is a matter for determination by the delegated Country Energy Officer.
- 5 These clearances allow for normal whip by trees in high winds. However, additional allowances may have to be made for very slender trees. No limb should be permitted to overhang the clearing space or any conductor in any fire hazard area.

ATTACHMENT C3 - INSULATED AND COVERED CONDUCTOR THICK (CCT) CABLE SYSTEMS VOLTAGES UP TO AND INCLUDING 22 KV TREE PRUNING – TYPICAL CLEARANCES

NOTES:

CLEARANCE SPACE

A tunnel of radius 500 mm from the ABC conductors.
See Notes 1 and 2



- 1 Where the original insulation material or screen has been removed, the clearances show for Attachment 3A, will apply. This requirement applies even if some form of covering is in place.
- 2 Trim any branches or twigs thicker than you thumb (approximately 15 mm diameter) which are in the aerial bundled cable clearance tunnel, or will encroach into the tunnel within the pruning cycle (typically 3 years), under still air conditions. The clearance tunnel should allow for variation in sag between support structures.
- 3 Leaves and twigs are otherwise allowed to remain in the clearance tunnel.
- 4 Trees and branches which overhang or nearly overhang the clearance tunnel and which are obviously likely to break and fall onto the conductors within the next pruning cycle (typically 3 years) should be trimmed or removed.
- 5 Access to all support structures for construction and maintenance needs to be allowed to ensure reliability and employee safety during operations and maintenance work.
- 6 The appropriate clearance in each situation will vary depending on local circumstances (eg, type of vegetation, climate, etc). In all cases the most appropriate clearance is a matter for determination by the delegated Country Energy Officer.

24 REFERENCES

Country Energy Documents

CEK8029 - Network Management Plan
CEPG8022 - Bush Fire Risk Management Plan
CEPG2299 - Pesticide Notification Plan (DRAFT)
CEPG2021 – Removing Vegetation Near Overhead Powerlines
CEPG2010 – Vegetation Clearing Guidelines for New Powerlines
CEPG2016 - Environmental Impact Assessment (DRAFT)

Acts, Regulations and Other References

National

Environmental Protection and Biodiversity Conservation Act 1999 (Commonwealth)

New South Wales

Australian Heritage Commission Act 1975
Electricity Supply Act 1995
Electricity Supply (General) Regulation 2001
Environmental Planning and Assessment Act 1979
Fisheries Management Act 1994
Heritage Act 1977
Native Vegetation Act 2003
National Parks and Wildlife Act 1974
National Parks and Wildlife Regulation 2002
Noxious Weeds Act 1993
Occupational Health and Safety Act 2000
Rural Fires Act 1997
Soil Conservation Act 1938
State Environmental Planning Policies
Threatened Species Conservation Act 1997
Australian Standard AS4373 – Pruning of Amenity Trees
Code of Practice for the Amenity Tree Industry (NSW)
ISSC3 Guideline for Managing Vegetation Near Power Lines
Urban Erosion and Sediment Control Field Guide (NSW Department of Land and Water Conservation)

Victoria

Electricity Safety Act 1998

Electricity Safety (Electric Line Clearance) Regulations 2005 (Vic)

Electricity Safety (Network Assets) Regulation 1999

Queensland

Electricity Act 1994 (Qld)

Environmental Protection Act 1994

Electricity Safety Act 2002

Electrical Safety Regulation 2002

Workplace Health and Safety Act (Qld) 1995;

Code of Practice – Working near Exposed Live Parts Electrical Safety Act 2002

25 REVISIONS

Revision Number	Section	Details of Changes in this Revision
1		Original Issue
2	8.5	Update planting guide image
3	All	Plan updated to new template Document Number used to be CEK8008