

Appendix J

Bushfire Hazard Assessment Report



Holiday Coast Bushfire Solutions

ACN: 117 523 449
ABN: 82 117 523 449

Steve Ellis
Bushfire Risk Assessor
176 Wallace Street
MACKSVILLE NSW 2447
Telephone: 02 6568 3312
Facsimile: 02 6568 2461
Mobile: 0419 245 725
E-mail: steve@bushfiresolutions.com.au

BUSHFIRE HAZARD ASSESSMENT REPORT

REPORT PREPARED IN RELATION TO:	RESIDENTIAL SUBDIVISION (stage 2 of 2)
PROPERTY DESCRIPTION:	LOT 260 DP 1110719 GRAHAM DRIVE, SANDY BEACH, via WOOLGOOLGA.
REPORT COMMISSIONED BY: (my Client)	Sandy Beach Mill Pty Ltd, c/- Mark Petersen Consulting Group
 BUSHFIRE PLANNING AND DESIGN Certified Practitioner Certification No. <u>BPD-PA-09420</u> Signature <u>[Signature]</u> DATE ISSUED: <u>11-6-2009</u>	

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 (or his/her agents).

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 AS3959 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.
Required	-	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 REGULATORY FRAMEWORK

Below are relevant extracts of the document “*Planning for Bushfire Protection 2006*” (*PBP-2006*). Sections have been suitably modified to reflect the scope of this proposed development and its relationship with the relevant legislation.

0.1 Environmental Planning and Assessment Act

On 1 August 2002 the Environmental Planning and Assessment Act 1979 (*EP&A Act*) and the Rural Fires Act 1997 (*RF Act*) were both amended to enhance bushfire protection through the development assessment process.

0.2 Bushfire Prone Land Mapping

Bushfire prone land maps provide the trigger for the various development assessment provisions. The identification of bushfire-prone areas in NSW is required under section 146 of the *EP&A Act*. The NSW Rural Fire Service designates, through separate guidelines, what constitutes a bushfire-prone area and how it is to be mapped. Each Council then prepares a map in accordance with the guidelines and submits the map for approval by the NSW Rural Fire Service.

The subject property has been identified as bushfire-prone land by the Coffs Harbour City Council’s Bushfire Prone Land Map, a copy of the relevant extract is provided below.

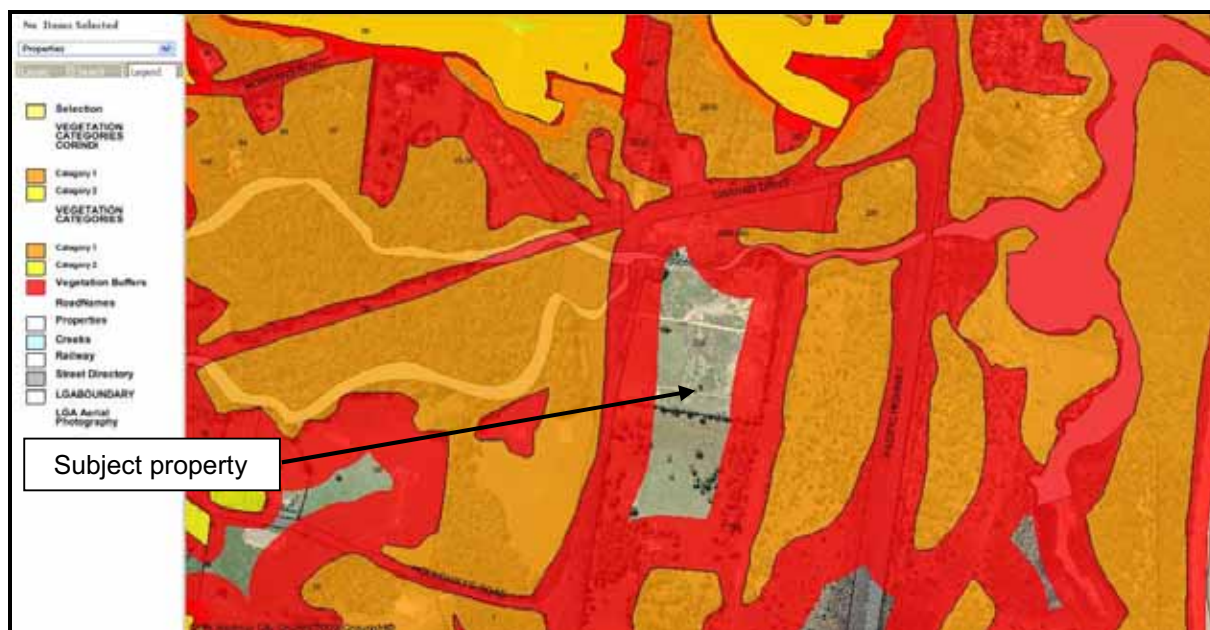


Figure 1: extract of Bushfire Prone Land Map (CHCC 2009)



0.3 The Development Assessment Framework

The *EP&A Act* establishes a system for requiring bushfire protection measures on bushfire-prone land at Development Application (DA) stage. It requires Councils to map bushfire-prone land. If any part of a development site is affected, special submission and assessment requirements may apply to the DA.

Section 91 of the *EP&A Act* (in combination with the *RF Act* requirements for a section 100B Bushfire Safety Authority) classes subdivision as Integrated Development.

In summary, if a development site is on bushfire-prone land, the requirements of **PBP-2006** will apply. For subdivision an Integrated DA approval must be obtained from the NSW Rural Fire Service, i.e. a Bushfire Safety Authority is required. The matters to be addressed in the application for a Bushfire Safety Authority are set out in cl.44 of the *Rural Fires Regulation 2008*.

0.4 Planning for Bushfire Protection – meeting the requirements

PBP-2006 introduces a performance-based approach, and identifies **objectives** and detailed **Performance Criteria** to satisfy desired outcomes.

The general **aims** and **objectives** of **PBP-2006** are:

- (i) afford occupants of any building adequate protection from exposure to a bushfire;
- (ii) provide for a defendable space to be located around buildings;
- (iii) provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent direct flame contact and material ignition;
- (iv) ensure that safe operational access and egress for emergency service personnel and residents is available;
- (v) provide for ongoing management and maintenance of bushfire protection measures, including fuel loads in the asset protection zone (APZ); and
- (vi) ensure that utility services are adequate to meet the needs of firefighters (and others assisting in bushfire fighting).

0.4.1 Performance Criteria for the Bushfire Protection Measures

Performance Criteria are the outcomes to be met for satisfying the bushfire protection measures (BPM). The **Performance Criteria** can be satisfied in one of two different ways:

- use of the **Acceptable Solutions**; OR
- demonstrating another solution satisfying the specific **objectives** and **Performance Criteria**.

These **Performance Criteria** can be found in the Tables in Chapter 4 of **PBP-2006**. Specifically, subdivision development proposals should meet the relevant requirements provided at Section 4.1 of **PBP-2006**.



Performance Criteria allow applicants, Consent Authorities and the NSW Rural Fire Service to be flexible and innovative in responding development opportunities and constraints. In order to reach an acceptable siting and design solution, the **Performance Criteria** have been developed taking into account the range of circumstances across the State and recognising that no two sites or proposals are the same.

They also allow applicants, Councils and the NSW Rural Fire Service to consider a broad range of issues and information, including community expectations, environmental protection and the application of new technologies.

0.4.2 Acceptable Solutions

PBP-2006 has identified some **Acceptable Solutions** which will satisfy the **Performance Criteria**. Any variation from the **Acceptable Solutions** will require detailed justification to demonstrate how the **Performance Criteria** can be met through another method(s).

0.4.3 Proposing Alternative Solutions

Submissions proposing variations to **Acceptable Solutions** must provide substantiated evidence that the specific **objectives** and **Performance Criteria** can be met.



1.0 GENERAL DESCRIPTION OF LAND AND PROPOSAL

1.1 The Land

A site assessment was carried out by me on Thursday 5th March 2009 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 approximately 20km north of Coffs Harbour, and approximately 3km south of Woolgoolga, on the north coast of NSW.

The property fronts Graham Drive to the west, from which access to the site is gained. The Pacific Highway is located approximately 250m to the east of the site. The land between the site and the Highway is burdened by overhead electricity lines within a managed easement. A creek known as Double Crossing Creek forms the northern boundary of the site.

The site has an area of 7.89 hectares, is flat and generally un-vegetated, and was vacant at the time of the site assessment.



Figure 2: aerial image indicating general location of property (© NSW Lands 2009)



Figure 3: aerial image showing property and surrounding landuse (© NSW Lands 2009)

1.2 The Proposal

This Report is an assessment of Stage 2 of a staged subdivision. From the details provided to this office, Stage 1 included the subdivision of lot 260 to create 24 lots plus residue lot (Development Consent 508/07 - 19 February 2008). The residue lot is now the land over which Stage 2 is to be developed.

As part of the Development Consent process for DC 508/07, a *Bushfire Hazard Assessment* was carried out by *Barry Eadie Consulting Pty Ltd*. This assessment was conducted in response to the bushfire legislation in force at that time - **PBP-2001**. This Report does not seek to carry out a re-assessment of the bushfire impact on Stage 1; however there may appear to be anomalies between the requirements provided within this Report to those in the original assessment. These anomalies would primarily be due to the different site assessment methodologies, vegetation classifications and computer modelling used to predict radiant heat flux.

Stage 2 is for the subdivision of the residue lot to create another 43 urban-sized residential allotments, a residue lot will form public reserve along the southern bank of Double Crossing Creek.

Below is a plan provided by the client indicating the overall subdivision proposal for the site. The plan incorporates both Stage 1 and Stage 2 of the proposal, while Figure 5 indicates the Stages individually. As previously stated, this Report will only deal with stage 2 and its compliance with **PBP-2006**.



Figure 4: subdivision and landscape plan – Stage 1 and 2

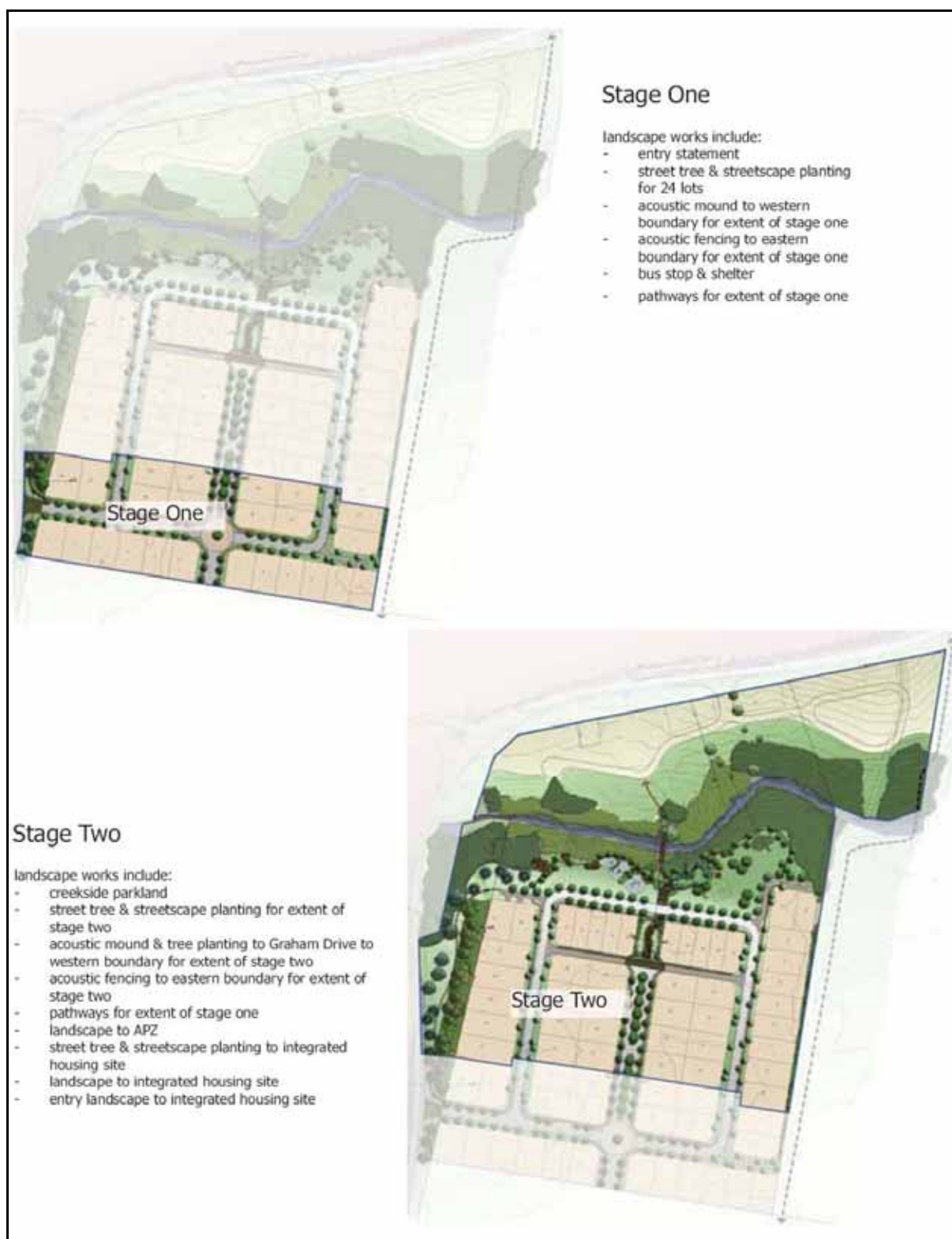


Figure 5



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 property boundaries, in all directions. It is determined that the general vegetation description is summarised as follows:

North - Along the northern boundary of the property is the riparian corridor of Double Crossing Creek. Vegetation along this area is generally a mixture of weeds, reeds and Casuarina.



Figure 6: looking north across Double Crossing Creek towards neighbouring residence

Beyond the creek is grasslands associated with the neighbouring dwelling and vacant allotments.



North of these grasslands is Graham Drive, then APZs around the established developments north of Graham Drive.

- East** - Immediately east of the eastern boundary is a cleared area under the overhead electricity transmission lines. This cleared area is approximately 40m wide. Beyond the cleared area is swamp forest with an open canopy. The western fringe is Eucalypt-dominant with the understorey dominated by grass and regrowth saplings. The eastern fringe is dominated by Casuarina and Melaleuca, with Twig Rush dominating the near-surface fuel loads.



Figure 7: *looking east from the property boundary across electricity easement towards swamp*

- South** - The property to the south of the site is paddock with scattered trees that are insignificant in relation to bushfire behaviour. This grassland extends for a distance of approximately 250m to the neighbouring dwelling.



Figure 8: *looking south across neighbouring grasslands*

- West** - To the immediate west of the site is the Graham Drive road reserve. Further west of Graham Drive is forest, with a mosaic of grasslands, APZs and forest to the south-west and north-west.



Figure 9: looking north-west across Graham Drive

The wedge-shaped un-formed section of the Graham Drive road reserve to the immediate west of the site (to the right of the road in Figure 9 above) is to be managed as an APZ / bushfire non-hazard in accordance with the Landscape Masterplan, prepared by Jackie Amos Landscape Architect (DC 508/07).

2.2 Vegetation Classification

PBP-2006 requires the various vegetation formations to be classified in accordance with the system adopted by D. 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** - Riparian corridor (assumed to be indicative vegetation class *rainforest* in accordance with page 52 of **PBP-2006**), then
Grasslands and managed lands
- East** - Forested wetland
- South** - Grasslands
- West** - Forest

2.3 Past or Future Disturbance Factors (including extenuating circumstances)

The forest to the west of the site has been identified as Secondary and Tertiary Koala Habitat on the Coffs Harbour City Council's GIS mapping system (refer to Figure 11 below). It is unlikely that the current bushfire threat from this area will be reduced.

The disturbance on the land to the east of the site is expected to continue while ever the overhead transmission lines are located there.

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 property 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	Riparian corridor Grasslands and managed lands	0° Upslope
East	Forested wetland	0°
South	Grasslands	Upslope
West	Forest	Upslope

4.0 SIGNIFICANT ENVIRONMENTAL FEATURES

The following environmental features are to be considered and assessed by the applicant in a Statement of Environmental Effects (SoEE):

- 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

The riparian corridor to the north of the site is subject to a landscaping and rehabilitation plan prepared by Jackie Amos Landscape Architect. The plan forms part of the SoEE and Preliminary Environmental Assessment (PEA) for Stage 2.

A preliminary assessment of the creek rehabilitation plan indicates that the vegetation will be managed to prevent the possibility of high intensity bushfires along the riparian corridor. Therefore, the *required* setback from the riparian corridor for APZ is considered to be conservative under the circumstances.

However, ultimately the construction requirements on the proposed new lots may not be impacted by the *required* setbacks / APZs from this riparian corridor.

A copy of the creek rehabilitation plan is provided below.



Figure 10: landscaping and rehabilitation plan prepared by Jackie Amos Landscape Architect

In relation to Koala habitat, the following map is an extract from the Coffs Harbour City Council's GIS mapping system. The map shows that the lands surrounding the site have been identified as potential Koala habitat. No Koala habitat occurs on the site, and therefore no additional Koala habitat need be disturbed in order to provide the *required* APZs for the proposed development.



Figure 11: CHCC LEP map extract (constraints - Koala Habitat)

5.0 THREATENED SPECIES, POPULATIONS, COMMUNITIES, HABITAT

These matters have been considered and assessed by the applicant in a Preliminary Environmental Assessment. An extract from the PEA is provided below.

A Flora and Fauna Survey dated November 2006 accompanied Development Application 508/07. The threatened species assessment completed as part of the Survey concluded that the proposal was unlikely to have a significant effect on threatened species, populations, ecological communities or their habitats.

6.0 ABORIGINAL HERITAGE

Aboriginal heritage issues have been considered and assessed by the applicant in a Preliminary Environmental Assessment. An extract from the PEA is provided below.

Development Application 508/07 included correspondence from the Coffs Harbour Local Aboriginal Land Council and Yarrawarra Aboriginal Corporation advising that the site did not have any cultural significance nor was it likely to contain objects of significance.



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 PBP-2006 . (1.1.2) the APZ is wholly within the boundaries of the development site. Exceptional circumstances may apply (see section 3.3 of PBP-2006).	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.

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	Upslope/Flat	Effective Slopes			
		>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 12: extract from PBP-2006 (Table A2.5)

- ✓ 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 the provision of the reticulated water supply to the site, below is an extract from the PEA.

Potable water will be provided to the Project from the existing 225mm diameter water main immediately to the north east of the site. A 150mm diameter water main will be constructed to connect to the existing main, and loop around the site. The remainder of the site will be serviced by 100mm diameter mains fed by the 150mm diameter main.

Some of the **Acceptable Solutions** provided above vary from the requirements of the superseded bushfire protection document **PBP-2001**. The design and location of the water supply within the site are to comply with the relevant **Acceptable Solutions** above.

- ✓ 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). (3.2.2) The perimeter road is linked to the internal road system at an interval of no greater than 500m in urban areas. (3.2.3) Traffic management devices are constructed to facilitate access by emergency services vehicles. (3.2.4) Public roads have a cross fall not exceeding 3°. (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. (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. (3.2.7) The minimum distance between inner and outer curves is 6m. (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.	Complies (see note below) Complies Complies Complies Complies Complies Complies



	(3.2.9) There is a minimum vertical clearance to a height of 4m above the road at all times.	Complies
(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.	(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.	Complies
	(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.	Complies
(3.5) There is clear access to reticulated water supply.	(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.	Complies
	(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.	Complies
(3.6) Parking does not obstruct the minimum paved width.	(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.	Complies
	(3.6.2) Public roads directly interfacing the bush fire hazard vegetation provide roll top kerbing to the hazard side of the road.	Not applicable

In relation to **Acceptable Solution 3.2.1**, the proposed road layout in Stage 2 appears to be reflection of the design of Stage 1. **PBP-2006** prefers the use of perimeter roads where the development interfaces with bushfire hazard vegetation. In that regard:

- The land to the north is a riparian corridor being managed as a non-hazard in accordance with a creek rehabilitation plan, further north is grasslands.
- The land to the east is an easement under overhead power lines, the bushfire hazard vegetation is located approximately 40m to the east of the property boundary.



- The land to the south is grassland.
- The forest to the west is separated by Graham Drive.

The loop road forms a perimeter road along the riparian corridor to the north (Stage 2), and along the grasslands to the south (Stage 1). The loop road does not form a perimeter road along the eastern boundary (Stage 1 and 2). The approval for Stage 1 permitted the road to be a non-perimeter road without the requirement for a fire trail. Given that the electricity easement separates the site from the swamp forest further east, it is my opinion that the loop road need not form a perimeter road along the eastern boundary, and that its alignment should continue on the same alignment as per the approval for Stage 1.

In relation to **Acceptable Solution 3.6.2**, there is no bushfire hazard vegetation directly interfacing the site.

All of the relevant **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 supply of water 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
	(4.4.8) Maximum grades for sealed roads do not exceed 15° and not more than 10° for unsealed roads. <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>	Not applicable



	(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.	Not applicable
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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 the documents 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



	(5.1.5) The trail has the capacity for passing by: - 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. <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>	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.	(5.2.1) The fire trail is accessible to firefighters and maintained in a serviceable condition by the owner of the land. (5.2.2) Appropriate drainage and erosion controls are provided. (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. (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). (5.2.5) Gates for fire trails are provided and locked with a key/lock system authorized by the local RFS.	Not applicable Not applicable Not applicable Not applicable Not applicable
(5.3) Fire trails designed to prevent weed infestation, soil erosion and other land degradation.	(5.3.1) Fire trail design does not adversely impact on natural hydrological flows. (5.3.2) Fire trail design acts as an effective barrier to the spread of weeds and nutrients. (5.3.3) Fire trail construction does not expose acid-sulphate soils.	Not applicable Not applicable Not applicable

As stated at 7.3 above, the site does not directly interface with bushfire hazard vegetation. **PBP-2006** also provides the following clarification on the effectiveness of fire trails:

Fire trails are expensive to maintain and can only be effective in the context of a strategic advantage and access for hazard reduction operations.



Therefore, given that a strategic advantage is already provided to the site by virtue of the setback from the riparian corridor, the 40m wide transmission line easement, and Graham Drive, it is determined that fire trails would be superfluous in this circumstance. In addition, hazard reduction could not be carried out from the property boundary as there is no bushfire hazard vegetation directly interfacing the site.

- ✓ 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 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 property. 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.

This vegetation management plan 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 within the property boundaries. These minimum APZs are based on Level 3 construction requirements, as specified in *AS3959 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 the separation distance from the unmanaged bushfire hazard vegetation increases there is a corresponding decrease in the bushfire resistant construction standards. 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

Figure 13: extract from Table A3.4 of PBP-2006



The setback distances imposed by the *PBP-2006* extract above are reproduced in the following sketch.

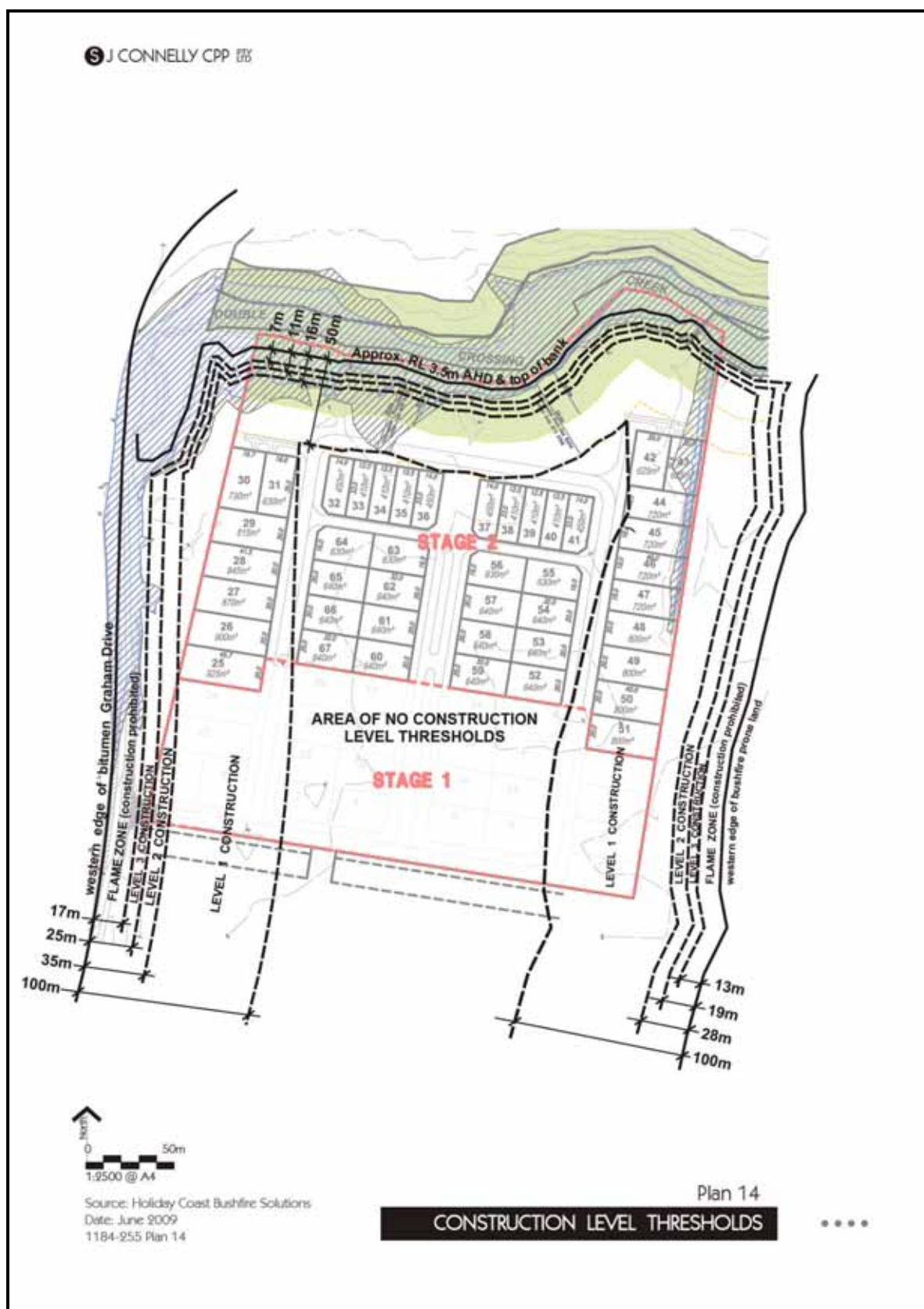


Figure 14: copy of survey plan showing construction Level thresholds



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
(6.1) Electricity Services • 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.	(6.1.1) Where practicable, electrical transmission lines are underground. Where overhead electrical transmission lines are proposed: - 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
(6.2) Gas services • location of gas services will not lead to ignition of surrounding bushland or the fabric of buildings	(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. (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. (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. (6.2.4) Polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not used.	Not applicable (see note) Not applicable (see note) Not applicable (see note) Not applicable (see note)

In relation to **Acceptable Solution 6.1.1**, condition 19 of the DA consent for Stage 1 requires that the electricity supply to the project be provided via underground cables, and a letter from Country Energy is required to be provided prior to release of the subdivision certificate stating that satisfactory arrangements have been made.

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

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

- SR1** The location of the reticulated water supply is to comply with the **Acceptable Solutions** provided in Table 2 of this Report.
- SR2** The public roads are to comply with the relevant **Acceptable Solutions** provided in Table 3 of this Report.
- SR3** 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. 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. Vegetation management over occupied allotments should be carried out in accordance with the principles for Inner Protection Areas of Appendix A of this Report.
- SR4** The construction requirements of future dwellings are to comply with the provisions of *AS3959 Construction of buildings in bushfire-prone areas* as provided by Figure 13 and Figure 14 of this Report.

Therefore, having satisfied all of the relevant **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



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- SR4** The construction requirements of future dwellings are to comply with the provisions of *AS3959 Construction of buildings in bushfire-prone areas* as provided by Figure 13 and Figure 14 of this Report.

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9.0 REFERENCES

ABCB (2007), *Building Code of Australia 2007*, CanPrint Publications Pty Ltd, ACT.

Coffs Harbour City Council (2009), *Bushfire prone land map*, CHCC, Coffs Harbour.

Coffs Harbour City Council (2009), *LEP map extracts*, CHCC, Coffs Harbour.

Coffs Harbour City Council (2009), *Notice of determination of development application – 508/07*, CHCC, Coffs Harbour.

Jackie Amos Landscape Architect, *various landscape plans*, Nana Glen.

NSW Government, *Environmental Planning and Assessment Act 1979* (as amended), <http://www.legislation.nsw.gov.au>

NSW Government, *Rural Fires Act 1997*, <http://www.legislation.nsw.gov.au>

NSW Government, *Rural Fires Regulation 2008*, <http://www.legislation.nsw.gov.au>

NSW Government Geospatial Portal (2009), *various images*, <http://imagery.maps.nsw.gov.au/>

NSW Rural Fire Service (2006), *Planning for Bushfire Protection 2006*, Sydney.

NSW Rural Fire Service (2001), *Planning for Bushfire Protection 2001*, Sydney.

NSW Rural Fire Service (2005), *Standards for asset protection zones*, Sydney.

S.J. Connelly CPP Pty Ltd (2008), *Preliminary environmental assessment – Stage 2*, Lennox Head.

Standards Australia (1999), *Australian Standard 3959-1999 Construction of buildings in bushfire-prone areas*, Sydney.

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*.

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 defendable 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).

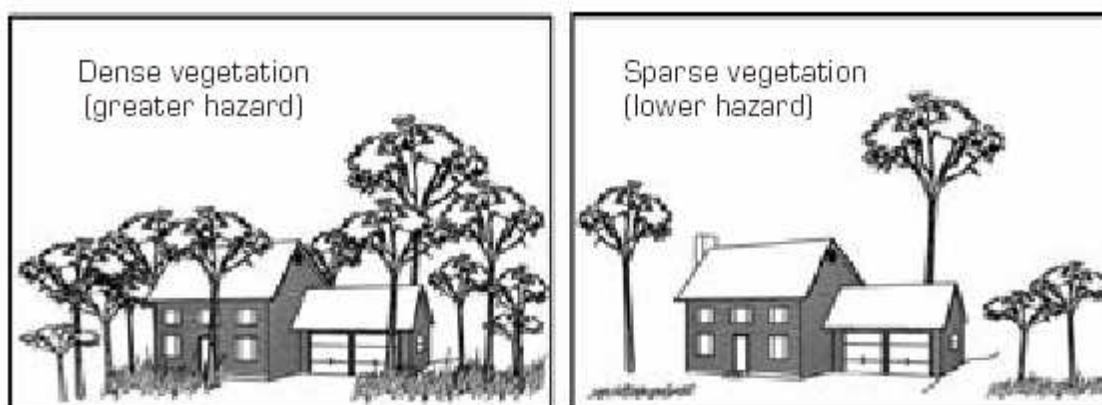
STEP 1. DETERMINE IF AN APZ IS REQUIRED

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.

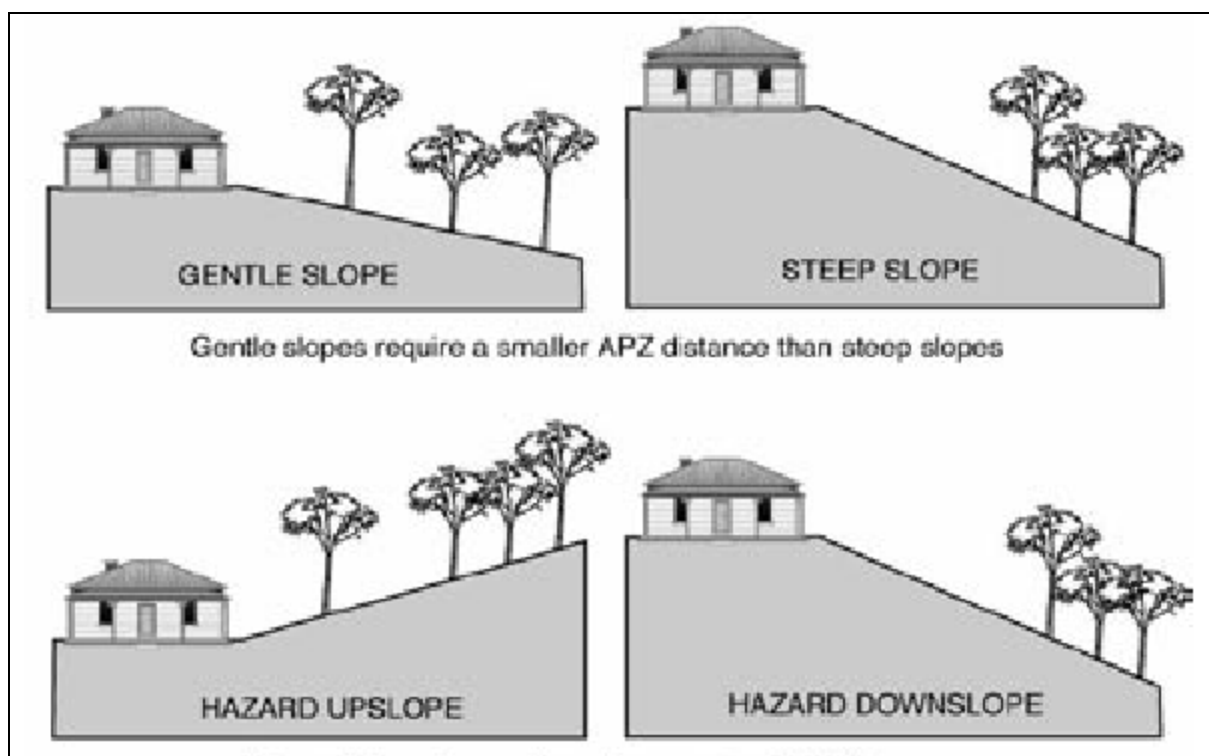
If your current development consent provides for an APZ, you do not need further approvals for works that are consistent with this consent.

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.

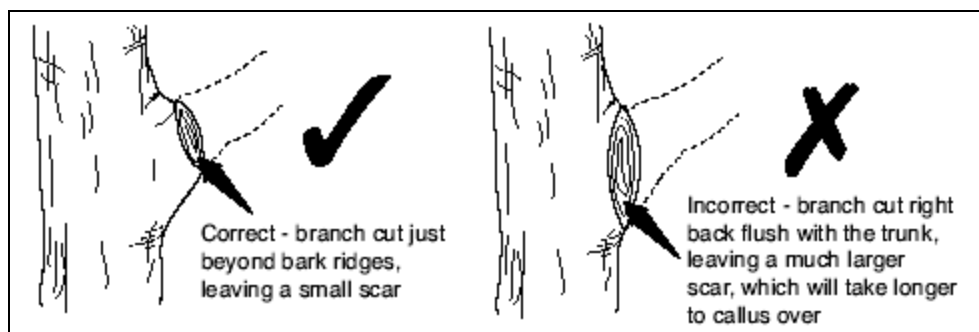
When choosing plants for removal, the following basic rules should be followed:

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.

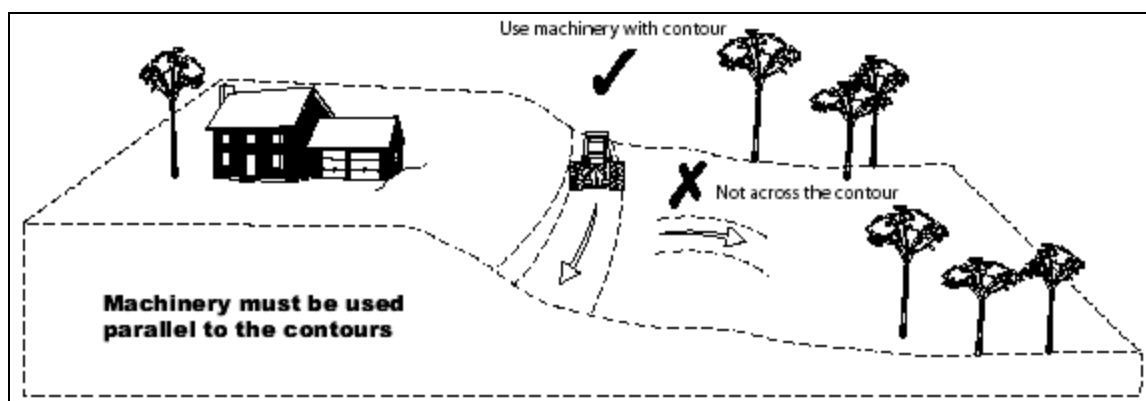
Soil erosion can greatly reduce the quality of your land through:

- 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.



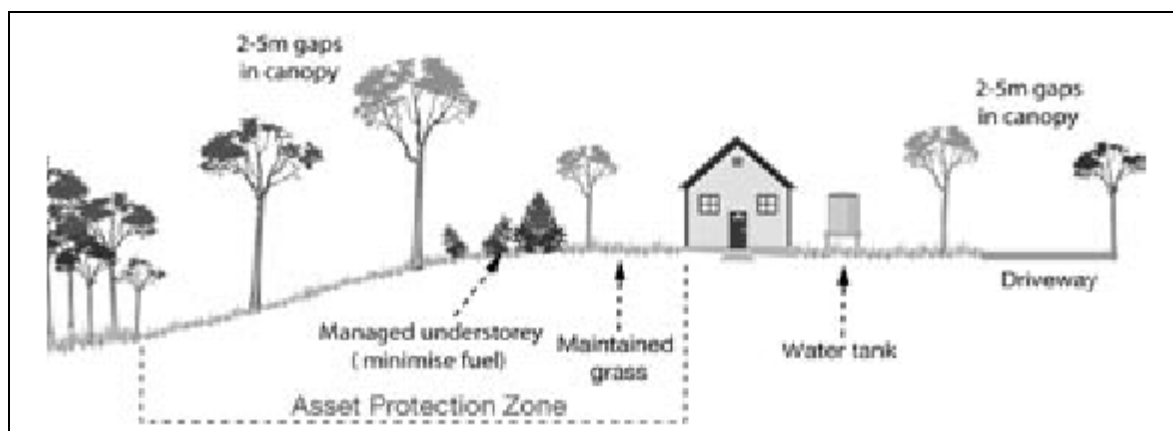
STEP 6. ONGOING MANAGEMENT AND LANDSCAPING

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*.

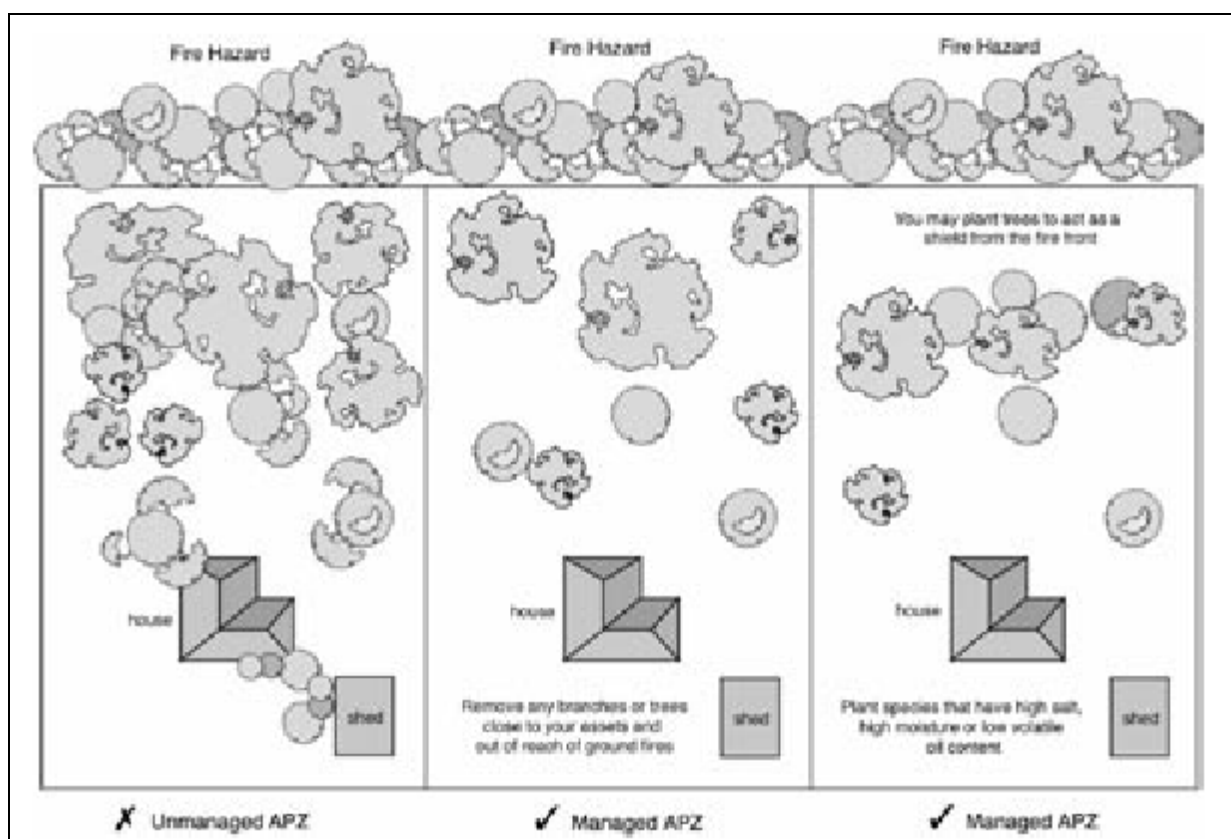
WIND BREAKS

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,

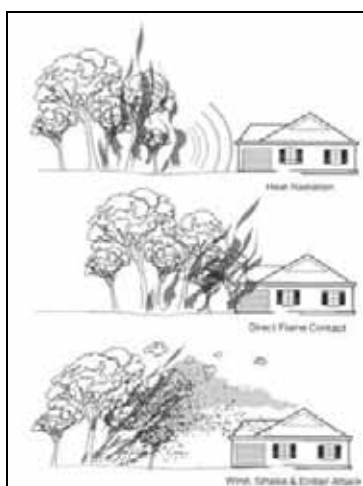
and evidence indicates ember attack is responsible for most bushfire related house fires. Strong winds resulting from severe bushfires will drive embers into vulnerable areas of a building, preheat and dry fuel ahead of a fire, lift roofing and extend flames along a more horizontal plane closer to building 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 defendable 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)

3.3 Flooring	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.
3.4 Supporting Posts, Columns, Stumps, Piers, and Poles	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

	(a) non-combustible (b) fire-retardant-treated timber for a minimum of 400mm above finished ground level (c) timber mounted on galvanised metal shoes with a clearance of not less than 75mm above finished ground level or paving level etc. The above do not apply where the subfloor space is totally enclosed as described in clause 3.3.1(c)(ii).	shall be as for Level 1 construction (clause 3.4.1).	Level 2 construction (clause 3.4.2) except that all timber shall be fire-retardant-treated to full height.
3.5 External Walls	3.5.1 Level 1 (a) One or a combination of the following: (i) a wall having an external leaf or masonry, concrete, pise, rammed earth or stabilised earth. (ii) a framed wall that incorporates either: (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 (B) an insulation material conforming to the appropriate AS for that material. (NOTE: no restrictions apply to the cladding material) (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. (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:	3.5.2 Level 2 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.	3.5.3 Level 3 The requirements for Level 3 construction shall be as for Level 2 construction (clause 3.5.2).

	(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; (ii) by substituting with a suitable non-combustible sheet material, or fire-retardant-treated timber; or (iii) where the external cladding is timber, by using fire-retardant-treated timber.		
<u>3.6 Windows</u>	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.	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.	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.
<u>3.7 External Doors</u>	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.	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.	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.
<u>3.8 Vents and Weepholes</u>	3.8.1 Level 1 Shall be protected with spark guards made from corrosion-resistant steel, bronze or aluminium mesh with a maximum aperture	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	3.8.3 Level 3 The requirements for Level 3 construction shall be as for Level 2 construction (clause 3.8.2).

	size of 1.8mm.	be used.	
<u>3.9 Roofs</u>	3.9.1 Level 1 3.9.1.1 General (a) Timber shakes or shingles shall not be used. (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. (c) Sarking shall have a flammability index of not more than 5 (AS1530.2). 3.9.1.2 Tiled roofs 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. 3.9.1.3 Sheeted roofs (a) Only metal or fibre-cement sheet shall be used. (b) All gaps under corrugations or ribs of the roof material where it meets the fascia or wall line shall be sealed or protected: (i) by fully sarking the roof; or (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. (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. 3.9.1.4 Rooflights The requirements for Level 1 construction are as follows: (a) All penetrations of the roof space for the installation of rooflights and associated	3.9.2 Level 2 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.	3.9.3 Level 3 As for Level 2 construction (clause 3.9.2) except that no fibre-reinforced cement or aluminium sheet shall be used.

	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. (b) Vented rooflights shall be provided with corrosion-resistant steel or bronze mesh having a maximum aperture size of 1.8mm. 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. 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.		
3.10 Eaves	3.10.1 Level 1 All eaves shall be enclosed, and the fascia or the gaps between the rafters shall be sealed.	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.	3.10.3 Level 3 As for Level 2 construction (clause 3.10.2) except that aluminium shall not be used.
3.11 Fascias	3.11.1 Level 1 No requirements	3.11.2 Level 2 All materials shall be either non-combustible or of a fire-retardant-treated timber.	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.
3.12 Gutters and Downpipes	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).	3.12.2 Level 2 As for Level 1 construction (clause 3.12.1).	3.12.3 Level 3 As for Level 2 construction (clause 3.12.2).

<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).