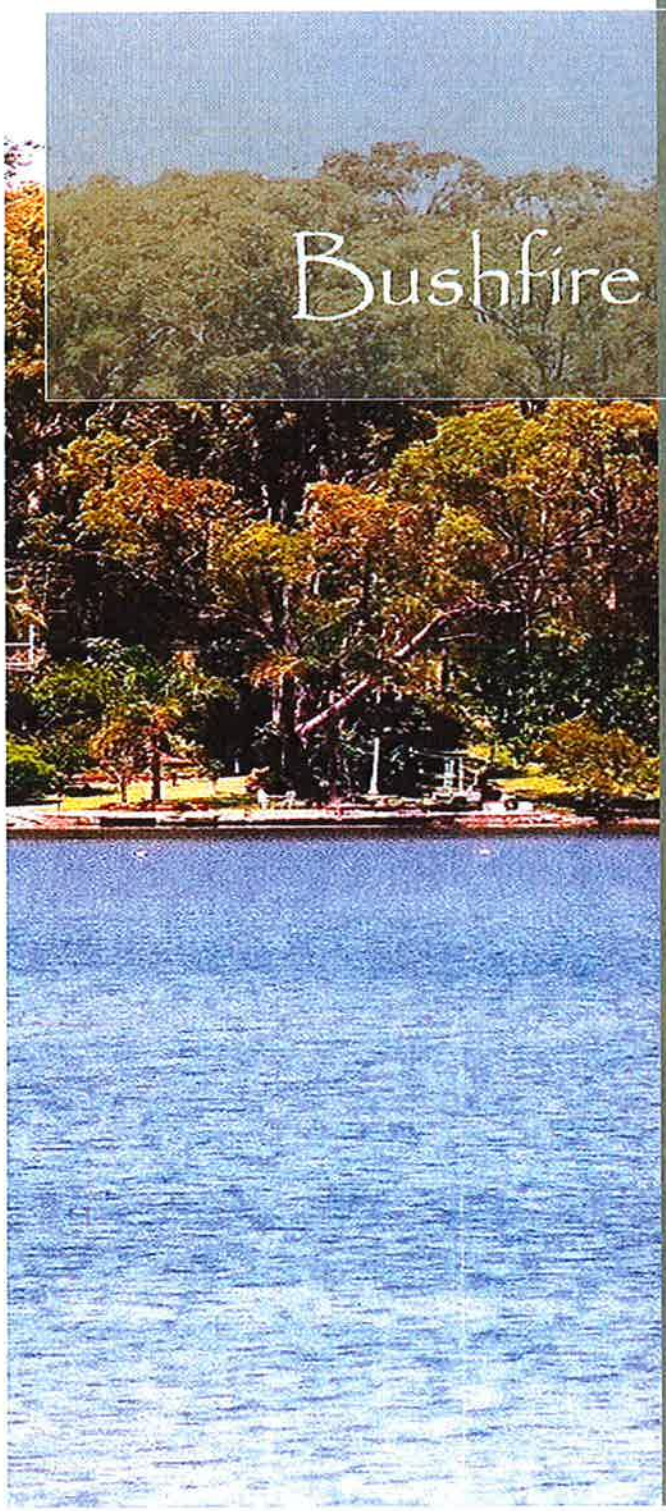
Travers environmental

Bushfire Planning



RAMSGATE ESTATE
DP 1596, WYEE POINT

December 2008
(REF:8108B)

BUSHFIRE PLANNING

RAMSGATE ESTATE
DP 1596, WYEE POINT

DECEMBER 2008

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EXECUTIVE SUMMARY

Bushfire planning has been undertaken by *Travers environmental* on behalf of *Woromar Pty Ltd* for the current development concept application for Ramsgate Estate at DP 1596, Wyee Point.

The proposed Ramsgate Estate occupies an area of 37.5 (ha) hectares and is situated within the Lake Macquarie (LGA).

Bushfire planning for the project has considered the matters raised within the *NSW Rural Fire Service* planning document *Planning for Bushfire Protection, 2006 (PBP). PBP* provides concepts for building in bushfire prone areas as well as guidance on the planning and development control processes in relation to bushfire protection measures. *PBP* aims to provide for the protection of human life (including fire fighters) and to minimise impacts on property from the threat of bush fire, while having due regard to development potential, onsite amenity and protection of the environment. The *aims & objectives* as outlined with PBP are to;

1. Afford occupants of any building adequate protection from exposure to a bush fire.

2. Provide for a defendable space to be located around buildings.

3. Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent direct flame contact and material ignition.

4. Ensure that safe operational access and egress for emergency service personnel and residents is available.

5. Provide for ongoing management and maintenance of bush fire protection measures, including fuel loads in the asset protection zone (APZ).

Following detailed assessment, the report concludes that the Ramsgate Estate concept application is capable of supporting adequate asset protection zones, provides efficient and effective access / egress capabilities and a potential to support adequate water supply in accordance with *Planning for Bushfire Protection, 2006.*

BUSHFIRE PLANNING – RAMSGATE ESTATE CONCEPT APPLICATION

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1 INTRODUCTION

Travers environmental has been engaged to undertake bushfire planning for the proposed *Ramsgate Estate* concept application. The *Ramsgate Estate Concept Plan* provides an indicative subdivision layout for the future development of DP 1596.

Bushfire planning requires consideration of the matters raised within the *NSW Rural Fire Service* planning document entitled *Planning for Bushfire Protection* published in 2006 *(PBP)*. *PBP* provides planning controls for building in bushfire prone areas as well as guidance on effective bushfire protection measures. This report addresses these requirements.

1.1 AIMS OF THE ASSESSMENT

The aim of this bushfire planning document is to:

- Assess the bushfire prone lands and determine the possible bushfire attack potential.
- Provide advice on mitigation measures including the provision of defendable space and the construction standards in accordance with *Planning for Bushfire Protection, 2006.*
- Review the potential to carry out hazard management over the landscape.
- Liaise with the *NSW Rural Fire Service.*

1.2 INFORMATION COLLATION

To achieve the aims of this report, a review of the information relevant to the study area was undertaken prior to the initiation of field surveys. Information sources reviewed include the following:

- Site plans prepared by *McElwee Associates Pty Ltd.*
- Australian Standard 3959 '*Construction of Buildings in Bush Fire Prone Areas*'.
- *Google* Aerial Photograph.
- Catherine Hill Bay topographical map DLPI of NSW 1:25,000 9433-IV-N.
- Ecological Assessment, 2008 by *Travers environmental.*
- Site inspections to consider topography, slopes, aspect, drainage, vegetation and adjoining land use. The identification of existing bush fire protection measures and a visual appraisal of bush fire hazard and risk were also undertaken.
- *Lake Macquarie Council* bush fire prone land and zoning maps.

1.3 PROJECT SYNOPSIS

The site occupies an area of approximately 37.5 hectares (ha). The current development concept plan contains 161 lots of varying size and layout.

A riparian environmental corridor of approximately 50m in width and 380m in length runs through the centre of the site to the foreshores of Lake Macquarie where foreshore reserve encompasses the salt marsh. The proposed development is divided by this corridor to form an eastern and a western portion.

The eastern side of the proposed development adjoining existing residential development to the east will contain lots of a standard development size, while those of the western side of the development adjoining extensive native bushland will generally be of a larger size.

The main access to the Estate is from the south east and runs along the eastern side of the Riparian Wildlife Corridor to form perimeter protection to the dwellings within the eastern sector. This then joins to a long avenue at the north of the Estate which follows the approximate line of the foreshores of Lake Macquarie.

One loop road branching from the foreshore avenue will service the north-western side with an alternative access road provided to Saddlers Road in the south. The eastern portion of the estate is adjacent to the terminal ends of five current residential streets to the east. This existing road network to the east will be linked either directly, or via pedestrian pathways, to the proposed road network of the Ramsgate Estate and in turn provide access to the proposed development.

The land is has a mixture of zones as indicated in the figure below. The majority of the estate is zoned 10 Investigation Zone under the *Lake Macquarie City Council* Local Environment Plan. This zoning is suitable for residential development subject to council approval. The area zoned 7(1) is Environmental Protection Conservation (primary) and is not proposed for residential development under this concept application. Other zonings include 6(1) Open Space and 7(3) Environmental Protection Environmental (General).

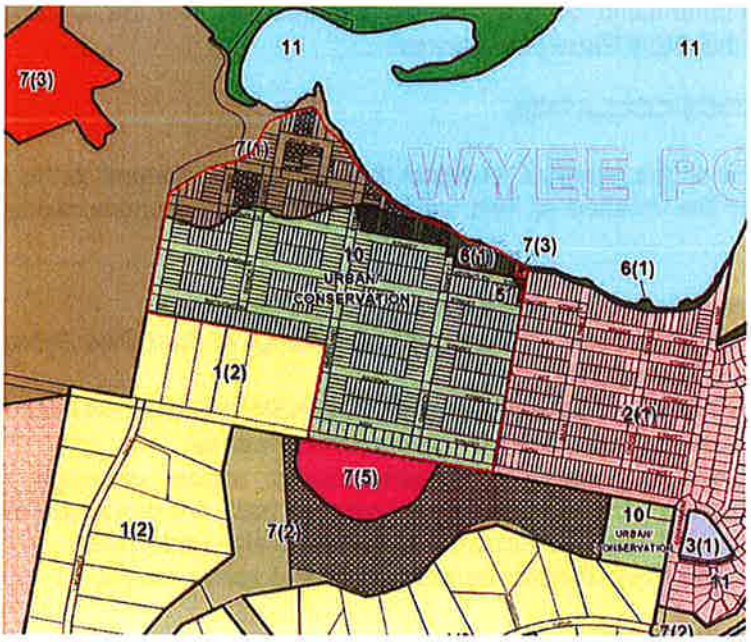

Figure 1: Zoning Map (source: Lake Macquarie Council website)

1.4 SITE DESCRIPTION

Landscape Context

Ramsgate Estate adjoins the western side of the township of Wyee Point, with frontage of approximately 1 km to Lake Macquarie and an unnamed tidal creek. The site is approximately 37.5 ha in size and is bounded by residential development to the east, natural bushland to the west, a mosaic of natural bushland and rural holdings to the south. Lake Macquarie and the associated foreshore bound the property to the north. It lies within the Local Government Area of *Lake Macquarie City Council.*

The property adjoins the unformed Saddlers Road in the south, and is adjacent to existing residential development to the east of which will be linked into the proposed development. Approximate AMG coordinates of the property are 361100E and 6331900N.

Natural Landscape Descriptions

Topography and Drainage

The majority of the local area has slopes of less than 6^0. The property has a general north-westerly aspect with gradients from 2-6^0. The area is characterised as reasonably flat to gently sloping, with a slight gradient sloping from the north-western boundary (near the SEPP 14 Coastal Wetlands), up to the south-eastern corner (adjacent to the existing residential development). The approximate elevation of the property is 0-30 metres Australian Height Datum (AHD).

A number of small, poorly defined, drainage lines cross the property in a general south-east to north-west direction. These drainage lines pass through the centre of the site, the west of the site and within the north-eastern portion of the property. These poorly defined drainage lines (together with overland flow) direct all runoff from the property into Lake Macquarie, the edge of which adjoins the northern boundary of the site. Approximately 15-20% of this runoff would flow into the unnamed creek that adjoins the north western boundary of the property and flows into Lake Macquarie.

Figure 2: Aerial Appraisal

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2 PLANNING CONTROLS

2.1 LEGISLATIVE RELATIONSHIPS

The Estate's landscape is located on land that is mapped by *Lake Macquarie City Council* as being bushfire prone (refer Figure 3). This triggers assessment by Council in respect of the *NSW Rural Fire Service* policy document *PBP*, 2006.

Planning for residential subdivision is required to be considered under the requirements of the *Rural Fires Act* as expressed within Section 100B. This requires the *RFS* to consider any development proposals in line with *PBP* and then to consider issuing a *Bushfire Safety Authority*. This then allows Council to approve or not approve any development application.

Figure 3: Bushfire Prone Land Map
(Source: Lake Macquarie Council website)

2.2 PLANNING POLICIES

PBP provides concepts for building in bushfire prone areas as well as guidance on the planning and development control processes in relation to bushfire protection measures. *PBP* aims to provide for the protection of human life (including fire fighters) and to minimise impacts on property from the threat of bush fire, while having due regard to development potential, onsite amenity and protection of the environment. The *aims & objectives* as outlined within *PBP* are to;

1. Afford occupants of any building adequate protection from exposure to a bush fire.
2. Provide for a defendable space to be located around buildings.
3. Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent direct flame contact and material ignition.
4. Ensure that safe operational access and egress for emergency service personnel and residents is available.
5. Provide for ongoing management and maintenance of bush fire protection measures, including fuel loads in the asset protection zone (APZ); and

6. Ensure that utility services are adequate to meet the needs of fire fighters (and others assisting in bush fire fighting).

The additional objectives for subdivisions are to:

7. Minimise the perimeters of the subdivision exposed to the bushfire hazard.

8. Minimise bushland corridors that permit the passage of fire.

9. Provide for the siting of future dwellings away from ridge-tops and steep slopes – particularly up-slopes, within saddles and narrow ridge crests.

10. Ensure that separation distances (APZ) between the bushfire hazard and future dwellings enable conformity with the deemed-to-satisfy requirements of the *BCA*.

11. Provide and locate, where the scale of development permits, open space and public recreation areas as accessible public refuge areas or buffers (APZ).

12. Ensure the ongoing management of asset protection zones.

13. Provide clear and ready access from all properties to the public road system for residents and emergency services.

14. Ensure the provision of and adequate supply of water and other services to facilitate effective fire fighting.

2.3 ACCEPTABLE BUSHFIRE PROTECTION STRATEGIES

In general terms, an acceptable level of protection from bush fires is achieved through a combination of strategies which:

1. Control the types of development permissible in bush fire prone areas.

2. Minimise the impact of radiant heat and direct flame contact by separating the development from the bush fire hazard.

3. Reduce the rate of heat output (intensity) of a bush fire close to a development through control of fuel levels.

4. Minimise the vulnerability of buildings to ignition from radiation and ember attack.

5. Enable relatively safe access for the public and facilitate fire-fighting operations.

6. Provide adequate water supplies for bush fire suppression operations.

7. Implement community education programs, focusing on property preparedness, including emergency planning and property maintenance requirements.

8. Facilitate the maintenance of APZ's, fire trails, access for fire fighting and on-site equipment.

2.4 BUSHFIRE PROTECTION MEASURES

In a development assessment context, there are six key *bush fire protection measures;*

1. The provision of clear separation of buildings and bush fire hazards, in the form of an asset protection zone. An APZ is an area of *defendable space* that must be managed to minimise fuel loads to reduce potential radiant heat levels, flame, ember and smoke attack.

2. Construction standards and design. Construction standards relate to the specifications identified within the *Building Code of Australia* and the detailed advice within *Australian Standard AS 3959 Construction of Buildings in Bushfire Prone Areas*. This standard sets out requirements for the construction of buildings in bushfire prone areas. These requirements are intended to improve the performance of buildings subjected primarily to bushfire attack.

3. Appropriate access standards for residents, fire fighters, emergency service workers and those involved in evacuation as defined by *PBP*, 2006. For new subdivisions and large scale SFPP's, design of public and property access roads should enable safe access, egress and defendable space for emergency services. Fire trails enable access for management of APZ's.

4. Adequate water supply and pressure in accordance with *PBP*, AS2419 *Fire Hydrant Installations* and Council engineering guidelines. Adequate supply of water is essential for fire fighting purposes when considering all forms of development. In addition, gas and electricity should be located so as not to contribute to the risk of fire or impede the fire fighting effort. *AS2419* specifies requirements for the installation of fire hydrants when connected to town water. It also specifies the requirements for hydrant system design and acceptable sources of water supply. The standard is, however, subordinate to the *PBP* in that *PBP* requires hydrant spacing to be no more than 70 metres in residential developments.

5. Emergency and evacuation arrangements e.g. procedures, routines and consideration of safe havens, are of particular relevance to schools and such facilities. The *Australian Standard AS 3745 Emergency control organization and procedures for buildings* assists in this regard. This standard gives guidance on the establishment of an Emergency Control Organisation (ECO) and the preparation of emergency procedures for buildings or groups of buildings, for ensuring controlled movement of occupants including evacuation as necessary.

6. Suitable landscaping, to limit fire spreading to a building. In considering all DAs, the type, location and ongoing maintenance of landscaping, within the APZ is a necessary bush fire protection measure.

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3 BUSHFIRE PROTECTION ASSESSMENT

Developing in bushfire prone areas requires consideration of the overall threat upon a site and the way occupants of a site or dwelling(s) are potentially able to cope in the event of a bushfire. This allows an effective approach to designing appropriate bushfire protection measures for any possible development.

It is generally accepted that all bushfire protection must assume that persons will be housed within an acceptable habitable structure and not out in the open where exposure can be both dangerous and or fatal.

PBP provides a methodology that that provides consistency of approach and potential for flexibility in its use. Essentially the approach is to determine the potential vulnerability from radiant heat flux, ember attack or direct flame contact. These three impacts can all destroy a building and remove all protection for human occupation.

Thus once the level of possible vulnerability is determined the process of applying an appropriate protection strategy can be applied. The process of determining vulnerability requires the *gradient of the slopes* affecting the development areas for up to 100 metres and *hazardous vegetation types* for up to 140 metres. A bushfire attack model can then be derived that provides a qualitative assessment of the level of potential bushfire risk.

3.1 HAZARDOUS VEGETATION

The bushfire hazard is defined as the potential severity of a fire and is measured by way of intensity i.e. kW/m^2 (Kilowatts per square metre of fire front). The factors that influence the bushfire hazard are primarily the nature of the vegetation (fuel) and the slope of the land where the hazardous vegetation is located. Factors such as wind and fuel dryness also contribute to the hazard achieving maximum intensity levels.

The vegetation within the property consists of open forest vegetation with a variable, but generally sparse shrub layer and dense groundcover of herbs and grasses. The low-lying area adjoining Lake Macquarie contains a mosaic of overlapping forested wetland, mangrove, herb-field and grassland communities.

Contained within this proposed subdivision will be a riparian wildlife corridor averaging approximately 50m in width running in a north / south direction throughout the site. This corridor of vegetation also runs along the northern boundary of the site in an east / west direction encompassing the SEPP 14 Coastal Wetland. Herein the property will be considered in two portions, the eastern portion and the western portion.

Six vegetation communities were identified within the property using aerial photographic interpretation and extensive ground truthing. Table 1 below provides the diversity of vegetation communities and the *RFS* vegetation structure category as defined by *Keith* (2004).

Table 1 - Vegetation Communities within the Site

Vegetation Community Title	Dominant Species	RFS Vegetation category
Scribbly Gum Open Forest – Dry Understorey	*Angophora costata* (Sydney Red Gum), *Corymbia gummifera* (Red Bloodwood), *Eucalyptus resinifera* (Red Mahogany) and *Eucalyptus signata* (Scribbly Gum).	Forest
Scribbly Gum Open Forest – Moist Understorey	Angophora costata (Sydney Red Gum), Corymbia gummifera (Red Bloodwood), Eucalyptus resinifera (Red Mahogany) and Eucalyptus signata (Scribbly Gum).	Forest
Forest Red Gum Woodland	Eucalyptus tereticornis (Forest Red Gum), Breynia oblongifolia, *Imperata cylindrica* (Blady Grass).	Forest
Swamp Mahogany – Sydney Red Gum – Scribbly Gum Woodland (EEC under the *TSC Act* 1995)	*Eucalyptus robusta* (Swamp Mahogany), *Angophora costata* (Sydney Red Gum), *Corymbia gummifera* (Red Bloodwood), *Eucalyptus resinifera* (Red Mahogany) and *Eucalyptus signata* (Scribbly Gum).	Forest
Swamp Mahogany Woodland (EEC under the *TSC Act* 1995)	*Eucalyptus robusta* (Swamp Mahogany) and *Angophora costata* (Sydney Red Gum).	Forested Wetland
Swamp Oak Woodland / Salt marsh (EEC under the *TSC Act* 1995)	*Casuarina glauca* (Swamp Oak) *Acacia longifolia* (Sydney Golden Wattle) and *Avicennia marina* (Grey Mangrove).	Forested Wetland

Lands external to the property in the east present no threat in relation to bushfire due to the presence of existing residential development and Lake Macquarie to those aspects. The main area of concern in terms of bushfire impact upon the proposed subdivision is the significant area of bush land to the south, north-west and west of the property as well as the bushland within the riparian wildlife corridor internal to the estate.

3.2 BUSHFIRE ATTACK ASSESSMENT

The bushfire attack assessment has been undertaken using the *Ramsgate Estate* concept application as being the proposed retained landscape. Tables 2 and 3 below provide the results of this assessment.

Table 2 – Eastern Section

Aspect	Vegetation within 140m of Development	Effective Slope of Land	APZ Provided	Level of Bushfire Attack	Construction Standard
North	Coastal saltmarsh / Forest	2° D	22 - 32 metres 32 – 44 metres 44 – 100 metres	Extreme High Medium	Level 3 Level 2 Level 1
East	Residential Development	0°	Not Required	Low	Not Required
South	Forest	2-5° U	30 - 40 metres 40 – 100 metres	High Medium	Level 2 Level 1
West	Riparian Corridor Forest	0°	40 metres	Medium	Level 1

Table 3 – Western Section

Aspect	Vegetation within 140m of Development	Effective Slope of Land	APZ Provided	Level of Bushfire Attack	Construction Standard
North	Forest & Forested Wetland	0°	40 metres	Medium	Level 1
East	Riparian Corridor Forest	0°	40 metres	Medium	Level 1
South	Woodland within existing residential allotments	2° U	23 metres	Medium	Level 1
West	Forest	2-5° D	40 - 49 metres 49 – 100 metres	High Medium	Level 2 Level 1

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4 SPECIFIC PROTECTION ISSUES

The bushfire protection measures available to be used within the *Ramsgate Estate* concept application comprise of asset protection zones, effective access, adequate water supplies, appropriate construction design and construction as well as adequate fire fighting infrastructure.

The proposed estate layout has been designed so that the majority of the asset protection zones fall within the perimeter roads and lot boundaries.

4.1 BUILDING PROTECTION

In the development of land within a designated bushfire prone landscape for the purpose of residential living *PBP* requires that Class 1 & 2 structures as defined by the *Building Code of Australia* be provided with asset protection zones. This provides the required level of *defendable space* to protect a structure from bush fire attack.

Buildings such as Class 1 and 2 dwellings are required to be constructed in accordance with Australian Standard AS 3959, *Construction of Buildings in Bush Fire Prone Areas.* This standard classifies the level of building construction and satisfies the requirements of Part 2.3.4 of the *Building Code of Australia.* The implementation of AS3959 is made more complex in NSW because the *RFS* requires that the maximum level of bushfire attack upon a habitable building must not exceed 29 kW/m^2 of radiant heat flux for *residential development.*

Tables 2 and 3 within Section 3.2 above define this relationship and depicts variable levels of bushfire attack ranging from low (no specific construction requirements) through to high (Level 2 construction). These are 'deemed to satisfy' solutions in accordance with *PBP,* AS3959 and the *BCA.* (Schedule 1 depicts these results graphically).

The level of construction required for a particular dwelling is determined depending on the type of vegetation, slope and the separation distance between the building and the vegetation. For example;

- No construction standards should apply to the building if it is generally located more than 100m from a bushfire hazard (forest vegetation) or 50m from a bushfire hazard (rainforest threat – riparian corridor of 20 metres wide).

- Level 1 construction standards of AS3959 Construction of buildings in bushfire prone areas are subject to Medium level of bushfire attack.

- A level 2 construction standard of AS3959 Construction of buildings in bushfire prone areas applies to areas subject to High level of bushfire attack.

- A Level 3 construction standard of AS3959 Construction of buildings in bushfire prone areas applies to areas subject to Extreme bushfire attack.

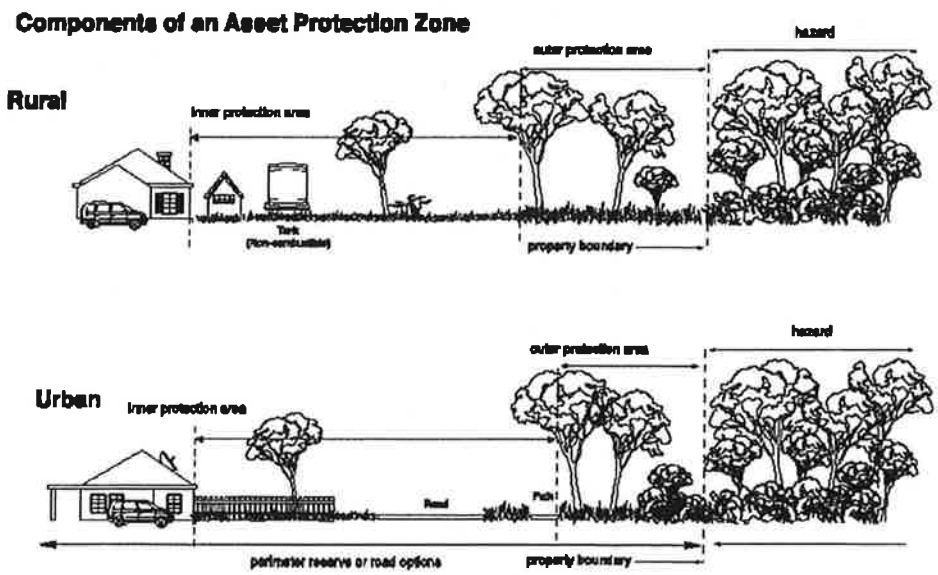
Flame Zone is where *deemed to satisfy* construction can not occur because the necessary distance for the APZ can not be provided. In this case there may be some scope for a performance based *Alternative Solution* to be applied for development within the outer edges of the flame zone. However the cost to apply the building materials may inhibit the practical application for a normal residential subdivision.

Habitable buildings that are proposed to be located within the specified distances for Extreme bushfire attack as outlined within *PBP* are required to be built to Level 3 type construction standard. Similarly buildings located within the specified distances for High bushfire attack require Level 2 type construction whilst Level 1 construction standards should apply if the proposed building is located within the specified distances for Medium bushfire attack. There is no Level 3 construction necessary for this development.

4.2 ASSET PROTECTION ZONES

The major mitigating factor that limits the effects of wildfire is the amount of fuel available to burn. By reducing the amount of fuel there will be a reduction in the intensity of the fire. These fuel reduced areas or asset protection zones have been planned to occur between hazardous vegetation and other future development.

A typical APZ and therefore defendable space is graphically represented as follows;



The results illustrate that the site is exposed to a Medium / High level of bushfire attack from the impact of bushfires burning within the adjacent bushland surrounding the site. The APZ's shown in Table 2 & 3 and depicted in Schedule 1 attached adhere to the requirements of *PBP*, 2006.

An asset protection zone should also be provided, 5 metres in width, to either side of the proposed road, linking the eastern and western portions of the proposed development.

4.3 HAZARD MANAGEMENT

There is a legal requirement under *Section 63* of the *Rural Fires Act* to manage hazardous fuels. This requires that all 'practical steps' to be taken to stop fire either entering or leaving an allotment. This refers the responsibility to either the landowner or the land occupier.

The *RFS* provides practical advice in this regard via a document entitled *Standards for Asset Protection Zones*. This outlines specifications for managing asset protection zones. The *RFS* also provides practical assistance through community voluntary brigades either in advice or assistance with burning operations. The volunteer brigades are community based and sourced from local people.

In terms of implementing and or maintaining asset protection zones there is no physical reason that could constrain hazard management from being successfully carried out by normal means e.g. mowing / slashing.

Guidelines for managing asset protection zones are provided as Appendix 1 attached.

The allotments exposed to the southern aspect of the western portion of the proposed development will be constrained by a 7 metre building setback followed by a 20 metre buildable zone, of which the required Asset Protection Zone of 23 metres will be measured from. This will allow for the retention of some vegetation to the rear of the allotments and the enhancement of the Riparian Wildlife Corridors links to existing natural vegetation generally to the west.

4.4 EGRESS AND EVACUATION SAFETY

Evacuation safety is a basic tenant of effective bushfire planning for all types of developments.

The cleared residential landscape to the east of the proposed estate provides for a safe egress route and connection to the surrounding suburban landscape. This route is unlikely to be impacted directly by fire due to the existing residential development already established within the area. A secondary access route is provided within the western portion to link with Saddlers Road in the south.

PBP recommends perimeter roads as the preferred option to separate bushland from urban areas. The proposed road layout within *Ramsgate Estate* provides for a perimeter road around the existing vegetated areas to the north, west and to the vegetated corridor internally within the estate.

The eastern and western portion of the development is connected via a long avenue at the north of the Estate which follows the approximate line of the foreshores of Lake Macquarie. A 10 metre wide asset protection zone will apply to either side of the road to provide safe access / egress.

A loop road branching from the foreshore avenue along with an access road to Saddlers Road in the south will service the western portion of the estate.

The eastern portion of the estate is adjacent to the terminal ends of five current residential streets to the east. This existing road network to the east will be linked either directly or via pedestrian pathways to the proposed road network of the *Ramsgate Estate* and in turn provide additional access to the proposed development. The eastern portion of the estate

contains three roads ending in 'Y' shaped hard-stand turning areas of less than 200 metres in width.

The road network within the Estate will require construction and upgrading in line with the public road specifications within *PBP*, 2006. This requires the minimum widths for the internal road system (public roads) for a single lane as ranging between 3.5m and 4.5m. The minimum width of a two way road ranges from 6.5m to 8m.

As a guide, the following should be considered as being the minimal access specifications;

- Roads should be two-wheel drive, sealed, all-weather roads.
- Perimeter roads are provided with at least two traffic lane widths (carriageway 8 metres minimum kerb to kerb) and shoulders on each side, allowing traffic to pass in opposite directions.
- Perimeter road is linked to the internal road system at an interval of no greater than 500 metres in urban areas.
- Roads are through roads. Dead end roads are not more than 200 metres in length from a through road, incorporate a minimum 12 metres outer radius turning circle, and are clearly sign posted as a dead end.
- Traffic management devices are constructed to facilitate access by emergency services vehicles.
- A minimum vertical clearance of four metres to any overhanging obstructions, including tree branches, is provided.
- Curves have a minimum inner radius of six metres and are minimal in number to allow for rapid access and egress.
- The minimum distance between inner and outer curves is six metres.
- Maximum grades do not exceed 15 degrees and average grades are not more than 10 degrees.
- Public roads have a cross-fall of the pavement that is not more than 3 degrees.
- Roads do not traverse through a wetland or other land potentially subject to periodic inundation (other than flood or storm surge).
- Roads are clearly sign-posted and bridges clearly indicate load ratings.
- The internal road surfaces and bridges have a capacity to carry fully-loaded fire-fighting vehicles (15 tonnes).

4.5 AVAILABILITY OF FIRE FIGHTING SERVICES

There is a *NSW Rural Fire Service* brigade located at Wyee Point approximately 1 kilometre to the east on Government Road. The *NSW Rural Fire Service* brigade would have a response time of approximately 5 minutes to service the development if they are not assisting elsewhere.

There is a *NSW Fire Brigades* station located at Doyalson approximately 9 kilometres to the south at the corner of Wyee Road and the Pacific Highway. Doyalson *NSW Fire Brigades* would have a response time of approximately 20-25 minutes to service the development if they are not assisting elsewhere.

4.6 WATER SUPPLIES

Water hydrants should be installed in accordance with *Australian Standard* AS2419-1 (1994). This standard recommends spacing of no greater than 120 metres (Source AS 2419.1 2005 Appendix B, B2) for residential development and 90 metres for commercial development (Appendix B, B3). In addition all hydrant locations may be required by Council to be marked with a blue 'cat's eye' in the centre of the road. However the *RFS* requires that hydrants be spaced no greater than 90 metres when a subdivision occurs within bushfire prone landscapes. This can be negotiated with the *RFS* but only when detailed development plans can substantiate protection against risk.

4.7 COMMUNICATIONS

Telephone communications will be provided for this development to aid in communications during a bushfire incident.

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5 CONCLUSION

5.1 CONCLUSION

The bushfire planning of the *Ramsgate Estate* concept application has been undertaken in accordance with the requirements of the *NSW Rural Fire Service* planning policy entitled *Planning for Bushfire Protection 2006* and has concluded that the concept plan is capable of supporting adequate asset protection zones, efficient and effective access / egress capabilities and a potential to support adequate water supply.

Additional specific measures will need to be incorporated in the future when final development plans are completed.

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SCHEDULE 1

PLAN OF BUSHFIRE PROTECTION MEASURES

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Additional fire hydrants should be located in accordance with Australian Standard 2419.

Legend

- Property Boundary
- Asset Protection Zone
- Proposed Public Road Link
- Public Pathways
- Strategic Fire Hydrant Locations
- Existing Residence

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50 0 50 100 150 200 metres

Scale 1:5,000

Drawing No.	7323/4245	Date
Layout / Drawn by	NA\KF	09/10/08
Amendment		Date
A	APZ Amendments KF	03/12/08
B		
C		

Schedule 1 -

Bushfire Protection Measures - Ramsgate Estate, Wyee Point

Source: McElwee Associates Pty Ltd

APPENDIX 1

DETAILS OF ASSET (FIRE) PROTECTION ZONES

1.0 INTRODUCTION

The major mitigating factor that limits the effects of wildfire is the amount of fuel available to burn. By reducing the amount of fuel there will be a reduction in the intensity of the fire.

The area in which the fuel reduction occurs is referred to as an Asset Protection Zone. Asset Protection Zones are areas that are usually shown on 'plans' adjacent to either cultural or natural assets (eg. dwelling, rainforest). They act to significantly lessen the impact of intense fire. The Asset Protection Zone can be further identified by two sub-zones.

Each has a specific role to play within an asset protection zone. These sub-zone areas are called the Inner Protection Area (Fuel Free Zone) and the Outer Protection Area (Fuel Reduced Zone). The sub-zones characterise the physical appearance of the landscape and in particular the way the combustible fuels shall appear after they are modified. (See Photos 1 - 6).

The Inner Protection Area is always located immediately adjacent to the asset/value at risk. The Outer Protection Area is located between the Inner Protection Area and the bushland.

When considering bush fire fuel it is important to understand that it occurs in our native bushland in three vertical layers – see Table 1.

Table 1 – Fuel Layers

Fuel Layer Name	Location of Layer in vertical Column	Type of Fuel
Ground Fuels	Below ground level	Peatmoss (always below the surface)
Surface Fuels	0-200 mm	Litter layer (leaves & twigs)
Aerial Fuels	200 – 3000 mm	Shrubs and grasses
Canopy Fuels	> 3000 mm	Tree canopy

2.0 INNER PROTECTION AREA (I.P.A)

This area is *almost free* of all fuels, it usually takes the form of grassy areas, car parks, roads, concrete areas, track or trails. It does not imply the wholesale removal of all or every tree - see Table 2 for guidelines on the extent of trees that can occur within this zone.

Rationale: By its very nature this zone is intended to stop the transmission of flame and reduce the transmission of radiated heat by the elimination of available fuel. Thus its Inner Protection Area name. This area also allows airborne embers to fall safely thus stopping further outbreaks of fire to begin.

Fire Fighting Advantage: This zone allows safe fire fighting operations to occur and clear fire control lines to be implemented by fire fighters.

Measurability: A fuel free Inner Protection Area is measured in two ways. The weight of the fuel and the width of the zone. Practitioners measure fuel load in *tonnes per hectare*. It is assessed by measuring the weight of fuel in a small quadrat eg. 300mm by 300mm and equating that to a hectare. The width of the zone is the separating distance between an asset and the bushland.

Performance Standard: A safe load is between 0-3 t/Ha.

Photographic Montage Depicting Inner Protection Area

PHOTO – 1

Site Description: The site is a paved roadway. It separates two areas of bushland and is normally called in this instance a fire break.

Fire Behaviour: No fire could occur on this fire break but the narrow nature of the break would allow fire to pass between the two bushland areas without difficulty.

Maintenance: None required due to paved surface. Do not allow shrubs to grow.

Fuel Weight: Zero

PHOTO – 2

Site Description: The site is mineral earth. There is no fuel on this narrow strip. The narrow strip forms a narrow fire break between two areas of unmanaged bushland.

Fire Behaviour: No fire could occur on this mineral earth but the narrow nature of the fire break would allow fire to pass between the two bushland areas without difficulty.

Maintenance: Regular raking and removal of litter layer. Do not allow shrubs to grow.

Fuel Weight: Zero

PHOTO – 3

Site Description: This is a grassed fire trail on level land adjacent to unmanaged bushland. The grass height on the level lands is 20-50 mm.

Fire Behaviour: This area, if mowed regularly, would exhibit flame heights not above 300 mm (12 inches). Note: The grass in the bushland zone is approx' 400-500mm in height and would achieve flame heights approximate to 750 –1200mm (depending on fuel loadings and Fire Danger Index).

Maintenance: This fuel free zone is able to be managed by normal mowing means. Raking and removal of litter layer; and/or mowing of grasses; and raking and/or mowing. Fuel Weight in photo 4: < 2 T/Ha.

Fuel Weight: < 2 T/Ha.

PHOTO – 4

Site Description: This is a grassed Inner Protection Area with scattered trees, no shrub larger and minimal understorey. The grass height is maintained to provide < 3 tonnes per hectare.

Fire Behaviour: This area, if maintained regularly, would exhibit flame height not above 300mm.

Maintenance: This Inner Protection Area is managed by mowing, raking and removal of the litter layer.

Fuel Weight: < 3 tonnes/hectare.

Photographic Montage Depicting Inner Protection Area

PHOTO – 5

Site Description: The site is a grassed Inner Protection Area with large smooth barked tree 5 metres clear of the dwelling.
The grass height is maintained to provide < 3 tonnes per hectare.

Fire Behaviour: This area, if maintained regularly, would exhibit flame height not above 300mm.

Maintenance: This Inner Protection Area is managed by mowing, raking and removal of the litter layer.

Fuel Weight: < 3 tonnes/hectare

PHOTO – 6

Site Description: This site shows a grassed Inner Protection Area with rock and landscaped areas constituting approximately 15% of the Inner Protection Area. Tree more than 5 metres from dwelling with no canopy connection to adjoining trees.

Fire Behaviour: This area, if maintained regularly, would exhibit flame height not above 300mm.

Maintenance: This Inner Protection Area is managed by mowing, raking and removal of the litter layer.

Fuel Weight: < 3 tonnes/hectare to grass areas landscaped areas 3-4 tonnes/hectare.

PHOTO – 7

Site Description: This site shows an Inner Protection Area which includes a paved Access/Fire Trail. Smooth barked trees < 5 metres from fire aspect of dwelling.
Fuel loading to trail zero with grassed areas displaying approximately 3 tonnes/hectare.

Fire Behaviour: Fires impacting the bushland to the left of the Access/Fire Trail would loose intensity with the provision of the Inner Protection Area.

Maintenance: This Inner Protection Area is managed by mowing, raking and removal of the litter layer.

Fuel Weight: Nil to Access/Fire Trail. 3 tonnes/hectare to grassed area.

PRESENCE OF SHRUBS IN AN INNER PROTECTION AREA

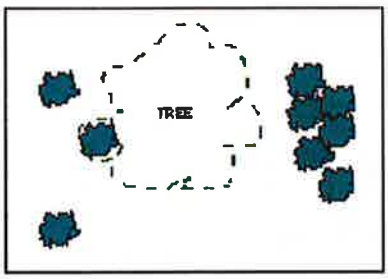
Shrubs may occur within an Inner Protection Area, but only where it is recommended by an experienced bush fire protection manager.

Thus landscaping works within the Inner Protection Area may occur in some instances. Where it is approved to occur, some 10-15 % and in some cases up to 30% of the Inner Protection Area may be able to be landscaped but always away from glass in buildings.

The design of the Inner Protection Area will be dependent on species selection and spatial arrangement.

Note: eg. 10 % means that for every 100 square metres (eg. 10 metres x 10 metres) only 10 % of that area may have a shrub component. The remainder would be free of shrubs see Figure 1. A 10 % landscaped shrub layer would add a further 1.5 tonnes of fuel to the overall hazard weight. To maintain the aggregate below 3 t/ha the ground fuels must be mown grass, or similar.

Figure 1 – Example of Spatial Arrangement in a Inner Protection Area



If a shrub layer is present the following table shows the additional fuel weights that should be added to the calculated surface fuels.

Shrub cover	Fuel Weight
10-30 %	2.5 tonnes / ha
35-50 %	5.0 tonnes / ha
55-75%	7.5 tonnes / ha

PRESENCE OF TREES WITHIN AN INNER PROTECTION AREA

A tree may occur within an Inner Protection Area if the canopy does not form a link with shrubs. The reason is to lessen any chance for 'vegetation linking' and the capability for fire to extend into the canopy.

It is a basic premise in fire behaviour understanding that fire cannot occur in the canopy unless surface fuels such as grasses or shrubs are burning. This merging creates opportunity for fire to link with the canopy and therefore increase fire intensity by some significant amount.

Trees that have a canopy beginning near the ground (such as Forest Oaks *Allocasuarina*) form a continuous link with the tree canopy and shrubs. A forest canopy cannot therefore burn without fuel to feed that fire. In a 'tall open forest' where the trees are generally above 20 metres in height the canopy is separated from the land surface by some distance. In an 'open woodland' the low canopy height (usually < 5 metres) merges with the shrubland layer.

Knowing the relationship between the shrub layer and the tree canopy allows fire managers to design safer areas in the asset protection zones. It is for this reason that vegetation such as Forest Oaks are usually excluded from an Inner Protection Area.

Similarly in 'open forests' the height of the forest is sufficiently removed from the shrub layer. As a general rule trees are allowed within an Inner Protection Area where the density of those trees is commensurate with Table 2 below and located on slopes up to 20% with a Westerly aspect.

In respect of trees that can be located in an Inner Protection Area Table 2 provides guidelines.

Table 2 – Tree Density in Inner Protection Area

Distance from dwelling wall	Trees permitted on the exposed side of a dwelling	Trees permitted on the non exposed side of a dwelling
within 5 metres	No trees	No trees
between 5-10 metres	One tree per 100 m^2	2 trees per 100 m^2
Between 10-20 metres	<10 tree per 400 m^2.	<10 trees per 400 m^2

There are variations to Table 2.

- Trees vary in height and tree crown width /depth. Some trees have canopies that extend close to the ground (eg < 5 metres from the ground) whilst other trees have canopies that area high off the ground (> 15 metres off the ground). In some cases these tall trees do not have canopies that are affected by undergrowth / tall shrubs that could cause fire to burn into the canopy. Therefore if trees are isolated they do not form a significant risk.

- Similarly smooth barked trees are less of a hazard than heavily barked trees. The latter can cause fire to run up into the canopy and if there is sufficient wind the resulting fire can be of high intensity.

- Similar to the above, the number of trees per 100 m^2 depends on an individual assessment being undertaken to determine the 'type / size of tree', and its resultant potential impact upon a dwelling.

- The exposed side of a dwelling is the side that is directly affected by a moving fire particularly when fanned by wind. The non-exposed side of a dwelling is the side where fire is unlikely to come from either from a lack of wind, slope or other factors such as a lack of hazardous fuel.

3.0 OUTER PROTECTION AREA (O.P.A)

Rationale: This zone is designed to stop the development of 'intense' fires and the transmission of 'severe' radiated heat.

Physical Appearance: This area assumes all trees will remain but with a modified shrub / grass and litter layer. In some sparse vegetation communities the shrub layer may not require modification.

Fire Fighting Advantage: Reduced fire intensity. It achieves this by denying fire a significant proportion of the fuel to feed upon. Fuels containing small (or fine) leaves such as *Forest Oaks* (or similar) are targeted for removal due to the capacity to burn quickly and therefore feed fire up into adjacent trees.

Measurability: Practitioners measure fuel load in *tonnes per hectare*. It is assessed by way of measuring the load in a given small quadrat eg. 300mm by 300mm and equating that to a hectare.

Performance Standard: A safe load is between 4-6 T/Ha.

Note: An experienced / qualified bush fire protection practitioner should undertake an individual assessment of a site to determine the requirements within an Asset Protection Zone.

Photographic Montage Depicting Outer Protection Area

PHOTO – 1

Site Description: This area has a low tree and shrub density but a high presence of native grasses. Almost no litter layer present.

Fire Behaviour: The lack of shrubs means that fire behaviour will be less but the presence of the sloping lands and the heavy presence of grass means that fire can burn quickly up the slope with flame heights between 1200-1800mm.

Maintenance: Maintain the grass height. Shrubs can grow to what is pictured in Photo 1.

Fuel Weight: 2-3 T/Ha

PHOTO – 2

Site Description: This area has increased shrub density and the beginnings of those shrubs linking with the tree canopy. Litter layer is present, but less than 3 T/Ha. The shrub layer is approx' 3 T/Ha.

Fire Behaviour: The increase in shrubs means that fire behaviour will be high. Flame heights would be expected to be between 2000mm – 6000mm (depending on fuel loadings and Fire Danger Index).

Maintenance: Maintain the grass height and current density of shrubs.

Fuel Weight: 6 T/Ha.

PHOTO – 3

Site Description: This area has a low tree and shrub density but a high presence of native grasses.

Fire Behaviour: The heavy presence of native grass means that fire can burn quickly through the outer protection area with flame heights of between 1200-3m.

Maintenance: Remove and maintain grass layer/leaf litter by slashing/hand removal.

Fuel Weight: 6-8 tonnes/hectare

PHOTO – 4

Site Description: Outer Protection Area above dwelling showing large rock outcrops, low shrub and tree density.

Fire Behaviour: Fires impacting this area would burn down slope to the dwelling. Flame heights in the order of 1-2 metres.

Maintenance: Management of this area by slashing/hand removal/burning to maintain fuel loading to < 8 tonnes/hectare.

Fuel Weight: < 6 tonnes/hectare
Nil on rock ledges.

APPENDIX 2

SUMMARY OF AUSTRALIAN STANDARD AS3959 (1999 – AMENDED)

CONSTRUCTION OF BUILDINGS IN BUSHFIRE PRONE AREAS

AUSTRALIAN STANDARD AS3959 (1999 – AMENDED)

CONSTRUCTION OF BUILDINGS IN BUSHFIRE-PRONE AREAS

Levels of Construction:

Three levels of construction are given which correspond to the category of bushfire attack determined by *Planning for Bushfire Protection 2006*:

Level 1 Construction – For the category of **medium** bushfire attack.

Level 2 Construction – For the category of **high** bushfire attack.

Level 3 Construction – For the category of **extreme** bushfire attack.

Important note: The following is a summary of AS3959 and must be read only as a summary. Reliance should be placed completely upon the AS3959 published by Standards Australia.

ITEM	LEVEL 1	LEVEL 2	LEVEL 3
FLOORING SYSTEMS	The requirements for a floor in a Level 1 construction shall be one, or a combination, of the following: (a) A concrete slab-on-the-ground. (b) A suspended floor, which may be one, or a combination of the following, supported by posts, columns, stumps, piers, or 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 one bearer at any point is greater than 600mm above the finished ground level. (c) A suspended timber floor, framed with timber or metal, where the underside of any one bearer, at any point, is not greater than 600mm above the 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 the 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 material shall meet the bottom of the cladding material to ensure there are no gaps on the exterior face of the building.	**The requirements for a floor in a Level 2 construction shall be as for Level 1 construction (see Clause 3.3.1)** NOTE: The protection of subfloor openings against the entry of burning debris by way of introducing non-combustible material, such as fibre-reinforced cement sheeting to effectively enclose the subfloor space, may conflict with the requirements for termite protection and should therefore, take into consideration of the provisions of AS 3660.1.	**The requirements for a floor in a Level 3 construction shall be as for Level 2 construction (see Clause 3.3.2)** Except that in the case of a framed floor, where any bearer or joist is greater than 600mm above finished 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.

ITEM	LEVEL 1	LEVEL 2	LEVEL 3
SUPPORTING POSTS, COLUMNS, STUMPS, PIERS AND POLES	The requirements for supporting posts, columns, stumps, piers and poles in a Level 1 construction shall be one, or a combination, of the following: (a) Non-combustible. (b) Fire-retardant-treated timber for a minimum of 400 mm above the finished ground level. (c) Timber mounted on galvanized metal shoes with a clearance of not less than 75 mm above the adjacent finished ground level or paving level (see Figure 3.2). The above do not apply where the subfloor space is totally enclosed as described in Clause 3.3.1(c) (ii).	The requirements for supporting posts, columns, stumps, piers and poles in a Level 2 construction shall be as for Level 1 construction (see Clause 3.4.1)	Except in enclosed subfloor spaces, the requirements for supporting posts, columns, stumps, piers and poles in a Level 3 construction shall be as for Level 2 construction (see Clause 3.4.2) except that all timber shall be fire-retardant-treated to full height.

ITEM	LEVEL 1	LEVEL 2	LEVEL 3
EXTERNAL WALLS	The requirements for external walls in a Level 1 construction shall be as follows: (a) External walls shall be one, or a combination, of the following: i) A wall having an external leaf of masonry, concrete, pise, rammed earth or stabilized 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 (see AS 1530.2) installed immediately behind the external cladding; or B) an insulation material conforming to the appropriate Australian Standard for that material. NOTE: No restrictions apply to the cladding material. 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 400 mm above finished ground level, the cladding shall be protected for not less than 400 mm above the adjacent finished ground level (see Figure 3.3) (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 (see Figures 3.3 (a) and 3.3(b)); (ii) by substituting with a suitable non-combustible sheet material, or fire-retardant-treated timber (see Figure 3.3 (c)); or (iii) where the external cladding is timber, by using fire-retardant-treated timber.	**The requirements for walls in a Level 2 construction shall be as for Level 1 construction (see Clause 3.5.1),** except that PVC cladding is not permitted and all external timber wall cladding shall be of fire-retardant-treated timber.	**The requirements for external walls in a Level 3 construction shall be as for Level 2 construction (see Clause 3.5.2).**

ITEM	LEVEL 1	LEVEL 2	LEVEL 3
WINDOWS	All openable windows, including louvres, in a Level 1 construction shall be screened with corrosion-resistant steel, bronze or aluminium mesh with a maximum aperture size of 1.8 mm in such a way that the entire opening remains screened when the window is open.	**The requirements for all windows, including louvres, in a Level 2 construction shall be as for Level 1 construction (see 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 shutters constructed of a non-combustible material or of toughened glass.	**The requirement for windows in a Level construction shall be as for Level 2 construction (see Clause 3.6.2)** except that where the windows are not protected by non-combustible shutters, they shall be glazed with toughened glass.

ITEM	LEVEL 1	LEVEL 2	LEVEL 3
EXTERNAL DOORS	External doors in a level 1 construction are to 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 1.8 mm.	**The requirements for external doors in a Level 2 construction shall be as for Level 1 construction except that aluminium shall not be used for the mesh (see Clause 3.7.1).** If leadlight glazing panels are incorporated in the doors, they shall be protected by shutters constructed of a non-combustible material or of toughened glass.	**The requirements for external doors in a Level 3 construction shall be as for Level 2 construction (see Clause 3.7.2)** except that – (a) timber doors shall be fire-retardant-treated or shall have a non-combustible covering on the exterior surface; or (b) doors shall be protected by shutters of non-combustible material; or (c) doors shall be solid-core having a thickness not less than 35 mm.
VENTS AND WEEPHOLES	Vents and weepholes in a Level 1 construction shall be protected with spark guards made from corrosion-resistant-steel, bronze or aluminium mesh with a maximum aperture size of 1.8 mm (see Figure 3.4).	**The requirements for Level 2 construction vents and weepholes shall be as for Level 1 construction (see Clause 3.8.1),** except that aluminium mesh shall not be used.	**The requirements for vents and weepholes in a Level 3 construction shall be as for Level 2 construction (see Clause 3.8.2**

ITEM	LEVEL 1	LEVEL 2	LEVEL 3
ROOFS	The following general requirements shall apply to all types of roofing systems in a Level 1 construction: (a) Timber shakes or shingles shall not be used for the roof covering. (b) The roof/wall junction shall be sealed either by the use of fascias and eaves linings, or by sealing the gaps between the rafters with a suitable non-combustible material. (c) Sarking shall have a flammability index of not more than 5 (see AS1530.2). ***Tiled roofs*** Tiled roofs shall be fully sarked (see Clause 3.9.1.1(c). The sarking shall be located directly below the tiling barrens and shall cover the entire roof area including the ridge ***Sheeted roofs*** The requirements for sheeted roofs in a Level 1 construction are as follows: (a) Only metal or fibre-cement sheet shall be used. (b) All gaps under the corrugations or ribs of the roofing 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 1.8 mm, profiled metal sheet, neoprene seal, compressed mineral wool or similar material.	**The requirements for a roof in a Level 2 construction shall be as for Level 1 construction (see 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 as the glazing for rooflights. The case of the evaporative cooler shall be manufactured from a non-combustible material.	**The requirements for roof covering in a Level 3 construction shall be as for Level 2 construction (see Clause 3.9.2)** except that no fibre-reinforced cement or aluminium sheet shall be used.

ITEM	LEVEL 1	LEVEL 2	LEVEL 3
ROOFS (Cont.)	NOTES: 1) The method of protection in Item (b)(ii) can only be achieved on a roof without valleys and having the deck fixed directly to, but not structurally supported by, the fascia. 2) It is generally recognized that where compressed mineral wool is used for sealing against bushfire attack or for other purposes, adequate ventilation should be provided to stop condensation on the mineral fibre causing corrosion in the roof sheeting or supporting structure. (c) Rib caps and ridge capping shall be sealed in accordance with Clause 3.9.1.3 (b) (see Figure 3.5(a)), or preformed rib caps or ridge capping shall be used (see Figures 3.5(b) and (c)). ***Rooflights*** The requirements for rooflights in a Level 1 construction are as follows: (a) All penetrations of the roof space for the installation of rooflights and associated shafts shall be sealed with a non-combustible sleeve or lining. Thermoplastic sheet in a metal frame may be used for a rooflight, but the diffuser installed at ceiling level shall be of wired or toughened glass in a metal frame NOTE: AS 1288 and AS 4285 sets out specific requirements for glazing and skylights. (b) Vented rooflights shall be provided with corrosion-resistant steel or bronze mesh having a maximum aperture size of 1.8 mm.		

ITEM	LEVEL 1	LEVEL 2	LEVEL 3
ROOFS (Cont.)	***Roof ventilators*** All components of roof ventilators, including the rotary type, in a Level 1 construction 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 1.8 mm. ***Roof-mounted evaporative cooling units*** Roof-mounted evaporative cooling units shall only be used if the openings to the cooling unit are encased in corrosion-resistant steel or bronze mesh with a maximum aperture size of 1.8 mm.		
EAVES	All eaves in a Level 1 construction shall be enclosed, and the fascia or the gaps between the rafters shall be sealed (see Clause 3.9.1.1)	**The requirements for eaves in a Level 2 construction shall be as for Level 1 construction (see Clause 3.10.1),** except that all timber eaves lining and joining strips shall be of fire-retardant-treated timber.	**The requirements for eaves in a Level 3 construction shall be as for Level 2 construction (see Clause 3.10.2)** except that aluminium shall not be used.
FASCIAS	There are no requirements for fascias in a Level 1 construction.	**All materials used for fascias in a Level 2 construction** shall be either non-combustible or of fire-retardant-treated timber.	**The requirements for fascias in a Level 3 construction shall be as for Level 2 construction (see Clause 3.11.2)** except that no fibre-reinforced cement or aluminium sheet shall be used.

ITEM	LEVEL 1	LEVEL 2	LEVEL 3
GUTTERS AND DOWNPIPES	Any materials or devices used to stop leaves collecting in the gutters of a Level 1 construction shall have a flammability index of not greater than 5 when tested in accordance with AS 1530.2.	**The requirements for gutters and downpipes in a Level 2 construction shall be as for Level 1 construction (see Clause 3.14.1).**	**The requirements for gutters and downpipes in a Level 3 construction shall be as for Level 2 construction (see Clause 3.12.2).**
VERANDAS AND DECKS	Verandas, decks, and the like, forming part of a building required to be Level 1 construction shall comply with one, or a combination, of the following: (a) *Slab* - A reinforced concrete suspended slab floor, supported by posts or columns complying with Clause 3.4 or walls complying with Clause 3.5, or a slab-on-the-ground floor complying with Clause 3.3. (b) *Sheeted or tongued and grooved solid flooring* – 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 400 mm above finished ground level, all joints in the flooring shall be covered (above the floor level) or shall be sealed. (c) *Spaced decking* – The requirements for spaced decking are as follows: (i) The decking timbers shall be fixed with a clearance of not less than 5 mm between adjacent timbers.	**The requirements for verandas and decks in a Level 2 construction shall be as for Level 1 construction (see Clause 3.11.1)** except that if spaced decking is used, fire-retardant-treated timber shall be used for the decking material.	**The requirements for verandas and decks in a Level 3 construction shall be as for Level 2 construction (see Clause 3.13.2)** except that all materials shall be non-combustible or where timber is used, it shall be fire- retardant-treated (including any balustrades).

ITEM	LEVEL 1	LEVEL 2	LEVEL 3
VERANDAS AND DECKS (Cont.)	(ii) The external perimeter beneath the decking shall not be enclosed nor shall access to the space beneath the decking be impeded. NOTE: This requirement is designed to ensure that access to extinguish fires and remove burning material is maintained. (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.		
SERVICE PIPES (WATER AND GAS)	All exposed piping, for water and gas supplies, in a Level 1 construction shall be metal. Pipes of other materials shall be buried to a depth of at least 300 mm below the finished ground level.	**The requirements for service pipes in a Level 2 construction shall be as for Level 1 construction (see Clause 3.12.1).**	**The requirements for service pipes in a Level 3 construction shall be as for Level 2 construction (see Clause 3.14.2).**