Travers

bushfire & ecology

bushfire protection assessment

Proposed Rural Residential Subdivision
Lot 1672 DP 855001
Capitol Hill Drive, Mount Vernon

Under Section 100B of the RF Act (1997)

FPA AUSTRALIA
Certified Business
Bushfire Planning
& Design

April 2013
(REF: A11099B2)

Travers

bushfire & ecology

Bushfire Protection Assessment

Proposed Rural Residential Subdivision
Lot 1672 DP 855001
Capitol Hill Drive, Mount Vernon

Report Authors:	John Travers & Nicole van Dorst
Plans prepared:	Peter Tolley
Checked by:	John Travers
Date:	18 April 2013
File:	A11099B2

Disclaimer:

This report has been prepared to provide advice to the client on matters pertaining to the particular and specific development proposal as advised by the client and / or their authorised representatives. This report can be used by the client only for its intended purpose and for that purpose only. Should any other use of the advice be made by any person including the client then this firm advises that the advice should not be relied upon. The report and its attachments should be read as a whole and no individual part of the report or its attachments should be relied upon as meaning it reflects any advice by this firm. The report does not suggest or guarantee that a bush or grass fire will not occur and or impact the development. The advice does advise on matters published by the NSW Rural Fire Service in their guidelines '*Planning for bush fire protection 2006*' and other advice available from that organisation.

The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered surveyor.

ABN 64 083 086 677
PO Box 7138
Kariong NSW 2250

38A The Avenue
Mt Penang Parklands
Central Coast Highway
Kariong NSW 2250

t: 02 4340 5331
f: 02 4340 2151
e: info@traversecology.com.au

Executive Summary

A bushfire protection assessment has been undertaken for the proposed thirty five (35) lot rural residential subdivision which forms part of the Capitol Hill Stage 2 development located at Lot 1672 DP 855001, Capitol Hill Drive, Mount Vernon.

The development is categorised by the NSW Rural Fire Service (RFS) as being a *rural residential subdivision* and this requires the RFS to issue a *Bushfire Safety Authority* (BSA) in accordance with *Planning for bush fire protection 2006* (PBP).

PBP dictates that the subsequent extent of bushfire attack that can potentially impact a building must not exceed a radiant heat flux of 29 kW/m^2 for rural *residential subdivision* developments. This rating assists in determining the size of the *asset protection zone* (APZ), which in turn provides the necessary *defendable space* between hazardous vegetation and a building.

The assessment found that bushfire can potentially affect the proposed development from the rural grassland vegetation surrounding the perimeter of the site, and within the riparian setback boundary resulting in possible ember attack, radiant heat and potentially flame attack.

The bushfire risk posed to the development however can be mitigated if appropriate bushfire protection measures are put in place and managed in perpetuity.

The assessment has concluded that the proposed development will provide:

- Compliance with *Planning for Bushfire Protection (2006)*, inclusive of a proposed alternate solution for access.

- Compliance with *AS 3959 Construction of buildings in bushfire prone areas (2009)*

Other bushfire protection measures are planned and identified within the recommendations of this report.

Glossary Of Terms

APZ	Asset protection zone
BCA	Building Code of Australia
BSA	Bushfire Safety Authority
FDI	Fire Danger Index
IPA	Inner protection area
OPA	Outer protection area
PBP	*Planning for bush fire protection, 2006*
RFS	NSW Rural Fire Service
SFPP	Special fire protection purpose
AS3959 (2009)	Australian Standard – Construction of buildings in bushfire-prone areas.

Table of Contents

Introduction 1

Travers bushfire & ecology has been requested by *Dino Seraglio* to undertake a bushfire protection assessment for the proposed thirty five (35) lot rural residential subdivision located at Lot 1672 DP 855001 Capitol Hill Drive, Mount Vernon..

The proposed subdivision is located (in part) on land mapped by the Penrith Council as being bushfire prone. This triggers a formal assessment by Council in respect of the NSW Rural Fire Service (RFS) policy against the provisions of *Planning for bush fire protection 2006* (PBP).

1.1 Aims of the assessment

The aims of the bushfire protection assessment are to:

- Review the bushfire threat to the landscape
- Undertake a bushfire attack assessment in accordance with PBP
- Provide advice on mitigation measures, including the provision of asset protection zones (APZs), construction standards and other specific fire management issues
- Review the potential to carry out hazard management over the landscape

1.2 Project synopsis

It is proposed to subdivide Lot 1672 into a 35 lot rural residential subdivision as part of the Capitol Hill Stage 2 development. Ropes Creek which runs generally along the south-western site boundary is a category 3 stream with a 30m setback from the top of bank proposed.

The proposal includes the construction of access roads as well as asset protection zones.

Schedule 1 attached shows the proposed subdivision, riparian constraints and bushfire protection measures including asset protection zones.

1.3 Information collation

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

- Local Environmental Plans
- Google aerial photography
- Topographical maps DLPI of NSW 1:25,000
- Australian Standard 3959 *Construction of buildings in bush fire prone areas*
- *Planning for bush fire protection 2006 (NSW RFS).*

An inspection of the proposed development site and surrounds was undertaken by John Travers on at least three occasions between 2000 and 2012 to assess the topography, slopes, aspect, drainage, vegetation and adjoining land use. The identification of existing bush fire measures and a visual appraisal of bush fire hazard and risk were also undertaken.

1.4 Site description

The site encompasses the area to the east and west of Capitol Hill Drive to the north of its intersection with Centennial Court. It is adjoined by rural residential properties to the south and east and by large expanses of grassland to the north and west. A riparian corridor runs external and adjacent to the sites western boundary and continues through the southern portion of the site.

The site appears to have a long history of agricultural pursuits including grazing and vegetable farming. The property has been largely cleared for agricultural purposes with the retention of a small number of trees.

The topography with the site is gently undulating away from creeks and relatively flat around the creek line.

Figure 1.1 – Aerial Appraisal

1.5 Legislation and Planning Instruments

1.5.1 Environmental Planning and Assessment Act 1979 (EP&A Act)

The proposed development is an 'integrated development' under Section 91 of the *Environmental Planning and Assessment Act 1979*.

The identification of bushfire prone land is required under section 146 of the *EP& A Act*.

1.5.2 Bushfire prone land

Bushfire prone land maps provide a trigger for the development assessment provisions. The proposed development is located on land that is mapped by the Penrith Council as being bushfire prone (refer Figure 1.2).

Consequently, to proceed, the proposed residential development will require a bushfire safety authority from the NSW Rural Fire Service (RFS). The Commissioner of the RFS must be satisfied that the proposal complies with *Planning for Bushfire Protection 2006* before granting a bushfire safety authority.

Figure 1.2 – Bushfire Prone Land Map
(Source: Penrith Council Bushfire Prone Land Map)

1.5.3 Rural Fires Act 1997

This legislation is concerned with the prevention and control of bushfire, hazard reduction and administration. Section 100B of the *Rural Fires Act 1997* states that the Commissioner may issue a bushfire safety authority for a subdivision development on bushfire prone land.

1.5.4 Local Environmental Plan (LEP)

An LEP provides for a range of zonings which list developments that is permissible or not permissible as well as the objectives for development within a zone.

The site is zoned under the Penrith Council LEP (2010) as *E4 – Environmental Living* with *E2 – Environmental Conservation* zoned land along Ropes Creek. The land surrounding the property to the east and south is also zoned E4 with RU2 Rural Landscape land to the west.

The proposal, including the provision of APZ's, will be consistent with the objectives of the proposed re-zoning.

1.5.5 Planning for Bushfire Protection 2006 (PBP)

Bushfire protection planning requires the consideration of the RFS 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. The policy aims to provide for the protection of human life (including fire fighters) and to minimise impacts on property and the environment from the threat of bushfire, while having due regard to development potential, on site amenity and protection of the environment. PBP outlines the following general objectives that must be achieved for all development as well as the specific objectives for subdivision development.

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

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 bushfire protection measures, including fuel loads in the APZ

6. Ensure that utility services are adequate to meet the needs of fire fighters (and others who may assist in bushfire fighting)

More specifically, the objectives for subdivision development 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 (APZs) between the bushfire hazard and future dwellings enable conformity with the deemed-to-satisfy requirements of the *Building Code of Australia*

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

12. Ensure the ongoing management of APZs

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

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

Planning for Bushfire Protection (PBP) outlines the bushfire protection measures required to be assessed for new development in bush fire prone areas. The proposal has been assessed in compliance with the following measures:

- Asset Protection Zones
- Building construction and design
- Access arrangements
- Water supply and utilities
- Landscaping, and
- Emergency management arrangements.

1.5.6 Building Code of Australia and the Australian Standards AS3959 - 2009

The BCA is given effect through the EP&A Act and forms part of the regulatory environment of construction standards and building controls. The BCA outlines objectives, functional statements, performance requirements and deemed-to-satisfy provisions. For residential dwellings these include Class 1, 2 & 3 buildings. The construction manual for the deemed-to-satisfy requirements is the Australian Standard AS3959 – 2009 *Construction of buildings in bushfire prone areas*.

1.6 Environmental Constraints

Detailed environmental investigations have been undertaken by *Travers bushfire & ecology* for the portion of the site to the west of Capitol Hill Drive.

1.6.1 Endangered Ecological Communities

River-flat Eucalypt Forest on Coastal Floodplains has been identified as the narrow strip of vegetation along the creek line and is listed as an endangered ecological community under Schedule 1 of the *Threatened Species Conservation Act 1995*.

1.6.2 Threatened species

There were no identified threatened flora species. The following two (2) threatened fauna species have been identified on site adjacent to the large dam:

Threatened Fauna

- East Coast Freetail Bat (*Micronomus norfolkensis*)
- Large-footed Myotis (*Myotis macropus*)

Given the cleared nature of the site and the proposed large lot rural residential subdivision it is unlikely that the proposal, including the provision of APZ will have a significant adverse impact on the EEC (no tree removal required) or the threatened fauna.

1.6.3 Riparian Constraints

A riparian setback of variable width has been provided within the attached Schedule 1. As no works are proposed within the riparian zone there will be a continuance of grazing or mowing on that land.

The NSW Office of Water is not able to apply revegetation works as part of this development application. Therefore in terms of bushfire threat, the current status of vegetation management within the corridor has been used to determine APZ and BAL level setbacks.

1.7 Cultural Constraints

A basic search was conducted on the Aboriginal Heritage Information System (AHIMS). The results show that there are no identified Aboriginal sites of significance within a 200m buffer distance from Lot 166 DP 803478 and or Lot 1672 DP 8555001.

Bushfire Threat Assessment

2

To assess the bushfire threat and to determine the required width of an asset protection zone for a development, a review of the elements that comprise the overall threat needs to be completed.

PBP provides a methodology to determine the size of any APZ that may be required to offset possible bushfire attack. These elements include the potential hazardous landscape that may affect the site and the effective slope within that hazardous vegetation.

2.1 Hazardous fuels

PBP guidelines require the identification of the predominant vegetation 'formation' in accordance with David Keith (2004) to determine APZ distances for subdivision developments. However when determining construction standards in accordance with *AS3959 – Construction in bushfire prone areas* AUSLIG Pictorial Analysis is used to determine the vegetation and hence building construction standards (refer Section 3.2 of this report). The hazardous vegetation is calculated for a distance of at least 140 metres from a proposed building envelope.

Hazardous fuels surrounding the proposed subdivision consist generally of the unmanaged grassland external to the north and south-western boundary. There is remnant forest vegetation within the creek line, however the riparian setback distance ensures that a grassland threat is the 'predominant' vegetation for a minimum 30 metres between the development and the 'riparian forest' threat (refer Schedule 1).

Photo 1 – Remnant forest and grassland vegetation

2.2 Effective Slope

The effective slope is assessed for a distance of 100 metres. Effective slope refers to that slope which provides the most effect upon likely fire behaviour. A mean average slope may not in all cases provide sufficient information such that an appropriate assessment can be determined.

The effective slope within the hazardous vegetation varies between 0–5 degrees adjoining the riparian corridor to the south-west and level within the grassland to the north of the site. These slopes as they relate to each proposed lot is detailed within Table 2.1 below

2.3 Bushfire Attack Assessment

A Fire Danger Index (FDI) of 100 has been used to calculate bushfire behaviour on the site using forest vegetation located within the Greater Sydney region.

Table 2.1 below provides a summary of the bushfire attack assessment and the minimum required asset protection zones in compliance with Appendix 2 (PBP).

Table 2.1 – bushfire attack assessment

Aspect	Vegetation Formation within 140m of development	Effective slope of land	Minimum APZ required (to achieve < BAL 29)
North	Grassland	Level	9 metres
South-west	Grassland for >30 metres then Riparian Forest	0-5°	10 metres
East and South	Managed rural residential	Level	N/A

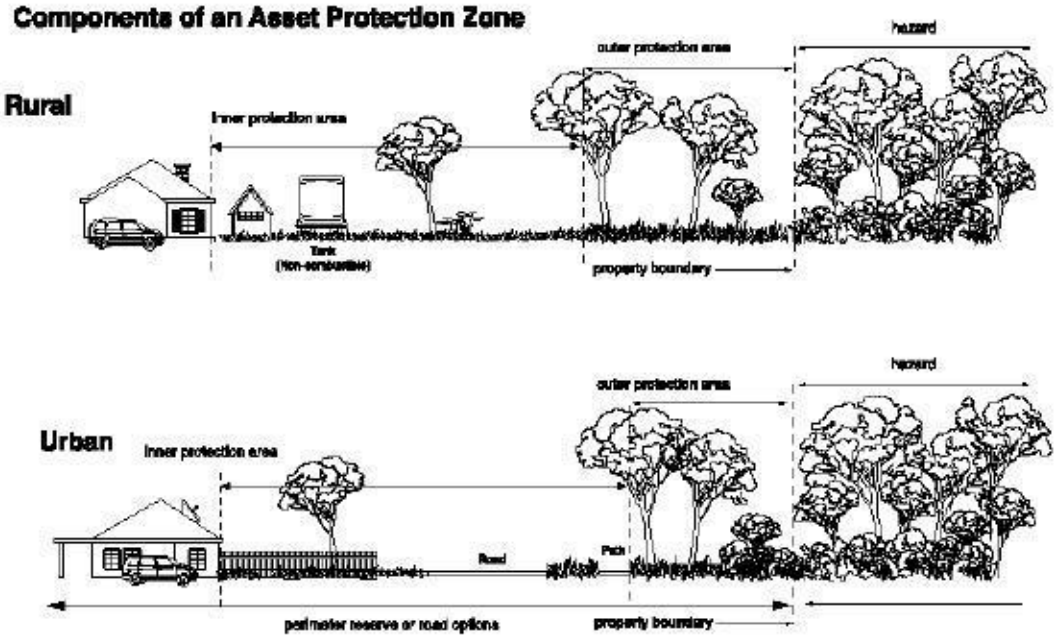
*Notes: * Slope is either 'U' meaning upslope or 'C' meaning cross slope or 'D' meaning downslope*

Specific Protection Issues

3

3.1 Asset protection zones

APZs are areas of defendable space separating hazardous vegetation from buildings. The APZ generally consists of two subordinate areas, an *inner protection area* (IPA) and an *outer protection area* (OPA). The OPA is closest to the bush and the IPA is closest to the dwellings. The IPA cannot be used for habitable dwellings but can be used for all external non-habitable structures such as pools, sheds, non-attached garages, cabanas, etc. A typical APZ and therefore defendable space is graphically represented below:



Source: RFS, 2006

Note: Vegetation management as shown is for illustrative purposes only. Specific advice is to be sought in regard to vegetation removal and retention from a qualified and experienced expert to ensure APZs comply with the RFS performance criteria.

PBP dictates that the subsequent extent of bushfire attack that can potentially emanate from a bushfire must not exceed a radiant heat flux of 29 kW/m^2 for rural residential subdivision developments. This rating assists in determining the size of the APZ to provide the necessary *defendable space* between hazardous vegetation and a building.

Table 3.1 outlines the proposals compliance with the performance criteria for APZ's

Table 3.1 – Performance Criteria for Asset Protection Zones (PBP guidelines pg. 19)

Performance Criteria	Acceptable Solutions	Complies
Radiant heat levels at any point on a proposed building will not exceed 29kW/m^2	APZ's are provided in accordance with Appendix 2 APZ's are wholly within the boundary of the development site	Yes
APZ's are managed and maintained to prevent the spread of fire towards the building	In accordance with the requirements of 'Standards for Asset Protection Zones (RFS 2005)	Yes – can be made a condition of consent.
APZ maintenance is practical , soil stability is not compromised and the potential for crown fires is negated	The APZ is located on lands with a slope of less than 18 degrees.	Yes. APZ's are located on slopes less than 18 degrees

In terms of bushfire threat, the current status of vegetation management within the corridor has been used to determine APZ dimensions.

3.2 Building protection

The construction of buildings in bushfire prone areas is subject to stringent rules pertinent to the building envelope being located on the non-hazardous side of the APZ. The role of the APZ is to provide a safe space to separate the hazard from the building.

In terms of subdivision approval the minimum asset protection zone must be provided in accordance with Appendix 2 of PBP. The asset protection zones provided in Section 2.3 of this report comply these requirements.

Following on from the subdivision stage, any future construction is subject to Section 79BA of the *Environmental Planning and Assessment Act 1979* or the Codes SEPP (Clause 1.19). Building construction standards (in accordance with AS3959, 2009) are not applied until building construction stage.

The NSW RFS have released an amendment to PBP 2006 in the form of Appendix 3. This amendment follows the adoption on 1 May 2010 of AS3959 (2009) through the Building Code of Australia (BCA) 2010. This appendix, in conjunction with Table 2.4.2 of AS3959 (2009), is used to determine construction considerations when building on bushfire prone land.

The construction classification system is based on five (5) bushfire attack levels (BAL). These are BAL – Flame Zone (FZ), BAL 40, BAL 29, BAL 19 and BAL 12.5 (AS3959 (2009) – *Construction of buildings in bushfire prone areas*). The lowest level, BAL 12.5, has the longest APZ distance while BAL – FZ has the shortest APZ distance. These allow for varying levels of building design and use of appropriate materials.

Table 3.2 and Schedule 1 attached provide an indication of the bushfire attack levels that are likely to apply for future building construction. These BAL levels are indicative only and are to be reassessed prior to the issue of a construction certificate.

Table 3.2 – bushfire attack assessment

Aspect	Vegetation Formation within 140m of development	Effective slope of land	Minimum APZ required (to ensure < BAL 29)	Construction Standard
North	Grassland	Level	9 metres	BAL 29 (9–13m) BAL 19 (13-<19m) BAL 12.5 (19-<50m)
South-west	Grassland for >30 metres then Riparian Forest	0-5°	10 metres	BAL 29 (10–15m) BAL 19 (15-<22m) BAL 12.5 (22-<50m)
East and South	Managed rural residential	Level	N/A	N/A

*Notes: * Slope is either 'U' meaning upslope or 'C' meaning cross slope or 'D' meaning downslope*

3.3 Hazard management

Should the development be approved, the owner or occupier of each lot will be required to manage the APZ to the specifications of Council's approval. In terms of implementing and / or maintaining APZs, there is no physical reason that could constrain hazard management from being successfully carried out by normal means (e.g. mowing / slashing / grazing).

The APZ's are to be managed in accordance with RFS guidelines '*Standards for Asset Protection Zones*' (RFS, 2005) with landscaping to comply with Appendix 5 of PBP.

A summary of the guidelines for managing APZs are attached as Appendix 1 to this report.

3.4 Access for fire fighting operations

Public access to the development will be provided extending from Capitol Hill Drive to the west, with an existing road extending from Capitol Hill Drive to the east. This public access and its compliance with PBP is detailed within Table 3.3

Access to the proposed lots will be provided via private property access driveways to each dwelling extending from the Public Road System. Table 3.5 provides the necessary acceptable solutions for future access within the individual lots.

Table 3.3: Performance Criteria for Public Roads (PBP guidelines pg. 20)

Performance Criteria	Acceptable Solutions	Complies
Fire fighters are provided with safe all weather access to structures (thus allowing more efficient use of fire fighting resources)	Public Roads are two -wheel drive, all weather roads.	Yes
Public road widths and design that allow safe access for fire fighters while residents are evacuating an area	Urban perimeter roads are two way, that is, at least two traffic lane widths (carriageway 8 m minimum kerb to kerb) allowing traffic to pass in opposite directions. Non perimeter roads comply with Table 3.4 below. Perimeter road is linked with the internal road system at an interval of no greater than 500 metres in urban areas. Traffic management devices are constructed to facilitate access by emergency services. Public roads have a cross fall not exceeding 3 degrees. All roads are through roads. If unavoidable dead end roads are not more than 200 metres in length, incorporate a minimum 12 m outer radius turning circle, sign posed dead end and direct traffic away from the hazard. Curves of roads (other than perimeter) have a minimum inner radius of 6 m and are minimal in number to allow for rapid access and egress. The minimum distance between inner and outer curves is 6m. Maximum grades for sealed roads do not exceed 15 degrees and an average grade of not more than 10 degrees. Minimum vertical clearance of 4 m above the road at all times.	Yes. Given the rural residential nature of the property, large lot design and surrounding low risk threat posed by the grassland vegetation (in most cases dwellings will be located over 50 metres from the grassland threat) a perimeter road has not been provided. Road reserve widths of 15 metres have been provided and future public roads have the capacity to comply with the widths provided within Table 3.4 below. Proposed and existing dead end roads have a length of less than 200m and must incorporate a minimum 12 m outer radius turning circle.

Performance Criteria	Acceptable Solutions	Complies
The capacity of road surfaces and bridges is sufficient to carry fully loaded fire fighting vehicles	The capacity of road surfaces and bridges is sufficient to carry fully loaded fire fighting vehicles (15 tonnes for reticulated water and 28 tonnes for all other areas). Bridges clearly indicate load rating.	Yes
Roads that are clearly sign posed (with easily distinguishable names) and buildings / properties that are clearly numbered.	Public roads >6.5m wide to locate hydrants outside of parking reserves to ensure accessibility to reticulated water. Public roads 6.5 - 8 m wide are No Parking on one side with the hydrant located on this side to ensure accessibility to reticulated water. Public roads <6.5 m wide provide parking within parking bays and locate services outside of parking bays to ensure accessibility to reticulated water. One way only public access are no less than 3.5 m wide and provide parking within parking bays and locate services outside of parking bays to ensure accessibility to reticulated water.	Yes – Can be made a condition of consent
There is clear access to reticulated water supply. Parking does not obstruct the minimum paved width	Parking bays are a minimum of 2.6 metres wide from kerb edge to road pavement. No services or hydrants are located within parking bays. Public roads directly interfacing the bushfire hazard are to provide roll top kerbing to the hazard side of the road.	Yes – Can be made a condition of consent

Table 3.4: Minimum widths for Public Road that are not perimeter roads (PBP guidelines pg. 20)

Curve radius (inside edge) (metres)	Swept Path (metres width)	Single lane (metres width)	Two way (metres width)
<40	3.5	4.5	8.0
40-69	3.0	3.9	7.5
70-100	2.7	3.6	6.9
>100	2.5	3.5	6.5

Table 3.5 – Performance Criteria for Property Access (PBP guidelines pg. 22)

Performance Criteria	Acceptable Solutions	Complies
Access to properties is provided in recognition of the risk to fire fighters and / or evacuating occupants.	At least one alternative property access road is provided for individual dwellings (or groups of dwellings) that are located more than 200 m from a public through road.	Yes – all dwellings will be within 200 metres of a public road
The capacity of road surfaces and bridges is sufficient to carry fully loaded fire fighting vehicles All weather access is provided	Bridges clearly indicate load rating and pavements and bridges are capable of carrying a load of 15 tonnes. Roads do not traverse a wetland or other land potentially subject to periodic inundation (other than a flood or storm surge)	N/A. There are no proposed bridges and roads do not traverse wetlands or land subject to inundation.
Road widths and design enable safe access for vehicles	A minimum carriageway width of four metres for dwellings with a distance of greater than 70 metres from the nearest hydrant point to the most external part of a proposed building. *Note: No specific access requirements apply in a urban area where a 70 m unobstructed path can be demonstrated between the most distant external part of a dwelling and the nearest part of the public access road that supports the operational use of firefighting vehicles (road speed limit <70kph)* In forest, woodland and heath situations, rural property access roads have passing bays every 200m that are 20m long by 2m wide (min. width 6m). A minimum vertical clearance of four metres to any overhanging obstructions, including tree branches Internal roads for rural properties provide a loop road around any dwelling or incorporate a turning circle with a minimum outer radius of 12m.	Yes – Can be a condition of consent Proposed driveways will require compliance with this acceptable solution.

Performance Criteria	Acceptable Solutions	Complies
	Curves have a minimum inner radius of 6 m and are minimal in number to allow rapid access/egress. The minimum distance between inner and outer curves is 6 metres. The cross fall is not more than 10 degrees Maximum grades for sealed roads do not exceed 15 degrees and not more than 10 degrees for unsealed roads.	

3.5 Water supplies

Town reticulated water supply is available to the property in the form of an underground reticulated water system.

The following Table 3.6 outlines the performance criteria for reticulated water supply.

Table 3.6: Performance Criteria for Reticulated Water Supplies (PBP guidelines pg. 27)

Performance criteria	Acceptable Solutions
Water supplies are easily accessible and located at regular intervals	Reticulated water supply to urban subdivision uses a ring main system for areas with perimeter roads. 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. Hydrants are not placed within any road carriageway All above ground water and gas pipes external to the building are metal, including and up to taps. The provisions of parking on public roads are met.

3.6 Gas

The following Table 3.7 outlines the required performance criteria for the subdivisions gas supply.

Table 3.7 – Performance Criteria for Reticulated Water Supplies (PBP guidelines pg. 27)

Performance criteria	Acceptable Solutions	Complies
Location of gas services will not lead to the ignition of surrounding bushland land or the fabric of buildings	Reticulated or bottled gas bottles are to be installed and maintained in accordance with AS 1596 – 2002 and the requirements of relevant authorities. Metal piping is to be used. All fixed gas cylinders are to be kept clear of flammable materials to a distance of 10 metres and shielded on the hazard side of the installation. If gas cylinders are to be kept close to the building the release valves must be directed away from the building and at least 2 metres away from any combustible material, so that they do not act as a catalyst to combustion. Connections to and from gas cylinders are metal. Polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not to be used	Yes - can be made a condition of consent.

3.7 Electricity

The following Table 3.8 outlines the required performance criteria for the subdivisions gas supply.

Table 3.8 – Performance Criteria for Electricity Services (PBP guidelines pg. 27)

Performance criteria	Acceptable Solutions	Complies
Location of electricity services limit the possibility of ignition of surrounding bushland or the fabric of buildings Regular inspection of lines in undertaken to ensure they are not fouled by branches.	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 specification in ;'Vegetation Safety Clearances' issued by Energy Australia (NS179, April 2002).	Can be made a condition of consent

Conclusion & Recommendations

4

4.1 Conclusion

A bushfire protection assessment has been undertaken the proposed thirty five (35) lot rural residential subdivision located at Lot 1672 DP 855001, Capitol Hill Drive, Mount Vernon.

The assessment found that bushfire can potentially affect the proposed development from the grassland vegetation surrounding the perimeter of the site resulting in possible radiant heat flux and to a much lesser extent ember attack and flame attack.

The bushfire risk posed to the development however can be mitigated if appropriate bushfire protection measures are put in place and managed in perpetuity.

The assessment has concluded that the proposed development will provide:

- Compliance with *Planning for Bushfire Protection (2006)*.
- Compliance with *AS 3959 Construction of buildings in bushfire prone areas (2009)*

The following illustrates the proposals compliance with PBP.

Afford occupants of any building adequate protection from exposure to a bushfire

> Response: APZs have been provided and complies with the requirements of PBP. The future buildings will be constructed in accordance with AS 3959. Other bushfire protection measures are planned and identified with the recommendations below.

Provide for a defendable space to be located around buildings

> Response: APZs have been provided which comply with the minimum requirements of PBP.

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

> Response: APZs have been provided in accordance with PBP and building construction will be applied in accordance with AS3959 (2009). Fuel management will occur in the APZ and will be managed in perpetuity.

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

Response: Access complies with the performance requirement of Section 4.1.3 (1) & (2) of PBP.

Provide for ongoing management and maintenance of bushfire protection measures, including fuel loads in the APZ

> Response: Fuel management can be undertaken by the land owners under the guide of Appendix 1 and as outlined within NSW RFS publications such as 'Standards for Asset Protection Zones' available from the RFS website at www.rfs.nsw.gov.au.

Ensure that utility services are adequate to meet the needs of fire fighters (and others who may assist in bushfire fighting).

> Response: Water supply, gas services and electricity are to comply with Section 4.1.3 of PBP.

The following recommendations are provided to ensure that the development is in accord or greater than the requirements of PBP.

4.2 Recommendations

Recommendation 1 - The development is as generally indicated on the attached Schedule 1 – Plan of Bushfire Protection Measures.

Recommendation 2 - APZs are to be provided to the proposed development. APZs are to be measured from the exposed wall of the any dwelling toward the hazardous vegetation. The minimum APZs shall be as nominated in Table 2.1 and also as generally depicted in Schedule 1.

Recommendation 3 - Fuel management within the APZs is to be maintained by regular maintenance of the landscaped areas, mowing of lawns in accordance with the guidelines provided in Appendix 1, and / or as generally advised by the RFS in their publications.

Notwithstanding specialist advice in those guidelines, the following general advice for maintaining an APZ is to be followed:

- *Mowing or grazing of grass*: Grass needs to be kept short (approximately 5 cm in height) and green where possible adequate water supplies are available.

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

- *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 is not to overhang a dwelling unless specifically approved by the RFS. Native trees and shrubs should be retained as clumps in landscape beds and should not exceed a covering of more than 20% of the IPA.

- Trees or tall shrubs may require pruning upon dwelling completion in line with PBP. Notwithstanding this, the presence of shrubs and trees close to a dwelling in a bushfire prone landscape requires specific attention to day-to-day management and owners and / or occupiers should be made aware that whilst landscaping can contribute to a way of life and environmental amenity, the accumulated fuels must be regularly removed.

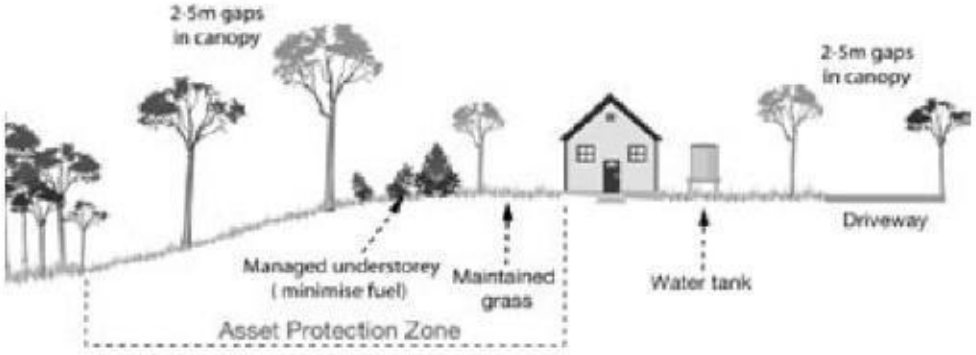
- Trees may remain within close proximity of a building where it can be demonstrated that the tree is not able to produce a build-up of fuel on the roof of a dwelling due to:

    1. A roof pitch which self sheds leaf litter
    2. Ongoing roof maintenance by staff or contractors
    3. Adequate ember protection has been installed

- Trees that are likely to be structurally unstable such that they could cause a limb to fall would require removal for the RFS to agree to a dwelling in proximity to the trees.

In addition the following general APZ planning advice is to be followed:

- Ensure that vegetation does not provide a continuous ignition path to the house
- 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 proposed dwellings so that plants will not ignite the dwelling by direct flame contact or radiant heat emission
- 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 crushed tiles
- The following RFS diagram depicts one version of an ideal situation. Divergence from this ideal should not be undertaken without expert advice



Recommendation 4 - Building construction standards for the proposed future dwellings are to be applied in accordance with Australian Standard AS3959 *Construction of buildings in bushfire prone areas (2009)* with additional construction requirements as listed within Section A3.7 of Addendum Appendix 3 (Planning for Bushfire Protection, 2006).

Recommendation 5 - Access is to comply with the performance criteria outlined in Section 4.1.3 of PBP. Public Road reserve widths of 15 metres have been provided and future public roads are to comply with the widths provided within Table 3.4 (Section 3.4 of this report). Proposed dead end roads must incorporate a minimum 12 m outer radius turning circle.

Private access roads to each allotment must have a minimum carriageway width of four metres for dwellings with a distance of greater than 70 metres from the nearest hydrant point to the most external part of a proposed building.

Recommendation 6 – Water, electricity and gas supply is to comply with Section 4.1.3 of PBP.

Recommendation 7 - The landowner / manager is to be made aware of their liability to manage the development lands for the ongoing protection of themselves and their neighbours (refer Section 63(2) *Rural Fires Act*)

Recommendation 8 - Landowners living in bushfire prone areas should familiarise themselves with publications published by the NSW Rural Fire Service. These are located on the RFS web site www.rfs.nsw.gov.au under 'Publications'.

REFERENCES

Australian Building Codes Board (2010) – *Building Code of Australia*, Class 1 and Class 10 Buildings Housing Provisions Volume 2.

Chan, K.W. (2001) – *The suitability of the use of various treated timbers for building constructions in bushfire prone areas*. Warrington Fire Research.

Councils of Standards Australia AS3959 (2009) – *Australian Standard Construction of buildings in bush fire-prone areas.*

Keith, David (2004) – *Ocean Shores to Desert Dunes – The Native Vegetation of New South Wales and the ACT*. The Department of Environment and Climate Change.

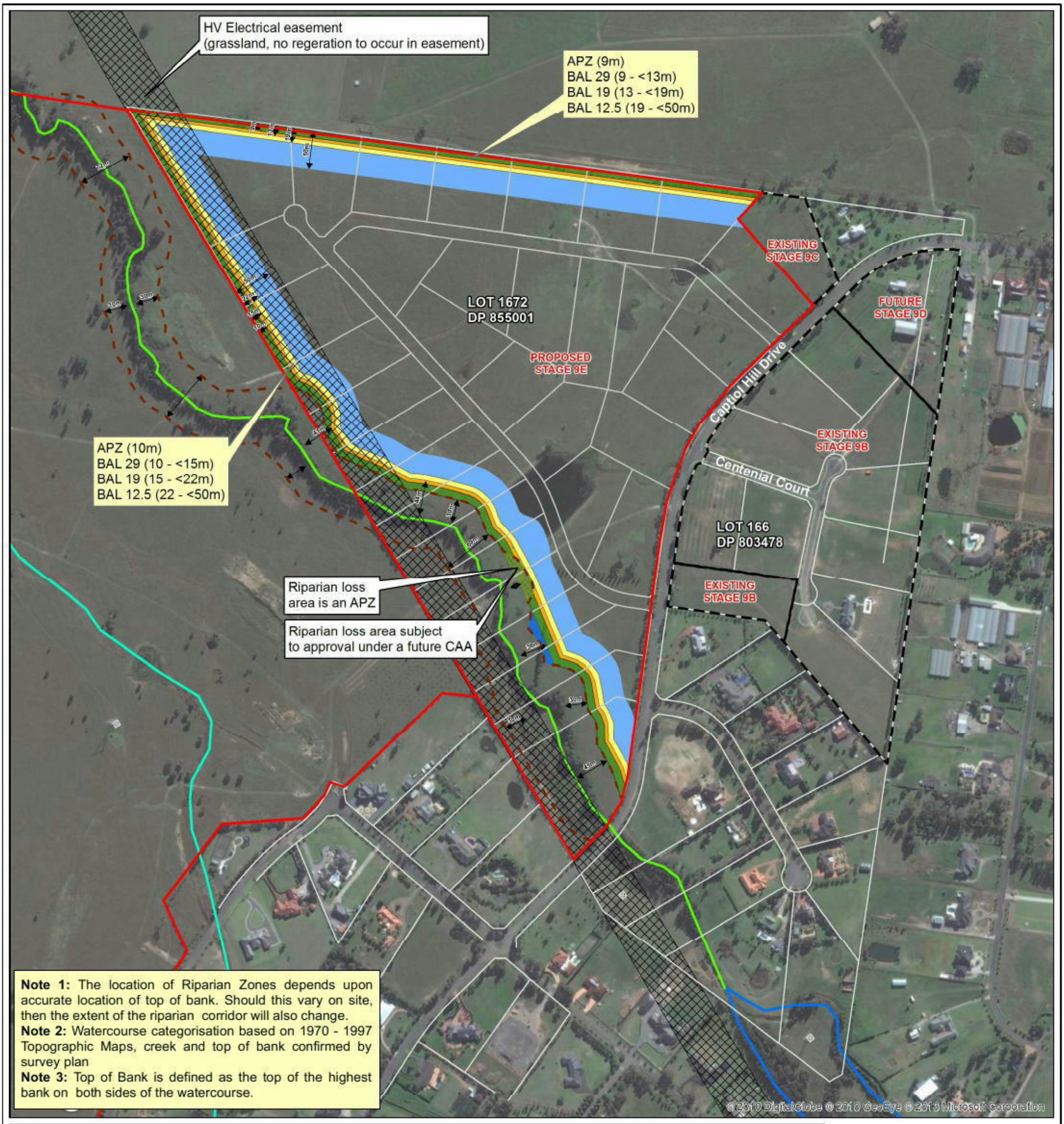
Rural Fire Service (2006) - *Planning for bushfire protection – a guide for councils, planners, fire authorities and developers*. NSW Rural Fire Service.

Rural Fire Service (2006) - Bushfire Attack Software on RFS Web site.

Tan, B., Midgley, S., Douglas, G. and Short (2004) - *A methodology for assessing bushfire attack*. RFS Development Control Service.

Plan of Bushfire Protection Measures

S1



Legend

- Subject site
- Riparian Zone Boundary (variable channel/width)
- Electrical Easement (60.6m wide) (Managed)
- Asset Protection Zone with riparian corridor (798m²)
- Riparian Offset Area (654m²)
- Minimum Asset Protection Zone

Bushfire Construction Standards (AS3959)

(Bushfire Attack Level (BAL))*

- BAL 29
- BAL 19
- BAL 12.5

Riparian Zone from Top of Bank

(Notes 1, 2 & 3)

- Stream Order 1 (10m + channel width)
- Stream Order 2 (20m + channel width)
- Stream Order 3 (30m + channel width)

* Please refer to additional construction requirements for BAL levels which are contained in Addendum Apendix 3 of Planning for Bushfire Protection (2006).

Travers bushfire & ecology
www.traversecology.com.au

Disclaimer: The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered surveyor.

PROJECT	REFERENCE
Mount Vernon (0 50 100 150 200 m)	A11099_F003_A
SCALE	**DATE (ISSUE)**
1:5,000 @ A3	28.02.2013

TITLE

Schedule 1 - Bushfire Protection Measures

Management of Asset Protection Zones

A1

The NSW Rural Fire Service (RFS) advises that when living in a bushfire prone environment asset protection zones are required to be provided between hazardous fuels and a dwelling.

The RFS provide basic advice in respect of managing asset protection zones in several documents namely *Planning for bush fire protection 2006* (PBP) and *Standards for Asset Protection Zones* (undated but circa 2006).

Asset protection zones (APZs) provide a level of defendable space between the hazard and a habitable dwelling or similar structure. These zones are usually shown on plans adjacent to either cultural or natural assets (e.g. dwelling). They act to significantly lessen the impact of intense fire. 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.

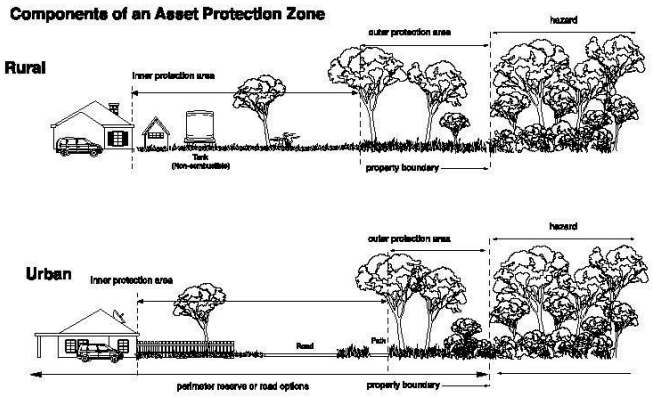
When considering bushfire fuel it is important to understand that it occurs in our native bushland in three vertical layers – see Table 1.

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

The APZ can be further classified into two sub-zones with each having a specific role. These sub-zone areas are called the inner protection area (IPA) and the outer protection area (OPA) – see figure below.

The IPA is managed as a fuel free zone while the OPA is managed as a fuel reduced zone. This means that the fuel free zone has little fuel available to be consumed in the event of a fire whilst the fuel reduced zones has less than normal fuel levels that could be consumed in the event of a fire.



Inner Protection Area (IPA)

This area is *almcst free* of all fuels and usually takes the form of grassy areas, car parks, roads, concrete areas, tracks or trails. It does not imply or require the wholesale removal of every tree and or shrub.

This zone is intended to stop the transmission of flame and reduce the transmission of radiant heat by the elimination of available fuel. This area also allows airborne embers to fall safely without igniting further outbreaks.

This zone also provides a safe fire fighting position and is operationally important for implementation of clear fire control lines.

Grasses may occur within an IPA if they are generally no higher than 50-75mm. Above this height, fuel weights tend to increase exponentially and consequentially cause greater flame heights and therefore fire intensity.

Shrubs may occur within an IPA in the form of clumping amidst open grassy areas. The design of the clumping will be dependent on species selection and spatial density. For example the larger the shrubs the less clumping may occur in a given area.

As a general rule trees are allowed within an IPA but only where those trees are at least 5 metres away from a dwelling.

A recommended performance standard for the fuel load of an IPA is between 0 – 4 t/ha. Shrubs may occur within an IPA commensurate with a spatial distribution of 15-20%. For example an area of 100m2 (10mx10m) can have up to 20% of this area composed of shrubs.

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 IPA 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 *Allccasuarina*) 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 APZs. It is for this reason that vegetation such as Forest Oaks are usually excluded from an IPA.

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 IPA 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 IPA 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

Outer Protection Area (OPA)

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

The OPA assumes all trees will remain but with either a modified shrub / grass layer or regular removal of the litter layer. In some sparse vegetation communities the shrub layer may not require modification.

The fire fighting advantage will manifest in 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.

In most cases the removal of 85% of the litter layer will achieve a satisfactory OPA. A recommended performance standard for the fuel load of an OPA is between 4-6 t/ha.

Managing the APZ

Fuel management within the APZs should be maintained by regular maintenance such as

- Mowing grasses regularly - Grass needs to be kept short and, where possible, green.
- 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.
- 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.
- Tree or tall shrubs may require pruning upon dwelling completion in line with PBP. Notwithstanding this, the presence of shrubs and trees close to a dwelling in a bushfire prone landscape requires specific attention to day to day management and owners and or occupier should be made aware that whilst landscaping can contribute to a way of life and environmental amenity the accumulated.

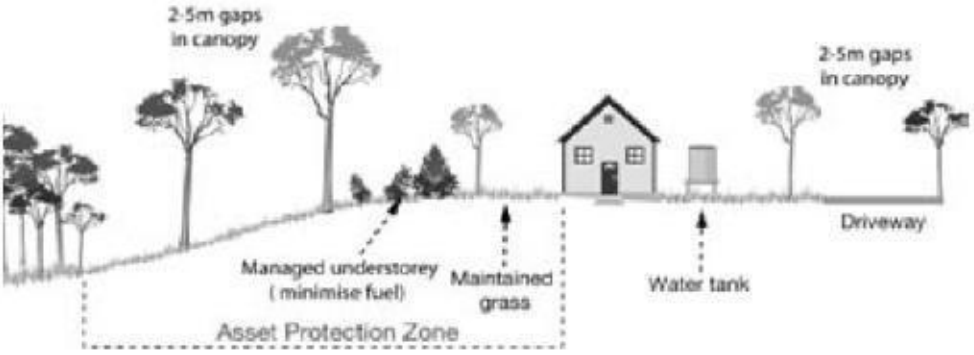
In addition the following general APZ planning advice should be followed.

- Ensure that vegetation does not provide a continuous path to the house.
- 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.

- 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

- The following RFS illustrative diagram depicts one version of an ideal situation. Specific advice is to be sought from qualified experts to ensure that the implemented APZs meet the *performance criteria* of APZs.



Figures courtesy of NSW RFS 2006.