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bushfire & ecology

bushfire protection assessment

Rezoning Application
Part Lot 51 DP1195704
165 Louisiana Road, Wadalba

Under Section 117(2) Direction No 4.4
of the *EP&A Act*

September 2016
(REF: A15026B2)

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bushfire & ecology

Bushfire Protection Assessment

**Rezoning Application
Part Lot 51 DP1195704
165 Louisiana Road, Wadalba**

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File:	A15026B2

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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.

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EXECUTIVE SUMMARY

A bushfire protection assessment has been undertaken for the *planning proposal* to rezone land located at part Lot 51 DP 1195704, 165 Louisiana Road, Wadalba. The proposal is to rezone part of the land from RU6 to R2 Low Density Residential.

This report identifies matters for consideration for the planning proposal and highlights the required bushfire protection measures, including asset protection zones (APZs), for future development under the *Environmental Planning and Assessment Act 1979 (EP&A Act)*, *Section 117 Direction 4.4* and in accordance *Planning for Bush Fire Protection 2006 (PBP)* and *Community Resilience Practice Note 2/12 Planning Instruments and Policies*.

The key principle for the proposal is to ensure that future development is capable of complying with *PBP*. Planning principles for the proposal include the provision of adequate access including perimeter roads, establishment of adequate asset protection zones (APZs) for future housing, specifying minimum lot depths to accommodate APZs and the introduction of controls which avoid placing inappropriate developments in hazardous areas and placement of combustible material in APZs.

Our assessment found that bushfire can potentially affect the site from the forest vegetation located within the narrow corridor to the west (albeit it has short fire run at 55m), forest vegetation located within the Wadalba Wildlife Corridor upslope to the south and the remnant forest located beyond Louisiana Road in the north-east. The narrow strip of vegetation to the immediate east is Council owned and managed. David Lemke (Bushfire and Land Management Officer) from Wyong Council has advised the land will be managed as it is a council infrastructure zone.

The bushfire risk posed to the rezoning proposal will be mitigated as appropriate bushfire protection measures (including APZs) can be put in place and managed in perpetuity. This report has been prepared utilising an alternative solution approach for the narrow vegetation corridor to the west of the site. The fire run potential from this aspect is limited to 55m. In addition amended slope and fuel load inputs were used to determine APZ and BAL requirements to the south, east and north-east.

The assessment has concluded that future development on site will provide compliance with the planning principles of *PBP* and *Community Resilience Practice Note 2/12 – Planning Instruments and Policies*.



Introduction

1

Travers bushfire & ecology has been requested by *Optima Development Pty Ltd* to undertake a bushfire protection assessment for the planning proposal to rezone part of the land located at part Lot 51 DP 1195704, 165 Louisiana Road, Wadalba.

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 planning principles, including the provision of perimeter roads, asset protection zones (APZs) and other specific fire management issues
- Review the potential to carry out hazard management over the landscape, taking into consideration the proposed retention of trees within the final development plans.

1.2 Project synopsis

The proposal is to rezone the land from RU6 to R2 Low Density Residential. The part of the site zoned E2 will be transferred to Council as part of a previous deed of agreement and will be added to the Wadalba Wildlife Corridor.

A proposed concept plan has been provided (refer Figure 1.1) and as such the bushfire constraints have been highlighted and minimum APZs have been recommended. Recommendations have also been made for future road design, building construction, water supply and utilities.

Lots 1-5 will have a council perimeter road in the form of a four (4) metre wide fire trail and adjoining managed verges (to the east). Lots 6-14 will have a perimeter road. Lots 15-19 will front an internal road.

Future residential development within the site will access Louisiana Road to the east and ultimately Van Stappen Road in the north. The land within the northern portion of the site is a dedicated road reserve with the extension and formalisation of Van Stappen Road proposed to provide a link to Louisiana Road in the future (refer Figure 3.1).

The current immediate proposal (prior to the extension of Van Stappen Road) is to provide a single through road connection to the north via an unformed road network with the provision of a temporary RFS locked gate (as highlighted in Figure 1.1 and Schedule 1 attached).

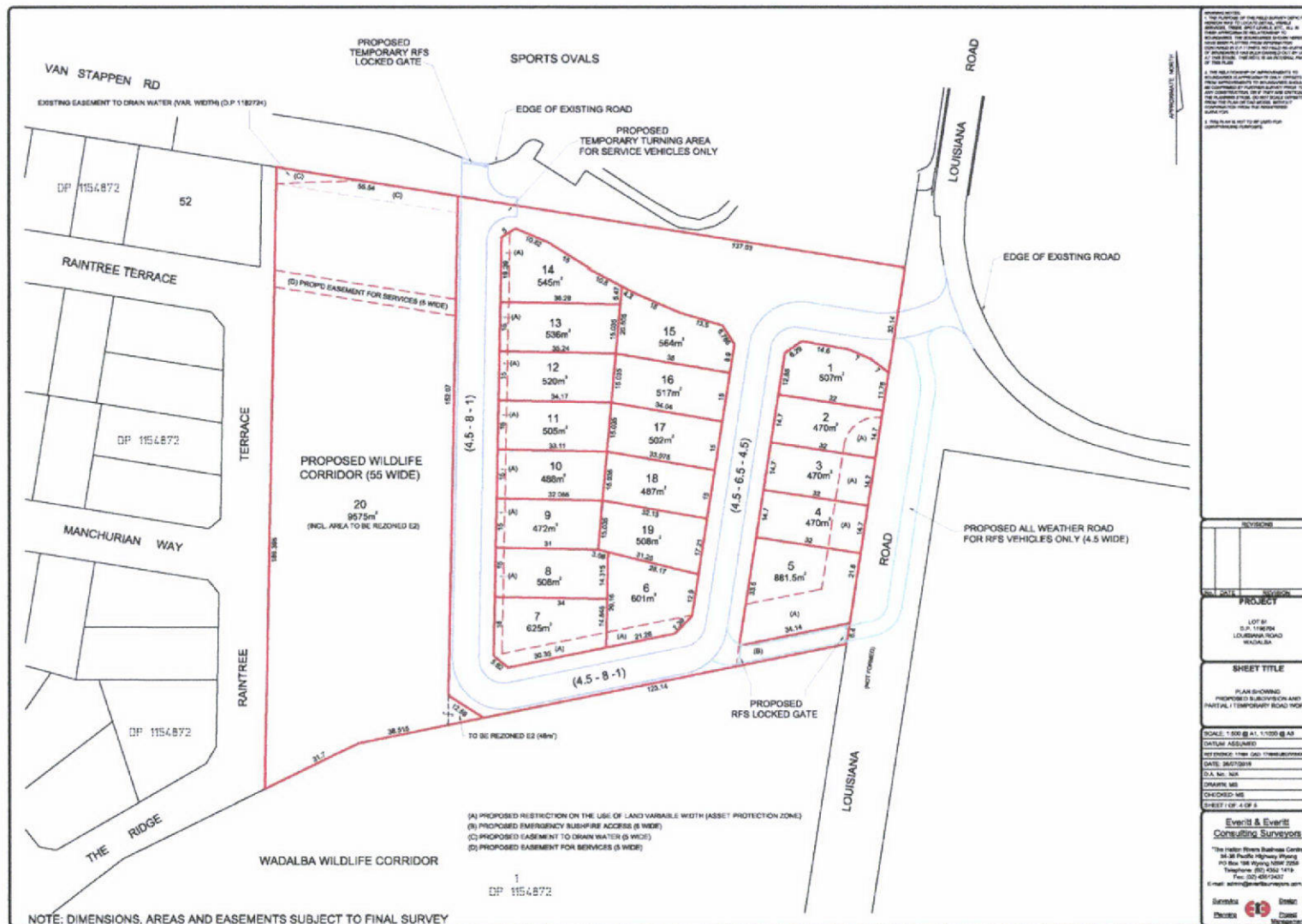


Figure 1.1 – Concept plan

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:

- Proposed subdivision plan prepared by *Everitt & Everitt Consulting Surveyors* (dated 28/07/2016)
- Wyong Local Environmental Plan
- *NearMap* aerial photography
- Topographical maps *DLPI of NSW 1:25,000*
- *Australian Standard 3959 Construction of buildings in bushfire-prone areas*
- *Planning for Bush Fire Protection 2006 (PBP)*
- *Community Resilience Practice Notes 2/12 Planning Instruments and Policies.*

An inspection of the proposed development site and surrounds was undertaken by John Travers & Nicole van Dorst in November 2015 to assess the topography, slopes, aspect, drainage, vegetation and adjoining land use. The identification of existing bushfire measures and a visual appraisal of bushfire hazard and risk were also undertaken.

1.4 Site description

The site is located on corner of Louisiana Road & Wahrenonga Road, Wadalba in the Local Government Area of Wyong (refer Figure 1.2).

The site is adjoined by the Kanwal–Warnervale Football club to the north, managed residential land to the west (beyond the proposed Wadalba Wildlife Corridor extension), Wadalba Wildlife Corridor (upslope) to the south and managed rural landscape to the east. The narrow strip of vegetation to the immediate east is Council owned and managed. David Lemke (Bushfire and Land Management Officer) from Wyong Council has advised that the land will be managed as it is a council infrastructure zone.



Figure 1.2 – Aerial appraisal

1.5 Legislation and planning instruments

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

The *EP&A Act* governs environmental and land use planning and assessment within New South Wales. The Act provides for the establishment of environmental planning instruments, development controls and the operation of construction controls through the *Building Code of Australia (BCA)*. Section 146 also provides for the identification of bushfire prone land on maps. These maps provide a trigger for the development assessment provisions under Section 79BA and Section 100B of the Rural Fires Act.

The Rural Fires Act provides for the orderly development of certain development categories in NSW and provides for the Commissioner of the NSW Rural Fire Service to issue a *bushfire safety authority* should those developments accord with Planning for Bushfire Protection 2006.

The proposed rezoning is located on land that is mapped by *Wyang Council* as being bushfire prone (refer Figure 1.3). Although the land to the east is mapped as bushfire prone, the majority of this landscape (beyond the electrical easement) has been recently cleared therefore reducing the bushfire threat from this aspect.

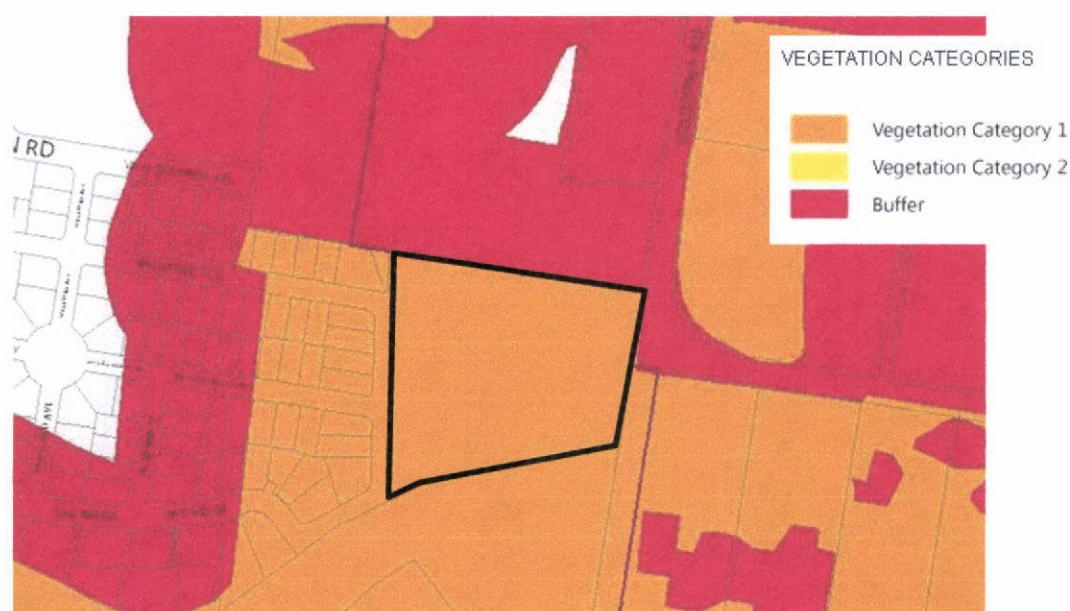


Figure 1.3 – Bushfire prone land map
(Source: Wyong Council)

PBP (pg 4) stipulates that if a proposed amendment to land use zoning or land use affects a designated bushfire prone area then the Section 117(2) Direction No 4.4 of the *EP&A Act* must be applied. This requires Council to consult with the Commissioner of the RFS and to take into account any comments by the Commissioner and to have regard to the planning principles of *PBP* (detailed within Section 1.5.3).

1.5.2 Local Environmental Plan (LEP)

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

The proposal is to proceed as an amendment to the current *Wyong LEP 2013* as outlined below.

Wyong Local Environmental Plan 2013

The site is zoned under the current *Wyong LEP 2013* as RU6 – Transition & E2 Environmental conservation (refer Figure 1.4). The proposal seeks to amend the LEP to rezone the RU6 portion of the property to R2 – Low Density Residential.

The proposal, including the provision of APZs, would seek to comply with the objectives of the proposed rezoning.

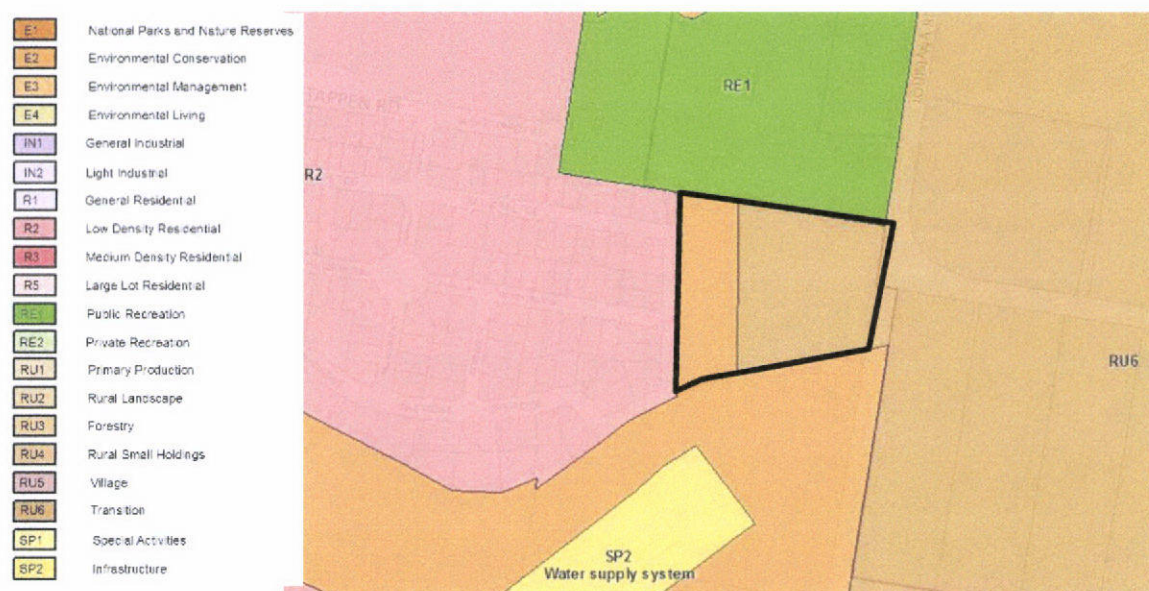


Figure 1.4 – Wyong LEP 2013
(Source: Wyong Shire Council website)

1.5.3 Planning for Bush Fire Protection 2006 (PBP)

Bushfire protection planning requires the consideration of the RFS planning document entitled *PBP*. *PBP* provides planning principles for rezoning to residential land 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 planning principles that must be achieved for all rezoning proposals:

1. Provision of a perimeter road with two way access which delineates the extent of the intended development.
2. Provision, at the urban interface, for the establishment of adequate APZs for future housing.

3. Specifying minimum residential lot depths to accommodate APZs for lots on perimeter roads.
4. Minimising the perimeter of the area of land interfacing the hazard, which may be developed.
5. Introduction of controls which avoid placing inappropriate developments in hazardous areas.
6. Introduction of controls on the placement of combustible materials in APZs.

In addition to the above, *PBP* outlines the bushfire protection measures required to be assessed for new development in bushfire prone areas.

The proposed rezoning has been assessed in compliance with the following measures to ensure that future development is capable of complying with *PBP*:

- asset protection zones
- building construction and design
- access arrangements
- water supply and utilities
- landscaping
- emergency arrangements

1.5.4 Building Code of Australia (BCA) and the Australian Standard AS3959 Construction in bushfire-prone areas 2009 (AS3959)

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 Classes 1, 2 and 3 buildings. The construction manual for the deemed to satisfy requirements is *AS3959*. Although consideration of *AS3959* is not specifically required in a rezoning proposal, this report (Section 3.2) provides the indicative setbacks for each dwelling construction level and can be used in future planning for master plans and / or subdivision proposals.

1.6 Environmental and cultural constraints

1.6.1 Environmental constraints

An ecological assessment for the proposed rezoning was undertaken by *Everitt Ecology* (8/12/2015). Five (5) threatened fauna species including one (1) bird and four (4) micro-bat species were recorded within or in close proximity to the site. No threatened flora species or endangered ecological communities were identified on site. The report concluded that the proposal is unlikely to have a significant impact on any threatened species, populations or endangered ecological communities.

1.6.2 Aboriginal heritage constraints

Previous studies prepared by Oliver Brown of *Archaeological and Heritage Management Solutions Pty Ltd* have determined that it is 'not likely that Aboriginal objects are present in the proposed subject area'. The latest report prepared by Oliver Brown states that 'no Aboriginal cultural or archaeological site have been found to exist, and no areas have been identified where undetected (subsurface) sites are thought likely to exist'.



Bushfire Threat Assessment

2

To assess the bushfire threat and to determine the required width of an APZ 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.

The hazardous vegetation is calculated for a distance of at least 140m from a proposed site boundary and can be summarised as:

- Forest vegetation located within the Wadalba Wildlife Corridor to the south of the site as well as forest beyond Louisiana / Wahroonga Road in the north-east.



Photo 1 – Forest vegetation beyond Louisiana Road

- Narrow riparian finger within the Wadalba Wildlife Corridor to the west. Our assessment detailed within Section 2.3, Appendix 2 & Schedule 1 has assumed the worst case scenario which is a single point of ignition located the furthest point away and burning directly towards the subdivision.



Photo 2 – Narrow corridor to the west (short fire run of 55m)

- The narrow strip of vegetation to the immediate east is Council owned and managed. David Lemke, Councils bushfire and land management officer, has advised the land (marked as 'A' below) will be managed as it is a council infrastructure zone – see Figure 2.1 below. A perimeter road in the form of a four (4) metre wide fire trail and adjoining managed verges is proposed in this area (refer Figure 1.1 and Schedule 1 attached). A grassland threat has been used in our assessment based on a worst case scenario.

The land marked 'B', also to the east, is already cleared and managed and does not pose a bushfire hazard.

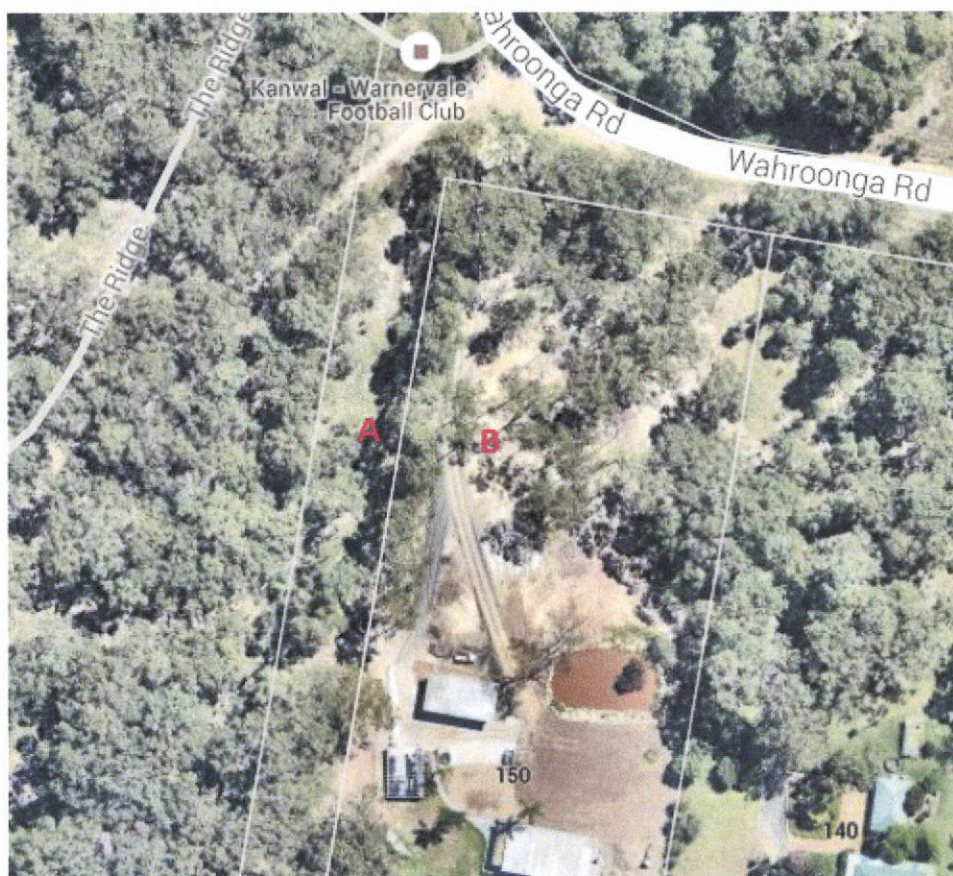


Figure 2.1 – Adjoining lands to the east

2.2 Effective slope

The effective slope is assessed for a distance of up to 100m. 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 is:

- 3^{0D} within the forest vegetation beyond Louisiana Road in the north-east
- 5^{0D} downslope within the Council land (grassland) to the east.
- 3-7^{0U} upslope within the forest vegetation to the south
- 5^{0D} within the narrow riparian corridor (short fire run) to the west.

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 APZs in compliance with BAL 29 building construction standards (AS3959).

Table 2.1 – Bushfire attack assessment

Aspect	Vegetation formation within 140m of development	Effective slope of land	Minimum APZ required equivalent to BAL 29 (metres)
East	Grass	5 ^{0D}	Variable between 0-10 (Refer to Note 1)
North-east	Forest on other side of Louisiana Road (24m)	3 ^{0D}	24 (Refer Note 2)
South	Perimeter road then Forest	3-7 ^{0U}	18
West	Forest (short fire run 55m)	5 ^{0D}	16 (Refer Note 2)

Notes: * Slope is either 'U' meaning up slope or 'C' meaning cross slope or 'D' meaning down slope

Note 1: The land to the immediate east will be managed by Council with a fire trail proposed in this area. In that case the assumption is that the grass will be the hazard. On the basis of grass being insitu then the APZ suggested is between 10 metres but could be less than 10m and down to zero. So for this assessment 10m is suggested as being the BAL 29 affectation.

Note 2: A performance based assessment using Appendix B of AS3959 was undertaken to determine the required APZ and BAL construction distances based on forest (PBP fuel load 20/25) and remnant forest vegetation (PBP fuel load 8/10) on a slope of 3° & 5° downslope – see Table 2.2 below.

The results of the assessment were prepared using the bushfire attack assessor (BFAA) developed by *Newcastle Bushfire Consulting*.

The 55m width of the corridor is 5m greater than the 50m maximum for determining a vegetation community as being either remnant forest i.e. rainforest or forest. Given the creek-bank shape along this section of the western aspect then it is more than reasonable to assert the vegetation should still be assessed as Rainforest.

This is because between 50-70% of the hazard is in fact an upslope. See Schedule 1 and the alignment of the creek in relation to the boundary of the corridor.

This means the downslope affectation upon the western boundary of the subdivision is between 38.5m - 27m in width. Given that AS3959 (Table 2.4.2) requires a 14m APZ for BAL 29 for Rainforest and modelling reduces the slope to 11 metres (see Table 2.2) therefore the 16m as suggested in this assessment provides a conservative defendable space.

Table 2.2 – Modelled outcome for western aspect - 5 degrees slope with an APZ of 11 metres

NBC Bushfire Attack Assessment Report V2.1

A 53959 (2009) Appendix B - Detailed Method 2

Printed: 23/05/2016 Assessment Date: 23/05/2016

Site Street Address: Wadalba Corridor, Wyong
 Assessor: John Travers, Travers Bushfire and Ecology
 Local Government Area: Wyong Alpine Area: No

Equations Used

Transmissivity: Fuss and Hammins, 2002
 Flame Length: RFS PBP, 2001
 Rate of Fire Spread: Noble et al., 1980
 Radiant Heat: Drysdale, 1985; Sullivan et al., 2003; Tan et al., 2005
 Peak Elevation of Receiver: Tan et al., 2005
 Peak Flame Angle: Tan et al., 2005

Run Description: Western aspect

Vegetation Information

Vegetation Type: Rainforest Vegetation Group: Forest and Woodland
 Vegetation Slope: 5 Degrees Vegetation Slope Type: Downslope
 Surface Fuel Load(t/ha): 8 Overall Fuel Load(t/ha): 10

Site Information

Site Slope: 5 Degrees Site Slope Type: Downslope
 Elevation of Receiver(m): Default APZ/ Separation(m): 11

Fire Inputs

Veg./Flame Width(m): 100 Flame Temp(K): 1090

Calculation Parameters

Flame Emissivity: 95 Relative Humidity(%): 25
 Heat of Combustion(kJ/kg): 18600 Ambient Temp(K): 308
 Moisture Factor: 5 FDI: 100

Program Outputs

Category of Attack: HIGH Peak Elevation of Receiver(m): 3.68
 Level of Construction: BAL 29 Fire Intensity(kW/m): 7003
 Radiant Heat(kW/m²): 28.96 Flame Angle (degrees): 68
 Flame Length(m): 10.01 Maximum View Factor: 0.439
 Rate Of Spread (km/h): 1.36 Inner Protection Area(m): 11
 Transmissivity: 0.867 Outer Protection Area(m): 0

Table 2.3 – Modelled outcome for north-eastern aspect - 3 degrees slope

NBC Bushfire Attack Assessment Report V2.1

AS3959 (2009) Appendix B - Detailed Method 2

Printed: 20/06/2016 Assessment Date: 7/12/2015

Site Street Address: Louisiana Road, Wadalba

Assessor: Mr Admin; admin

Local Government Area: Wyong

Alpine Area: No

Equations Used

Transmissivity: Fuss and Hammins, 2002

Flame Length: RFS PBP, 2001

Rate of Fire Spread: Noble et al., 1980

Radiant Heat: Drysdale, 1985; Sullivan et al., 2003; Tan et al., 2005

Peak Elevation of Receiver: Tan et al., 2005

Peak Flame Angle: Tan et al., 2005

Run Description: A North-eastern aspect

Vegetation Information

Vegetation Type: Forest

Vegetation Group: Forest and Woodland

Vegetation Slope: 3 Degrees

Vegetation Slope Type: Downslope

Surface Fuel Load(t/ha): 20

Overall Fuel Load(t/ha): 25

Site Information

Site Slope: 0 Degrees

Site Slope Type: Level

Elevation of Receiver(m): Default

APZ/ Separation(m): 24

Fire Inputs

Veg./Flame Width(m): 100

Flame Temp(K): 1090

Calculation Parameters

Flame Emissivity: 95

Relative Humidity(%): 25

Heat of Combustion(kJ/kg): 18600

Ambient Temp(K): 308

Moisture Factor: 5

FDI: 100

Program Outputs

Category of Attack: HIGH

Peak Elevation of Receiver(m): 9.7

Level of Construction: BAL 29

Fire Intensity(kW/m): 38129

Radiant Heat(kW/m2): 28.73

Flame Angle (degrees): 61

Flame Length(m): 22.19

Maximum View Factor: 0.452

Rate Of Spread (km/h): 2.95

Inner Protection Area(m): 24

Transmissivity: 0.835

Outer Protection Area(m): 0

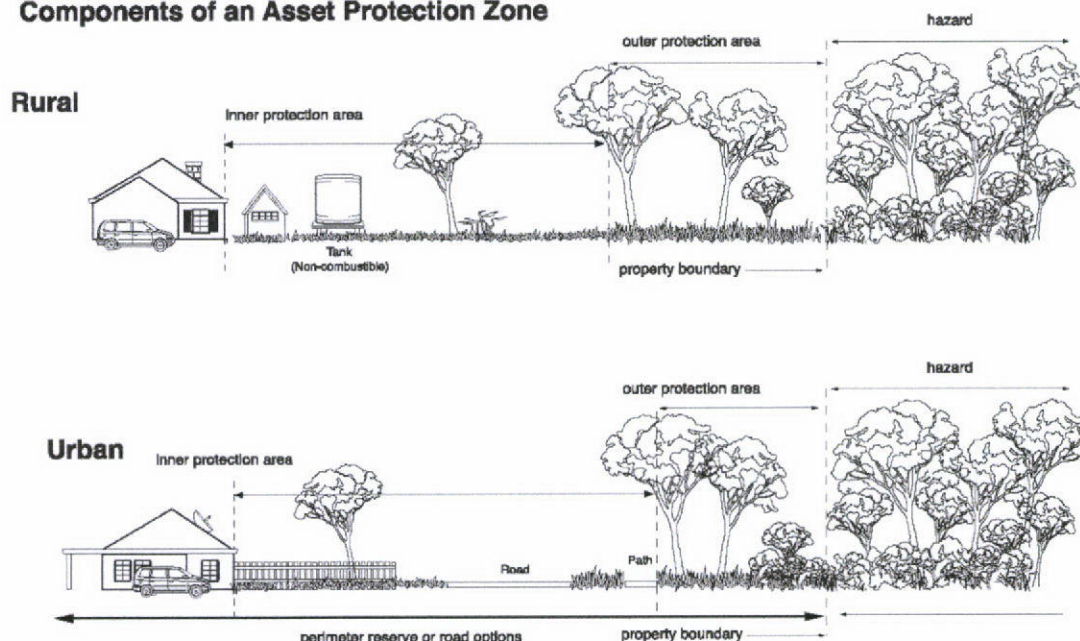
Specific Protection Issues

3

3.1 Asset protection zones (APZs)

APZs are areas of defensible 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 defensible space is graphically represented below:

Components of an Asset Protection Zone



APZs and progressive reduction in fuel loads (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 $29kW/m^2$ for residential subdivision developments. This rating assists in determining the size of the APZ in compliance with *PBP* to provide the necessary defensible space between hazardous vegetation and a building. Table 3.1 outlines the proposals compliance with the performance criteria for APZs.

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 .	APZs are provided in accordance with Appendix 2. APZs are wholly within the boundary of the development site.	Yes – A performance based assessment has been undertaken refer Table 2.1.
APZs are managed and maintained to prevent the spread of fire towards the building.	In accordance with the requirements of <i>Standards for Asset Protection Zones (NSW RFS 2005)</i> .	Yes - to 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°.	Yes - Slopes are less than 18°.

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 future subdivision approval, the minimum APZ must be provided in accordance with Appendix 2 of *PBP*. The APZs provided in Table 2.1 (Section 2.3) of this report comply with these requirements, whilst also considering the final building setbacks as per AS3959.

Although not required in terms of rezoning, the following advice in relation to building construction levels can be used for future planning and subdivision design.

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 – *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.

Indicative building construction standards have been depicted within Schedule 1 to identify developable land, so future purchasers have an idea regarding which construction level they can build to.

Please note that the BAL levels depicted are based on an alternative solution approach and therefore if using these BAL levels a further bushfire report will be required under Section 79BA of the *EP&A Act*. Alternatively a future occupant may wish to proceed in accordance with the Code's SEPP (i.e. complying development). If proceeding as complying development a higher BAL level may be applicable.

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 would constrain hazard management from being successfully carried out by normal means (e.g. mowing / slashing).

The APZs are to be managed in accordance with the 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 is attached as Appendix 1 to this report.

Council has advised their narrow of land to the immediate east will be managed (and a fire trail constructed) upon the development proceeding.

3.4 Access for fire fighting operations

Future residential development within the site will access Louisiana Road to the east and ultimately Van Stappen Road in the north. The land within the northern portion of the site is a dedicated road reserve with the extension and formalisation of Van Stappen Road proposed to provide a link to Louisiana Road in the future (refer Figure 3.1)

The current immediate proposal (prior to the extension of Van Stappen Road) is to provide a single through road connection to the north via an unformed road network with the provision of a temporary RFS locked gate (as highlighted in Schedule 1 attached).

Table 3.2 outlines the performance criteria and acceptable solutions for future public roads within the subdivision design.

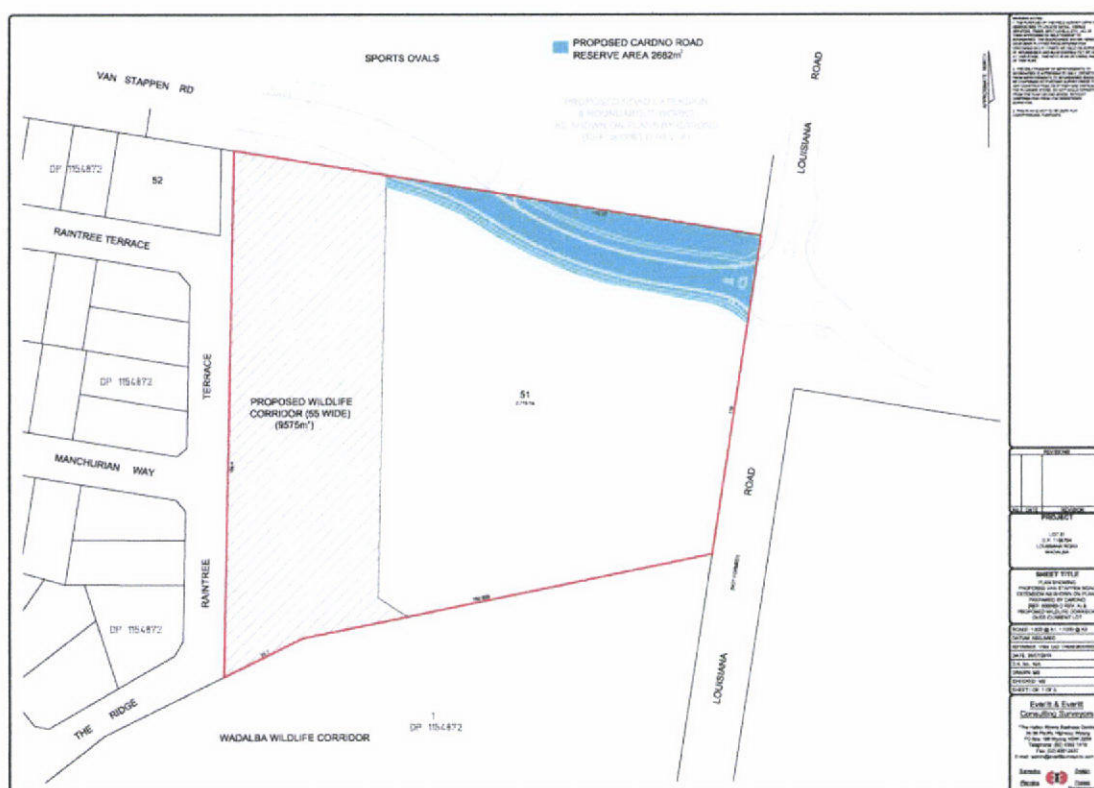


Figure 3.1 – Proposed future road extension
(Source: Everitt & Everitt)

Table 3.2 – Performance criteria for public roads (*PBP* guidelines pg. 20)

Performance criteria	Acceptable solutions	Compliance
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 8m minimum kerb to kerb) allowing traffic to pass in opposite directions. Non perimeter roads comply with Table 3.3 below. Perimeter road is linked with the internal road system at an interval of no greater than 500m in urban areas. Traffic management devices are constructed to facilitate access by emergency services. Public roads have a cross fall not exceeding 3°. All roads are through roads. If unavoidable, dead end roads are not more than 200m in length, incorporate a minimum 12m outer radius turning circle, sign posted dead end and direct traffic away from the hazard. Curves of roads (other than perimeter) have a minimum inner radius of 6m 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° and an	Yes. The perimeter road to the west and south is within a 13.5m wide road reserve. The proposed pavement width is 8m in compliance with PBP. The internal road will have a carriageway width of 6.5m. Yes. A locked gate is located at the end of the road link for emergency egress or access. See Schedule 1. Yes. Yes. All roads are through roads Yes Yes Yes

Performance criteria	Acceptable solutions	Compliance
	average grade of not more than 10°. Minimum vertical clearance of 4m above the road at all times.	Yes
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 posted (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 6.5-8m wide are No Parking on one side with the hydrant located on this side to ensure accessibility to reticulated water. Public roads <6.5m 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 3.5m wide and provide parking within parking bays and locate services outside of parking bays to ensure accessibility to reticulated water.	Yes can be 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 2.6m 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 a condition of consent

Table 3.3 – Minimum widths for public roads that are not perimeter roads

Curve radius (inside edge) (metres width)	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

3.5 Water supplies

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

Table 3.4 outlines the performance criteria and acceptable solutions for reticulated water supply.

Table 3.4 – 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

Table 3.5 outlines the required performance criteria for the gas supply.

Table 3.5 – Performance criteria for reticulated water supplies (PBP guidelines pg. 27)

Performance criteria	Acceptable solutions
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 AS1596 (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 10m 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 2m away from any combustible material, so that they do not act as a catalyst to combustion. Connections to and from gas cylinders are metal. Polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not to be used.

3.7 Electricity

Table 3.6 outlines the required performance criteria for electricity supply.

Table 3.6 – Performance criteria for electricity services (PBP guidelines pg. 27)

Performance criteria	Acceptable solutions
Location of electricity services limit the possibility of ignition of surrounding bushland or the fabric of buildings	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 <i>Vegetation Safety Clearances</i> issued by <i>Energy Australia</i> (NS179, April 2002).
Regular inspection of lines is undertaken to ensure they are not fouled by branches.	



Conclusion & Recommendations

4

4.1 Conclusion

A bushfire protection assessment has been undertaken for the planning proposal to rezone part of the land located at part Lot 51 DP 1195704, 165 Louisiana Road, Wadalba

Our assessment found that bushfire can potentially affect the site from the forest vegetation located within the narrow corridor to the west (short fire run), forest vegetation located within the Wadalba Wildlife Corridor in the south and the remnant forest located beyond Louisiana Road in the north-east.

Future development on site is to comply with the following planning principles.

Table 4.1 – Planning principles

Planning principles	Recommendations
Provision of a perimeter road with two way access which delineates the extent of the intended development.	A perimeter road has been provided in compliance with PBP.
Provision, at the urban interface, for the establishment of adequate APZs for future housing.	APZs have been recommended in compliance with BAL 29 (AS3959, 2009).
Specifying minimum residential lot depths to accommodate APZs for lots on perimeter roads.	Future subdivision design is to allow for the minimum APZs as recommended within Table 2.1 and as depicted within Schedule 1 attached.
Minimising the perimeter of the area of land interfacing the hazard, which may be developed.	Compliant.
Introduction of controls which avoid placing inappropriate developments in hazardous areas.	Future development consists of residential dwellings and is appropriate for the level of bushfire risk.
Introduction of controls on the placement of combustible materials in APZs.	Compliant – can be made a condition of consent.

The following recommendations are provided to ensure that future residential development is in accordance with, or greater than, the requirements of *PBP*.

4.2 Recommendations

Recommendation 1 - APZs are to be provided to the future residential development. APZs are to be measured from the exposed wall of any dwelling toward the hazardous vegetation.

The minimum APZ must be achievable within all lots fronting the bushfire hazard as nominated in Table 2.1 and also as generally depicted in Schedule 1.

Recommendation 2 - 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 as advised by the RFS in their publications.

Recommendation 3 - Building construction standards are to be applied for future residential dwellings 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 of *PBP*.

Recommendation 4 – Public access roads are to comply with the performance criteria within Section 4.1.3 of *PBP* (refer Section 3.4 of this report).

Recommendation 5 – Water, electricity and gas supply is to comply with the acceptable solutions as provided within Section 4.1.3 of *PBP* (refer Sections 3.5, 3.6 and 3.7 of this report).

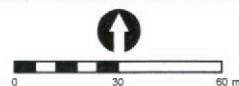
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Plan of Bushfire Protection Measures

S1



PROJECT & MVD REFERENCE
165 Louisiana Road, Wadalba
A15026_BF001

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Issue 1

SCALE & COORDINATE SYSTEM
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Schedule 1 - Bushfire Protection Measures





Management of Asset Protection Zones

A1

The RFS advises that when living in a bushfire prone environment APZs are required to be provided between hazardous fuels and a dwelling.

The RFS provides basic advice in respect of managing APZs in several documents namely *Planning for Bush Fire Protection 2006 (PBP)* and *Standards for Asset Protection Zones* (undated but circa 2006).

APZs provide a level of defensible 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.

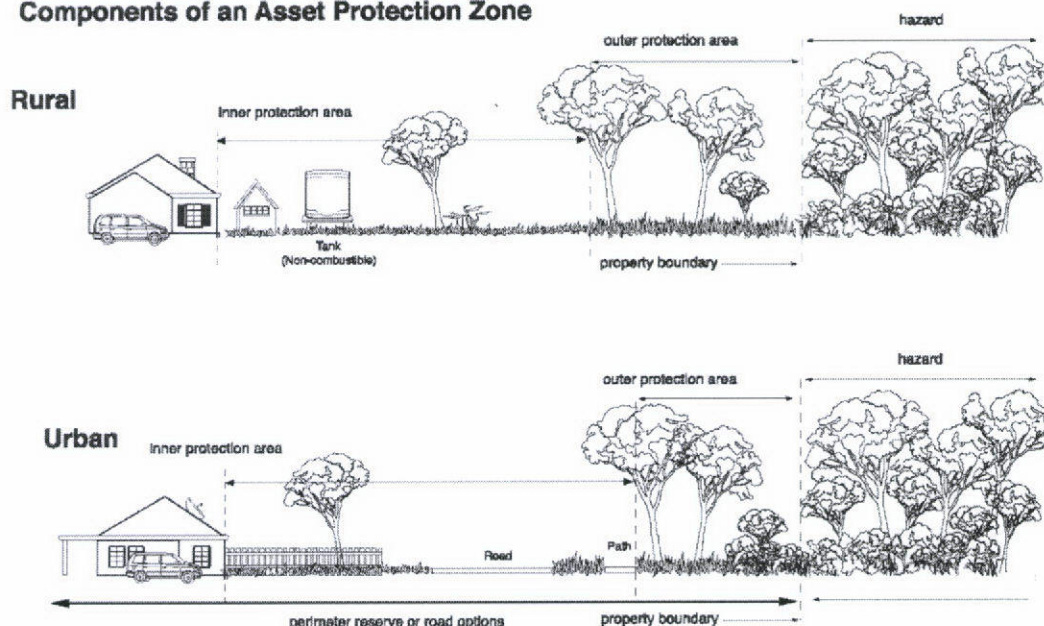
Table 1 – Fuel layers

Fuel layer name	Location of layer in vertical column	Type of fuel
Ground fuels	Below ground level	Peatmoss (always below the surface)
Surface fuels	0-200mm	Litter layer (leaves & twigs)
Aerial fuels	200-3,000mm	Shrubs and grasses
Canopy fuels	>3,000mm	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.

Components of an Asset Protection Zone



APZs and progressive reduction in fuel loads (Source: RFS, 2006)

Inner protection area (IPA)

This area is almost 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 5m away from a dwelling.

A recommended performance standard for the fuel load of an IPA is between 0-4t/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 *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 20m in height the canopy is separated from the land surface by some distance. In an open woodland the low canopy height (usually <5m) 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 5m	No trees	No trees
Between 5-10m	One tree per 100m ²	2 trees per 100m ²
Between 10-20m	<10 tree per 400m ²	<10 trees per 400m 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 4-6t/ha.

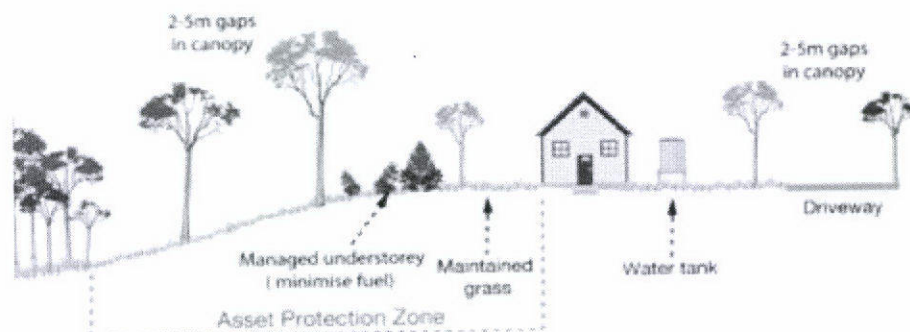
Managing the APZ

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 6mm 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 2-5m. A canopy should not overhang within 2-5m 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.
- 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 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 2m 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 crushed 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.