Travers

bushfire & ecology

bushfire protection assessment

Rouse Hill Seniors Living
for site compatibility certificate

Lot 1 & 2 DP 259604 & Lot 122 DP 530049
Edwards Road and Annangrove Road
Rouse Hill

Under Section 100B of the Rural Fires Act (1997)

April 2020
(Ref: 18BARR02)

Bushfire Protection Assessment

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Rouse Hill

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File:	18BARR02

Disclaimer:

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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 is to be confirmed by a registered surveyor.

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EXECUTIVE SUMMARY

This bushfire protection assessment has been undertaken to support a site compatibility certificate for the proposed Rouse Hill Seniors Living development on the corner of Edwards Road and Annangrove Road, Rouse Hill.

The proposed seniors living development is identified by the NSW Rural Fire Service (NSW RFS) as being a special fire protection purpose (SFPP) development and, as a result, this classification requires the NSW RFS to issue a bushfire safety authority (BSA) in accordance with Section 100b of the *Rural Fires Act 1997 (RF Act).*

This proposal has been assessed in accordance with *Planning for Bush Fire Protection 2019 (PBP). PBP* dictates that the subsequent extent of bushfire attack that can potentially impact a SFPP building must not exceed a radiant heat flux of 10kW/m^2. This rating assists in determining the size of the asset protection zone (APZ) to provide the necessary defendable space between hazardous vegetation and a building.

This assessment has found that bushfire can potentially affect the development from the grassland vegetation located beyond Annangrove Road to the east, and the woodland vegetation associated with the rural residential property to the north-west of the site, resulting in possible ember and radiant heat attack.

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

This assessment has concluded that the proposed future development can provide:

- APZs in accordance with the minimum setbacks outlined within *PBP* (Table A1.12.1 FFDI 100) for areas adjacent to grassland.
- Use of an alternative solution to determine minimum APZs for areas adjacent to woodland and forest based on a reduced flame width.
- Provision of access in accordance with the acceptable solutions outlined in *PBP.*
- Water, electricity and gas supply in compliance with the acceptable solutions outlined in *PBP.*
- Future dwelling construction in compliance with the appropriate construction sections of *AS3959-2009*, and *PBP.*
- Emergency management and evacuation in compliance with *PBP* and NSW RFS guidelines for the *Preparation of an Emergency / Evacuation Plan*.

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GLOSSARY OF TERMS

AHIMS	Aboriginal Heritage Information System
APZ	asset protection zone
AS1596	*Australian Standard – The storage and handling of LP Gas*
AS2419	*Australian Standard – Fire hydrant installations*
AS3745	*Australian Standard – Planning for emergencies in facilities*
AS3959	*Australian Standard – Construction of buildings in bushfire-prone areas 2018*
BAL	bushfire attack level
BCA	*Building Code of Australia*
BSA	bushfire safety authority
EEC	endangered ecological community
EP&A Act	*Environmental Planning & Assessment Act 1979*
FDI	fire danger index
FFDI	forest fire danger index
ILU	independent living unit
IPA	inner protection area
l	litres
LEP	Local Environmental Plan
LGA	local government area
m	metres
NCC	*National Construction Code*
OPA	outer protection area
PBP	*Planning for Bush Fire Protection 2019*
RACF	residential aged care facility
RF Act	*Rural Fires Act 1997*
NSW RFS	NSW Rural Fire Service
SFPP	special fire protection purpose

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Introduction 1

The property is located on land mapped by *The Hills Shire Council* as being bushfire prone (refer Figure 1.1). This triggers a formal assessment in respect of the NSW RFS policy against the provisions of *PBP.*

The proposal is considered a SFPP development under Section 100B of the *Rural Fires Act 1997 (RF Act)*. This triggers the need for an integrated referral to the NSW RFS and an assessment against *PBP* for any future development application within the site. This will also require the NSW RFS to consider issuing a bushfire safety authority (BSA).

Figure 1.1 – Bushfire prone land map
(source: ePlanning Spatial Viewer, 2020)

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 APZs, construction standards and other specific fire management issues
- review the potential to carry out hazard management over the landscape.

1.2 Project synopsis

As depicted in Figure 1.2, the current Masterplan has been developed based on the provision of a one hundred and twenty (120) bed residential aged care facility (RACF*)* and one hundred and eighty (180) Independent Living Units (ILUs) with parking and associated ancillary facilities including community centre, tennis courts, sports pavilion, bowling green and men's shed.

Figure 1.2 – Masterplan
(source: Jackson Teece, 11/11/19)

1.3 Information collation

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

- Site plan, sections and site context plan, prepared by *Jackson Teece* (project no. 2017137, dated 14/08/2019
- *NearMap* aerial photography
- Topographical maps DLPI of NSW 1:25,000
- Australian Standard 3959 *Construction of buildings in bushfire-prone areas 2018*
- *Planning for Bush Fire Protection 2019 (PBP)*

An inspection of the proposed development site and surrounds was undertaken 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 to the north-west of the intersection of Edwards Road and Annangrove Road, Rouse Hill, within the local government area (LGA) of The Hills Shire (refer Figure 1.3).

The site is bound by recent clearing (approved subdivision) to the south, unmanaged grassland to the east and to the north and west by predominantly managed rural residential land. The nearest bushfire hazard is grassy woodland within the rural residential land to the north-west, remnant forest beyond Hession Road to the west and forest to the south-east of the Edwards Road and Annangrove Road intersection.

Figure 1.3 – Aerial appraisal
(source: NearMap)

1.5 Legislation and planning instruments

Is the site mapped as bushfire prone?	Yes
Proposed development type	Special fire protection purpose (Seniors Living)
Is the development considered integrated for the purposes of Section 100B of the *Rural Fires Act 1997?*	Yes – referral to and approval by the NSW RFS is required for the issue of a BSA.
Zoning	RU6 – Transition, SP2 - Infrastructure
Significant environmental features	The entire property is to be maintained as an APZ. An ecological constraints assessment has been undertaken by *Cumberland Ecology* (July 2018). This report identified the remnant vegetation on site as Shale Sandstone Transition Forest. Section 5.2 of this report states *'given that the SSTF has an open canopy structure with no shrub layer and a ground layer dominated by exotic grasses that is modified by grazing or mowing, these areas could be incorporated into an APZ without the need to further modify vegetation'.*
Details of any Aboriginal heritage	No
Does the proposal rely on an alternative solution?	Yes – Method 2 of *AS3959* using reduced flame width.

Bushfire Threat Assessment 2

To assess the bushfire threat and to determine the required width of an APZ for a development, an assessment of the potential hazardous vegetation and the effective slope within the vegetation is required.

2.1 Hazardous fuels

PBP guidelines require the identification of the predominant vegetation formation in accordance with David Keith (2004) if using the simplified acceptable solutions in *PBP*, or alternatively the vegetation class if adopting the comprehensive vegetation fuel loads (as allowable when undertaking an assessment under Method 2 of *AS3959*). The hazardous vegetation is calculated for a distance of at least 140m from a proposed building envelope.

Vegetation survey of the development site has been undertaken by *Cumberland Ecology*. The results of this assessment with the vegetation conversions are identified in the following Table 2.1.

Table 2.1 – Vegetation

Vegetation community / plant community type (PCT)	Vegetation formation	Vegetation classification	Comprehensive fuel loads (t/ha)	Acceptable solution fuel loads (t/ha) *(PBP)*
Shale Sandstone Transition Forest (PCT 1395)	Grassy Woodlands	Coastal Valley Grassy Woodlands	10/18.07	10.5/20.2
Grassland	Grassland	Grassland	6/6	6/6

Note: The following assessment has adopted *PBP* (column 5) fuel loads identified above for the majority of aspects. The vegetation located to the south-east of the Annangrove and Edwards Roads intersection has a shrubby understory and therefore forest fuel loads have been adopted for that aspect.

Figure 1.3 – Vegetation Mapping
(source: Cumberland Ecology, 2018)

The vegetation posing a bushfire threat to the proposed development is depicted within Schedule 1 attached and includes:

- Woodland vegetation within the adjoining rural residential property to the north-west. As depicted in the following photos this vegetation consists of canopy trees only with an understorey of grass (no shrubs). The threat posed by the woodland is further reduced due to its narrow width and adjoining managed land associated with the existing dwelling / maintained lawn.

Photo 1– Woodland vegetation to the north-west (reduced flame width of 25m)

Photo 2 – Woodland vegetation to the north-west (reduced flame width of 25m)

- Remnant bushland within the adjoining rural residential property to the west of Hession Road.

Photo 3 – Remnant bushland to the west (Hession Road)

- Grassland to the east of Annangrove Road.

- Forest (shrubby understory) vegetation to the south-east of the intersection of Annangrove Road and Edwards Road.

Photo 4 – Forest (reduced flame width 30m) to the south-east of Edwards & Annangrove Roads intersection

The remaining land within 140m of the property is not considered a bushfire threat as it consists of managed gardens, lawns and curtilage to buildings (refer photos below).

Photo 5 – Managed land to the north-east

Photo 6 – Managed land to the north

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 vegetation has been determined as 0-5 degrees downslope to the south-east, north-west and west and level to upslope within the grassland to the east.

2.3 Bushfire attack assessment

A fire danger index (FDI) of 100 has been used to calculate bushfire behaviour on the site based on the site's location within the Greater Sydney region.

The assessment provided in Table 2.2 has determined the APZ via the following approaches;

- Table A1.12.1 of *PBP*; and
- Appendix B Method 2 (alternative solution) of *AS3959 Construction of buildings in bushfire prone areas* (2018).

Table 2.2 – Bushfire attack assessment

Aspect	Predominant vegetation within 140m of development	Effective slope of land	APZ required (Table A1.12.1 of *PBP*)	APZ provided
North & north-east	Managed rural residential land, then woodland	0-5^{o} D	50m	>50m
East	Grassland	Level to upslope	40m	40m (including Annangrove Road)
South-east	Forest (30m flame width)	0-5^{o} D	79m	65 -75m (refer Note 2)
South & south-west	Managed rural residential land, and recently constructed subdivision	N/A	N/A	>100m
West	Remnant forest (refer Note 1)	0-5^{o} D	47m	73m
North	Grassy woodland (25m flame width)	0-5^{o} D	50m	37m (refer Note 2)
	Grassy woodland (100m flame width)			>50m

Note 1: *PBP* describes remnant vegetation as a parcel of vegetation with a size of less than 1ha or a shape that provides a potential fire run directly towards a building not exceeding 50m. The vegetation to the west exhibits these qualities and therefore the threat posed is considered low and APZ setbacks for this aspect are the same as for the rainforest category outlined in *PBP.*

Note 2 - A performance-based assessment using Appendix B of *AS3959* was undertaken to determine the required APZ based on reduced flame width calculations using deemed to satisfy fuel loads and slope. The results of the assessments above are provided within Appendix 2 and were prepared using the bushfire attack level calculator developed by *Flamesol.*

Specific Protection Issues 3

3.1 Asset protection zones

Table 3.1 outlines the proposal's compliance with the performance criteria for APZs.

Table 3.1 – Performance criteria for asset protection zones

	Performance criteria	Acceptable solution	Acceptable solution	Performance solution	Comment
ASSET PROTECTION ZONES (APZS)	Radiant heat levels of greater than 10kW/m² (calculated at 1200K) will not be experienced on any part of the building	The building is provided with an APZ in accordance with Table A1.12.1	☐	☑	As outlined in Section 2.3, radiant heat levels have been determined as <10kW/m².
	APZ maintenance is practical, soil stability is not compromised and potential for crown fires is minimised	The APZ is not located on lands with a slope exceeding 18°	☑	☐	Complies
	APZs are managed and maintained to prevent the spread of a fire towards the building The APZ is provided in perpetuity	The APZ is managed in accordance with the requirements of Appendix 4 of this document, and is wholly within the boundaries of the development site	☑	☐	Complies. Vegetation within the APZ will be managed to the standards of an IPA
		Other structures located within the APZ need to be located further than 6m from the refuge building	☑	☐	Complies
Landscapin	Landscaping is designed and managed to minimise flame contact and radiant heat to buildings, and the	Landscaping is in accordance with Appendix 4	☑	☐	Complies. The APZ is to be managed as an inner protection area (IPA).

Performance criteria		Acceptable solution	Acceptable solution	Performance solution	Comment
	potential for wind-driven embers to cause ignitions.	Fencing is constructed in accordance with Section 7.6	☑	☐	Can be a condition of consent (see Note 1 below).
	Note 1: Section 7.6 of PBP states that all fences in bush fire prone areas should be made of either hardwood or non-combustible material. However, in circumstances where the fence is within 6m of a building they should be made of non-combustible material only.				

3.2 Building protection

Building construction standards (bushfire attack level (BAL) 12.5) for the proposed future buildings located within 100m of forest / woodland vegetation or within 50m of grassland are to be applied in accordance with *AS3959 Construction of buildings in bushfire prone areas (2018)* or NASH Standard and Section 7.5 of *Planning for Bush Fire Protection 2019*.

3.3 Hazard management

The entire property is to be managed as an inner protection area (IPA) in accordance with RFS guidelines *Standards for Asset Protection Zones* (RFS, 2005), with landscaping design to comply with Appendix 4 of *PBP*.

A summary of the guidelines for managing APZs (including landscaping guidelines) is attached as Appendix 2 to this report.

3.4 Access for fire-fighting operations

Access to the development will be via a single access point from Hession Road in the west. This access point is located over 100m from any bushfire prone vegetation and provides safe egress options to the north or south onto Edwards Road. The proposed internal access design and its compliance to PBP is outlined in Table 3.2 below.

Table 3.2 – Performance criteria for access

Performance criteria		Acceptable solution	Acceptable solution	Performance solution	Comment
ACCESS	Firefighting vehicles are provided with safe, all-weather access to structures and hazard vegetation.	SFPP access roads are two-wheel drive, all-weather roads.	☑	☐	Complies, will be a condition of consent.
		Access is provided to all structures	☑	☐	Complies.
		Traffic management devices are constructed to not prohibit access by emergency services vehicles.	☑	☐	Complies, will be a condition of consent.
		Access roads must provide suitable turning areas in accordance with Appendix 3.	☑	☐	All access roads are through roads.
		One-way only public access roads are no less than 3.5mm wide and have designated parking bays with hydrants	☑	☐	Complies, will be a condition of consent.

Performance criteria		Acceptable solution	Acceptable solution	Performance solution	Comment
		located outside of these areas to ensure accessibility to reticulated water for fire suppression.			
ACCESS	The capacity of access roads is adequate for firefighting vehicles.	The capacity of road surfaces and any bridges / causeways is sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes); bridges and causeways are to clearly indicate load rating.	☑	☐	Complies, will be a condition of consent.
	There is appropriate access to water supply.	Hydrants are located outside of parking reserves and road carriageways to ensure accessibility to reticulated water for fire suppression.	☑	☐	Complies, will be a condition of consent.
		Hydrants are provided in accordance with *AS 2419.1:2005*.	☑	☐	
		There is suitable access for a Category 1 fire appliance to within 4m of the static water supply where no reticulated supply is available.	☐	☐	N/A
PERIMETER ROADS	Perimeter roads are designed to allow safe access and egress for firefighting vehicles while residents are evacuating as well as providing a safe operational environment for emergency service personnel during firefighting and emergency management on the interface.	There are two-way sealed roads.		☑	Annangrove Road, Edwards Road and Hession Road provide existing perimeter roads. Fire-fighting access to the woodland vegetation in the north-west is provided by Hession Road. This vegetation is only narrow in width (<50m) with safe evacuation available to residents via the internal road network.
		Minimum 8m carriageway width kerb to kerb.			
		Parking is provided outside of the carriageway width.			
		Hydrants are located clear of parking areas.			
		There are through roads, and these are linked to the internal road system at an interval of no greater than 500m.			
		Curves of roads have a minimum inner radius of 6m.			
		The maximum grade road is 15° and average grade is 10°.			
		The road crossfall does not exceed 3°.			

Performance criteria		Acceptable solution	Acceptable solution	Performance solution	Comment
		A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.			
NON-PERIMETER ROADS	Non-perimeter access roads are designed to allow safe access and egress for firefighting vehicles while occupants are evacuating	Minimum 5.5m width kerb to kerb.	☑	☐	Complies, will be a condition of consent.
		Parking is provided outside of the carriageway width.	☑	☐	Complies, will be a condition of consent.
		Hydrants are located clear of parking areas.	☑	☐	Complies, will be a condition of consent.
		There are through roads, and these are linked to the internal road system at an interval of no greater than 500m.	☑	☐	There are no dead-end roads proposed.
		Curves of roads have a minimum inner radius of 6m.	☑	☐	Complies, will be a condition of consent.
		The maximum grade road is 15° and average grade is 10°.	☑	☐	Complies.
		The road crossfall does not exceed 3°.	☑	☐	Complies.
		A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.	☑	☐	Complies, will be a condition of consent.

3.5 Water supplies

Town reticulated water supply is available to the proposed development. The development shall comply with the acceptable solutions outlined in Table 3.3 below.

Table 3.3 – Performance criteria for reticulated water supplies (*PBP* guidelines pg. 47)

Performance criteria	Acceptable solutions	Acceptable solution	Performance solution	Comment
Adequate water supplies are provided for firefighting purposes.	Reticulated water is to be provided to the development, where available.	☑		Reticulated water is available to the development.
	A 10,000L minimum static water supply for firefighting purposes is provided for each occupied building where no reticulated water is available.	N/A	N/A	

Performance criteria	Acceptable solutions	Acceptable solution	Performance solution	Comment
Water supplies are located at regular intervals. The water supply is accessible and reliable for firefighting operations.	Fire hydrant, spacing, design and sizing complies with the relevant clauses of Australian Standard *AS 2419.1:2005.*	☑		Can be made a condition of consent.
	Hydrants are not located within any road carriageway.	☑		Can be made a condition of consent.
	Reticulated water supply to SFPPs use a ring main system for areas for areas with perimeter roads.	☑		Can be made a condition of consent.
Flows and pressure are appropriate.	Fire hydrant flows and pressures comply with the relevant clauses of *AS 2419.1:2005.*	☑		Can be made a condition of consent.
The integrity of the water supply is maintained.	All above-ground water service pipes are metal, including and up to any taps.	☑		Can be made a condition of consent.

3.6 Gas

The development shall comply with the acceptable solutions outlined in Table 3.4 below.

Table 3.4 – Performance criteria for gas supplies

Performance criteria	Acceptable solutions	Acceptable solution	Performance solution	Comment
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 *AS1596:2014* and the requirements of relevant authorities. Metal piping is to be used.	☑	☐	Can be made a condition of consent.
	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.	☑	☐	Can be made a condition of consent.
	Connections to and from gas cylinders are metal.	☑	☐	Can be made a condition of consent.

Performance criteria	Acceptable solutions	Acceptable solution	Performance solution	Comment
	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.	☑	☐	Can be made a condition of consent.
	Polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not to be used.	☑	☐	Can be made a condition of consent.
	Above-ground gas service pipes external to the building are metal, including and up to any outlets.	☑	☐	Can be made a condition of consent.

3.7 Electricity

The intent of measures is to locate electricity so as not to contribute to the risk of fire to a building. Table 3.5 outlines the required acceptable solutions for electricity supply.

Table 3.5 – Performance criteria for electricity services

Performance criteria	Acceptable Solutions	Acceptable solution	Performance solution	Comment
Location of electricity services limit the possibility of ignition of surrounding bushland or the fabric of buildings.	Where practicable, electrical transmission lines are underground.	☑	☐	Electricity will comply with the acceptable solutions.
	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 ISSC3 *Guideline for Managing Vegetation Near Power Lines.*	☑	☐	

3.8 Emergency and evacuation planning

Table 3.6 outlines the required performance criteria for the proposal's emergency procedures

Table 3.6 – Performance criteria for emergency and evacuation planning

Performance criteria	Acceptable solutions	Acceptable solution	Performance solution	Comment
A bush fire emergency and evacuation management plan is prepared.	A bush fire emergency management and evacuation plan is prepared consistent with the: • The NSW RFS document: *A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan* • NSW RFS *Schools Program Guide* (where applicable) • Australian Standard *AS 3745:2010 Planning for emergencies in facilities*; and • Australian Standard *AS 4083:2010 Planning for emergencies – Health care facilities* (where applicable),	☑	☐	An evacuation plan will be prepared
Note: A copy of the Bush Fire Emergency Evacuation Plan should be provided to the Local Emergency Management Committee for its information prior to occupation of the development.				
Suitable management arrangements are established for consultation and implementation of the emergency and evacuation plan.	An Emergency Planning Committee is established to consult with residents (and their families in the case of aged care accommodation and schools) and staff in developing and implementing an Emergency Procedures Manual.	☑	☐	Will be a condition of consent
	Detailed plans of all emergency assembly areas including 'on-site' and 'off-site' arrangements as stated in *AS 3745* are clearly displayed, and an annual (as a minimum) trial emergency evacuation is conducted.			

Conclusion & Recommendations

4

4.1 Conclusion

This bushfire protection assessment has been undertaken to support a site compatibility certificate for the proposed Rouse Hill Seniors Living development on the corner of Edwards Road and Annangrove Road, Rouse Hill.

This assessment has found that bushfire can potentially affect the development from the grassland vegetation located beyond Annangrove Road to the east, the forest to the south-east and the woodland vegetation associated with the rural residential property to the north-west of the site, resulting in possible ember and radiant heat attack.

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

This assessment has concluded that the proposed future development can provide:

- APZs in accordance with the minimum setbacks outlined within *PBP* (Table A1.12.1 FFDI 100) for areas adjacent to grassland.
- Use of an alternative solution to determine minimum APZs for areas adjacent to woodland and forest based on a reduced flame width.
- Provision of access in accordance with the acceptable solutions outlined in *PBP.*
- Water, electricity and gas supply in compliance with the acceptable solutions outlined in *PBP*
- Future dwelling construction in compliance with the appropriate construction sections of *AS3959-2009*, and *PBP*.
- Emergency management and evacuation in compliance with *PBP* and 'NSW RFS guidelines for the *Preparation of an Emergency / Evacuation Plan*.

The following recommendations are provided to ensure that the development is in accordance with 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 - The entire property is to be managed as an IPA as outlined in Appendix 4 of *Planning for Bush Fire Protection 2019* and the NSW RFS document *'Standards for asset protection zones'.*

Recommendation 3 - Building construction standards (BAL 12.5) for the proposed future buildings located within 100m of forest / woodland vegetation or within 50m of grassland are to be applied in accordance with *AS3959 Construction of buildings in bushfire prone areas (2018)* or NASH Standard and Section 7.5 of *PBP.*

Recommendation 4 - Access is comply with the performance criteria outlined in Section 6.8.2 and Tale 6.8b of *PBP.*

Recommendation 5 - Water, electricity and gas supply is to comply with Section 6.8.3 of *PBP.*

Recommendation 6 - A Bushfire Emergency Management and Evacuation Plan is to be prepared to comply with Section 6.8.4 of *PBP.*

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

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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

- Study area
- Managed land
- Contour 1m (source: LPI)

Aerial source: Nearmap

0 25 50 m

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 & MXD REFERENCE	DATE & ISSUE NUMBER	SCALE & COORDINATE SYSTEM
Edwards & Annangrove Rd, Rouse Hill 18BARR02_BF001	9/04/2020 Issue 1	1:1,500 @A3 GDA 1994 MGA Zone 56

TITLE

Schedule 1 - Bushfire Protection Measures

Document Path: N:\GIS STORAGE\N Drive\A17160_EdwardsRd_Rouse Hill\MXDs\18BARR02_BF001.mxd

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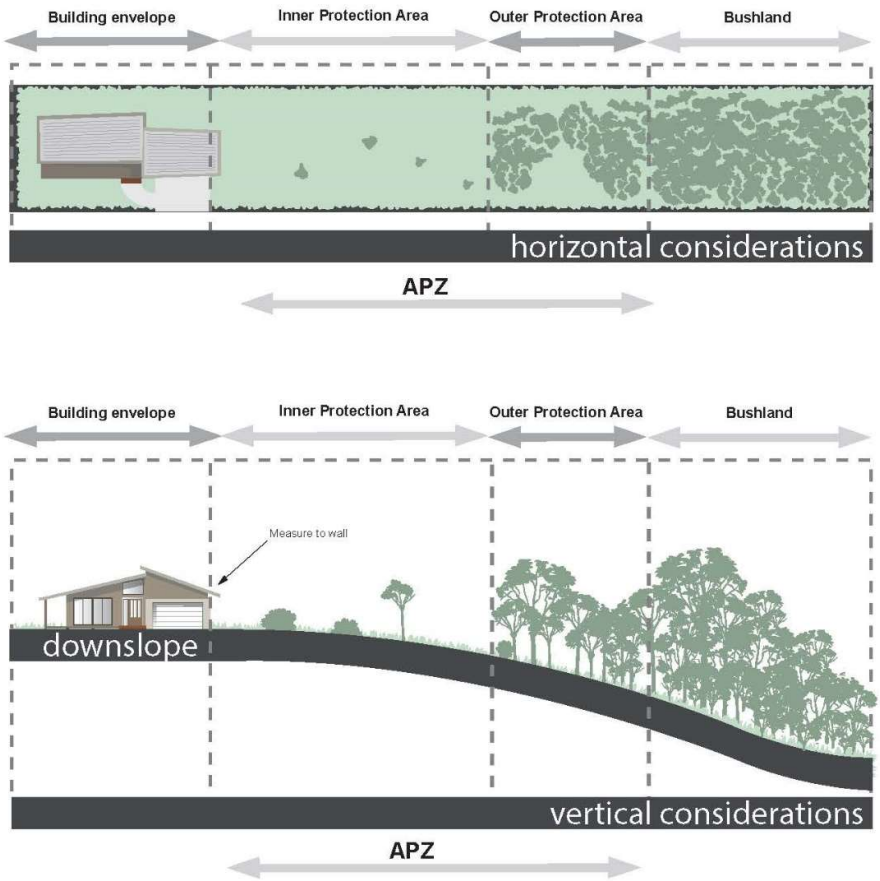
Management of Asset Protection Zones

A1

The NSW RFS provides basic advice in respect of managing APZs through documents such as *Standards for Asset Protection Zones* (RFS, 2005), with landscaping to comply with Appendix 5 of *PBP*.

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 property is to be managed to IPA standards only. A typical APZ is graphically represented below:



APZs and progressive reduction in fuel loads
(Source: PBP)

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

The following provides maintenance advice for vegetation within the IPA and OPA. The APZ is to be maintained in perpetuity and should be undertaken regularly, particularly in advance of the bushfire season.

Inner protection area (IPA)
Fuel loads within the IPA are to be maintained so they do not exceed 4t/ha.

Trees are to be maintained to ensure;

- canopy cover does not exceed 15% at maturity;
- trees (at maturity) do not touch or overhang the building;
- lower limbs should be removed up to a height of 2m above ground;
- tree canopies should be separated by 2 to 5m; and
- preference should be given to smooth barked and evergreen trees.

Shrubs are to be maintained to ensure;

- large discontinuities or gaps in the vegetation are created to slow down or break the progress of fire towards buildings.
- shrubs should not be located under trees;
- shrubs should not form more than 10% of ground cover; and
- clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of vegetation.

Grass is to be maintained to ensure:

- grass should be kept mown (as a guide grass should be kept to no more than 100mm in height); and
- leaves and vegetation debris should be removed (litter fuel within the IPA should be kept below 1cm).

Landscaping to the site is to comply with the principles of Appendix 5 of *PBP*. In this regard the following landscaping principles are to be incorporated into the development:

- suitable impervious areas being provided immediately surrounding the building such as courtyards, paths and driveways;
- restrict planting in the immediate vicinity of the building which may over time, and if not properly maintained, come in contact with the building;
- when considering landscape species, consideration needs to be given to estimated size of the plant at maturity.
- avoid species with rough fibrous bark, or which retain / shed bark in long strips or retain dead material in their canopies;
- use smooth bark species of trees species which generally do not carry a fire up the bark into the crown;
- avoid planting of deciduous species that may increase fuel at surface / ground level (i.e. leaf litter);
- avoid climbing species to walls and pergolas;
- locate combustible materials such as woodchips / mulch, flammable fuel stores away from the building;
- locate combustible structures such as garden sheds, pergolas and materials such timber garden furniture away from the building; and
- use of low flammability vegetation species.

Performance based assessment

A2

Calculated April 9, 2020, 2:04 pm (BALc v.4.8)

North-west

Bushfire Attack Level calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Fire Danger Index	100	Rate of spread	1.77 km/h
Vegetation classification	Woodland	Flame length	13.98 m
Surface fuel load	10.5 t/ha	Flame angle	75 °
Overall fuel load	20.2 t/ha	Panel height	13.51 m
Vegetation height	n/a	Elevation of receiver	3.51 m
Effective slope	5 °	Fire intensity	18,567 kW/m
Site slope	5 °	Transmissivity	0.802
Distance to vegetation	37 m	Viewfactor	0.0766
Flame width	25 m	Radiant heat flux	6.87 kW/m²
Windspeed	n/a	Bushfire Attack Level	BAL-12.5
Heat of combustion	18,600 kJ/kg		
Flame temperature	1,200 K		

Rate of Spread - Mcarthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Calculated April 9, 2020, 1:54 pm (BALc v.4.8)

South-east

Bushfire Attack Level calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Fire Danger Index	100	Rate of spread	3.72 km/h
Vegetation classification	Forest	Flame length	28.56 m
Surface fuel load	22 t/ha	Flame angle	71 °
Overall fuel load	36.1 t/ha	Panel height	27 m
Vegetation height	n/a	Elevation of receiver	7.81 m
Effective slope	5 °	Fire intensity	69,526 kW/m
Site slope	5 °	Transmissivity	0.765
Distance to vegetation	65 m	Viewfactor	0.064
Flame width	30 m	Radiant heat flux	5.47 kW/m²
Windspeed	n/a	Bushfire Attack Level	BAL-12.5
Heat of combustion	18,600 kJ/kg		
Flame temperature	1,200 K		

Rate of Spread - Mcarthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005