



Travers

bushfire & ecology

bushfire protection assessment addendum

Proposed Residential Aged Care Facility
Lot 3 DP 805710
181 Forest Way, Belrose

November 2019
(Ref: 18MORR02)



Traversers
bushfire & ecology

Bushfire Protection Assessment (addendum)

Proposed Residential Aged Care Facility
Lot 3 DP 805710
181 Forest Way, Belrose

Report Authors:	Nicole van Dorst BPAD-L3 23610 & John Travers BPAD-L3 15195
Plans prepared:	Bronte Talbot
Checked by:	John Travers
Date:	19 November 2019
File:	18MORR02
Old file no:	A16213

This document is copyright ©



This document is copyright ©

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. This report advises on matters published by the *NSW Rural Fire Service* in their guideline *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.

EXECUTIVE SUMMARY

Travers bushfire & ecology (TBE) prepared the original bushfire protection assessment for the proposed construction of a residential aged care facility at 181 Forest Way, Belrose in July 2017. Subsequently, an addendum bushfire protection assessment report was prepared in August 2018 to address the NSW Rural Fire Service (RFS) request for additional information within the issue of a bushfire safety authority (BSA) by the RFS on 30 November 2018.

This revised bushfire assessment has been undertaken in support of a new development application to take into account the amended site plan and Northern Beaches Council concerns in relation to the impacts on *Grevillea caleyi*, Duffys Forest endangered ecological community (EEC) and issues raised around the ongoing maintenance of the garden bed external to the site's southern boundary.

Table E1 below provides a summary of the proposed revised scheme's compliance with the conditions of consent issued by the RFS, as well as a summary response to the issues addressed by Council.

Table E1 – Response to Council concerns & BSA

Response to Northern Beaches Council meeting minutes following onsite meeting 28 February 2019	
Council concerns	Response
<p>Previous DA2017/0697 was recommended for refusal based on potential impacts to known individuals of <i>Grevillea caleyi</i> (Critically Endangered) within the road reserve immediately north of the property.</p> <p>The bushfire Consultant to include a short statement justifying the turning area and confirming no trees / vegetation will be requiring pruning or removal.</p>	<p><i>Travers bushfire & ecology</i> can confirm that no further clearing will be required within the adjoining road reserve or within the site to implement or utilise the existing access driveway. Refer Section 3.4 for further detail.</p>
<p>Colorbond fence: The submitted proposal included a 2.2m <i>Colorbond</i> fence along the northern boundary for 120m from the north-western corner, which will fragment the local occurrence of Duffys Forest EEC, as well as potentially indirectly impact on <i>Grevillea caleyi</i> and its habitat. Council's planning staff do not support the proposed fence.</p>	<p>The amended development layout supports a reduced fence length of 60m. As outlined in Section 2.3, an asset protection zone (APZ) of 25-30m has been provided from the retained Duffys Forest therefore negating the need for a fence to continue for the full 120m distance. As a result the fence will not impact on the EEC or on the <i>Grevillea caleyi</i> which is located further to the north.</p>
<p>Asset protection zone (APZ) - Council strongly recommends any APZ requirements be met within the property boundaries. If the APZ extends onto adjacent land, the property owner's consent must be submitted as well as the legal mechanism by which Council can enforce compliance in perpetuity.</p>	<p>The adjoining land was not considered an APZ but as existing 'managed' land. However, we are now provided with the knowledge that the neighbour will not continue to maintain / manage the garden bed. As a result, this area is no longer considered 'managed'. A worst-case scenario has been adopted and 'tall heath' has been used in the revised calculations. The site plan has been amended and the building is provided with a 26m APZ extending from the southern boundary, as detailed in Section 2.3.</p>

<p>Landscaping – It is critical that a dense bushland buffer be retained or established along Forest Way. How this is done, given the bushfire risks on site, will need to be worked through with your bushfire consultant</p>	<p>A bushland buffer (5m width) is proposed to be planted adjacent to the site's western boundary between the development and Forest Way. This 5m strip of bushland will not pose a significant bushfire risk to the site based on the separation provided between the bushland strip and the building as well as the separation provided by the emergency turning head in the north and access in the south.</p>
<p>NSW RFS Condition</p>	<p>Response</p>
<p>Condition 1 – At the commencement of building works and in perpetuity the entire property shall be managed as an inner protection area (IPA) as outlined within section 4.2.7 and Appendix 5 of 'Planning for Bush Fire Protection 2006' and the NSW Rural Fire Service's document 'Standards for asset protection zones'. The 100 metre APZ to the east of the building may be managed as 70 metre IPA and 30 metre outer protection area (OPA).</p>	<p>Refer Section 2.3 of this report.</p> <p>The revised scheme maintains a 100m APZ to the east (70m IPA & 30m OPA).</p> <p>Due to the retention of Duffys Forest EEC within the site, the APZ to the north of the building is between 25-30m. The APZ to the west is limited to a minimum 15m towards a proposed 5m wide bushland buffer adjacent to the Forest Way.</p>
<p>Condition 2 – The provision of water, electricity and gas shall comply with Section 4.1.3 and 4.2.7 of <i>PBP 2006</i>.</p>	<p>Refer Section 3.5 – 3.7. The revised scheme will maintain compliance with this condition.</p>
<p>Condition 3 – The proposed maintenance & fire egress path along the southern boundary and eastern elevation of the building shall comply with section 4.1.3 (3) of 'Planning for Bush Fire Protection 2006'.</p>	<p>Refer Section 3.4. The revised scheme will maintain compliance with this condition.</p>
<p>Condition 4 – Access along the Crown Road Reserve to the point of entry into the site on the northern boundary shall comply with section 4.1.3 (3) of 'Planning for Bush Fire Protection 2006'.</p>	<p>Refer Section 3.4. The revised scheme will maintain compliance with this condition. Please note however that the access road in parts is limited to 3.5m width. As outlined in section 3.4 of this report, adequate access can still be provided for firefighting vehicles in compliance with the performance criteria.</p>
<p>Condition 5 – The proposed turning areas for emergency vehicles located on the northern & eastern elevations of the building shall be suitably designed to enable an MRV – Category 1 Tanker to turn around.</p>	<p>Refer Section 3.4. The revised scheme will maintain compliance with this condition with the provision of turning 'T' & 'Y' heads.</p>

<p>Condition 6 – A Bush Fire Emergency Management and Evacuation Plan shall be prepared consistent with 'Development Planning - A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan December 2014' and Australian Standard AS3745 2010 'Planning for Emergencies in Facilities'.</p>	<p>This condition will remain, and a bushfire emergency management and evacuation plan will be required prior to occupation.</p>
<p>Condition 7 – The proposed building shall comply with Sections 3 and 5 (BAL 12.5) Australian Standard AS3959-2009 'Construction of buildings in bush fire-prone areas' or NASH Standard (1.7.14 updated) 'National Standard Steel Framed Construction in Bushfire Areas – 2014' as appropriate and section A3.7 Addendum Appendix 3 of 'Planning for Bush Fire Protection 2006'.</p>	<p>The revised scheme will maintain compliance with this condition. The proposed external ground floor deck to the east is to comply with bushfire attack level (BAL) 19.</p>
<p>Condition 8 – A minimum 2.2-metre-high radiant heat shield made of non-combustible materials shall be constructed along the northern property boundary for a distance of 120 metres. All posts and rails shall be constructed of non-combustible materials. The bottom of the fence is to be in direct contact with the finished ground level or plinth.</p>	<p>The revised scheme will maintain the requirement for a 2.2m high radiant heat shield, however, based on the revised site plan, the fence length is reduced from 120m to 60m.</p>
<p>Condition 9 – Landscaping of the site shall comply with the principles of Appendix 5 of '<i>Planning for Bush Fire Protection 2006</i>'.</p>	<p>The revised scheme will maintain compliance with this condition</p>

Travers bushfire & ecology can confirm that the bushfire risk posed to the development can be mitigated as appropriate bushfire protection measures have been incorporated into the development design and will be put in place and managed in perpetuity.

The assessment has concluded that the proposed development will provide compliance with the performance criteria as outlined within *PBP* and is subject to the following alternative solutions:

- APZs have been determined in accordance with Appendix B Method 2 (alternative solution) of *AS3959 Construction of buildings in bushfire prone areas (2009)*.
- Provision of a fire trail to provide access to the eastern and northern building elevations to enable firefighting activities and property defence, as per previous approvals.

GLOSSARY OF TERMS

APZ	asset protection zone
<i>AS1596</i>	<i>Australian Standard – The storage and handling of LP Gas</i>
<i>AS2419</i>	<i>Australian Standard – Fire hydrant installations</i>
<i>AS3745</i>	<i>Australian Standard – Planning for emergencies in facilities</i>
<i>AS3959</i>	<i>Australian Standard – Construction of buildings in bushfire-prone areas 2009</i>
BAL	bushfire attack level
BSA	bushfire safety authority
DA	development application
EEC	endangered ecological community
<i>EP&A Act</i>	<i>Environmental Planning & Assessment Act 1979</i>
FDI	fire danger index
ha	hectare
IPA	inner protection area
m	metres
<i>NCC</i>	<i>National Construction Code</i>
OPA	outer protection area
<i>PBP</i>	<i>Planning for Bush Fire Protection 2006</i>
<i>RF Act</i>	<i>Rural Fires Act 1997</i>
RMS	Roads and Maritime Services
RFS	NSW Rural Fire Service
SFPP	special fire protection purpose
<i>TSC Act</i>	<i>Threatened Species Conservation Act 1995</i>

TABLE OF CONTENTS

SECTION 1.0 – INTRODUCTION	1
1.1 Aims of the assessment.....	1
1.2 Project synopsis.....	1
1.3 Information collation.....	4
1.4 Site description	4
1.5 Legislation and planning instruments	5
1.6 Environmental and cultural constraints	7
SECTION 2.0 – BUSHFIRE THREAT ASSESSMENT	8
2.1 Hazardous fuels.....	8
2.2 Effective slope	12
2.3 Bushfire attack assessment	12
SECTION 3.0 – SPECIFIC PROTECTION ISSUES	16
3.1 Asset protection zones.....	16
3.2 Building protection	17
3.3 Hazard management	17
3.4 Access for fire fighting operations	18
3.5 Water supplies.....	25
3.6 Gas.....	25
3.7 Emergency and evacuation planning	26
SECTION 4.0 – CONCLUSION AND RECOMMENDATIONS	27
4.1 Conclusion.....	27
4.2 Recommendations.....	27

REFERENCES

SCHEDULE 1 – Bushfire Protection Measures

APPENDIX 1 – Management of Asset Protection Zones

APPENDIX 2 – Performance based assessment



Introduction

1

Travers bushfire & ecology has been requested to undertake a bushfire protection assessment for the proposed revised design and construction of a residential aged care facility at 181 Forest Way, Belrose.

The proposed development is located on land mapped by Northern Beaches Council as being bushfire prone.

The type of development triggers a formal assessment by Council in respect of the RFS policy entitled *Planning for Bush Fire Protection 2006 (PBP)*.

1.1 Aims of the assessment

The aims of the bushfire protection assessment are to:

- address the concerns raised by Northern Beaches Council in previous development applications (DAs);
- 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

The proposed development involves the construction of a residential aged care facility within the western portion of Lot 3 DP 805710. The eastern portion of the site will be managed as an APZ for a distance of 100m.

The facility will provide an overall one hundred and five (105) beds over four-storeys, landscaped courtyard, terrace and a parking / loading area with forty-five (45) car parks.

Figure 1.1 depicts the previous proposal (DA lodged in 2018) with the revised proposal depicted in Figure 1.2. The main changes relate to the amended / reduced building footprint which results in a 10-28m setback from the southern boundary and a 25-30m setback from the retained Duffys Forest within the northern site boundary.

Schedule 1 shows the proposed development and bushfire protection measures, including APZs.

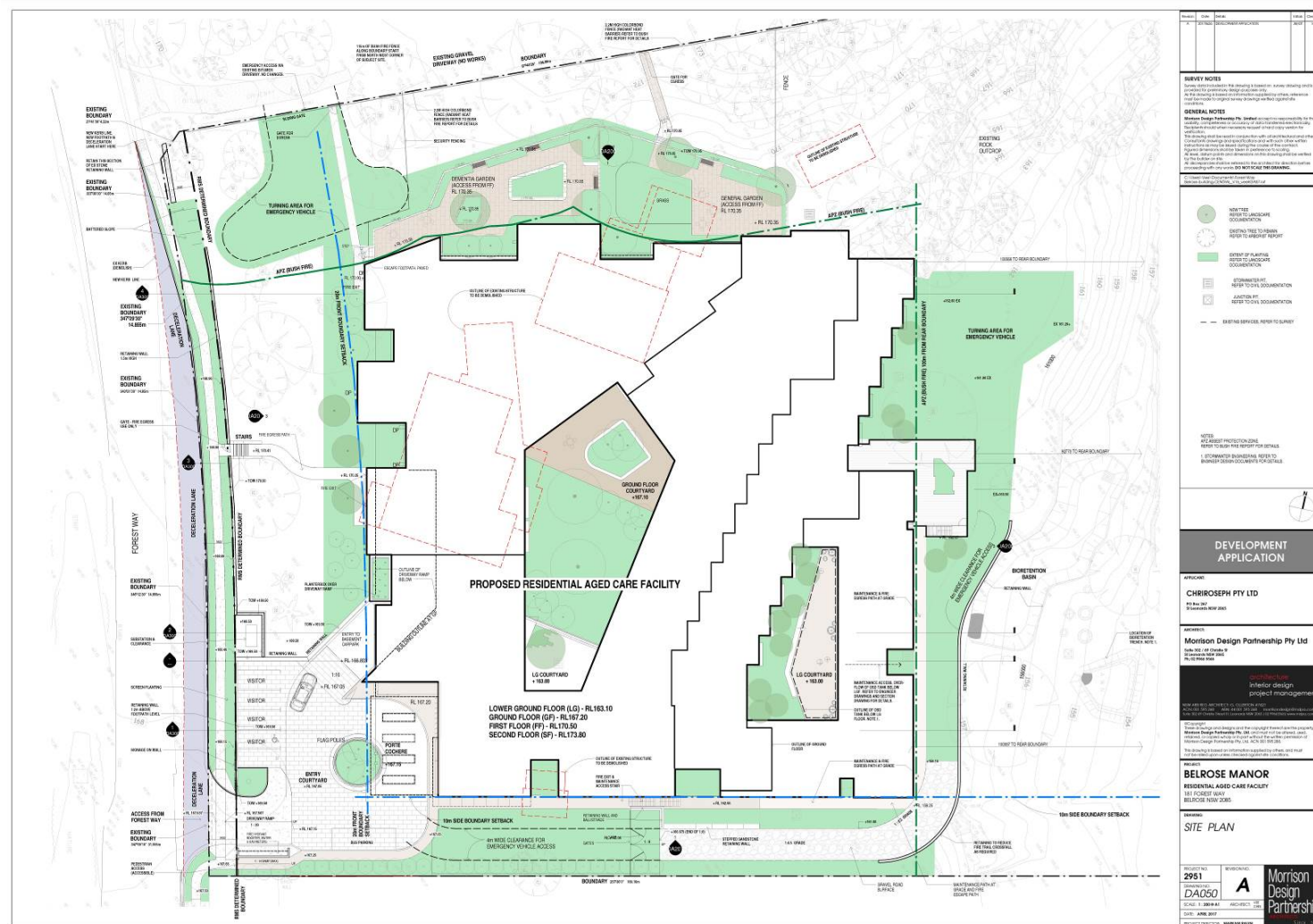


Figure 1.1 – Previous site plan
 (source: Morrison Design Partnership, dated April 2017)

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:

- Site plans prepared by *Morrison Design Partnership*, project no. 2951 Dwg no. DA050 revision I, dated 18 November 2019.
- Warringah Local Environmental Plan (2011)
- *NearMap* aerial photography
- Topographical maps DLPI of NSW 1:25,000
- Australian Standard 3959 *Construction of buildings in bushfire-prone areas (AS3959)*
- *Planning for Bush Fire Protection 2006 (PBP) (RFS)*.

Inspections of the proposed development site and surrounds were undertaken by Nicole van Dorst and John Travers on numerous occasions and more recently in June 2019 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 property currently supports a residential dwelling, granny flat and outbuildings and is located to the east of Forest Way, Belrose within the local government area (LGA) of the Northern Beaches (refer Figure 1.3).

The site is moderately cleared with remnant canopy only. The vegetation beyond the site to the east and north-east supports forest vegetation associated with a bushland reserve, with remnant forest and tall heath located within the private land to the south and within the road reserve to the north.



Figure 1.3 – Aerial appraisal
(source: NearMap)

1.5 Legislation and planning instruments

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

The *EP&A Act* governs environmental and land use planning and assessment within New South Wales. It provides for the establishment of environmental planning instruments, development controls and the operation of construction controls through the *National Construction Code (NCC)*. The identification of bushfire prone land is required under Section 10.3 of the *Environmental Protection & Assessment Act 1979 (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 Northern Beaches Council as being bushfire prone (refer Figure 1.4).

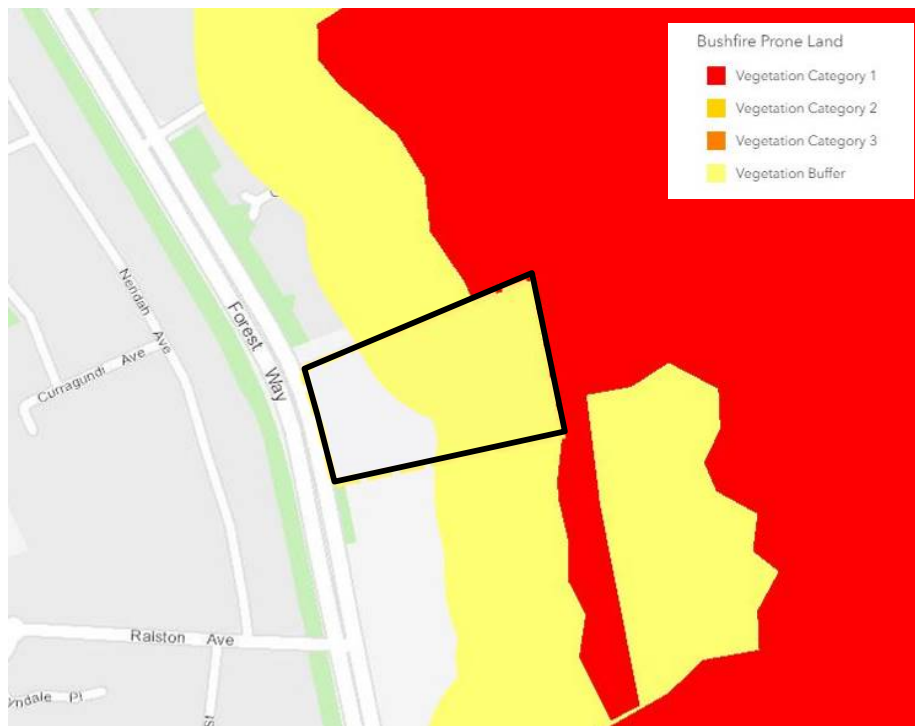


Figure 1.4 – Bushfire prone land map
(source: NSW Planning Portal, 2019)

The proposed development is an integrated development under Section 4.46 of the *EP&A Act*.

Consequently, to proceed, the proposed development will require a bushfire safety authority (BSA) from the RFS. The Commissioner must be satisfied that the proposal complies with *PBP* before granting a BSA.

1.5.3 Rural Fires Act 1997 (RF Act)

This legislation is concerned with the prevention and control of bushfire, hazard reduction and administration.

Section 100B of the *Rural Fires Act 1997 (RF Act)* states that the Commissioner may issue a BSA for a special fire protection purpose (SFPP) development (aged care) when it occurs on bushfire prone land.

1.5.4 Planning for Bush Fire Protection 2006 (PBP)

Bushfire protection planning requires the consideration of the RFS planning document entitled *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. More specifically, the aims and objectives for all development located on bushfire prone land should:

1. Afford occupants of any building adequate protection from exposure to a bushfire.
2. Provide for a defensible 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).

As the aged care development is a type of development regarded by the RFS as a SFPP development, *PBP* requires additional objectives to be considered. These include the need to:

7. Provide for the special characteristics and needs of occupants. Unlike residential subdivisions, which can be built to a construction standard to withstand the fire event, enabling occupants and fire fighters to provide property protection after the passage of fire, occupants of SFPP developments may not be able to assist in property protection. They are more likely to be adversely affected by smoke or heat while being evacuated.
8. Provide for safe emergency evacuation procedures. SFPP developments are highly dependent on suitable emergency evacuation arrangements, which require greater separation from bushfire threats. During emergencies, the risk to fire fighters and other emergency services personnel can be high through prolonged exposure, where door to door warnings are being given and exposure to the bushfire is imminent.

The nature of SFPP developments means that occupants may be more vulnerable to bushfire attack for because they may;

- be less educated in relation to bushfire impacts
- may have reduced capacity to evaluate risk and to respond adequately to the bushfire threat
- present organisational difficulties for evacuation and / or management
- be more vulnerable through stress, anxiety and smoke impacts arising from bushfire threat
- have significant communication barriers
- increased supervision may be required during a bushfire
- logistical arrangements for the numbers of residents may be complicated in terms of alternate accommodation, transport, healthcare and food supplies

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

1.5.5 National Construction Code (NCC) and the Australian Standard AS3959 Construction of buildings in bushfire-prone areas 2009 (AS3959)

The *NCC* is given effect through the *EP&A Act* and forms part of the regulatory environment of construction standards and building controls.

The *NCC* outlines objectives, functional statements, performance requirements and deemed to satisfy provisions.

In NSW, construction in bushfire prone areas applies to Classes 2, 3, 4 and 9b buildings or a Class 10a associated with Classes 2, 3, 4 and 9b buildings.

The construction manual for the deemed to satisfy requirements is the *AS3959*.

1.6 Environmental and cultural constraints

Cumberland Ecology have prepared a Biodiversity Development Assessment Report for a proposed Seniors Housing Development.

The report states that the vegetation retained on the subject land will be modified as part of an APZ. All retained vegetation will be managed under a BMP, which will improve the function of the ecological communities present through weed control and active management. The mitigation measures recommended to be implemented include:

- Vegetation protection;
- Erosion, sedimentation and pollution control;
- Pre-clearing and clearing surveys;
- Weed control measures; and
- Re-vegetation.



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 SFPP developments. The hazardous vegetation is calculated for a distance of at least 140m from a proposed building envelope.

The vegetation within 140m of the development is detailed below:

- Remnant tall heath to the north of the site. The bushfire risk posed by this vegetation is minimal / negligible due to its narrow width and fire run potential (i.e. <10-20m road side vegetation). The bushfire risk is further reduced by the presence of an existing service road / electrical easement. The vegetation is dominated by tall heath which is managed / maintained in accordance with *TransGrid* guidelines (i.e. maintain a height less than 4m) and has a size of less than 1ha.



Photo 1 – Remnant tall heath vegetation to the north

As approved previously by the NSW RFS, a 24m APZ (to include the adjoining service road where it meets the site boundary) has been provided along with the construction of a 2.2m high *Colorbond* fence which will further reduce the radiant heat impact on the proposed development from the north.



Photo 2 – Remnant vegetation to the north of the site

- Proposed retained remnant forest (Duffys Forest EEC) and tall heath within the site to the north-east of the proposed building. Again, the bushfire risk posed by this vegetation is minimal due to its narrow width and fire run potential (i.e. <50m). The bushfire risk is further reduced by the presence of an existing service road / electrical easement to the north of this parcel of vegetation. This vegetation is located upslope from the building as depicted below.



Photo 3 – Remnant Duffys Forest vegetation to the north of the site

- Forest vegetation east and north-east of the site (separation >100m)



Photo 4 – Forest vegetation to the east (with private access road)



Photo 5 – Forest vegetation to the east

- Tall heath vegetation to the south-east of the site. As approved by the NSW RFS previously, *TBE* has assumed a worst-case scenario and re-establishment of the vegetation to the south-east (i.e. east of the tennis court) to a 'tall heath formation'. This vegetation community is supported by mapping prepared by Native Vegetation of Sydney Metropolitan Area (2016). The area consists of exposed rock with the potential for the re-establishment of Sydney Coastal Heath. As previously approved, two (2) design fires have been calculated, one based on a 10m flame width (based on the angle of impact and managed land provided by the tennis court) and a 100m flame width, as depicted within Schedule 1 attached.



Figure 2.1 – Vegetation mapping

- Tall heath vegetation to the south of the site (between the tennis court and maintained lawn area).

Northern Beaches Council identified the potential requirement for a legal mechanism to be implemented over the land to the south to ensure ongoing maintenance of the garden bed as an APZ. The previous report prepared by this firm identified the property to the south as existing 'managed' land. However *Travers bushfire & ecology* has been advised that the neighbour will not continue to maintain / manage the garden bed. As a result, this area is no longer considered 'managed'. A worst-case scenario has been adopted and a 'tall heath' vegetation classification has been used in the revised calculations.

This vegetation community is supported by mapping prepared by Native Vegetation of Sydney Metropolitan Area (2016). The area consists of exposed rock with the potential for the re-establishment of Sydney Coastal Heath to maximum width of 19m.

Table 2.1 provides a summary of the revised bushfire assessment for the southern aspect of the site (identified in bold text) and north-eastern portion (adjacent to the retained Duffys Forest). This assessment assumes re-establishment of tall heath within the rocky garden bed to the south (between the existing tennis court and managed front lawn).

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 areas is described as follows:

- >15-18 degrees downslope within the forest vegetation to the east;
- 10-15 degrees downslope within the forest vegetation to the north-east;
- level to upslope within the remnant vegetation to the north; and
- 13.5 degrees downslope within the tall heath to the south-east.

The effective slope within the newly assessed areas are as follows:

- 0 – 5 degrees cross slope within the “re-established” tall heath in the garden bed to the south;
- 5 degrees upslope within the retained Duffy’s Forest to the north; and
- Level within the retained Duffys Forest to the north-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 its location within the Greater Sydney region.

Table 2.1 provides a summary of the bushfire attack assessment, the minimum required APZs (i.e. to ensure radiant heat <10kWm²) and the APZs provided in compliance with the performance requirements of *PBP*. The bold text represents the new revised assessment as a result of the proposed vegetation retention within the site and re-established vegetation to the south.

Table 2.1 – Bushfire attack assessment

Aspect	Predominant vegetation within 140m of development	Effective slope of land	APZ required in accordance with Appendix 2 of <i>PBP</i> (metres)	APZ provided (metres)	
South	Tall heath (19m flame width)	0-5 ^{0C}	50m	28m 9.62kW/m ²	Reassessment based on re-established vegetation within garden bed (refer Note 1)
North-east	Remnant Forest (refer Note 3)	Level	30m	30m	Reassessment based on retained Duffys Forest - deemed to satisfy
North		5 ^{0U}	30m	25m 9.96kW/m ²	Reassessment based on retained Duffys Forest – alternate solution (refer Note 2)

Aspect	Predominant vegetation within 140m of development	Effective slope of land	APZ required in accordance with Appendix 2 of PBP (metres)	APZ provided (metres)	APZ provided (metres)
The following assessment for these aspects has been assessed previously by the RFS. The results of the performance-based assessment (as approved by the RFS) are provided in Appendix 2.					
North	Remnant forest (refer Note 3)	Level	30	24 (see Note 4 in Appendix 2)	As per original assessment
North-east	Forest	10-15 ^{0D}	100	>72 (see Note 5 in Appendix 2)	As per original assessment
East	Forest	>15-20 ^{0D}	100	100 (70m IPA & 30m OPA)	As per original assessment
South-east	Tall heath (10m flame width)	13.5 ° ^D	60	>28m (refer Note 6 in Appendix 2) 8.17kW/m ²	As per original assessment
	Tall heath (100m flame width)			>64m setback provided to 100m flame width 8.79kW/m ²	

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

Note 1 – A performance-based assessment using Appendix B of AS3959 was undertaken to determine the radiant heat exposure based on “re-established” tall heath vegetation (reduced flame width of 19m) on a downslope of 5⁰ (worst case). The results of the assessment, provided below, were prepared using the bushfire attack level calculator developed by *Flamesol*.



Calculated November 7, 2019, 2:02 pm (BALc v.4.8)

181 Forest Way Belrose

Bushfire Attack Level calculator - AS3959-2009 (Method 2)			
Inputs		Outputs	
Fire Danger Index	100	Rate of spread	5.88 km/h
Vegetation classification	Scrub	Flame length	13.62 m
Surface fuel load	25 t/ha	Flame angle	65 °
Overall fuel load	25 t/ha	Panel height	12.35 m
Vegetation height	3 m	Elevation of receiver	6.17 m
Effective slope	5 °	Fire intensity	75,987 kW/m
Site slope	0 °	Transmissivity	0.825
Distance to vegetation	28 m	Viewfactor	0.1043
Flame width	19 m	Radiant heat flux	9.619999999999999 kW/m ²
Windspeed	45 km/h	Bushfire Attack Level	BAL-12.5
Heat of combustion	18,600 kJ/kg		
Flame temperature	1,200 K		

Note 2 – A performance-based assessment using Appendix B of AS3959 was undertaken to determine the required APZ (equivalent to radiant heat <math><10\text{ kW/m}^2</math> for the SFPP building) based on remnant forest vegetation (fuel load 8/10) on an upslope of 5 degrees. The results of this assessment are depicted in Schedule 1 with the modelled results of the assessment, provided below, prepared using the bushfire attack level calculator developed by *Flamesol*.



Calculated November 7, 2019, 2:29 pm (BALc v.4.8)

181 Forest Way, Belrose

Bushfire Attack Level calculator - AS3959-2009 (Method 2)			
Inputs		Outputs	
Fire Danger Index	100	Rate of spread	0.67 km/h
Vegetation classification	Rainforest	Flame length	5.61 m
Surface fuel load	8 t/ha	Flame angle	83 °
Overall fuel load	10 t/ha	Panel height	5.57 m
Vegetation height	n/a	Elevation of receiver	2.78 m
Effective slope	-5 °	Fire intensity	3,512 kW/m
Site slope	0 °	Transmissivity	0.826
Distance to vegetation	25 m	Viewfactor	0.1079
Flame width	100 m	Radiant heat flux	9.960000000000001 kW/m ²
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

Note 3 – The vegetation to the north poses a reduced bushfire risk to the site due to its short and / or narrow ‘fire run’ length (i.e. <50m) which in-turn reduces the opportunity to support a fully developed bushfire. *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 north 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*.

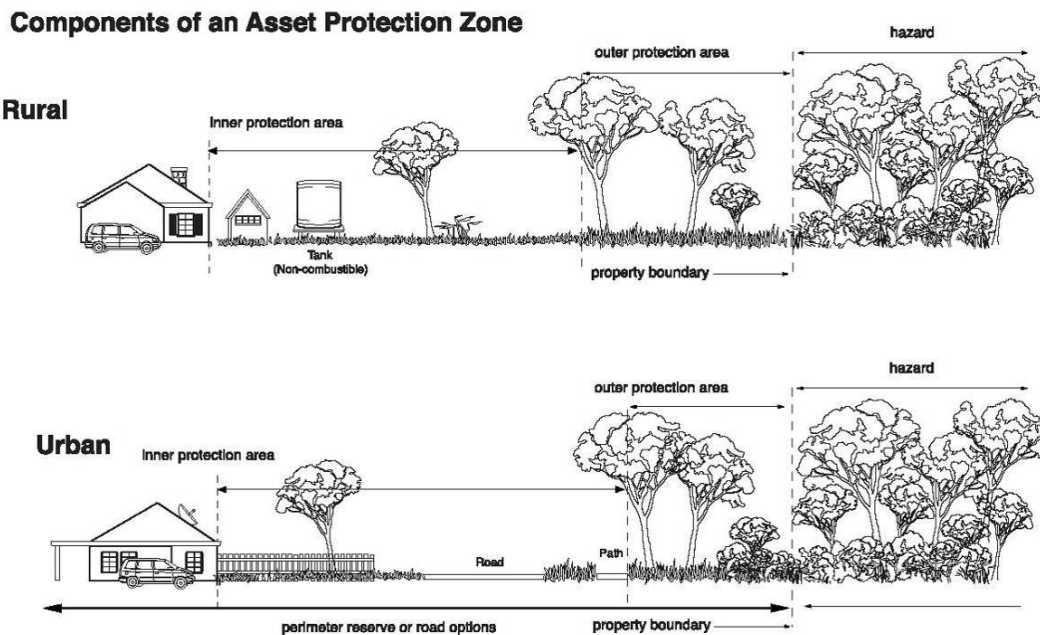


Specific Protection Issues

3

3.1 Asset protection zones

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:



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 10kW/m^2 for SFPP developments.

This rating assists in determining the size of the APZ in compliance with Appendix 2 of *PBP* to provide the necessary defensible space between hazardous vegetation and a building. Table 3.1 outlines the proposal's 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 of greater than 10kW/m ² will not be experienced by occupants or emergency services workers entering or exiting a building.	An APZ is provided in accordance with the relevant tables and figures in Appendix 2 of <i>PBP</i> . Exits are located away from the hazard side of the building. The APZ is wholly within the boundaries of the development.	Complies with the performance criteria. As outlined in Section 2.3, a performance-based assessment has been undertaken to ensure all aspects of the building are not exposed to radiant heat >10kW/m ² . The external deck on the eastern façade is to be constructed to comply with BAL 19 (provided with a setback of 92m)
Applicant demonstrates that issues relating to slope are addressed: maintenance is practical, soil stability is not compromised and the potential for crown fire is negated.	Mechanisms are in place to provide for the maintenance of the APZ over the life of the development. The APZ is not located on land with a slope exceeding 18°.	Complies – The APZ will consist of landscaped areas, roads and turf areas.
APZs are managed and maintained to prevent the spread of a fire towards the building.	In accordance with the requirements of <i>Standards for Asset Protection Zones (RFS 2005)</i> .	Complies - to be made a condition of consent.

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.

The construction classification system is based on five (5) bushfire attack levels (BALs). These are BAL – Flame Zone (FZ), BAL 40, BAL 29, BAL 19 and BAL 12.5 AS3959. 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.

The proposed aged care building is to comply with a BAL 12.5 rating. The proposed ground floor deck on the eastern façade is to comply with BAL 19.

Note: There is no BAL 10 in AS3959 so BAL 12.5 must be used.

3.3 Hazard management

Future development is to ensure that the APZ is (as depicted within Schedule 1):

- Managed in accordance with RFS document *Standards for Asset Protection Zones* available from www.rfs.nsw.gov.au by following the link 'Publications' and 'Hazard Reduction' and that:

- Landscape design within the property is to be undertaken in accordance with Appendix 5 of *PBP* also available from www.rfs.nsw.gov.au by following the link 'Publications' and *Building in a Bush Fire Prone Area*.

3.4 Access for fire fighting operations

The primary access to the development will be via from Forest Way in the west. An existing service road / electrical easement is also located adjacent to the northern boundary of the site as well as a private access road extending from Morgan Road in the north which runs parallel to the eastern boundary of the site (refer Figure 3.1).



Figure 3.1 - Access

Public access to the facility will be limited to patrons, staff and visitors. The proposal will provide a single-entry driveway ramp (1:20 and 1:16) to an entry courtyard with port cochere, together with entry to a basement carpark as per the original proposal.

The revised scheme maintains firefighting access to all aspects of the building and to the rear of the site (for APZ maintenance) via the provision of a fire trail.

In respect to the bushfire matters raised by Northern Beaches Council, *Travers bushfire & ecology* provide the following response:

Council comment: Previous DA2017/0697 was recommended for refusal based on potential impacts to known individuals of *Grevillea caleyi* (Critically Endangered) within the road reserve immediately north of the property.

Bushfire Consultant to include a short statement justifying the turning area and confirming no trees / vegetation will be requiring pruning or removal.

Travers bushfire & ecology can confirm that no further clearing will be required within the adjoining road reserve to the north or within the site to implement or utilise the existing access driveway. The following figure depicts the location of the *Grevillea caleyi* within the adjoining land.



Figure 3.2: *Grevillea caleyi* within the unformed road reserve
(source: Cumberland Ecology, 2017)

As depicted in Figure 3.2 above, the *Grevillea species* is located at the entry to the road to the north. The existing unformed road has a width of 3.5m. The only portion of this existing road proposed to be used as a secondary emergency access point is the first 20m length before the turning head is provided on site. *Planning for Bush Fire Protection (PBP)* allows for some short restrictions in access where they are not less than 3.5m and extend for no more than 30m and where the obstruction cannot be reasonably avoided or removed. The existing unformed road does not require any further clearing to provide sufficient access for fire fighting vehicles and therefore there will be no impact on the *Grevillea sp.*

In addition, the proposed turning area within the property has been located to ensure no impact on existing vegetation. Confirmation from engineers is required to ensure that the existing ground surface is capable of carrying fully loaded firefighting vehicles of 15 tonnes. Alternatively, *grass-crete* (capable of supporting 15 tonnes) can be used to minimise environmental impact.

In addition, Council had concerns that the area may be used for access outside of emergency situations. A compatible locked (RFS) gate will be included in the amended proposal to prevent this situation. The proposed gate is depicted in the site plan prepared by *Morrison Design* (refer Figure 3.3) as a sliding gate.

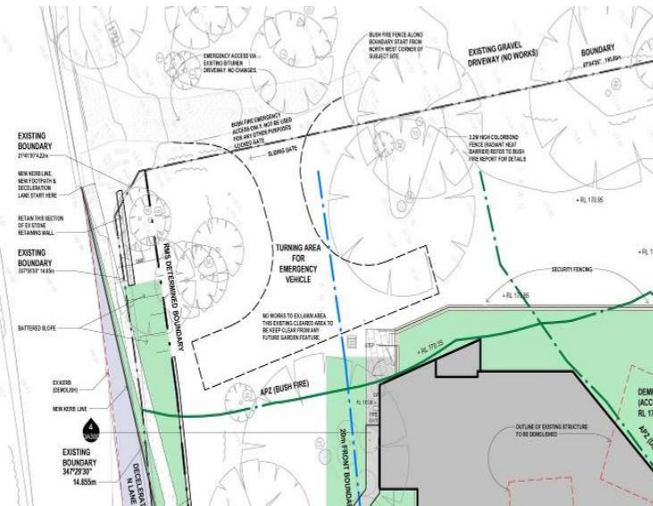


Figure 3.3: Turning head dimensions
(source: Morrison Design, 2019)

Photos 6 & 7 depict the existing bitumen driveway on the existing road reserve.



Photo 6 – Existing driveway access to the site (right of picture)

picture taken looking east



Photo 7 – Existing access looking west towards Forest Way.

Table 3.2 provides detail regarding design / construction and how the 'intent of measures' required by the RFS for internal roads is provided by the development i.e. *"to provide safe operational access for emergency services personnel in suppressing a bush fire, while residents are accessing or egressing an area"*.

Table 3.3 outlines the design requirements for the fire trails.

Table 3.2 – Performance criteria for internal roads (PBP guidelines pg. 35)

Performance criteria	Acceptable solutions to RFS	Compliance comments
Internal road widths and design enable safe access for emergency services and allow crews to work with equipment about the vehicle.	Internal roads are two-wheel drive, sealed, all weather roads.	Yes.
	Internal perimeter roads are provided with at least two traffic lane widths (carriageway 8m minimum curb to curb) and shoulders on each side, allowing traffic to pass in opposite directions.	A perimeter road is not proposed. Fire fighting access will be provided via the existing and proposed fire trails within and external to the site. The driveway / ramp has a minimum width of 6.5m.
	Roads are through roads. Dead end roads are not more than 100m in length from a through road, incorporate a minimum 12m outer radius turning circle, and are clearly sign posted as a dead end.	N/A
	Traffic management devices are constructed to facilitate access by emergency services vehicles.	Access is to be designed to allow access for fire fighting vehicles (i.e. 4m height clearance).
	A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.	The port cochere is to have a minimum height of 4m.
	Curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress.	Yes.
	The minimum distance between inner and outer curves is 6m.	Yes.
	Maximum grades do not exceed 15° and average grades are not more than 10°.	Yes.

Performance criteria	Acceptable solutions to RFS	Compliance comments
	Cross fall of the pavement is not more than 10°.	Yes
	Roads do not traverse through a wetland or other land potentially subject to periodic inundation (other than storm surge).	Yes
	Roads are clearly sign-posted and bridges clearly indicate load ratings.	Yes
	The internal road surfaces and bridges have a capacity to carry fully-loaded firefighting vehicles (15 tonnes).	Yes

Table 3.3 – Performance criteria for fire trails (PBP guidelines pg. 24)

Performance criteria	Acceptable solutions	Compliant or not compliant
The width and design of the fire trails enables safe and ready access for fire fighting vehicles.	<p>A minimum carriageway width of 4m with an additional 1m strip on each side of the trail clear of bushes and long grass.</p> <p>Sealed trails have a maximum grade of 15° and not more than 10° for unsealed roads.</p> <p>A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches.</p> <p>The cross fall of the trail is not more than 10°.</p> <p>The trail has the capacity for passing by:</p> <ul style="list-style-type: none"> reversing bays using the access to properties to reverse fire tankers, which are 6m wide and 8m deep to any gates, with a minimum turning radius of 6m and outer minimum radius of 12m and / or a passing bay every 200m, 20m long x 3m wide, making a minimum trafficable width of 7m at the passing bay. 	<p>Yes – can be made a condition of consent.</p> <p>Portions of the fire trail over 10 degrees is to be sealed.</p> <p>The port cochere is to have a minimum height of 4m</p> <p>Yes</p>

Performance criteria	Acceptable solutions	Compliant or not compliant
<p>Fire trails are trafficable under all weather conditions. Where the fire trail joins a public road, access shall be controlled to prevent use by unauthorised persons.</p>	<p>The fire trail is accessible to fire fighters and maintained in a serviceable condition by the owner of the land.</p> <p>Appropriate drainage and erosion controls are provided.</p> <p>The fire trail system is connected to the property access road and / or through road system at intervals of at least 200m.</p> <p>Fire trails do not traverse a wetland or other land subject to periodic inundation (other than a flood or storm surge).</p> <p>Gates for fire trails are provided and locked with a key / lock system authorised by the local RFS.</p>	<p>Yes – can be made a condition of consent.</p>
<p>Fire trails designed to prevent weed infestation, soil erosion and other land degradation.</p>	<p>Fire trail design does not adversely impact on natural hydrological flows.</p> <p>Fire trail design acts as an effective barrier to the spread of weeds and nutrients.</p> <p>Fire trial construction does not expose acid-sulphate soils.</p>	<p>Yes – can be made a condition of consent.</p>

3.5 Water supplies

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

Table 3.4 outlines the proposal's compliance with the performance criteria for reticulated water supply.

Table 3.4 – Performance criteria for reticulated water supplies (*PBP* guidelines pg. 37)

Performance criteria	Acceptable solutions	Complies
Water supplies are easily accessible and located at regular intervals.	<p>Access points for reticulated water supply to SFPP developments incorporate a ring main system for all internal roads.</p> <p>Fire hydrant spacing, sizing and pressures comply with <i>AS2419.1</i>. Where this cannot be met, the RFS will require a test report of the water pressures anticipated by the relevant water supply authority, once development has been completed. In such cases, the location, number and sizing of hydrants shall be determined using fire engineering principles.</p> <p>The provisions of public roads in Section 4.1.3 of <i>PBP</i> in relation to parking are met.</p>	Complies - can be made a condition of consent.

3.6 Gas

Table 3.5 outlines the required performance criteria for the proposal's gas supply.

Table 3.5 – Performance criteria for gas supplies (*PBP* guidelines pg. 37)

Performance criteria	Acceptable solutions	Complies
Location of gas services will not lead to the ignition of surrounding bushland land or the fabric of buildings.	<p>Reticulated or bottled gas bottles are to be installed and maintained in accordance with <i>AS1596</i> and the requirements of relevant authorities. Metal piping is to be used.</p> <p>All fixed gas cylinders are to be kept clear of flammable materials and located on the non hazard side of the development.</p> <p>If gas cylinders are to be kept close to the building the release valves must be directed away from the building and away from any combustible material, so that they do not act as a catalyst to combustion.</p> <p>Polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not to be used.</p>	Complies - can be made a condition of consent.

3.7 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 (PBP guidelines pg.39)

Performance criteria	Acceptable solutions	Complies
An emergency and evacuation management plan is approved by the relevant fire authority for the area.	<p>An emergency / evacuation plan is prepared consistent with the <i>RFS</i> Guidelines for the Preparation of Emergency / Evacuation Plan.</p> <p><i>Note: The applicant should provide a copy of the above document to the local Bush Fire Management Committee for their information prior to the occupation of any accommodation of a SFPP.</i></p>	Complies - can be made a condition of consent.
Suitable management arrangements are established for consultation and implementation of the emergency and evacuation plan.	<p>An emergency planning committee is established to consult with staff in developing and implementing an emergency procedures manual.</p> <p>Detailed plans of all emergency assembly areas including onsite and offsite arrangements as stated within AS3745 are clearly displayed, and an annual trail emergency evacuation is conducted.</p>	Complies - can be made a condition of consent.



Conclusion & Recommendations

4

4.1 Conclusion

This addendum bushfire assessment report has been undertaken in support of a revised development application to take into account the amended site plan and Northern Beaches Council concerns in relation to the impacts on *Grevillea calei*, Duffys Forest endangered ecological community (EEC) and issues raised around the ongoing maintenance of the garden bed external to the sites southern boundary.

This assessment has found that bushfire can potentially affect the proposed development from the forest vegetation located to external to the site's eastern boundary, as well as the remnant forest to the north and tall heath to the south and south-east resulting in possible flame, ember and radiant heat attack.

Travers bushfire & ecology can confirm that the bushfire risk posed to the development can be mitigated as appropriate bushfire protection measures have been incorporated into the development design and will be put in place and managed in perpetuity.

The assessment has concluded that the proposed development will provide compliance with the performance criteria as outlined within *PBP* and is subject to the following alternative solutions:

- APZs have been determined in accordance with Appendix B Method 2 (alternative solution) of *AS3959 Construction of buildings in bushfire prone areas (2009)*.
- Provision of a fire trail to provide access to the eastern and northern building elevation to enable firefighting activities and property defence, as per previous approvals.

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

4.2 Recommendations

Recommendation 1 – At the commencement of building works and in perpetuity the APZ, as depicted in Schedule 1 – Bushfire Protection Measures prepared by *Travers bushfire & ecology* ref: 18MORR02, dated 8/11/19, shall be managed as an inner protection area (IPA) as outlined within section 4.2.7 and Appendix 5 of *Planning for Bush Fire Protection 2006* and the RFS document *Standards for asset protection zones*. The 100m APZ to the east of the building may be managed as 70 metre IPA and 30m outer protection area (OPA).

Recommendation 2 – The provision of water, electricity and gas shall comply with Section 4.1.3 and 4.2.7 of *PBP 2006*.

Recommendation 3 – The proposed maintenance and fire egress path along the southern boundary and eastern elevation of the building shall comply with section 4.1.3 (3) of *Planning for Bush Fire Protection 2006*.

Recommendation 4 – Access along the Crown Road Reserve to the point of entry into the site on the northern boundary shall comply with section 4.1.3 (3) of *Planning for Bush Fire Protection 2006*. No further clearing of the existing 3.5m wide access road in Crown Reserve is required.

Recommendation 5 – The proposed turning areas for emergency vehicles located on the northern and eastern elevations of the building shall be suitably designed to enable an MRV – Category 1 Tanker to turn around.

Recommendation 6 – A Bush Fire Emergency Management and Evacuation Plan shall be prepared consistent with *Development Planning - A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan December 2014* and *Australian Standard AS3745 2010 Planning for Emergencies in Facilities*.

Recommendation 7 – The proposed building shall comply with Sections 3 and 5 (BAL 12.5) *Australian Standard AS3959-2009 Construction of buildings in bush fire-prone areas* or NASH Standard (1.7.14 updated) *National Standard Steel Framed Construction in Bushfire Areas – 2014* as appropriate and section A3.7 Addendum Appendix 3 of *Planning for Bush Fire Protection 2006*. The ground floor deck on the eastern façade is to comply with BAL 19.

Recommendation 8 – A minimum 2.2m high radiant heat shield made of non-combustible materials shall be constructed along the northern property boundary for a distance of 60m. All posts and rails shall be constructed of non-combustible materials. The bottom of the fence is to be in direct contact with the finished ground level or plinth.

Recommendation 9 – Landscaping of the site shall comply with the principles of Appendix 5 of *Planning for Bush Fire Protection 2006*.

REFERENCES

- Australian Building Codes Board (2019) – *National Construction Code 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 bushfire-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

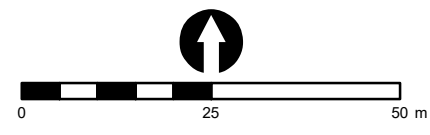
S1



Legend

Site Boundary (Source: LPI) contour	Lower Ground Deck (BAL 19)	Inner Protection Area (IPA)
Service road / electrical easement	Residential aged care facility (BAL 12.5)	Outer Protection Area (OPA)
Firetrail		
Existing private access		
Managed land		

Aerial source: Nearmap



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
 181 Forest Way, Belrose
 18MORR02_BF001

DATE & ISSUE NUMBER
 19/11/2019
 Issue 1
 BT

SCALE & COORDINATE SYSTEM
 1:1,000 @A3
 GDA 1994 MGA Zone 56

TITLE
Schedule 1 - Bushfire Protection Measures

Document Path: N:\GIS STORAGE\IN Drive\18MORR02_ForestWay_Belrose\MXDs\18MORR02_BF001.mxd





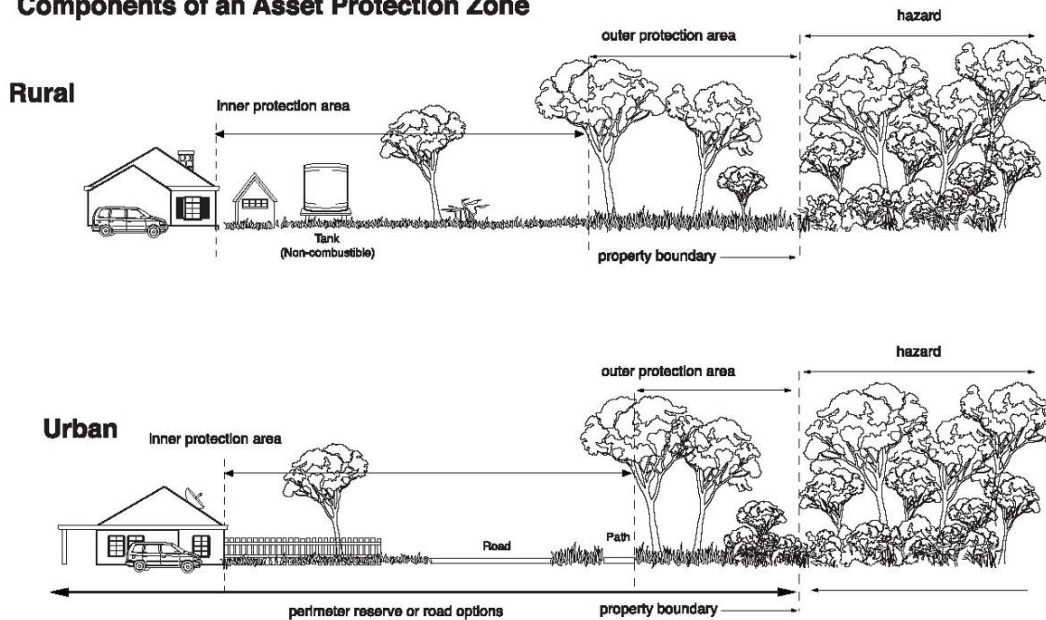
Management of Asset Protection Zones

A1

The 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:

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.

The following provides maintenance advice for vegetation within the IPA and OPA.

Inner protection area (IPA)

Fuel loads within the IPA are to be maintained so it does not exceed 4t/ha.

Trees are to be maintained to ensure;

- canopy cover does not exceed 15%
- trees (at maturity) do not touch or overhang the building

- tree canopies (at maturity) should be well spread out and not form a continuous canopy
- lower limbs should be removed up to a height of 2m above ground
- preference should be given to smooth barked and evergreen trees.

Shrubs are to be maintained to ensure;

- large discontinuities or gaps in vegetation
- shrubs should not be located under trees
- shrubs should not form more than 10% of ground cover
- 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:

- a height of 10cm or less
- leaves and debris are removed.

Outer protection area (OPA)

Fuel loads within the OPA are to be maintained so it does not exceed 8t/ha.

Trees are to be maintained to ensure;

- canopy cover does not exceed 30%
- trees should have canopy separation

Shrubs are to be maintained to ensure;

- they do not form a continuous canopy
- shrubs should be no more than 20% of ground cover

Grass is to be maintained to ensure:

- height of 10cm or less
- leaves and debris are mown, slashed or mulched.

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 way from the building; and
- Use of low flammability vegetation species.



Performance Based Assessment

A2

This information is to be read in conjunction with Table 2.3. The following assessment has been previously approved by the NSW RFS with the issue of a BSA.

Note 4 – The vegetation to the north poses a reduced bushfire risk to the site due to its short and or narrow ‘fire run’ length (i.e. <50m) which in-turn reduces the opportunity to support a fully developed bushfire. *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 north 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*.

A performance-based assessment using Appendix B of AS3959 was undertaken to determine the required APZ (equivalent to radiant heat <10 kW/m^2 for the SFPP building) based on remnant vegetation (fuel load 8/10) on a level slope.

The results indicate that based on this vegetation / slope and 24m APZ the SFPP building (as identified in Schedule 1) would be exposed to a radiant heat threshold of 13.22 kW/m^2 (i.e. refer A North Base Calculation below).

This impact is reduced further by with the construction of a 2.2m high *Colorbond* fence along the boundary of the site as detailed below.

Radiant heat shielding by 2.2m high radiant heat barrier

The following modelling has been undertaken using accepted methodology based on the view factor model. In this circumstance the construction of a 2.2m high *Colorbond* fence acts as a radiant heat shield to the affectation of the western vegetation.

The radiant heat barrier will be located adjacent to the bushland in this circumstance and therefore the methodology is straight forward.

The modelled results (refer below) were prepared using the bushfire attack assessor (BFAA) developed by *Newcastle Bushfire Consulting*. The radiant heat calculations have been undertaken using the following three (3) steps;

1. Create a base model of the unshielded fire and record the view factor. This calculation is identified as:
 - ‘Run Description: A North BASE. This has been undertaken based on a 24m APZ.
2. Create a shielded model of the fire with the vegetation fuel loadings reduced, decreasing the flame height to the same height of the proposed radiant heat shield i.e. 2.2m. The flame angle is then determined depending on the location of the radiant heat shield in relation to the building and the vegetation. As the radiant heat shield is directly against the vegetation it offers a 90-degree flame angle reduction. The view factor is then recorded. This calculation as;
 - ‘Run Description: B North SHIELD
3. Finally, the view factor of the final radiant heat exposure to the building is measured as the ‘View factor from Step 1 minus the view factor from Step 2’.

The measurement of a 2.2m radiant heat shield is shown in the following table. The results show that the aged care building will be exposed to radiant heat of 9.81 k/Wm².

Calculation	Radiant heat k/Wm ²	View factor
Base calculation	13.87	0.15
2.2m pre - shield calculation	4.08	0.044
Final calculation	9.81	0.106

NBC Bushfire Attack Assessment Report V2.1

AS3959 (2009) Appendix B - Detailed Method 2

Printed: 8/12/2016 Assessment Date: 24/11/2016

Site Street Address: 181 Forest Way, Belrose
 Assessor: Mr Admin; admin
 Local Government Area: Warringah 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 BASE

Vegetation Information

Vegetation Type: Rainforest Vegetation Group: Forest and Woodland
 Vegetation Slope: 0 Degrees Vegetation Slope Type: Level
 Surface Fuel Load(t/ha): 8 Overall Fuel Load(t/ha): 10

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): 1200

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: MODERATE Peak Elevation of Receiver(m): 3.66
 Level of Construction: BAL 19 Fire Intensity(kW/m): 4960
 Radiant Heat(kW/m2): 13.87 Flame Angle (degrees): 80
 Flame Length(m): 7.44 Maximum View Factor: 0.15
 Rate Of Spread (km/h): 0.96 Inner Protection Area(m): 24
 Transmissivity: 0.83 Outer Protection Area(m): 0

Run Description: B North SHEILD	
Vegetation Information	
Vegetation Type: Rainforest	Vegetation Group: Forest and Woodland
Vegetation Slope: 0 Degrees	Vegetation Slope Type: Level
Surface Fuel Load(t/ha): 2.5	Overall Fuel Load(t/ha): 2.1
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) 1200
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: LOW	Peak Elevation of Receiver(m): 1.1
Level of Construction: BAL 12.5	Fire Intensity(kW/m): 326
Radiant Heat(kW/m2): 4.08	Flame Angle (degrees): 90
Flame Length(m): 2.2	Maximum View Factor: 0.044
Rate Of Spread (km/h): 0.3	Inner Protection Area(m): 24
Transmissivity: 0.828	Outer Protection Area(m): 0

Run Description: C North FINAL	
Vegetation Information	
Vegetation Type: Rainforest	Vegetation Group: Forest and Woodland
Vegetation Slope: 0 Degrees	Vegetation Slope Type: Level
Surface Fuel Load(t/ha): 8	Overall Fuel Load(t/ha): 10
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) 1200
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: LOW	Peak Elevation of Receiver(m): 3.72
Level of Construction: BAL 12.5	Fire Intensity(kW/m): 4960
Radiant Heat(kW/m2): 9.81	Flame Angle (degrees): 90
Flame Length(m): 7.44	Maximum View Factor: 0.106
Rate Of Spread (km/h): 0.96	Inner Protection Area(m): 24
Transmissivity: 0.828	Outer Protection Area(m): 0

Note 5 – As outlined in the original bushfire report, a performance based assessment using Appendix B of AS3959 was undertaken to determine the required APZ (equivalent to radiant heat <10 kW/m² for the SFPP building) based on forest vegetation (fuel load 20/25) on a 10-15 degree slope and flame width potential of 24m. The results of this assessment are depicted in Schedule 1 attached with modelled results using the bushfire attack assessor (BFAA) (developed by *Newcastle Bushfire Consulting*) provided below.

Run Description: D North-east	
<u>Vegetation Information</u>	
Vegetation Type: Forest	Vegetation Group: Forest and Woodland
Vegetation Slope: 15 Degrees	Vegetation Slope Type: Downslope
Surface Fuel Load(t/ha): 20	Overall Fuel Load(t/ha): 25
<u>Site Information</u>	
Site Slope 0 Degrees	Site Slope Type: Level
Elevation of Receiver(m) Default	APZ/Separation(m): 72
<u>Fire Inputs</u>	
Veg./Flame Width(m): 24	Flame Temp(K) 1200
<u>Calculation Parameters</u>	
Flame Emissivity: 95	Relative Humidity(%): 25
Heat of Combustion(kJ/kg) 18600	Ambient Temp(K): 308
Moisture Factor: 5	FDI: 100
<u>Program Outputs</u>	
Category of Attack: LOW	Peak Elevation of Receiver(m): 19.45
Level of Construction: BAL 12.5	Fire Intensity(kW/m): 87268
Radiant Heat(kW/m2): 6.68	Flame Angle (degrees): 56
Flame Length(m): 46.92	Maximum View Factor: 0.078
Rate Of Spread (km/h): 6.76	Inner Protection Area(m): 72
Transmissivity: 0.767	Outer Protection Area(m): 0

Note 6 – A performance-based assessment using Appendix B of AS3959 was undertaken to determine the radiant heat exposure based on “re-established” tall heath vegetation (reduced flame width of 10m and 100m) on a downslope of upslope of 13.5°. The results of the assessment, provided below, were prepared using the bushfire attack assessor (BFAA) developed by *Newcastle Bushfire Consulting*.

Run Description: A South-east	
<u>Vegetation Information</u>	
Vegetation Type: Scrub/Tall Heath	Vegetation Group: Shrub & Heath
Vegetation Slope: 13.5 Degrees	Vegetation Slope Type: Downslope
Surface Fuel Load(t/ha): 25	Overall Fuel Load(t/ha): 25
<u>Site Information</u>	
Site Slope 0 Degrees	Site Slope Type: Level
Elevation of Receiver(m) Default	APZ/Separation(m): 27
<u>Fire Inputs</u>	
Veg./Flame Width(m): 10	Flame Temp(K) 1200
<u>Calculation Parameters</u>	
Flame Emissivity: 95	Relative Humidity(%): 25
Heat of Combustion(kJ/kg) 18600	Ambient Temp(K): 308
Moisture Factor: 5	FDI: 100
<u>Program Outputs</u>	
Category of Attack: LOW	Peak Elevation of Receiver(m): 7.31
Level of Construction: BAL 12.5	Fire Intensity(kW/m): 136602
Radiant Heat(kW/m2): 8.17	Flame Angle (degrees): 55
Flame Length(m): 17.85	Maximum View Factor: 0.088
Rate Of Spread (km/h): 10.58	Inner Protection Area(m): 27
Transmissivity: 0.834	Outer Protection Area(m): 0

Run Description: A South-east (100m flame width)	
Vegetation Information	
Vegetation Type: Scrub/Tall Heath	Vegetation Group: Shrub & Heath
Vegetation Slope: 13.5 Degrees	Vegetation Slope Type: Downslope
Surface Fuel Load(t/ha): 25	Overall Fuel Load(t/ha): 25
Site Information	
Site Slope: 0 Degrees	Site Slope Type: Downslope
Elevation of Receiver(m): Default	APZ/Separation(m): 64
Fire Inputs	
Veg./Flame Width(m): 100	Flame Temp(K): 1200
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: LOW	Peak Elevation of Receiver(m): 8.73
Level of Construction: BAL 12.5	Fire Intensity(kW/m): 136602
Radiant Heat(kW/m2): 8.79	Flame Angle (degrees): 78
Flame Length(m): 17.85	Maximum View Factor: 0.103
Rate Of Spread (km/h): 10.58	Inner Protection Area(m): 64
Transmissivity: 0.763	Outer Protection Area(m): 0



Referral Responses

A3

All communications to be addressed to:

Headquarters
15 Carter Street
Lidcombe NSW 2141

Headquarters
Locked Bag 17
Granville NSW 2142

Telephone: 1300 NSW RFS
e-mail: records@rfs.nsw.gov.au

Facsimile: 8741 5433



The General Manager
Northern Beaches Council
PO Box 882
MONA VALE NSW 1660

Your Ref: DA2018/1654
Our Ref: D18/7763
DA18102215674 GB

ATTENTION: Luke Perry

30 November 2018

Dear Mr Perry

Integrated Development Application - 3//805710 - 181 Forest Way Belrose 2085

I refer to your correspondence dated 22 October 2018 seeking general terms of approval for the above Integrated Development Application.

The New South Wales Rural Fire Service (NSW RFS) has considered the information submitted. General Terms of Approval, under Division 4.8 of the 'Environmental Planning and Assessment Act 1979', and a Bush Fire Safety Authority, under Section 100B of the 'Rural Fires Act 1997', are now issued subject to the following conditions:

Asset Protection Zones

The intent of measures is to provide sufficient space for fire fighters and other emergency services personnel, ensuring radiant heat levels permit operations under critical conditions of radiant heat, smoke and embers, while supporting or evacuating occupants. To achieve this, the following conditions shall apply:

1. At the commencement of building works and in perpetuity the entire property shall be managed as an inner protection area (IPA) as outlined within section 4.2.7 and Appendix 5 of 'Planning for Bush Fire Protection 2006' and the NSW Rural Fire Service's document 'Standards for asset protection zones'.

The 100 metre APZ to the east of the building may be managed as 70 metre IPA and 30 metre outer protection area (OPA).

Water and Utilities

The intent of measures is to provide adequate services of water for the protection of buildings during and after the passage of a bush fire, and to locate gas and electricity so as not to contribute to the risk of fire to a building. To achieve this, the following conditions shall apply:

2. The provision of water, electricity and gas supplies shall comply with sections 4.1.3 and 4.2.7 of 'Planning for Bush Fire Protection 2006'.

Access

The intent of measures for fire trails is to provide suitable access for fire management purposes and maintenance of APZs. To achieve this, the following conditions shall apply:

3. The proposed maintenance & fire egress path along the southern boundary and eastern elevation of the building shall comply with section 4.1.3 (3) of 'Planning for Bush Fire Protection 2006'.
4. Access along the Crown Road Reserve to the point of entry into the site on the northern boundary shall comply with section 4.1.3 (3) of 'Planning for Bush Fire Protection 2006'.
5. The proposed turning areas for emergency vehicles located on the northern & eastern elevations of the building shall be suitably designed to enable a MRV – Category 1 Tanker to turn around.

Evacuation and Emergency Management

The intent of measures is to provide suitable emergency and evacuation (and relocation) arrangements for occupants of special fire protection purpose developments. To achieve this, the following conditions shall apply:

6. A Bush Fire Emergency Management and Evacuation Plan shall be prepared consistent with 'Development Planning - A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan December 2014' and Australian Standard AS3745 2010 'Planning for Emergencies in Facilities'.

Design and Construction

The intent of measures is that buildings are designed and constructed to withstand the potential impacts of bush fire attack. To achieve this, the following conditions shall apply:

7. The proposed building shall comply with Sections 3 and 5 (BAL 12.5) Australian Standard AS3959-2009 'Construction of buildings in bush fire-prone areas' or NASH Standard (1.7.14 updated) 'National Standard Steel Framed Construction in Bushfire Areas – 2014' as appropriate and section A3.7 Addendum Appendix 3 of 'Planning for Bush Fire Protection 2006'.
8. A minimum 2.2 metre high radiant heat shield made of non-combustible materials shall be constructed along the northern property boundary for a distance of 120 metres. All posts and rails shall be constructed of non-combustible materials. The bottom of the fence is to be in direct contact with the finished ground level or plinth.

Landscaping

9. Landscaping of the site shall comply with the principles of Appendix 5 of 'Planning for Bush Fire Protection 2006'.

Should you wish to discuss this matter please contact Garth Bladwell on 1300 NSW RFS.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Nika Fomin', written in a cursive style.

Nika Fomin
Manager, Planning and Environment Services East

For general information on bush fire protection please visit www.rfs.nsw.gov.au