



BUSHFIRE CONSULTANCY AUSTRALIA

www.bushconaustralia.com.au - Email-info@bushconaustralia.com.au

PO Box 363 Balgowlah, NSW, 2093

Bush Fire Assessment Report

In relation to a proposed development at:

15 Manly Road, Seaforth, NSW

<i>Report No:</i> 15Man-01	<i>Date:</i> 20.12.2024	<i>Author:</i> Matthew Toghill- Bushfire Consultant Grad Cert in Bushfire Protection, UWS 2012 Certificate IV Building and Construction Certificate III in Public Safety (firefighting and emergency operations)
-------------------------------	----------------------------	--

Contents

Executive Summary	3
1. Description of the subject property.....	4
2. Development Proposal and Building Classification	5
3. Classification of the Vegetation on and surrounding the site	6
4. Assessment of effective slope	7
5. Access and Egress	8
6. Adequacy of water supply.....	8
7. Features that may mitigate the impact of a high intensity bushfire.....	8
8. Environmental impact of any proposed bushfire protection measures.....	8
9. Bushfire Risk Assessment.....	9
9.1 Alterations and additions.....	9
9.2 Pool.....	10
9.3 Fences and gates	10
9.4 Retaining walls	10
9.5 Landscaping.....	10
10. Assessment of the extent to which the development can conform to the Aim and Objectives of ‘Planning for Bush Fire Protection 2019’ (PBP).	11
11. The extent to which the construction conforms or deviates from Chapter 7 of ‘Planning for Bushfire Protection 2019’.....	12
12. Recommendations.....	13
13. Summary	14
14. References.....	15
Appendix 1: Method 2 AS3959-2018 calculations	16
Appendix 2: Performance criteria and acceptable solutions as per Table 7 <i>Planning for bushfire Protection 2019</i>	19
Appendix 3: 7.5.2 NSW State Variations under G5.2(a)(i) and 3.10.5.0(c)(i) of the NCC	20
Appendix 4: Asset Protection Zones (APZ’s)	21
Appendix 5: Northern Beaches Council Bushfire Assessment Certificate.	23
Abbreviations and definitions.....	24

Executive Summary

The purpose of the report is to determine the category of bushfire attack and subsequent construction standard for the proposed alterations and additions to the existing dwelling at No. 15 Manly Road, Seaforth, NSW.

The site had been identified as 'bush fire prone land' for the purpose of Section 146 of the *Environmental Planning and Assessment Act 1979* and the Legislative requirements for building on bush fire prone lands are applicable.

The proposed development is in infill development as defined within Chapter 7 of *Planning for Bushfire Protection 2019* and this report has been prepared in accordance with the requirements of Section 4.14 of the *Environmental Planning and Assessment Act*.

This assessment includes an analysis of the hazard, threat and subsequent risk of the development proposal and provides recommendations that satisfy the Objective and Performance requirements of the Building Code of Australia, *Planning for Bushfire Protection 2019 [PBP]* and Australian Standard AS3959, 2018.

Following a site assessment, it was determined the distance of the development from the closest hazard would keep the Bushfire Attack Level (BAL) to BAL-29, in accordance with the methodology described in PBP and AS3959-2018 and Short Fire Run modelling. The development also meets performance criteria as set out in chapter 7 of PBP in relation to APZ's, siting and design, construction standards, access and egress requirements, water and utility services and landscaping.

1. Description of the subject property

Property address: No. 15 Manly Road, Seaforth

Lot 8/-/DP19832

Local Government Area: Northern Beaches

Land Zoning: R2: Low density residential



Figure 1: Location of the subject site

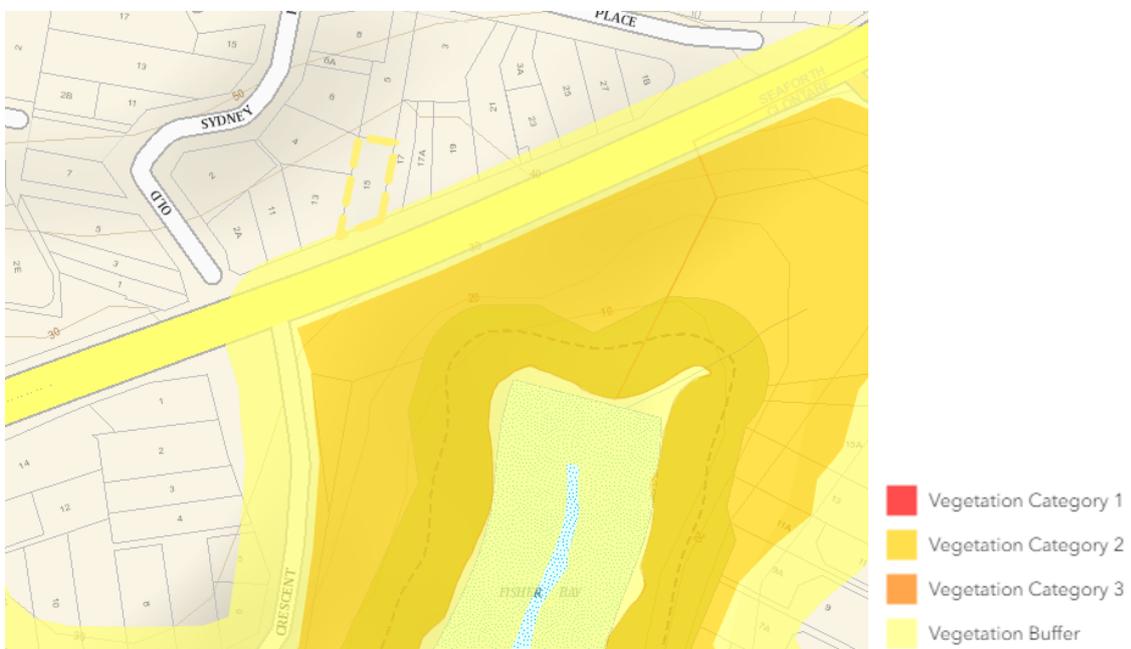


Figure 2: Bushfire prone land map showing the location of the subject site.

2. Development Proposal and Building Classification

The development proposal is for the alterations and additions to the existing dwelling.

Architectural plans provided by:

Peter Zavaglia Design Studio

Dated: 26.11.2024 (Rev A)

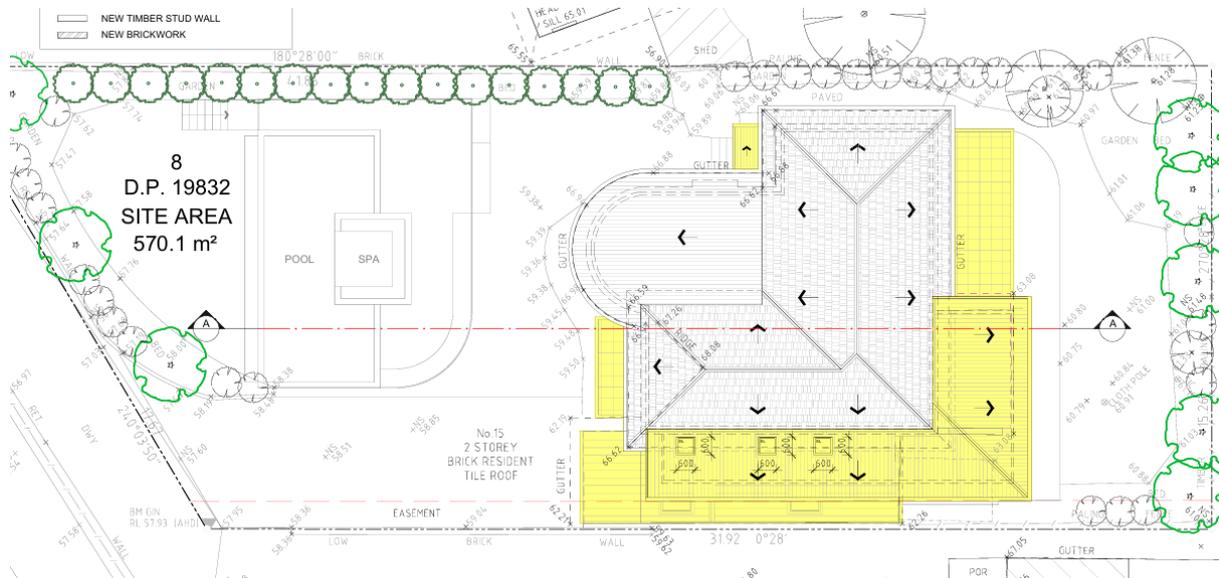


Figure 3: Site plan

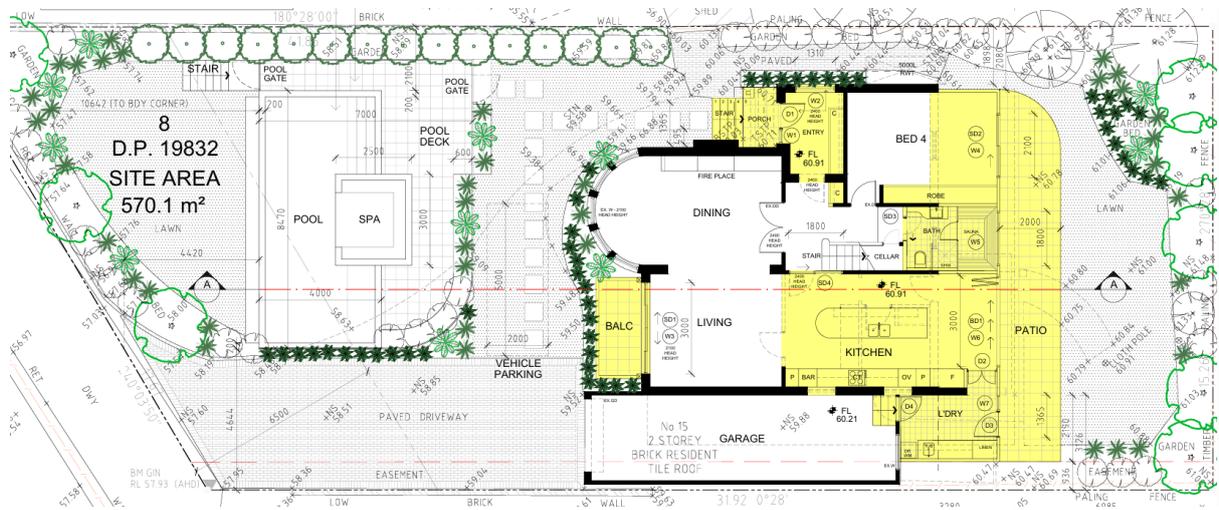


Figure 4: Ground floor plan

3. Classification of the Vegetation on and surrounding the site

For the purpose of a Bush Fire Risk Assessment, vegetation within 140m of the development is assessed and classified. In this instance, the most significant threat from bushfire comes from the area of Category 2 vegetation to the south of the site which is the most significant threat from bushfire. The vegetation formation within this area consists of Sydney Coastal Dry Sclerophyll Forest (Refer to Figure 5).



Figure 4: Aerial photo showing vegetation within 140m of the development.



Figure 5: Vegetation formations surrounding the subject site (Source: NSW Government Central Resource for Sharing and Enabling Environmental Data).

4. Assessment of effective slope

The effective slope is the slope of the land under the classified vegetation. It has a direct influence on the rate of spread, intensity and ultimate level of radiant heat flux of a fire. The effective slope is the slope of the ground under the hazard (vegetation), not the slope between the vegetation and the building.



Legend:  Direction of effective slope

Figure 6: Contour map showing direction of effective slope.

Transect Line	Effective slope
T1	34m fall over 100m= 19 degree downslope
T2	34m fall over 50m= 34 degree downslope <i>Note: The slope cap for the modelling is 30 degrees)</i>
T3	34m fall over 100m= 19 degree downslope

5. Access and Egress

The site has direct access to Manly Road, which is a public road, access and egress for emergency vehicles appears adequate. *Planning for Bushfire Protection 2019* requires no specific access requirements in an urban area where a 70m, unobstructed path can be demonstrated between the most distant external part of the dwelling and the nearest part of the public access road (where the speed limit is not greater 70kph) that supports operational use of emergency firefighter vehicles. As such, there are no formal property access requirements.

6. Adequacy of water supply

The site is serviced by reticulated water supply with street hydrants located at regular interval along surrounding residential streets. No additional water supply will be recommended.

7. Features that may mitigate the impact of a high intensity bushfire

There are no significant features on or adjoining the site that may mitigate the impact of a high intensity bushfire on the proposed development.

8. Environmental impact of any proposed bushfire protection measures.

The scope of this assessment has not been to provide an environmental assessment. However, the bushfire protection measures that are proposed will have no adverse environmental effects. All protection measures are either within the boundaries of the allotment or part of the constructed building.

9. Bushfire Risk Assessment

9.1 Alterations and additions

This assessment will employ the use of Short Fire Run (SFR) modelling based on Method 2 AS3959-2018 to determine the radiant heat exposure for the dwelling. As this is a Performance-based method, referral to the NSW Rural Fire Service is required for their review prior to approval.



Figure 9: Aerial photo showing distance to surrounding vegetation and length of fire run used for Method 2 calculations.

Table 1; Determination of the category of bushfire attack for the site, and subsequent required building standards (Reference; Method 2 AS3959-2018).

Note: Refer to Appendix 2 for full Method 2 calculations

Transect	Distance to classified vegetation	Vegetation Classification	Assessment of effective slope	Fire Run (m)	FDI	Radiant heat exposure
T1	40.00m	Sydney Coastal DSF	Downslope 19 degrees	120m	100	17.53Kw/m2 (BAL-19)
T2	40.00m	Sydney Coastal DSF	Downslope 30 degrees	50m	100	28.54Kw/m2 (BAL-29)
T3	40.00m	Sydney Coastal DSF	Downslope 19 degrees	120m	100	17.53Kw/m2 (BAL-19)

9.2 Pool

For the purpose of this assessment the pool is considered a Class 10 structure. With reference to *Planning for Bush Fire Protection 2019* Section 8.3.2, Class 10 structures that are located within 6m of a dwelling must be constructed in accordance with the NCC. Under the Deemed to Satisfy provisions of the NCC, building work on Bush Fire Prone Land must comply with AS 3959-2018 or the NASH Standard.

9.3 Fences and gates

With reference to *Planning for Bush Fire Protection 2019* Section 7.6, 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 or in areas of BAL-29 or greater, they should be made of non-combustible material only.

9.4 Retaining walls

For the purpose of this assessment the retaining walls are considered a Class 10b structure. With reference to *Planning for Bush Fire Protection 2019* Section 8.3.2, Class 10a and 10b structures that are located within 6m of a dwelling must be constructed in accordance with the NCC. All new retaining walls should be constructed of masonry or other non-combustible material.

9.5 Landscaping

All new landscaping should be designed in accordance with Appendix 4 of *Planning for Bushfire Protection 2019* which outlines the requirements for Asset Protection Zones (APZ's), refer to Appendix 3 of this report.

10. Assessment of the extent to which the development can conform to the Aim and Objectives of 'Planning for Bush Fire Protection 2019' (PBP).

Aim	Meets Criteria	Comment
The aim of PBP is to provide for the protection of human life and minimise the impacts on property from the threat of bushfire, while having due regard to development potential, site characteristics and the protection of the environment.	Yes	This threat assessment has determined that the category of bushfire attack for the proposal is BAL-29 and not within the Flame Zone. Construction standards BAL-29 have been recommended. Landscaping, defensible space, access and egress, emergency risk management and construction standards are all in accordance with the requirements of PBP 2019 and the aim has been achieved.
Objectives	Meets Criteria	Comment
Afford building and their occupants protection from exposure to bushfire.	Yes	This threat assessment has determined that the category of bushfire attack for the proposal is BAL-29 and not within the Flame Zone. Construction standards BAL-29 have been recommended.
Provide for a defensible space to be located around buildings	Yes	Defensible space can be provided on all sides of the buildings.
Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to other buildings	Yes	Appropriate separation can be provided by a combination of onsite APZ and adjoining developed sites and public roads.
Ensure that appropriate operational access and egress for emergency services personnel and occupants is available.	Yes	This site has direct access to public roads, and the access and egress for emergency vehicles and evacuation appears to be adequate.
Provide for ongoing management and maintenance of BPM's	Yes	All BPM's are provided within the subject site or adjoining managed residential properties and public roads. BPM's can be managed and maintained by the occupants.
Ensure that utility services area adequate to meet the needs of firefighters	Yes	Utility services can be provided in accordance with Table 7.4a of PBP

11. The extent to which the construction conforms or deviates from Chapter 7 of 'Planning for Bushfire Protection 2019'.

Performance Criteria	How this development meets acceptable solutions
The intent may be achieved where:	
<u>In relation to APZ's:</u> -Defendable space is provided onsite. -An APZ is provided and maintained for the life of the building.	Defendable space is provided on all sides of the building. Asset protection zones are provided for on-site and by adjoining development and public roads.
<u>In relation to construction standards:</u> It is demonstrated that the proposed building can withstand bushfire attack in the form of wind, smoke, embers, radiant heat and flame contact.	Construction standards have been recommended in accordance with the requirements of <i>Planning for Bushfire Protection 2019</i> and <i>AS 3959-2018 Construction of buildings in bushfire prone areas</i> .
<u>In relation to access requirements:</u> Safe operational access is provided [and maintained] for emergency service personnel in suppressing a bushfire while residents are seeking to relocate, in advance of a bushfire.	This site has direct access to public roads, and the access and egress for emergency vehicles and evacuation appears to be adequate.
<u>In relation to water and utility services:</u> -Adequate water and electrical services are provided for fire fighting operations.	The area has reticulated water supply with hydrants spaced at a regular distance along surrounding residential streets.
<u>In relation to landscaping:</u> It is designed and managed to minimise flame contact and radiant heat to buildings, and the potential for wind driven embers to cause ignition.	All new landscaping should Appendix 4 of <i>Planning for Bushfire Protection 2019</i> which outlines the requirements for landscaping and property maintenance.
<u>In relation to emergency and evacuation planning</u>	It is advised the residents should complete a <i>Bushfire Survival Plan</i> as formulated by the NSW Rural Fire Service and Fire and Rescue NSW.

12. Recommendations

The following recommendations are made for the bushfire protection measures for the proposed new alterations and additions to the existing dwelling at No. No. 15 Manly Street, Seaforth, NSW and are based upon the relevant provisions of the NSW RFS guideline entitled *Planning for Bushfire Protection 2019*.

1) <u>Construction standard.</u> <i>North elevation</i>	All new construction shall comply with a minimum standard of section 3 [construction general] and section 6 (BAL-19), AS 3959-2018 and Chapter 7 of <i>Planning for Bushfire Protection 2019</i> .
2) <u>Construction standard.</u> <i>Roof, east, south and west elevations</i>	All new construction shall comply with a minimum standard of section 3 [construction general] and section 7 (BAL-29), AS 3959-2018 and Chapter 7 of <i>Planning for Bushfire Protection 2019</i> .
3) <u>Asset Protection Zones</u>	-At the commencement of building works and in perpetuity the entire site shall be established and maintained in accordance with the APZ requirements of Appendix 4 of PBP 2019. -All new landscaping should be designed in accordance with the Asset protection Zone principles of Appendix 4 of PBP 2019.
4) <u>Emergency Risk Management</u>	It is advised the residents should complete a <i>Bushfire Survival Plan</i> as formulated by the NSW Rural Fire Service and Fire and Rescue NSW. An emergency evacuation is not recommended as a condition of consent.
5) <u>Adjacent Structures [class 10a & 10b]</u>	Where Class 10a & 10b structures are within 6m from a dwelling in bush fire prone areas it must be built in accordance with the NCC.
6) <u>Water supplies</u>	Reticulated water supply is located on the adjoining road at regular intervals and is easily accessible. No additional water supplies have been recommended.
7) <u>Fences and gates</u>	All fences in bush fire prone areas should be made from either hardwood or non-combustible material. However, in circumstances where the fence connects directly to the dwelling, or in areas of BAL-29 or greater, they should be made of non-combustible material.
8) <u>Electrical services</u>	Where practicable, electrical transmission lines are underground.
9) <u>Gas supply</u>	-Reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:2014 and the requirements of relevant authorities, and metal piping is used. -All fixed gas cylinders are kept clear of all flammable materials to a distance of 10m and shielded on the hazard size. -Connections to and from gas cylinders are metal. -polymer-sheathed flexible gas supply lines are not used. -above-ground gas service pipes are metal, including and up to any outlets.

13. Summary

This report consists of a bushfire risk assessment for the proposed alterations and additions to the existing dwelling at No. 15 Manly Street, Seaforth, NSW.

The report concludes that the proposed development is on designated bushfire prone land and the legislative requirements for development of bushfire prone areas are applicable. The proposed development will be constructed to the minimum standard required in accordance with the guidelines of *Planning for Bushfire Protection 2019* and *AS 3959-2018 Construction of buildings in bushfire prone areas*.

This report has considered all of the elements of bushfire attack and provided the proposed development is constructed in accordance with the recommendations of Section 13 of this report, it is my considered opinion that the development satisfies the Objectives and Performance requirements of the *Building Code of Australia, Planning for bushfire Protection 2019 and Australian Standard AS3959, 2018*. However, as this assessment relies on Short Fire Run (SFR) Modelling to determine the BAL, referral to the NSW RFS is required.

Note: Not with standing the precautions adopted, it should always be remembered that bushfires burn under a wide range of conditions and an element of risk, no matter how small always remains, and although the standard is designed to improve the performance of such buildings, there can be no guarantee, because of the variable nature of bushfires, that any one building will withstand a bushfire attack on every occasion. This report is a Bushfire Hazard Assessment that provides the required information to assist Local Councils and the Rural fire Service in determining compliance in accordance with Planning for Bushfire Protection 2019 and AS3959, 2018. The local Council is the final consenting authority and the construction of the building must comply with the recommendations included in the council's conditions of consent



Matthew Toghill- Bushfire Consultant
Grad Cert in Bushfire Protection, UWS 2012
Certificate IV Building and Construction
Certificate III in Public Safety (firefighting and emergency operations)

14. References

Australian Building Codes Board

Building Code of Australia

Volume 1 & 2

Canprint

Australian Building Codes Board [2001]

Fire Safety Engineering Guidelines

Edition 2001

ABCB Canberra

D. Drysdale D. [1998]

Introduction to Fire Dynamics 2nd Edition

John Wiley & Sons Ltd

NSW Government Environmental Planning and Assessment Act [1979]

Part 79BA-Consultation and development consent- Certain bushfire prone land

NSW Government Printer

Planning for Bushfire Protection 2019

A guide for Councils, Planners, Fire Authorities and Developers

This document provides the necessary planning considerations when developing areas for residential use in residential, rural residential, rural and urban areas when development sites are in close proximity to areas likely to be affected by bushfire events and replaces Planning for Bushfire Protection 2006.

[This document is essential reading. Download a copy from the RFS website or purchase a copy through the NSW Government online shop or phone 9228 6333.](#)

Ramsay C & Rudolph L [2003]

Landscape and building design for bushfire prone areas

CSIRO Publishing

Standards Australia [2018]

Australian Standards 3959

Australian Building Code Board

Appendix 1: Method 2 AS3959-2018 calculations



NBC Bushfire Attack Assessment Report V4.1

AS3959 (2018) Appendix B - Detailed Method 2

Print Date: 20/12/2024

Assessment Date: 20/12/2024

Site Street Address: 15 Manly Street (T1), Seaforth
Assessor: Matthew Toghil; Bushcon Australia Pty Ltd
Local Government Area: Northern Beaches **Alpine Area:** No

Equations Used

Transmissivity: Fuss and Hammins, 2002
 Flame Length: RFS PBP, 2001/Vesta/Catchpole
 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: T1

Vegetation Information

Vegetation Type: North Coast DSF
Vegetation Group: Dry Sclerophyll Forests (Shrubby)
Vegetation Slope: 19 Degrees **Vegetation Slope Type:** Downslope
Surface Fuel Load(t/ha): 21.3 **Overall Fuel Load(t/ha):** 28.44
Vegetation Height(m): 1.4 **Only Applicable to Shrub/Scrub and Vesta**

Site Information

Site Slope: 6 Degrees **Site Slope Type:** Down slope
Elevation of Receiver(m): Default **APZ/Separation(m):** 40

Fire Inputs

Veg./Flame Width(m): 43.92 **Flame Temp(K):** 1090

Calculation Parameters

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

Program Outputs

Level of Construction: BAL 19 **Peak Elevation of Receiver(m):** 10.5
Radiant Heat(kW/m2): 17.53 **Flame Angle (degrees):** 56
Flame Length(m): 35.48 **Maximum View Factor:** 0.286
Rate Of Spread (km/h): 9.48 **Inner Protection Area(m):** 40
Transmissivity: 0.805 **Outer Protection Area(m):** 0
Fire Intensity(kW/m): 139335



NBC Bushfire Attack Assessment Report V4.1

AS3959 (2018) Appendix B - Detailed Method 2

Print Date: 20/12/2024

Assessment Date: 20/12/2024

Site Street Address: 15 Manly Street (T2), Seaforth
Assessor: Matthew Toghil; Bushcon Australia Pty Ltd
Local Government Area: Northern Beaches Alpine Area: No

Equations Used

Transmissivity: Fuss and Hammins, 2002
Flame Length: RFS PBP, 2001/Vesta/Catchpole
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: T2

Vegetation Information

Vegetation Type: Sydney Coastal DSF
Vegetation Group: Dry Sclerophyll Forests (Shrubby)
Vegetation Slope: 30 Degrees Vegetation Slope Type: Downslope
Surface Fuel Load(t/ha): 21.3 Overall Fuel Load(t/ha): 27.3
Vegetation Height(m): 1.4 Only Applicable to Shrub/Scrub and Vesta

Site Information

Site Slope: 6 Degrees Site Slope Type: Downslope
Elevation of Receiver(m): Default APZ/Separation(m): 40

Fire Inputs

Veg./Flame Width(m): 18.3 Flame Temp(K): 1090

Calculation Parameters

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

Program Outputs

Level of Construction: BAL FZ Peak Elevation of Receiver(m): 10.21
Radiant Heat(kW/m²): 28.54 Flame Angle (degrees): 28
Flame Length(m): 61.42 Maximum View Factor: 0.44
Rate Of Spread (km/h): 20.26 Inner Protection Area(m): 40
Transmissivity: 0.854 Outer Protection Area(m): 0
Fire Intensity(kW/m): 285709



NBC Bushfire Attack Assessment Report V4.1

AS3959 (2018) Appendix B - Detailed Method 2

Print Date: 20/12/2024

Assessment Date: 20/12/2024

Site Street Address: 15 Manly Street (T3), Seaforth

Assessor: Matthew T oghill; Bushcon Australia Pty Ltd

Local Government Area: Northern Beaches

Alpine Area:

No

Equations Used

Transmissivity: Fuss and Hammins, 2002

Flame Length: RFS PBP, 2001/Vesta/Catchpole

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: T3

Vegetation Information

Vegetation Type: Sydney Coastal DSF

Vegetation Group: Dry Sclerophyll Forests (Shrubby)

Vegetation Slope: 19 Degrees

Vegetation Slope Type: Downslope

Surface Fuel Load(t/ha): 21.3

Overall Fuel Load(t/ha): 27.3

Vegetation Height(m): 1.4

Only Applicable to Shrub/Scrub and Vesta

Site Information

Site Slope: 6 Degrees

Site Slope Type: Downslope

Elevation of Receiver(m): Default

APZ/Separation(m): 40

Fire Inputs

Veg./Flame Width(m): 43.92

Flame Temp(K): 1090

Calculation Parameters

Flame Emissivity: 95

Relative Humidity(%): 25

Heat of Combustion(kJ/kg): 18600

Ambient Temp(K): 308

Moisture Factor: 5

FDI: 100

Program Outputs

Level of Construction: BAL 19

Peak Elevation of Receiver(m): 10.5

Radiant Heat(kW/m²): 17.53

Flame Angle (degrees): 56

Flame Length(m): 35.48

Maximum View Factor: 0.286

Rate Of Spread (km/h): 9.48

Inner Protection Area(m): 40

Transmissivity: 0.805

Outer Protection Area(m): 0

Fire Intensity(kW/m): 133750

Appendix 2: Performance criteria and acceptable solutions as per Table 7 Planning for bushfire Protection 2019

	PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS		PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS
ACCESS	<p>The intent may be achieved where:</p> <ul style="list-style-type: none"> firefighting vehicles are provided with safe, all-weather access to structures and hazard vegetation. the capacity of access roads is adequate for firefighting vehicles. there is appropriate access to water supply. firefighting vehicles can access the dwelling and exit the property safely. 	<ul style="list-style-type: none"> property access roads are two-wheel drive, all-weather roads. 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. hydrants are provided in accordance with the relevant clauses of AS 2419.1:2005; <ul style="list-style-type: none"> There is suitable access for a Category 1 fire appliance to within 4m of the static water supply where no reticulated supply is available. at least one alternative property access road is provided for individual dwellings or groups of dwellings that are located more than 200 metres from a public through road; <ul style="list-style-type: none"> There are no specific access requirements in an urban area where an unobstructed path (no greater than 70m) is provided between the most distant external part of the proposed dwelling and the nearest part of the public access road (where the road speed limit is not greater than 70kph) that supports the operational use of emergency firefighting vehicles. <p>In circumstances where this cannot occur, the following requirements apply:</p> <ul style="list-style-type: none"> minimum 4m carriageway width; in forest, woodland and heath situations, rural property roads have passing bays every 200m that are 20m long by 2m wide, making a minimum trafficable width of 6m, at the passing bay; a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches; property access must provide a suitable turning area in accordance with Appendix 3; curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress; the minimum distance between inner and outer curves is 6m; the crossfall is not more than 10 degrees; maximum grades for sealed roads do not exceed 15 degrees and not more than 10 degrees for unsealed roads; and a development comprising more than three dwellings has formalised access by dedication of a road and not by right of way. <p>Note: Some short constrictions in the access may be accepted where they are not less than 3.5m wide, extend for no more than 30m and where the obstruction cannot be reasonably avoided or removed. The gradients applicable to public roads also apply to community style development property access roads in addition to the above.</p>	WATER SUPPLIES	<p>The intent may be achieved where:</p> <ul style="list-style-type: none"> an adequate water supply is provided for firefighting purposes. water supplies are located at regular intervals; and the water supply is accessible and reliable for firefighting operations. flows and pressure are appropriate. the integrity of the water supply is maintained. a static water supply is provided for firefighting purposes in areas where reticulated water is not available. 	<ul style="list-style-type: none"> reticulated water is to be provided to the development, where available; and a static water supply is provided where no reticulated water is available. fire hydrant spacing, design and sizing comply with the relevant clauses of AS 2419.1:2005; hydrants are not located within any road carriageway; and reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads. fire hydrant flows and pressures comply with the relevant clauses of AS 2419.1:2005. all above-ground water service pipes external to the building are metal, including and up to any taps. where no reticulated water supply is available, water for firefighting purposes is provided in accordance with Table 5.3d; <ul style="list-style-type: none"> a connection for firefighting purposes is located within the IPA or non-hazard side and away from the structure, 65mm Storz outlet with a ball valve is fitted to the outlet; ball valve and pipes are adequate for water flow and are metal; supply pipes from tank to ball valve have the same bore size to ensure flow volume; underground tanks have an access hole of 200mm to allow tankers to refill direct from the tank; a hardened ground surface for truck access is supplied within 4m; above-ground tanks are manufactured from concrete or metal; raised tanks have their stands constructed from non-combustible material or bush fire-resisting timber (see Appendix F of AS 3959); unobstructed access can be provided at all times; underground tanks are clearly marked; tanks on the hazard side of a building are provided with adequate shielding for the protection of firefighters; all exposed water pipes external to the building are metal, including any fittings; where pumps are provided, they are a minimum 5hp or 3kW petrol or diesel-powered pump, and are shielded against bush fire attack; any hose and reel for firefighting connected to the pump shall be 19mm internal diameter; and fire hose reels are constructed in accordance with AS/NZS 1221:1997, and installed in accordance with the relevant clauses of AS 2441:2005.
ASSET PROTECTION ZONES	<p>The intent may be achieved where:</p> <ul style="list-style-type: none"> APZs are provided commensurate with the construction of the building; and A defensible space is provided. APZs are managed and maintained to prevent the spread of a fire to the building. the APZ is provided in perpetuity. APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is minimised. Home-based child care: the building must not be exposed to radiant heat levels exceeding 29kW/m² (1090K). 	<ul style="list-style-type: none"> an APZ is provided in accordance with Table A1.12.2 or A1.12.3 in Appendix 1. APZs are managed in accordance with the requirements of Appendix 4 of PBP. APZs are wholly within the boundaries of the development site. APZ are located on lands with a slope less than 18 degrees. an APZ is provided in accordance with Table A1.12.2 or A1.12.3 in Appendix 1. 	ELECTRICITY SERVICES	<p>The intent may be achieved where:</p> <ul style="list-style-type: none"> location of electricity services limits the possibility of ignition of surrounding bush land or the fabric of buildings. 	<ul style="list-style-type: none"> where practicable, electrical transmission lines are underground; and where overhead, electrical transmission lines are proposed as follows: <ul style="list-style-type: none"> lines are installed with short pole spacing (30m), unless crossing gullies, gorges or riparian areas; and no part of a tree is closer to a power line than the distance set out in accordance with the specifications in <i>ISSC3 Guideline for Managing Vegetation Near Power Lines</i>.
	LANDSCAPING	<p>The intent may be achieved where:</p> <ul style="list-style-type: none"> landscaping is designed and managed to minimise flame contact and radiant heat to buildings, and the potential for wind-driven embers to cause ignitions. 		<ul style="list-style-type: none"> compliance with the NSW RFS 'Asset protection zone standards' (see Appendix 4); a clear area of low-cut lawn or pavement is maintained adjacent to the house; fencing is constructed in accordance with section 7.6; and trees and shrubs are located so that: <ul style="list-style-type: none"> the branches will not overhang the roof; the tree canopy is not continuous; and any proposed windbreak is located on the elevation from which fires are likely to approach. 	GAS SERVICES
EMERGENCY MANAGEMENT		<p>The intent may be achieved where:</p> <ul style="list-style-type: none"> Home-based child care: a bush fire emergency and evacuation management plan is prepared. 	<ul style="list-style-type: none"> a Bush Fire Emergency Management and Evacuation Plan is prepared by the operator consistent with the NSW RFS publication: <i>A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan</i>, and the AS 3745:2010. 	CONSTRUCTION STANDARDS	
	<p>The intent may be achieved where:</p> <ul style="list-style-type: none"> proposed fences and gates are designed to minimise the spread of bush fire. proposed Class 10a buildings are designed to minimise the spread of bush fire. Home-based child care: the proposed building can withstand bush fire attack in the form of wind, localised smoke, embers and expected levels of radiant heat. 	<ul style="list-style-type: none"> fencing and gates are constructed in accordance with section 7.6. Class 10a buildings are constructed in accordance with section 8.3.2. an APZ is provided in accordance with Table A1.12.2 or A1.12.3 in Appendix 1 of this document around the entire building or structure; and the existing dwelling is required to be upgraded to improve ember protection. This is to be achieved by enclosing or covering openings with a corrosion-resistant steel, bronze or aluminium mesh with a maximum aperture of 2mm. Where applicable this includes the openable portion of the windows, vents, weepholes and eaves, but does not include roof tile spaces. Weather strips, draught excluders or draught seals shall be installed at the base of side hung external doors as per AS 3959. The subfloor space must be enclosed. 			

Note: the above specifications and requirements apply in relation to residential infill developments but may be used to guide the application of BPMs for 'other' developments (see Chapter 8).

Appendix 3: 7.5.2 NSW State Variations under G5.2(a)(i) and 3.10.5.0(c)(i) of the NCC

Certain provisions of AS 3959 are varied in NSW based on the findings of the Victorian Bush Fires Royal Commission and bush fire industry research.

The following variations to AS 3959 apply in NSW for the purposes of NSW G5.2(a)(i) of Volume One and NSW 3.10.5.0(c)(i) of Volume Two of the NCC; clause 3.10 of AS 3959 is deleted and any sarking used for BAL-12.5, BAL-19, BAL-29 or BAL-40 shall:

- be non-combustible; or
- comply with AS/NZS 4200.1, be installed on the outside of the frame and have a flammability index of not more than 5 as determined by AS 1530.2; and
- clause 5.2 and 6.2 of AS 3959 is replaced by clause 7.2 of AS 3959, except that any wall enclosing the subfloor space need only comply with the wall requirements for the respective BAL; and
- clause 5.7 and 6.7 of AS 3959 is replaced by clause 7.7 of AS 3959, except that any wall enclosing the subfloor space need only comply with the wall requirements for the respective BAL; and
- fascias and bargeboards, in BAL-40, shall comply with:
 - clause 8.4.1(b) of AS 3959; or
 - clause 8.6.6 of AS 3959.

The interpretation of this variation is:

Enclosed subfloors: For subfloor supports there are no requirements for supporting posts, columns, stumps, stringers piers and poles for subfloor supports for BAL 12.5 and BAL 19 when the subfloor space is enclosed with a wall that complies with the determined BAL level for the site.

Unenclosed subfloors: For unenclosed subfloor supporting posts, columns, stumps, stringers piers and poles the requirements are upgraded from BAL 12.5 and BAL 19 to BAL 29 level.

Enclosed verandas: There are no requirements for supporting posts, columns, stumps, stringers piers and poles for verandas, decks, steps and landings when the subfloor space is enclosed with a wall that complies with the determined BAL level for the site.

Unenclosed verandas: The requirements for supporting posts, columns, stumps, stringers piers and poles for verandas, decks, steps, and landings are upgraded from BAL 19 and BAL 12.5 to BAL 29 level.

For unenclosed subfloors of the main building or verandas, decks, steps and landings for BAL 12.5, 19 and BAL29 supporting posts, columns, stumps, stringers piers and poles shall be:

1. A non-combustible material; or
2. A Bushfire resistant timber; or
3. A combination of 1 and 2

Acceptable timber species:

Black-butt, Turpentine, Silver Top Ash, Spotted Gum, Red Iron Bark, Kwila, Red River Gum

Sarking: To comply with the NSW State variation any sarking used for BAL 12.5 shall:

- Be Non-combustible; or
- Comply with AS/NZ 4200.1 be installed on the outside of the frame and have a flammability index of not more than 5 as determined by AS1530.2

Appendix 4: Asset Protection Zones (APZ's)

A4.1.1 Inner Protection Areas (IPAs)

The IPA is the area closest to the building and creates a fuel-managed area which can minimise the impact of direct flame contact and radiant heat on the development and act as a defensible space. Vegetation within the IPA should be kept to a minimum level. Litter fuels within the IPA should be kept below 1cm in height and be discontinuous.

In practical terms the IPA is typically the curtilage around the building, consisting of a mown lawn and well maintained gardens.

When establishing and maintaining an IPA the following requirements apply:

Trees

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

Shrubs

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

Grass

- 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.

A4.1.2 Outer Protection Areas (OPAs)

An OPA is located between the IPA and the unmanaged vegetation. It is an area where there is maintenance of the understorey and some separation in the canopy. The reduction of fuel in this area aims to decrease the intensity of an approaching fire and restricts the potential for fire spread from crowns; reducing the level of direct flame, radiant heat and ember attack on the IPA.

Because of the nature of an OPA, they are only applicable in forest vegetation.

When establishing and maintaining an OPA the following requirements apply:

Trees

- tree canopy cover should be less than 30%; and
- canopies should be separated by 2 to 5m.

Shrubs

- shrubs should not form a continuous canopy; and
- shrubs should form no more than 20% of ground cover.

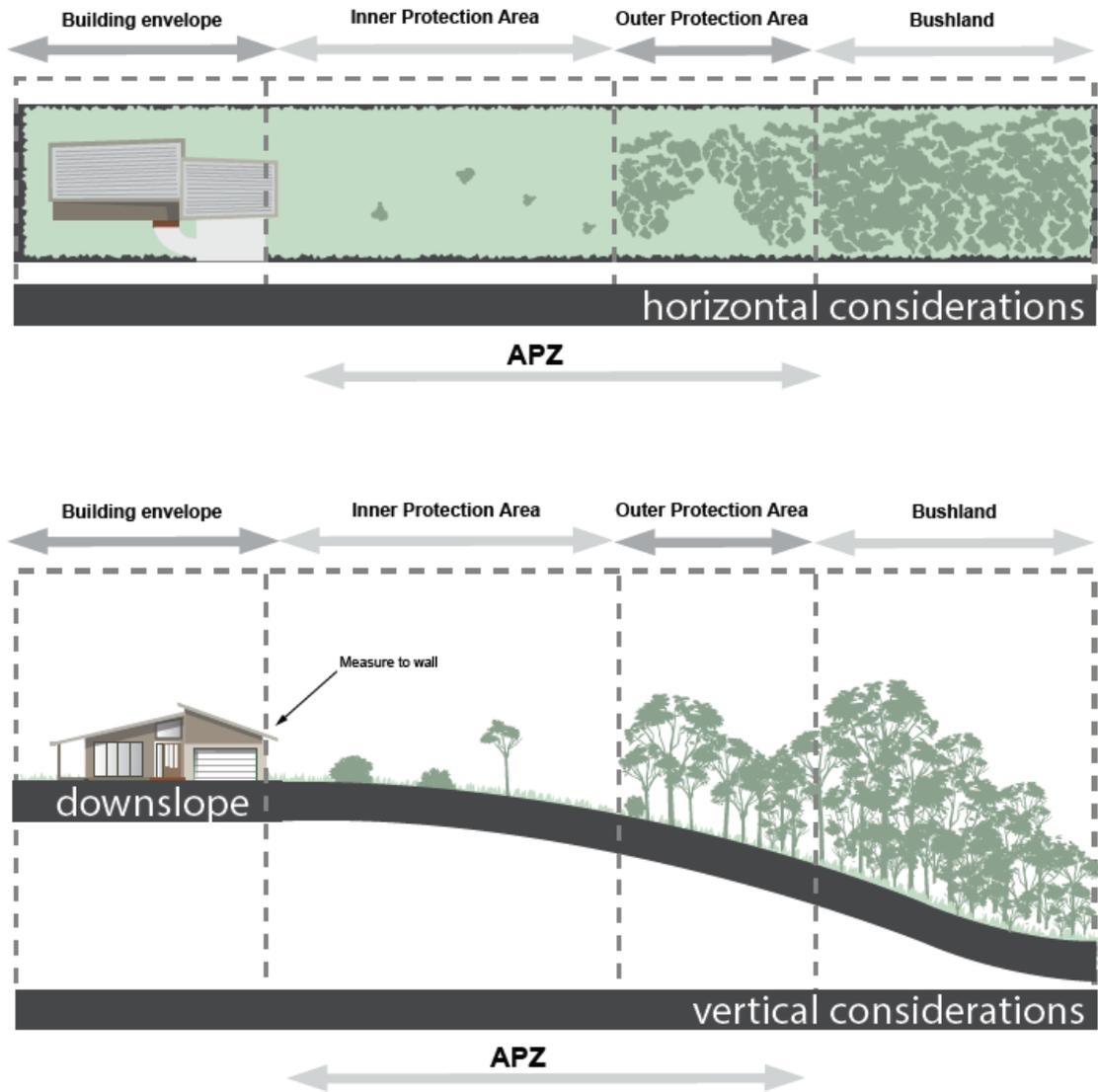
Grass

- grass should be kept mown to a height of less than 100mm; and
- leaf and other debris should be removed.

An APZ should be maintained in perpetuity to ensure ongoing protection from the impact of bush fires. Maintenance of the IPA and OPA as described above should be undertaken regularly, particularly in advance of the bush fire season.

Figure A4.1

Typical Inner and Outer Protection Areas.



Abbreviations and definitions

AS 3959	Australian Standard AS 3959:2018 <i>Construction of buildings in bush fire-prone areas</i>
AS 2419.1:2005	Australian Standard AS 2419.1:2005 <i>Fire hydrant installations System design, installation and commissioning</i>
AS 2441:2005	Australian Standard AS 2441:2005 <i>Planning for emergencies in facilities</i>
APZ	Asset Protection Zone
BAL	Bushfire Attack Level
BFPL	Bushfire prone land
BRPL Map	Bushfire prone land map
BPM's	Bushfire protection measures
BFSA	Bushfire safety authority
DA	Development application
DCP	Development Control Plan
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
FDI	Fire Danger index
FFDI	Forest Fire Danger Index
IPA	Inner Protection Area
kW/m ²	Kilowatts per metre squared
LGA	Local government area
NASH	Nation Association of Steel Framed Housing Steel Framed Construction in Bushfire Areas 2021
NCC	National Construction Code
OPA	Outer Protection Area
PBP	<i>Planning for Bush Fire protection 2019</i>
RF Act	<i>Rural Fires Act 1997</i>
RF Reg	<i>Rural Fires Regulation 2013</i>
NSW RFS	NSW Rural Fire Service
SEPP	State Environmental Planning Policy
SFPP	Special Fire protection Purpose
SFR	Short fire run

Asset Protection Zone: A fuel reduced area surrounding a built asset or structure which provides a buffer zone between a bush fire hazard and an asset. The APZ includes a defensible space within which firefighting operations can be carried out. The size of the required APZ varies with slope, vegetation and FFDI.

Bush Fire Attack level (BAL): A means of measuring the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact. IN the NCC, the BAL is used as the basis for establishing the requirements for construction to improve protection of building elements.

Bush fire: An unplanned fire burning in vegetation, also referred to as wildfire.

Bush fire prone land (BFPL): An area of land that can support a bush fire or is likely to be subject to bush fire attack, as designated on a bush fire prone land map.

Bush fire prone land map: A map prepared in accordance with the NSW RFS requirements and certified by the Commissioner of the NSW RFS under EP&A Act s.10.3(2).

Bush fire protection measures (BPMs): A range of measures used to minimise the risk from a bushfire that need to be complied with. BPM's include APZ's, construction provisions, suitable access, water and utility services, emergency management and landscaping.

Bush fire safety authority (BFSA): An approval by the commissioner of the NSW RFS that is required for a subdivision for residential or rural residential purpose or for a SFPP development listed under section 100B of the RF Act.

Consent authority: As identified in the EP&A Act, in relation to development consents, usually the local council.

Defendable space: An area adjoining a building that is managed to reduce combustible elements free from constructed impediments. It is a safe working environment in which efforts can be undertaken to defend the structure, before and after the passage of a bush fire.

Effective slope: The land beneath the vegetation which most significantly effects fire behaviour, having regard to the vegetation present.

Fire Danger Index (FDI): The chance of a fire starting, its rate of spread, its intensity and the difficulty potential for its suppression, according to various combinations of air temperature, relative humidity, wind speed and both the long- and short-term drought effects.

Inner protection Area (IPA): The component of a APZ which is closest to the asset (measured from unmanaged vegetation). It consists of an area maintained to minimal fuel loads so that a fire path is not created between the hazard and the building.

Managed land: Land that has vegetation removed or maintained to a level that limits the spread and impact of bush fire. This may include developed land (residential, commercial or industrial), roads, golf course fairways, playgrounds, sports fields, vineyards, orchards, cultivated ornamental gardens and commercial nurseries. Most common will be gardens and lawns within curtilage of buildings. These areas are managed to meet the requirements of an APZ.

Outer Protection Area (OPA): The outer component of an APZ, where fuel loads are maintained at a level where the intensity of an approaching bush fire would be significantly reduced. Applies to Forest vegetation only.

Special Fire Protection Purpose (SFPP) developments: Developments where the vulnerable nature of the occupants means that a lower radiant heat threshold needs to be accommodated for in order to allow for the evacuation of occupants and emergency services.

Vegetation classification: Vegetation types identified using the formations and classifications within *Ocean Shores to Desert Dunes: The Native Vegetation of New South Wales and ACT (Keith, 2004)*.