Travers

bushfire & ecology

bushfire protection assessment

Proposed redevelopment of
Katoomba Christian Convention (KCC)

Lot 5 DP 222736
119 Cliff Drive, Katoomba

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

February 2018
(Ref: A16026B)

Bushfire Protection Assessment

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119 Cliff Drive, Katoomba

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File:	A16026B

Disclaimer:

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

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EXECUTIVE SUMMARY

A bushfire protection assessment has been undertaken for the proposed redevelopment of the existing facilities with the Katoomba Christian Convention (KCC) located at 119 Cliff Drive, Katoomba.

The proposed works include the demolition and construction of a new auditorium (church), new bookshop, meeting rooms, reception, dining hall, café and new accommodation buildings.

The proposal will see a modest increase in bed numbers (i.e. currently 220 people) to 390 people as well as an increase in seat numbers which form part of the auditorium. It is worth noting that the approved 2011 DA (ref DA X/541/2010) allowed up to 3000 patrons per convention. The proposal allows for an additional 500 seats above this capacity.

Due to the existing nature of the development the proposed redevelopment (accommodation buildings) is categorised by the NSW Rural Fire Service (RFS) as being an infill special fire protection purpose (SFPP) development and as a result the proposal is to comply with the provisions of infill development as outlined in *Planning for Bush Fire Protection 2006 (PBP).* The key objective for infill developments is to achieve an improved bushfire protection outcome for the overall development than if the proposed redevelopment did not proceed.

This includes proposed buildings not being positioned any closer to the bushfire hazard than the existing buildings and to ensure all new buildings comply with the relevant construction standard applicable based on the level of radiant heat exposure.

Under the *Rural Fires Act 1997* the proposed redeveloped dining / administration building, auditorium (church) and meeting / breakout rooms are not identified as a SFPP development. However Clause 4.2.6 of PBP states that Class 9 assembly buildings should be considered as if they were an SFPP and the merits of the proposal assessed against the SFPP objectives.

This report has assessed the entire development as a SFPP, whilst taking into account the previous development (Integrated Development no; X/541/2010) which was approved by the NSW RFS on 16/7/2010 and determined by Blue Mountains Council on 13 December 2011. This approval included conditions such as BAL 29 (AS3959) construction for the bookstore and meeting / breakout rooms along with an increased use of the site for up to 3,000 people.

The assessment found that bushfire can potentially affect the proposed development from the existing forest vegetation located within the southern portion of the property as well as the forest and remnant forest external to the site and beyond the adjoining public roads to the north, south-east, south and west resulting in possible ember attack, radiant heat and potentially flame attack.

In this instance, it is considered that the proposal can comply with the specific objectives for SFPP infill development. The proposal, whilst increasing usage rates at certain times of the year, will provide an improved overall bushfire outcome in accordance with best practice bushfire guidelines as it will include a comprehensive suite of bushfire protection measures and is reliant of the adoption of a highly competent bushfire evacuation plan.

Improvements will include implementation of asset protection zones throughout the site and improved access for firefighting services as well as increased building construction standards beyond those recommended in AS3959 (2009). New buildings located greater than 100m from bushfire prone vegetation will be constructed to comply with BAL 12.5 with the reminder

of the BAL ratings determined using a flame temperature of 1200. An emergency evacuation plan will also be prepared which will ensure monitoring of fire conditions and liaison with the local NSW RFS when a conference overlaps during extreme or catastrophic fire danger days. The auditorium will also be constructed to BAL 40 standards with the implementation of a drencher system.

The assessment has concluded that the proposed development will allow for an overall improved bushfire protection outcome with the proposed additions being provided with the same or increased setbacks from bushfire prone vegetation.

However it is recommended that following the submission of the DA the project manager arrange a meeting with the local RFS at Katoomba. This will aid in discussions with the development control team at head office to convey the historic working relationship between RFS and KCC.

GLOSSARY OF TERMS

APZ	Asset protection zone
AS1596	*Australian Standard – The storage and handling of LP Gas*
AS2419	*Australian Standard – Fire hydrant installations*
AS3745	*Australian Standard – Planning for emergencies in facilities*
AS3959	*Australian Standard – Construction of buildings in bushfire-prone areas 2009*
BAL	*Bushfire attack level*
BCA	*Building Code of Australia*
BSA	Bushfire safety authority
EEC	Endangered ecological community
EP&A Act	*Environmental Planning & Assessment Act 1979*
FDI	Fire danger index
ha	Hectare
IPA	Inner protection area
m	Metres
OPA	Outer protection area
PBP	*Planning for Bush Fire Protection 2006*
RF Act	*Rural Fires Act 1997*
RFS	NSW Rural Fire Service
SFPP	Special fire protection purpose
TSC Act	*Threatened Species Conservation Act 1995*

TABLE OF CONTENTS

Introduction 1

Travers bushfire & ecology has been requested to undertake a bushfire protection assessment for the proposed redevelopment of the existing facilities with Katoomba Christian Convention (KCC).

The site is located on land mapped by Blue Mountains Council as being bushfire prone. This triggers a formal assessment by Council in respect of the NSW Rural Fire Service (RFS) policy of *Planning for Bush Fire Protection 2006 (PBP).*

1.1 Aims of the assessment

The aims of the bushfire protection assessment are to:

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

1.2 Project synopsis

History

A development application for additions to KCC, comprising meeting rooms, offices, dining hall, amenities, bookshop and parking was lodged and approved by Blue Mountains Council on 13 December 2011 (Council reference; Integrated development no; X/541/2010).

The NSW RFS issued a bushfire safety authority for that development on the 16th July 2010 with conditions in relation to asset protection zones, water & utilities, access, landscaping and evacuation / emergency management. Those conditions have been brought forward and included in this assessment.

This new 2018 DA maintains the approved bookstore and the seven (7) breakouts spaces / meeting rooms and reception (refer Figure 1.2). These buildings have not changed from previous approvals. The design and construction requirements outlined in the BSA (for these buildings) from the RFS state the following:

- Roofing shall be gutterless or guttering and valleys are to be screened to prevent the build-up of flammable material. Any materials used shall have a Flammability Index of no greater than 5 when tested in accordance with Australian Standard AS1530.2−1993 'Methods for Fire Tests on Building Materials, Components and Structures − Test for Flammability of Materials'.
- All new fencing shall be non−combustible.
- New construction shall comply with Australian Standard AS3959−2009 "Construction of buildings in bush fire−prone areas" BAL 29.
- There shall be no exposed timber on the proposed bookstore/meeting room.

- Non-combustible shutters are to be provided to the southern, eastern and western elevations of the proposed bookstore/meeting room.

This application seeks to maintain the above conditions for those buildings (noting that there are no windows proposed on the western elevations of meeting rooms (B1 – B3).

That DA approval included the use of the site for 3000 people for conventions (noting that this DA proposes an extension to the auditorium to accommodate a capacity increase to 3500).

Proposal subject to DA

KCC is proposing to redevelop the existing facilities within the southern portion of the site (south of Violet Street). The proposed works will be staged (refer Figure 1.3) and include:

- Demolition of the existing auditorium and construction of a new 3,500 seat auditorium to be used as a place of public worship.
- Demolition of the existing 200 seat dining hall and construction of a new dining hall with 500 seat capacity, kitchen; laundry, storage, reception and administration space;
- A new café fronting Violet Street.
- Demolition of the existing accommodation buildings and construction of new accommodation buildings including six eco lodges and three chalets to provide a total of 390 beds (a net increase of 170 beds); and
- New internal access roads and car parking area.
- A new bookshop building to replace the existing bookshop building (previously approved DA X/541/2010)
- Seven new breakout spaces/meeting rooms (previously approved DA X/541/2010)
- A new reception building with store rooms (previously approved DA X/541/2010).

The new auditorium, bookshop, breakout rooms and reception will be constructed around the existing plaza. The proposed development is seeking to provide modern facilities for the events held on the site. The principal use of the new auditorium will remain as a place of public worship. The bookshop will operate during KCC worship events and other Bible study and worship events.

The existing camping area will be retained and used for larger events (i.e. Easter), however during peak activities, may be used for overflow car parking.

The proposed works will be constructed in stages.

KCC currently hold seven worship events per year, some of which are held over concurrent weekends. The largest events are the Easter Convention which includes activities and events on the KCC site as well as events off-site at other facilities in the Blue Mountains and the KYCK youth events.

The Easter Convention (occurring outside of the bushfire season) will be able to cater for up to 3,500 event attendees in the auditorium. During these worship events, all the facilities on-site (i.e. accommodation, breakout spaces and seminar rooms) will be used by KCC.

The new facilities will provide the opportunity of holding all activities on-site, rather than using both on-site and off-site facilities as currently occurs.

The site is also used by other Christian organisations for worship and Bible study retreats including:

- Church Missionary Society (CMS);
- Scripture Union Family Missions;
- Wesley International Congregation;
- Moore Theological College; and
- Various Christian church groups.

The use of the facilities by these and similar groups will continue.

CMS hold one large event in January each year and utilise the facilities on site. During this time the KCC site manager and ground staff will be on site. Other uses are typically smaller groups. Outside of KCC events and activities, the accommodation on the site will continue to be available to schools and other not-for-profit groups for activities such as bush camps and adventure camps for short term stays, as currently occurs. Other minor ancillary uses of the site such as use by Ultra Trail and Scout groups will also continue.

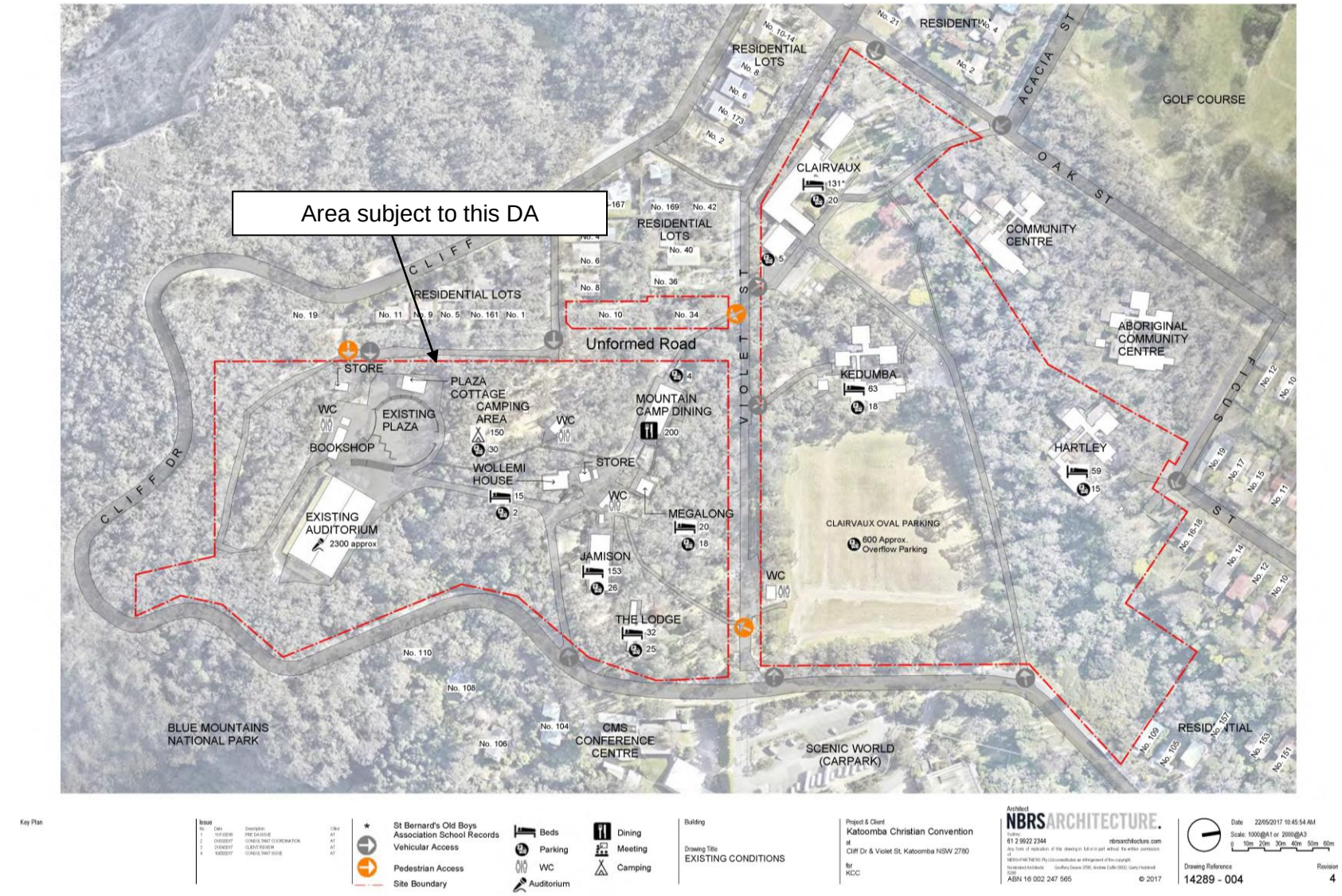
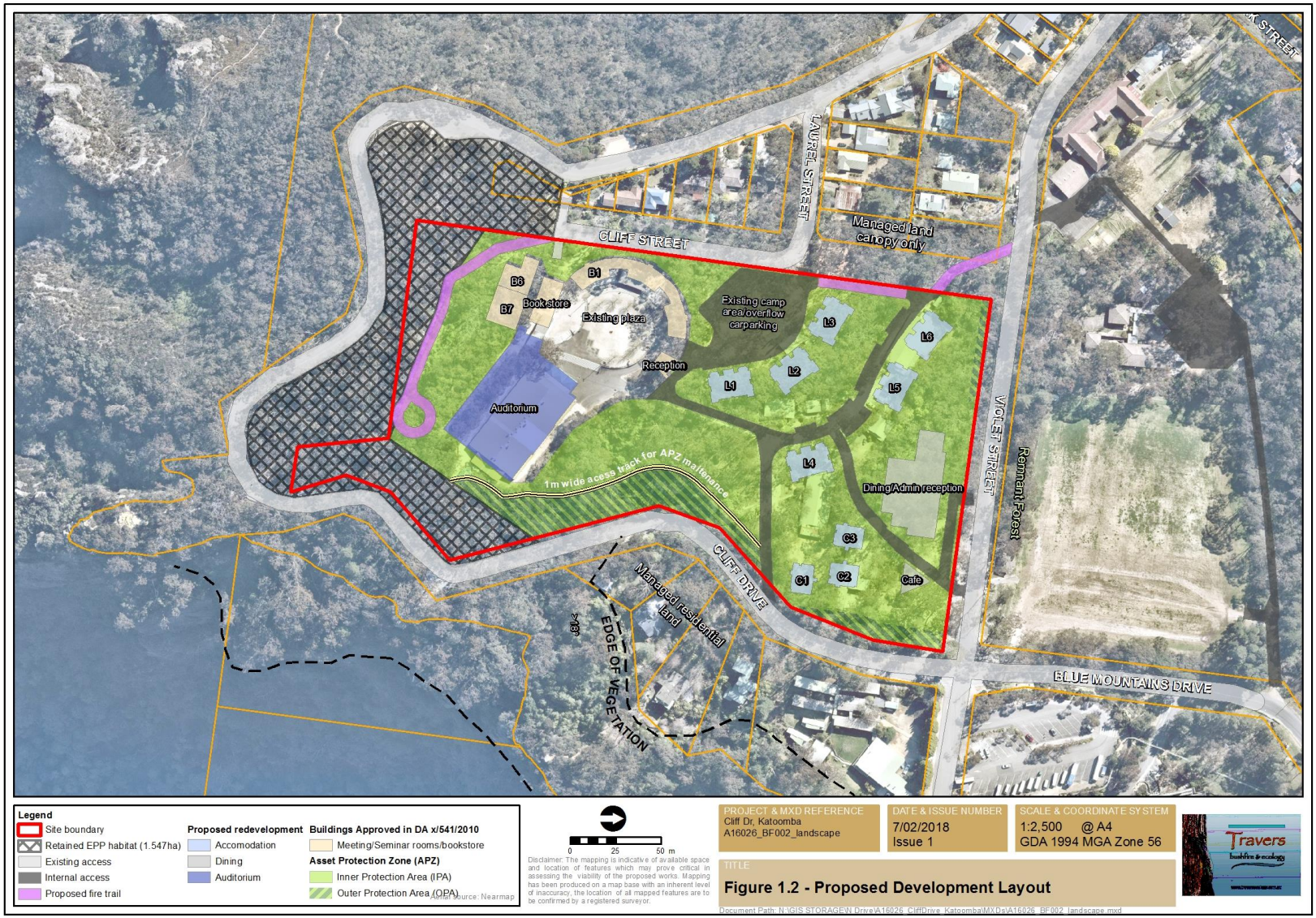


Figure 1.1 – Existing development layout


CLIFF STREET
LAUREL STREET
VIOLET STREET
CLIFF DRIVE
BLUE MOUNTAINS DRIVE
Managed land canopy only
B1
B6
B7
Bookstore
Existing plaza
Existing camp area/overflow carparking
Reception
Auditorium
L1
L2
L3
L4
L5
L6
1m wide access track for APZ maitenance
Dining/Admin reception
Remnant Forest
C1
C2
C3
Cafe
Managed residential land
EDGE OF VEGETATION
Legend
Site boundary
Retained EPP habitat (1.547ha)
Existing access
Internal access
Proposed fire trail
Proposed redevelopment
Accomodation
Dining
Auditorium
Buildings Approved in DA x/541/2010
Meeting/Seminar rooms/bookstore
Asset Protection Zone (APZ)
Inner Protection Area (IPA)
Outer Protection Area (OPA)
Aerial source: Nearmap
0 25 50 m
Disclaimer: The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered surveyor.
PROJECT & MXD REFERENCE
Cliff Dr, Katoomba
A16026_BF002_landscape
DATE & ISSUE NUMBER
7/02/2018
Issue 1
SCALE & COORDINATE SYSTEM
1:2,500 @ A4
GDA 1994 MGA Zone 56
TITLE
Figure 1.2 - Proposed Development Layout
Document Path: N:\GIS STORAGE\N Drive\A16026_CliffDrive_Katoomba\MXDs\A16026_BF002_landscape.mxd
Travers bushfire & ecology

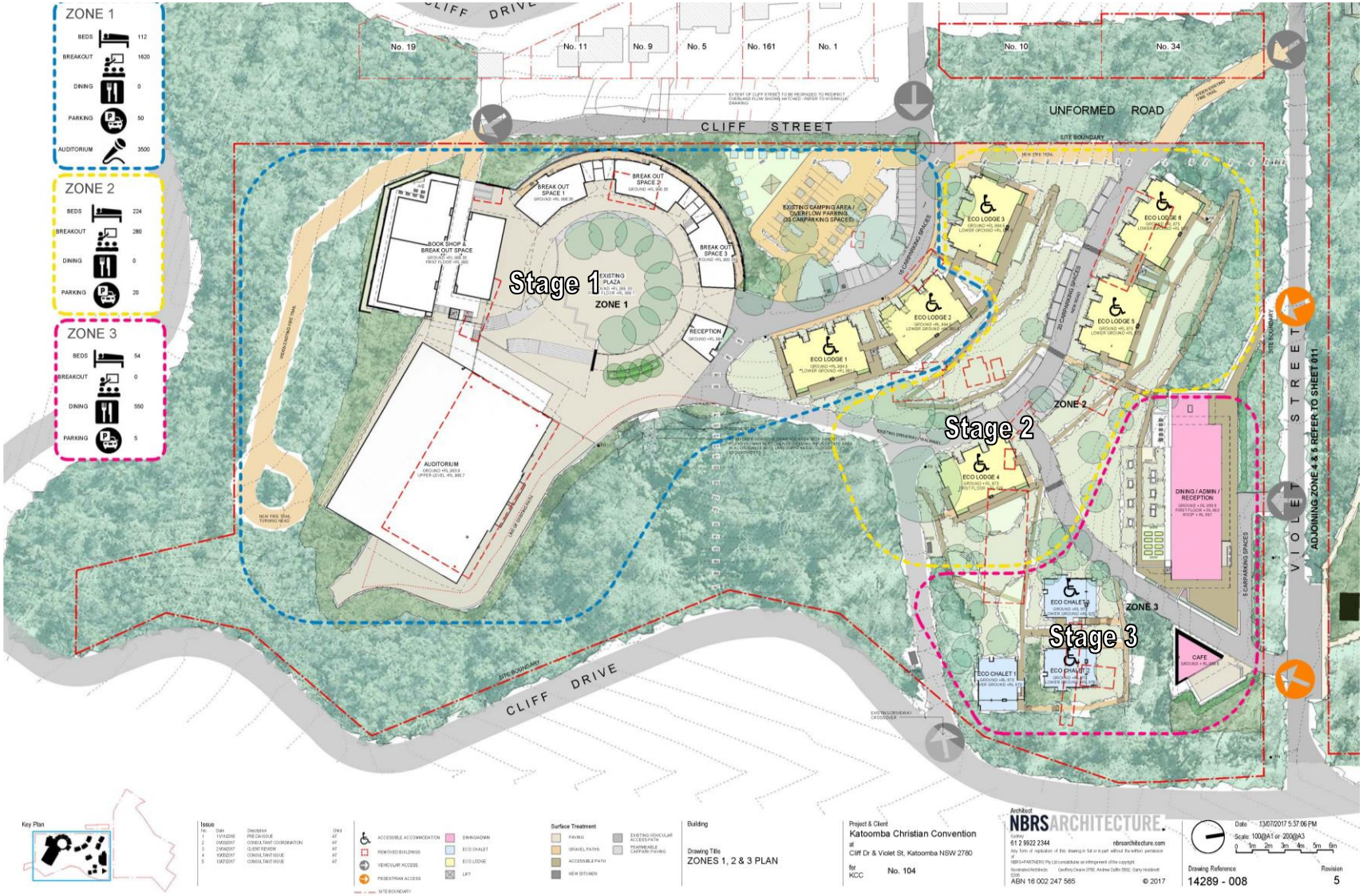


Figure 1.3 – Proposed staged development

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:

- DA plan prepared by *NBRS Architecture* (Sheet No. 000 - 021) dated August 2017
- Flora & Fauna Assessment prepared by *Travers bushfire & ecology* dated July 2017
- Vegetation Management Plan prepared by *Travers bushfire & ecology* dated July 2017
- *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).*

An inspection of the proposed development site and surrounds was undertaken by John Travers on numerous occasions between 2010 and 2017 to assess the topography, slopes, aspect, drainage, vegetation and adjoining land use. The identification of existing bushfire measures and a visual appraisal of bushfire hazard and risk were also undertaken.

1.4 Site description

The site for the proposed redevelopment of KCC is situated to the south of Violet Street and is bound by Cliff Drive to the east and Cliff Street to the west within the suburb of Katoomba in the Blue Mountains local government area.

The land directly adjoining the site to the east and west is predominantly residential land with the land to the north of Violet Street also forming part of KCC. Blue Mountain National Park is located beyond Cliff Drive to the south, south-east and west.

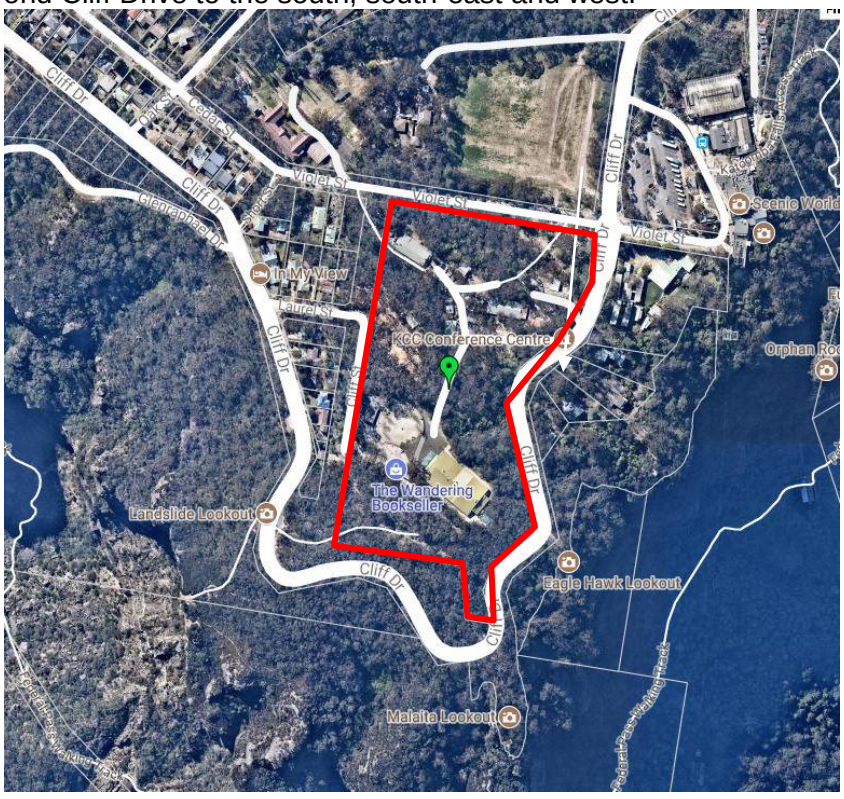


Figure 1.4 – Aerial appraisal

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

1.5.2 Bushfire prone land

Bushfire prone land maps provide a trigger for the development assessment provisions. The proposed redevelopment is located on land that is mapped by Blue Mountains Council as being bushfire prone (refer Figure 1.5).

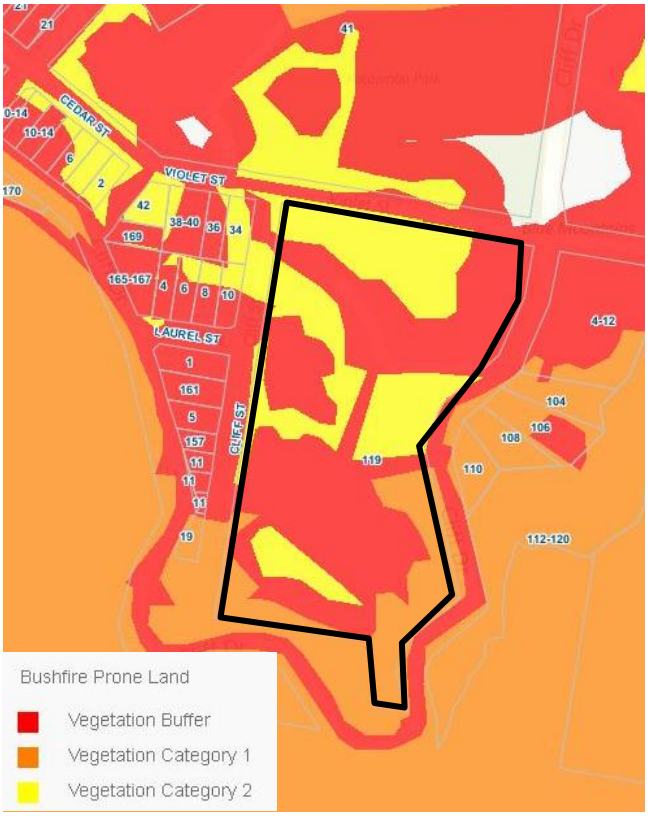


Figure 1.5 – Bushfire prone land map
(source: http://emapping.bmcc.nsw.gov.au)

1.5.4 Local environmental plan (LEP)

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

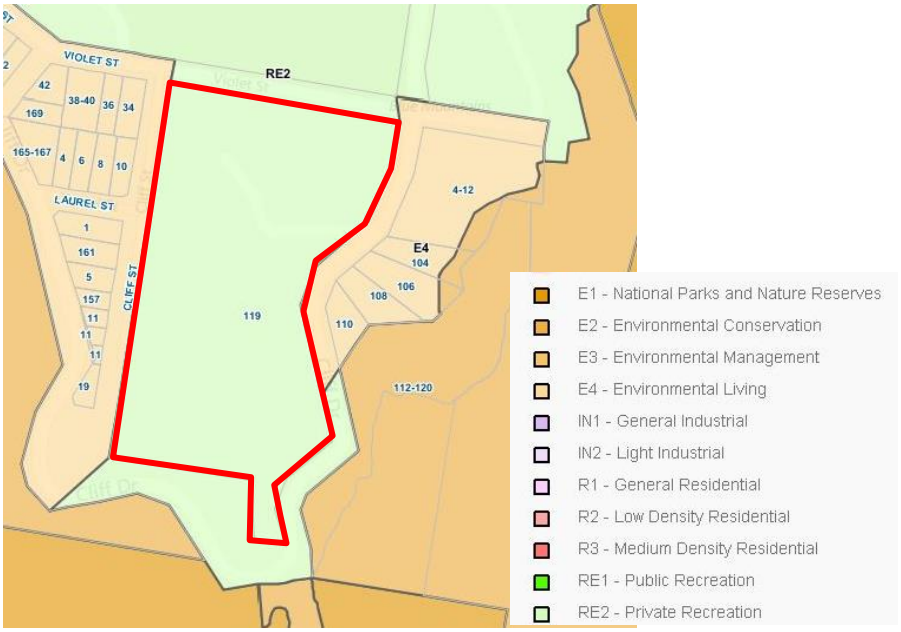


Figure 1.6 – Zoning map
(Source: Blue Mountains LEP, 2015)

The site is zoned under the Blue Mountains LEP (2012) as RE2 – Private Recreation and is identified as containing Protected Area – Slope constrained.

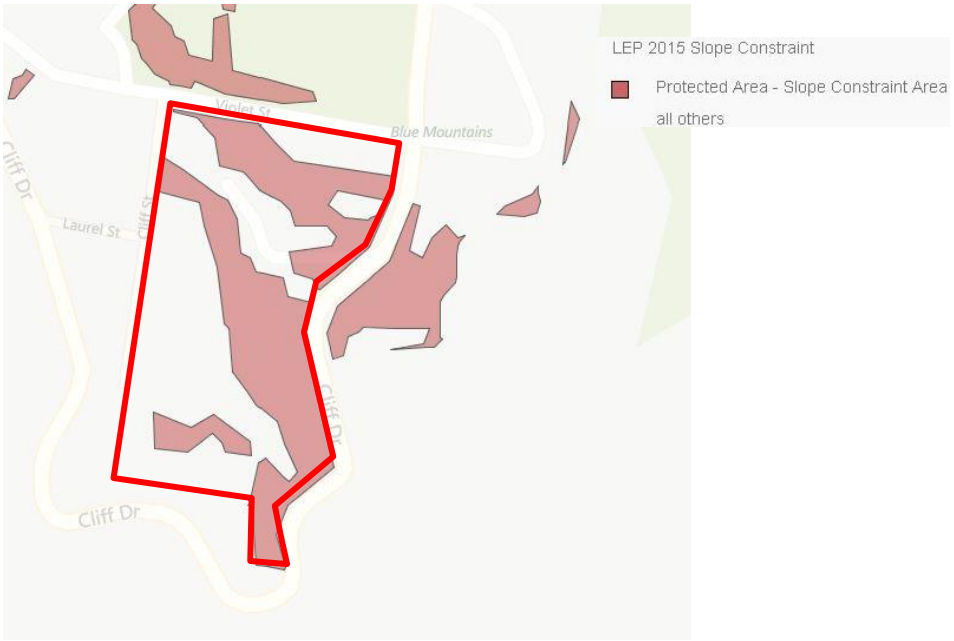


Figure 1.7 – Slope Constraints
(Source: Blue Mountains LEP, 2015)

The proposal, including the provision of APZs, is consistent with the objectives of the zoning. The implementation of the asset protection zone will be sensitive to the slope constrained areas and will be implemented in accordance with a vegetation management plan (as previously approved).

1.5.3 Planning for Bush Fire Protection 2006 (PBP)

Bushfire protection planning requires the consideration of the RFS planning document entitled *PBP. PBP* provides planning 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 defendable space to be located around buildings.

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

4. Ensure that safe operational access and egress for emergency service personnel and residents is available.
5. Provide for ongoing management and maintenance of bushfire protection measures, including fuel loads in the APZ.

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

As the development is a type of development regarded by the RFS as a special fire protection purpose (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 SFPPs means that occupants may be more vulnerable to bushfire attack for one or more of the following reasons:

- they may be less educated in relation to bushfire impacts
- they may have reduced capacity to evaluate risk and to respond adequately to the bushfire threat
- they may present organisational difficulties for evacuation and / or management
- they may be more vulnerable through stress, anxiety and smoke impacts arising from bushfire threat
- there may be significant communication barriers
- supervision during a bushfire may be difficult

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

The *BCA* is given effect through the *EP&A Act* and forms part of the regulatory environment of construction standards and building controls. The *BCA* outlines objectives, functional statements, performance requirements and deemed to satisfy provisions. 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

A flora and fauna assessment report (February 2018) has been prepared by this firm. The report concluded that the proposed development is unlikely to result in a significant impact on any threatened species, populations or EECs or their habitats. The report recommends that a vegetation management plan is prepared.

Bushfire Threat Assessment

2

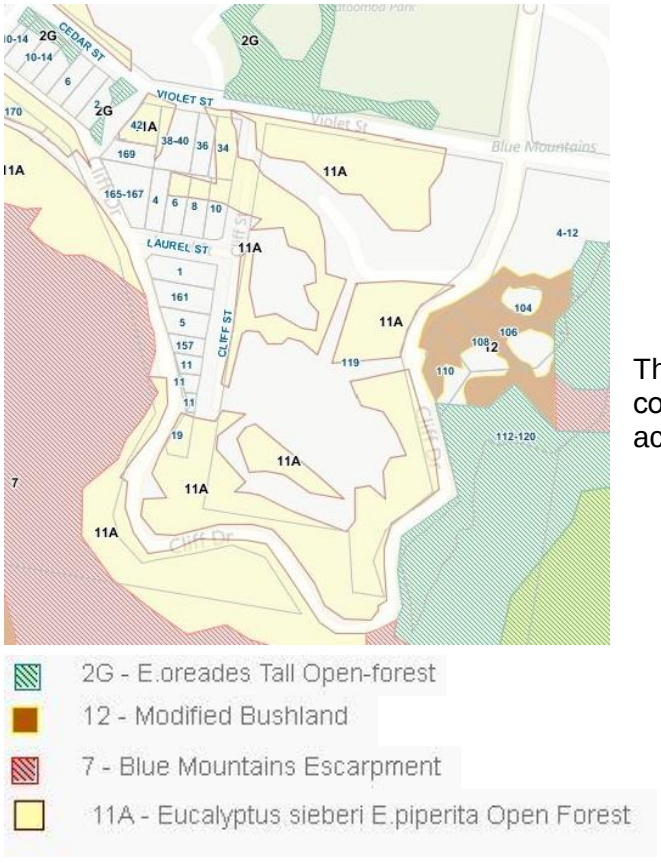
To assess the bushfire threat and to determine the required width of an APZ for a development, a review of the elements that comprise the overall threat needs to be completed.

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 KCC Facility has been identified using Blue Mountains Council vegetation mapping (refer Figure 2.1). These communities are:



- *Eucalyptus sieberi E.piperita* Open Forest & Blue Mountains Escarpment– adjoining the site to the south and south-west
- *E.oreades* Tall Open Forest to the south-east (beyond Cliff Drive)
- Remnant forest (E.oreades Tall Open Forest) beyond Violet Street to the north.

These vegetation communities when converted to a Keith formation is 'Forest' in accordance with Appendix 2 of PBP.

Figure 2.1 – Vegetation communities (source: http://emapping.bmcc.nsw.gov.au viewed July 2017)

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:

- >15-20 degrees beyond Cliff Drive to the south, south-east and west.
- 5-10 degrees downslope within the remnant vegetation beyond Violet Street in the north
- 6-13 degrees downslope within the Eastern Pygmy Possum (EPP) retained habitat to the south-east of the auditorium
- 0-4 degrees downslope within the EPP retained habitat to the south-west and west of the bookshop and auditorium.

2.3 Bushfire attack assessment

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

Tables 2.1 – 2.3 provide a summary of the bushfire attack assessment, the minimum required APZs for the proposed building additions in compliance with Appendix 2 (*PBP*) for SFPP developments as well as the APZ provided based on the existing site constraints.

Table 2.1 – Bushfire attack assessment (Eco chalets & Eco lodge)

Building	Aspect	Vegetation within 140m of development	Effective slope of land	APZ required (Appendix 2 PBP)	APZ provided (metres)	Radiant heat exposure (refer Note 1)	AS3959 BAL (refer Note 2)
Eco Chalets (C1 – C3) – Refer Schedule 1 attached							
Eco Chalet (C1)	East	Forest	>15-18^{0d}	100	70	**27.5 kW/m^2**	BAL 29 & BAL 19
Eco Chalet (C2)	East	Forest	>15-18^{0d}	100	87	**18.76 kW/m^2**	BAL 19 & BAL 12.5
Eco Chalet (C3)	East	Forest	>15-18^{0d}	100	>100	<10 kW/m^2	BAL 12.5
Eco Chalets (C1 – C3)	North	Remnant forest (refer Note 3)	5-10^{0d}	50	65	<10 kW/m^2	BAL level determined above
Eco Chalets (C1 – C3)	South and west	Managed land	N/A	N/A	>100		
Eco Lodge (L1-L6) – Refer Schedule 1 attached							
L1 & L2	North, south, east & west	Managed land	N/A	N/A	>100	<10 kW/m^2	BAL 12.5 (refer Note 4)
L3 & L4	North	Remnant forest (refer Note 3)	5-10^{0d}	50	80 - 90	<10 kW/m^2	BAL level determined above
	East, south and west	Managed land	N/A	N/A	>100	<10 kW/m^2	BAL 12.5
L5	North	Remnant forest (refer Note 3)	5-10^{0d}	50	46	**11.07 kW/m^2**	
	South, east & west	Managed land	N/A	N/A	>100	<10 kW/m^2	
L6	North	Remnant forest (refer Note 3)	5-10^{0d}	50	32	**18.07 kW/m^2**	BAL 19 (north-eastern and north-western elevation)
	South, east & west	Managed land	N/A	N/A	>100	<10 kW/m^2	BAL level determined above

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

Run Description:	A Eco Chalet C1 (east)		
Vegetation Information			
Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	20 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	20	Overall Fuel Load(t/ha):	25
Site Information			
Site Slope	15 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m)	Default	APZ/Separation(m):	70
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:	HIGH	Peak Elevation of Receiver(m):	10.7
Level of Construction:	BAL 29	Fire Intensity(kW/m):	123222
Radiant Heat(kW/m2):	27.5	Flame Angle (degrees):	65
Flame Length(m):	65.01	Maximum View Factor:	0.32
Rate Of Spread (km/h):	9.54	Inner Protection Area(m):	70
Transmissivity:	0.77	Outer Protection Area(m):	0

Run Description:	B Eco Chalet C2 (east)		
Vegetation Information			
Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	20 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	20	Overall Fuel Load(t/ha):	25
Site Information			
Site Slope	15 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m)	Default	APZ/Separation(m):	87
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):	7.23
Level of Construction:	BAL 19	Fire Intensity(kW/m):	123222
Radiant Heat(kW/m2):	18.76	Flame Angle (degrees):	70
Flame Length(m):	65.01	Maximum View Factor:	0.224
Rate Of Spread (km/h):	9.54	Inner Protection Area(m):	87
Transmissivity:	0.751	Outer Protection Area(m):	0

Run Description:	D Eco Lodge 5 (north)		
Vegetation Information			
Vegetation Type:	Remnant Vegetation	Vegetation Group:	Remnant Vegetation
Vegetation Slope:	10 Degrees	Vegetation Slope Type:	Downslope
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):	46
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):	6.7
Level of Construction:	BAL 12.5	Fire Intensity(kW/m):	9889
Radiant Heat(kW/m2):	11.07	Flame Angle (degrees):	79
Flame Length(m):	13.64	Maximum View Factor:	0.126
Rate Of Spread (km/h):	1.91	Inner Protection Area(m):	46
Transmissivity:	0.786	Outer Protection Area(m):	0

Run Description:	E Eco Lodge 6 (north)		
Vegetation Information			
Vegetation Type:	Remnant Vegetation	Vegetation Group:	Remnant Vegetation
Vegetation Slope:	10 Degrees	Vegetation Slope Type:	Downslope
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):	32
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):	6.62
Level of Construction:	BAL 19	Fire Intensity(kW/m):	9889
Radiant Heat(kW/m2):	18.07	Flame Angle (degrees):	76
Flame Length(m):	13.64	Maximum View Factor:	0.199
Rate Of Spread (km/h):	1.91	Inner Protection Area(m):	32
Transmissivity:	0.813	Outer Protection Area(m):	0

Table 2.2 – Bushfire attack assessment (dining and administration)

Building	Aspect	Vegetation within 140m of development	Effective slope of land	APZ required (Appendix 2 PBP)	APZ provided (metres)	Radiant heat exposure (refer Note 1)	AS3959 BAL (refer Note 2)
Dining / Administration building & cafe – Refer Schedule 1 attached							
North		Remnant forest (refer Note 3)	5-10^{0d}	50	30	**19.6 kW/m^2**	BAL 19 (northern, eastern and western elevation)
South, east & west		Managed land	N/A	N/A	>100	<10 kW/m^2	BAL 12.5 (southern elevation)

Run Description: C Dining / Administration Building & Cafe (north)

Vegetation Information

Vegetation Type:	Remnant Vegetation	**Vegetation Group:**	Remnant Vegetation
Vegetation Slope:	10 Degrees	**Vegetation Slope Type:**	Downslope
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):**	30

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:	HIGH	**Peak Elevation of Receiver(m):**	6.59
Level of Construction:	BAL 29	**Fire Intensity(kW/m):**	9889
Radiant Heat(kW/m2):	19.6	**Flame Angle (degrees):**	75
Flame Length(m):	13.64	**Maximum View Factor:**	0.215
Rate Of Spread (km/h):	1.91	**Inner Protection Area(m):**	30
Transmissivity:	0.818	**Outer Protection Area(m):**	0

Table 2.3 – Bushfire attack assessment (dining and administration)

Building	Aspect	Vegetation within 140m of development	Effective slope of land	APZ required (Appendix 2 PBP)	APZ provided (metres)	Radiant heat exposure (refer Note 1)	AS3959 BAL (refer Note 2)
Breakout Space & meeting rooms (B1 – B3, B 6&7, reception & book store) – Refer Schedule 1 attached							
Reception	North, south, east & west	Managed land	N/A	N/A	>100	<10 kW/m^2	BAL 12.5 (refer Note 4)
B1 – B3 & bookstore	South-west & west	Forest	>15-18^{0d}	100	60 - 85	Refer Note 5	BAL 29
	South, east and north	Forest	Level to upslope	60	>90		BAL 29
B 6&7	West	Forest	6$^{0\ U}$	60	10	Refer Note 5	BAL 29
	South	Forest	Level to upslope	60	20		
	North & east	Managed land	N/A	N/A	>100		BAL 29
Auditorium	South	Forest	Level to 4^{0D}	70	25	Refer Note 6	BAL 40
	East	Forest	>15-18^{0d}	100	47		BAL 40
	North	Managed land	N/A	N/A	>100		BAL 40

Note 1: A performance based assessment using Appendix B of AS3959 was undertaken to determine the radiant heat exposure (using a flame temperature of 1200) and the required BAL level based on the asset protection zone provided. Forest fuel loads (20/25t/ha) or remnant forest fuel loads (8/10/t/ha) (in accordance with PBP) were used based on slopes outlined in column 4. The results of the assessment, provided within Appendix 2 attached, were prepared using the bushfire attack assessor (BFAA) developed by Newcastle Bushfire Consulting.

Note 2*:* The BAL level for these aspects are determined by the BAL rating applied to the hazard side of the dwelling. The implementation of the construction standards is such that where a building has direct exposure to a particular level of bushfire attack, then that construction standard shall apply. Where a particular elevation of the same building is completely shielded from the impacts (i.e. on the leeward side), then the construction requirements may be downgraded by one level of construction – for example, a BAL 29 building may have the rear (shielded) elevation downgraded to BAL-19. The roof is required to be constructed to the higher level.

Note 3: *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*.

Note 4: The Eco Lodge 1 & 2 and reception building adjacent to the breakout rooms are located over 100m from bushfire prone vegetation. In accordance with PBP and AS3959 these building are exposed to a very low risk (BAL Low) and do not require compliance with the bushfire construction standards. However due to the proposed increase in density for the broader KCC and the risk posed to the surrounding buildings it is recommended that Eco Lodge 1 & 2 and the reception building are constructed to comply with BAL 12.5 standards. These buildings could be used a safe refuge in the event of a bushfire.

Note 5: This new DA maintains the approved bookstore and the seven (7) breakouts spaces / meeting rooms and reception (refer Schedule 1 attached). These buildings have not changed from previous approvals. The design and construction requirements outlined in the BSA (for these buildings) from the RFS will remain as previously approved (refer Section 3.2 for detail).

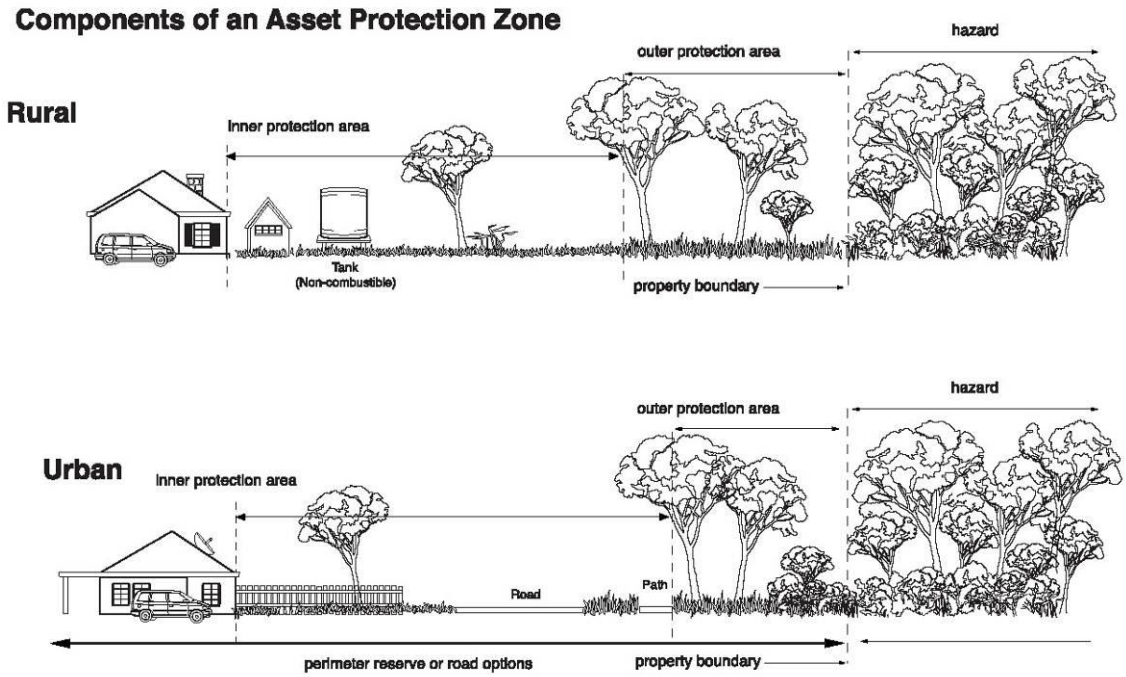
Note 6: Although the auditorium is exposed to flame zone contact, it is proposed that a combination of bushfire protection measures are afforded to the development, including construction in compliance with BAL 40 and the installation of a drenching system at the entry and exit points of the building. A comprehensive evacuation plan will also be prepared which will ensure monitoring of fire conditions and liaison with the local NSW RFS when a conference overlaps during extreme or catastrophic fire danger days.

Specific Protection Issues

3

3.1 Asset protection zones

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



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 10*kW/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 defendable space between hazardous vegetation and a building.

As outlined in Table 2.1 the majority of the accommodation buildings (seven (7) in total) are exposed to a radiant heat flux of <10kW/m^2 in compliance with the requirements of PBP. Two (2) of these buildings are not affected by bushfire prone land as they are located over 100m from bushland, however will be upgraded to comply with BAL 12.5 as part of a suite of measures to improve bushfire protection one site.

Whilst eco chalet 1 & 2, eco lodge 5 & 6 are exposed to a radiant heat flux of >10kW/m^2 they will be upgraded to comply with the relevant construction standard (using a flame temperature of 1200). These new buildings are provided within the same or increased setbacks from bushfire prone vegetation when compared to the existing buildings. Future vegetation management will occur on site to reduce the overall bushfire threat posed.

The proposed redeveloped dining / administration building, auditorium (church) and meeting / breakout rooms are not identified as a SFPP development. However Clause 4.2.6 of PBP states that Class 9 assembly buildings should be considered as if they were an SFPP and be assessed against the SFPP objectives. The majority of these buildings are exposed to a radiant heat threshold of >10kW/m^2, however they will be constructed to comply with AS3959 (2009). To satisfy the objectives for a SFPP an emergency evacuation plan will be prepared which will ensure monitoring of fire conditions and liaison with the local NSW RFS when a conference overlaps during extreme or catastrophic fire danger days. It is also noted that these buildings (breakout rooms and bookstore) were previously approved (Integrated development no; X/541/2010) by Blue Mountains Council on 13 December 2011.

Table 3.1 – Performance criteria for asset protection zones (*PBP* guidelines pg. 19 & 43)

Performance criteria	Acceptable solutions	Complies
Radiant heat levels of greater than 10kW/m^2 will not be experience by occupants or emergency services workers entering or exiting a building. For infill developments a defendable space is to be provided on site.	An APZ is provided in accordance with the relevant tables and figures in Appendix 2 of *PBP.* Exits are located away from the hazard side of the building. The APZ is wholly within the boundaries of the development.	Non compliance. As outlined above there are a number of buildings exposed to a radiant heat threshold of >10kWm^2. Four (4) accommodation buildings (C1, C2, L5 & L6) are exposed to a radiant heat of between 11.07 & 27.5kWm^2 with the assembly building (auditorium) also exposed to a radiant heat >10kW/m^2. However a sufficient defendable space (at least 36-72m) has been provided for the accommodation buildings and a minimum 19m for the auditorium. Additional measures will be implemented to provide for an improved outcome as allowable for infill developments (i.e. increased building construction standards, further on site management of vegetation, compliant access and improvements in fire fighter access to vegetation through the provision of fire trails). A comprehensive emergency evacuation plan will also be prepared.
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^o.	Complies – The APZ will be managed by KCC.

Performance criteria	Acceptable solutions	Complies
APZs are managed and maintained to prevent the spread of a fire towards the building.	In accordance with the requirements of *Standards for Asset Protection Zones* (*RFS* 2005).	Complies – can be a condition of consent.

3.2 Building protection

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.

This new DA retains the approved bookstore and the seven (7) breakouts spaces / meeting rooms and reception (refer Schedule 1 attached). The following design and construction requirements as outlined in the BSA from the RFS are to apply:

- Roofing shall be gutterless or guttering and valleys are to be screened to prevent the build-up of flammable material. Any materials used shall have a Flammability Index of no greater than 5 when tested in accordance with Australian Standard AS1530.2−1993 'Methods for Fire Tests on Building Materials, Components and Structures − Test for Flammability of Materials'.
- All new fencing shall be non−combustible.
- New construction shall comply with Australian Standard AS3959−2009 "Construction of buildings in bush fire−prone areas" BAL 29.
- There shall be no exposed timber on the proposed bookstore/meeting room.
- Non-combustible shutters are to be provided to the southern, eastern and western elevations of the proposed bookstore/meeting room.

This application seeks to maintain the above conditions for those buildings (noting that there are no windows proposed on the western elevations of meeting rooms (B1 – B3) and therefore shutters do not apply.

The remainder of the buildings (inclusive of the accommodation, dining / administration, café and auditorium) are to comply with the relevant BAL standards as provided in Tables 2.1 – 2.3 and depicted in Schedule 1 attached.

The auditorium is to be constructed to a BAL 40 standard with the provision of a water drenching system on the entry and exits points of the building.

3.3 Hazard management

Should the development be approved, the asset protection zone is to be managed in accordance with RFS guidelines *Standards for Asset Protection Zones* (RFS, 2005), with landscaping to comply with Appendix 5 of *PBP*.

In accordance with Council requirements and to limit impact on the slope constrained land the APZ is to be implemented in a manner that is sensitive to the protection of the existing native vegetation zone and maintaining slope stability.

Vegetation modification for the purpose of establishing the asset protection zones must consider the following:

- Implementation of the inner protection area and outer protection area as identified in Schedule 1.
- weed removal is to be prioritised over indigenous vegetation removal within the APZ;
- ensure retained shrub and tree clumps do not form a continuous canopy across the asset protection zone;
- maintain at least 75% cover of ground layer vegetation within the slope constrained area;
- involve the pruning of selected limbs (absent of hollows) in preference to complete tree removal; and,
- where tree removal is required to achieve canopy separation prefer juveniles and trees absent of hollows or of poor quality and retain stumps in-situ.

3.4 Access for fire fighting operations

The proposed redevelopment will allow for five (5) access points to the development. Public vehicular access to the site will be provided via Cliff Drive in the east, Cliff Street to the west and Violet Street in the north. The additional two (2) vehicle access points will be provided for emergency services only via a 4m wide fire trail extending from Violet Street in the north-west and Cliff Street in the south-west.

Two (2) fire trails will be created / upgraded within the site. A fire trail will be created to link the internal road network at the western boundary between eco lodge 3 & 4. The southern fire trail (extending within and parallel to the southern boundary) will be upgraded with the provision of a turning head.

This public access and its compliance with *PBP* is detailed within Table 3.2.

The construction of the fire trail/s is to comply with Table 3.4 below.

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

Performance criteria	Acceptable solutions	Complies
Fire fighters are provided with safe all weather access to structures (thus allowing more efficient use of fire fighting resources).	Public roads are two-wheel drive, all weather roads.	Yes
Public road widths and design that allow safe access for fire fighters while residents are evacuating an area.	Urban perimeter roads are two way, that is, at least two traffic lane widths (carriageway 8m minimum kerb to kerb) allowing traffic to pass in opposite directions. Non perimeter roads comply with Table 3.3. Perimeter road is linked with the internal road system at an interval of no greater than 500m in urban areas. Traffic management devices are constructed to facilitate access by emergency services. Public roads have a cross fall not exceeding 3^{o}. All roads are through roads. If unavoidable, dead end roads are not more than 200m in length, incorporate a minimum 12m outer radius turning circle, sign posted dead end and direct traffic away from the hazard. Curves of roads (other than perimeter) have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress. The minimum distance between inner and outer curves is 6m. Maximum grades for sealed roads do not exceed 15^{o} and an average grade of not more than 10^{o}. Minimum vertical clearance of 4m above the road at all times.	Internal roads are to have a carriageway width of 6.5m N/A Yes – can be a condition of consent Yes Yes. The fire trail is provided with a turning head. Yes. Yes. Yes. Yes – can be a condition of consent.

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

Table 3.3 – Minimum widths for public roads that are not perimeter roads (*PBP* guidelines pg. 20)

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

Table 3.4 – 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.	A minimum carriageway width of 4m with an additional 1m strip on each side of the trail clear of bushes and long grass. Sealed trails have a maximum grade of 15^{o} and not more than 10^{o} for unsealed roads. A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches. The cross fall of the trail is not more than 10^{o}. The trail has the capacity for passing by: • reversing bays using the access to properties to reverse fire tankers, which are 6m wide & 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.	Yes – can be made a condition of consent.
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.	The fire trail is accessible to fire fighters and maintained in a serviceable condition by the owner of the land. Appropriate drainage and erosion controls are provided. The fire trail system is connected to the property access road and / or through road system at intervals of at least 200m. Fire trails do not traverse a wetland or other land subject to periodic inundation (other than a flood or storm surge). Gates for fire trails are provided and locked with a key / lock system authorised by the local RFS.	Yes – can be made a condition of consent.
Fire trails designed to prevent weed infestation, soil erosion and other land degradation.	Fire trail design does not adversely impact on natural hydrological flows. Fire trail design acts as an effective barrier to the spread of weeds and nutrients. Fire trial construction does not expose acid-sulphate soils.	Yes – can be made a condition of consent.

3.5 Water supplies

A reticulated water and hydrant network exists within the site as depicted within Schedule 1 attached. Additional hydrants and static water supplies are to be provided as depicted within Schedule 1 attached. Water supply is to comply with the following conditions;

- Water, electricity and gas are to comply with the following requirements of section 4.1.3 of 'Planning for Bush Fire Protection 2006'
- Where the rear or most distant part of a proposed building is greater than 70 metres from the nearest hydrant, a new hydrant is required to be installed as per Australian Standard AS 2419.1− 2005 'Fire Hydrant Installations'.
- Locations of fire hydrants are to be delineated by blue pavement markers offset 150mm from the centre of the road. The direction of offset shall indicate on which side of the road the hydrant is located.
- A hardened ground surface for truck access is to be supplied up to and within 4 metres of the water source.
- A 65mm metal Storz outlet with a gate or ball valve shall be provided.
- In recognition that an unreliable reticulated water supply exists, two (2) 20,000 litre water supply shall be provided for firefighting purposes.
- Polycarbonate/plastic tanks shall be shielded from the impact of radiant heat and direct flame contact.
- All associated fittings to the tank shall be non-combustible.
- An 'SWS' marker shall be obtained from the local NSW Rural Fire Service and positioned for ease of identification by brigade personnel and other users of the SWS. In this regard:

a) Markers must be fixed in a suitable location so as to be highly visible; and
b) Markers should be positioned adjacent to the most appropriate access for the static water supply.

An independent water supply is to be provided for the proposed drenching system (auditorium). The cost for installation will be approximately $160,000. This includes the design, tanks, plumbing, pump and certification).

3.6 Gas

Gas supply is to comply with the following conditions;

- Reticulated or bottled gas is to be installed and maintained in accordance with Australian Standard AS/NZS 1596:2002: 'The storage and handling of LP gas' and the requirements of relevant authorities.
- All fixed gas cylinders are kept clear of all flammable materials to a distance of 10 metres and be shielded on the hazard side of the installation.
- Gas cylinders kept close to the building shall have release valves directed away from the building. Connections to and from gas cylinders are to be metal. Polymer sheathed flexible gas supply lines to gas meters adjacent to building are not to be used.

3.7 Emergency and evacuation planning

KCC is an existing development and is exposed to bushfire risk. The proposal, whilst increasing usage rates at certain times of the year, will provide an improved overall bushfire outcome in accordance with best practice bushfire guidelines.

The proposal will include a suite of bushfire protection measures and is reliant on the adoption of a highly competent bushfire evacuation plan which will work to;

- Monitor fire conditions and liaise with the local NSW RFS when a conference overlaps during extreme or catastrophic fire danger days. Noting that the Easter Convention occurs outside of the bushfire season therefore allowing up to 3,500 event attendees in the auditorium.
- Closure of the auditorium when a fire is within the immediate area.
- Outline procedures for the evacuation off site to a safe location.
- Outline procedures for a safe on-site assembly during periods of lower FDI in facilities that can accommodate the numbers of occupants expected on a certain day. Noting that increased building construction standards (beyond those recommended in AS3959 (2009)) have been applied to new buildings to increase the safety and reduce the exposure to bushfire risk.

It is important that in the preparation of an evacuation plan for the site, any procedures must acknowledge the fire danger rating and the number of people expected to use the site during any given event.

Table 3.5 outlines the required performance criteria for the proposal's emergency procedures

Table 3.5 – 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.	An emergency / evacuation plan is prepared consistent with the *RFS* Guidelines for the Preparation of Emergency / Evacuation Plan. *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*.	Complies - can be made a condition of consent.
Suitable management arrangements are established for consultation and implementation of the emergency and evacuation plan.	An emergency planning committee is established to consult with staff in developing and implementing and emergency procedures manual. Detailed plans of all emergency assembly areas including onsite and offsite arrangements as stated within *AS3745* are clearly displayed, and an annual trial emergency evacuation is conducted.	Complies - can be made a condition of consent.

Conclusion & Recommendations

4

4.1 Conclusion

A bushfire protection assessment has been undertaken for the proposed redevelopment of the existing facilities with the Katoomba Christian Convention (KCC) located at 119 Cliff Drive, Katoomba. The proposed works include the demolition and construction of a new auditorium (church), new bookshop, meeting rooms, reception, dining hall, café and new accommodation buildings.

The assessment found that bushfire can potentially affect the proposed development from the existing forest vegetation located within the southern portion of the property as well as the forest and remnant forest external to the site and beyond the adjoining public roads to the north, south-east, south and west resulting in possible ember attack, radiant heat and potentially flame attack.

The assessment has concluded that the proposed development will allow for an overall improved bushfire protection outcome with the proposed additions being provided with the same or increased setbacks from bushfire prone vegetation.

In this instance, it is considered that the proposal does comply with the specific objectives for SFPP infill development. Improvements include increased building construction standards beyond those recommended in AS3959 (2009). New buildings located greater than 100m from bushfire prone vegetation will be constructed to comply with BAL 12.5 with the reminder of the BAL ratings determined using a flame temperature of 1200. Other improvements include implementation of asset protection zones throughout the site and improved access for firefighting services. An emergency evacuation plan will also be prepared which will which ensure monitoring of fire conditions and liaison with the local NSW RFS when a conference overlaps during extreme or catastrophic fire danger days.

In this instance, it is considered that the proposal does comply with the specific objectives for SFPP infill development as outlined below:

Objective 1 - Ensure that the bushfire risk to adjoining lands is not increased.
The development will not increase the bushfire risk to adjoining lands and will be constructed to minimise material ignition in accordance with AS3959–2009.

Objective 2 - Provide a minimum defendable space.
The proposed redevelopment does not extend towards the bushfire threat (any closer than the existing development) and will maintain a minimum defendable space to all aspects.

Objective 3 - Provide better bushfire protection, on a redevelopment site, than the existing situation. This should not result in new works being exposed to greater risk than the existing building.

The new buildings will be constructed in excess of the standard requirements (i.e. BAL levels determined using a flame temperature of 1200 & buildings located >100m from hazard

vegetation will be construction to BAL 12.5). Other improvements include the implementation of asset protection zones throughout the site and improved access for firefighting services. An emergency evacuation plan will also be prepared which will ensure monitoring of fire conditions and liaison with the local NSW RFS when a conference overlaps during extreme or catastrophic fire danger days. A better outcome will be achieved by allowing this development to proceed.

Objective 4 - ensure that the footprint of the proposed building does not extend towards the hazard beyond existing building lines on neighbouring land

The proposed buildings do not extend closer to the bushfire hazard than the closest existing building footprints. The breakout / meeting rooms and book store retain the current approved footprints.

Objective 5 - not result in an increased bushfire management and maintenance responsibility on adjoining land owners unless they have agreed to the development

The development does not rely upon increased bushfire management within neighbouring lands in order to proceed.

Objective 6 - ensure building design and construction enhance the chances of occupant and building survival

The redeveloped buildings will comply with AS3959 as outlined in Section 3.2 and depicted in Schedule 1 attached.

4.2 Recommendations

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

Recommendation 2 – The asset protection zone is to be managed in accordance with RFS guidelines *Standards for Asset Protection Zones* (RFS, 2005), with landscaping to comply with Appendix 5 of *PBP*.

Recommendation 3 - This new DA retains the approved bookstore and the seven (7) breakouts spaces / meeting rooms and reception (i.e same location). The following design and construction requirements as outlined in the BSA from the RFS are to apply to these buildings:

- Roofing shall be gutterless or guttering and valleys are to be screened to prevent the build-up of flammable material. Any materials used shall have a Flammability Index of no greater than 5 when tested in accordance with Australian Standard AS1530.2−1993 'Methods for Fire Tests on Building Materials, Components and Structures − Test for Flammability of Materials'.
- All new fencing shall be non−combustible.
- New construction shall comply with Australian Standard AS3959−2009 "Construction of buildings in bush fire−prone areas" BAL 29.
- There shall be no exposed timber on the proposed bookstore/meeting room.
- Non-combustible shutters are to be provided to the southern, eastern and western elevations of the proposed bookstore/meeting room.

The remainder of the buildings (inclusive of the accommodation, dining / administration, café and auditorium) are to comply with the relevant BAL standards are provided in Table 2.1 and depicted in Schedule 1.

Recommendation 4 – Water and gas services should be installed in accordance with Section 4.2.7 of *PBP* as outlined below.

- Where the rear or most distant part of a proposed building is greater than 70 metres from the nearest hydrant, a new hydrant is required to be installed as per Australian Standard AS 2419.1− 2005 'Fire Hydrant Installations'.
- Locations of fire hydrants are to be delineated by blue pavement markers offset 150mm from the centre of the road. The direction of offset shall indicate on which side of the road the hydrant is located.
- A hardened ground surface for truck access is to be supplied up to and within 4 metres of the water source.
- A 65mm metal Storz outlet with a gate or ball valve shall be provided.
- In recognition that an unreliable reticulated water supply exists, two (2) 20,000 litre water supply shall be provided for fire fighting purposes.
- Polycarbonate/plastic tanks shall be shielded from the impact of radiant heat and direct flame contact.
- All associated fittings to the tank shall be non-combustible.
- An 'SWS' marker shall be obtained from the local NSW Rural Fire Service and positioned for ease of identification by brigade personnel and other users of the SWS. In this regard:

c) Markers must be fixed in a suitable location so as to be highly visible; and
d) Markers should be positioned adjacent to the most appropriate access for the static water supply.

An independent water supply is to be provided for the proposed drenching system (auditorium). The cost for installation will be approximately $160, 000. This includes the design, tanks, plumbing, pump and certification).

Recommendation 5 – Preparation of a highly competent and detailed emergency / evacuation plan consistent with the RFS *Guidelines for the Preparation of Emergency / Evacuation Plans.* This plan should incorporate the following;

- Monitor fire conditions and liaise with the local NSW RFS when a conference overlaps during extreme or catastrophic fire danger days. Noting that the Easter Convention occurs outside of the bushfire season therefore allowing up to 3,500 event attendees in the auditorium.
- Closure of the auditorium when a fire is within the immediate area.
- Outline procedures for the evacuation off site to a safe location.
- Outline procedures for a safe on-site assembly during periods of lower FDI in facilities that can accommodate the numbers of occupants expected on a certain day. Noting that increased building construction standards (beyond those recommended in AS3959 (2009)) have been applied to new buildings to increase the safety and reduce the exposure to bushfire risk.

It is important that in the preparation of an evacuation plan for the site, any procedures must acknowledge the fire danger rating and the number of people expected to use the site during any given event.

It is recommended that following the submission of the DA the project manager arrange a meeting with the local RFS at Katoomba. This will aid in discussions with the development control team at head office to convey the historic working relationship between RFS and KCC.

REFERENCES

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

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

Councils of Standards Australia AS3959 (2009) – *Australian Standard Construction of buildings in 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
- Contours - 1m (source: CAD)
- Retained EPP habitat (1.547ha)
- Existing access
- Internal access
- Proposed fire trail

Proposed redevelopment

- Accomodation
- Dining
- Auditorium

Buildings Approved in DA x/541/2010

- Meeting/Seminar rooms/bookstore

- Existing Fire Hydrant
- Recommended Fire Hydrant Locations
- Static water supply (20,000 litres)

Asset Protection Zone (APZ)

- Inner Protection Area (IPA)
- Outer Protection Area (OPA)

Bushfire Construction Standards

AS3959 (2009)*

- BAL 40
- BAL 29 (non combustible shutters)
- BAL 29 (no exposed timber)
- BAL 19
- BAL 12.5

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

Aerial source: Nearmap

Travers bushfire & ecology
www.traversecology.com.au

PROJECT & MXD REFERENCE	DATE & ISSUE NUMBER	SCALE & COORDINATE SYSTEM
Cliff Drive, Katoomba A16026_BF001	2/08/2017 Issue 1	1:1,500 @ A3 GDA 1994 MGA Zone 56

0 25 50 m

TITLE

Schedule 1 - Bushfire Protection Measures

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.

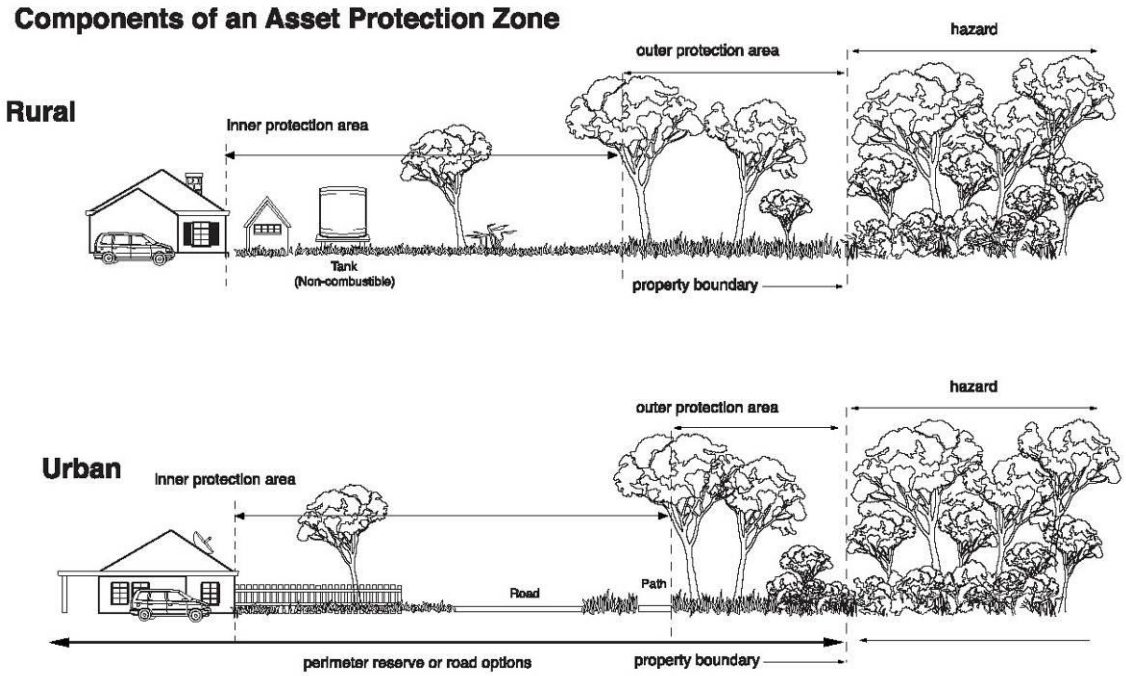
Document Path: N:\GIS STORAGE\N Drive\A16026_CliffDrive_Katoomba\MXDs\A16026_BF001.mxd

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. A typical APZ 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.

The following provides maintenance advice for vegetation within the IPA.

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% (at maturity)
- Trees (at maturity) should not touch or overhang the building
- 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;

- Create large discontinuities or gaps in vegetation to slow down or break the progress of fire towards buildings
- Shrubs should not be located under trees
- Shrubs should not form more than 10% of ground cover
- Shrubs should be in clumps no greater than $5m^2$
- 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:

- Should be kept mown (as a guide grass should be kept to no more than 100mm in height.
- Leaves and vegetation debris is removed.

Performance based assessment

A2

NBC Bushfire Attack Assessment Report V2.1

AS3959 (2009) Appendix B - Detailed Method 2

Printed: 13/07/2017 **Assessment Date:** 13/07/2017

Site Street Address: Katoomba Christian Convention Centre, Katoomba

Assessor: Mr Admin; admin

Local Government Area: Blue Mountains **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 Eco Chalet C1 (east)

Vegetation Information

Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	20 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	20	**Overall Fuel Load(t/ha):**	25

Site Information

Site Slope	15 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	70

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:	HIGH	**Peak Elevation of Receiver(m):**	10.7
Level of Construction:	BAL 29	**Fire Intensity(kW/m):**	123222
Radiant Heat(kW/m2):	27.5	**Flame Angle (degrees):**	65
Flame Length(m):	65.01	**Maximum View Factor:**	0.32
Rate Of Spread (km/h):	9.54	**Inner Protection Area(m):**	70
Transmissivity:	0.77	**Outer Protection Area(m):**	0

Run Description:	B Eco Chalet C2 (east)		
Vegetation Information			
Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	20 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	20	Overall Fuel Load(t/ha):	25
Site Information			
Site Slope	15 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m)	Default	APZ/Separation(m):	87
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):	7.23
Level of Construction:	BAL 19	Fire Intensity(kW/m):	123222
Radiant Heat(kW/m2):	18.76	Flame Angle (degrees):	70
Flame Length(m):	65.01	Maximum View Factor:	0.224
Rate Of Spread (km/h):	9.54	Inner Protection Area(m):	87
Transmissivity:	0.751	Outer Protection Area(m):	0

Run Description:	C Dining / Administration Building & Cafe (north)		
Vegetation Information			
Vegetation Type:	Remnant Vegetation	Vegetation Group:	Remnant Vegetation
Vegetation Slope:	10 Degrees	Vegetation Slope Type:	Downslope
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):	30
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:	HIGH	Peak Elevation of Receiver(m):	6.59
Level of Construction:	BAL 29	Fire Intensity(kW/m):	9889
Radiant Heat(kW/m2):	19.6	Flame Angle (degrees):	75
Flame Length(m):	13.64	Maximum View Factor:	0.215
Rate Of Spread (km/h):	1.91	Inner Protection Area(m):	30
Transmissivity:	0.818	Outer Protection Area(m):	0

Run Description: D Eco Lodge 5 (north)

Vegetation Information

Vegetation Type:	Remnant Vegetation	**Vegetation Group:**	Remnant Vegetation
Vegetation Slope:	10 Degrees	**Vegetation Slope Type:**	Downslope
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):**	46

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):**	6.7
Level of Construction:	BAL 12.5	**Fire Intensity(kW/m):**	9889
Radiant Heat(kW/m2):	11.07	**Flame Angle (degrees):**	79
Flame Length(m):	13.64	**Maximum View Factor:**	0.126
Rate Of Spread (km/h):	1.91	**Inner Protection Area(m):**	46
Transmissivity:	0.786	**Outer Protection Area(m):**	0

Run Description: E Eco Lodge 6 (north)

Vegetation Information

Vegetation Type:	Remnant Vegetation	**Vegetation Group:**	Remnant Vegetation
Vegetation Slope:	10 Degrees	**Vegetation Slope Type:**	Downslope
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):**	32

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):**	6.62
Level of Construction:	BAL 19	**Fire Intensity(kW/m):**	9889
Radiant Heat(kW/m2):	18.07	**Flame Angle (degrees):**	76
Flame Length(m):	13.64	**Maximum View Factor:**	0.199
Rate Of Spread (km/h):	1.91	**Inner Protection Area(m):**	32
Transmissivity:	0.813	**Outer Protection Area(m):**	0