Travers

bushfire & ecology

bushfire protection assessment

Wallacia Golf Course Redevelopment
Lot 2 DP 1108408
13 Park Road, Wallacia

Under Division 4.3 (section 4.14) of the EP&A Act 1979

December 2019
(REF: A18CMCT02BF)

Bushfire Protection Assessment

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Lot 2 DP 1108408
13 Park Road, Wallacia

Report Author:	Nicole van Dorst BPAD Level 3 23610 John Travers BPAD Level 3 15195
Plans prepared:	Sandy Cardow
Checked by:	John Travers BPAD Level 3 15195
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The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features is to be confirmed by a registered surveyor.

ABN 85 624 419 870
PO Box 7138
Kariong NSW 2250

38A The Avenue
Mt Penang Parklands
Central Coast Highway
Kariong NSW 2250

t: 02 4340 5331
e: info@traversecology.com.au
www.traversecology.com.au

EXECUTIVE SUMMARY

Travers bushfire & ecology has been requested to undertake a bushfire protection assessment for the proposed Wallacia Golf Course Redevelopment at No. 13 Park Road, Wallacia.

The proposal includes alterations and additions to the existing club house, redesign of the existing golf course and redevelopment of the eastern portion of the site to create the Nepean Memorial Park (cemetery) with an associated integrated road network.

The existing club and new multipurpose chapel are (in part) Class 9b buildings under the National Construction Code (NCC) and are therefore considered 'assembly' buildings. The proposed new administration building and existing maintenance building are Class 5 & 6 buildings.

The proposed development is categorised by the NSW Rural Fire Service (RFS) as infill development and must be assessed in accordance with *Planning for Bush Fire Protection (PBP)* under Section 4.14 of the *Environmental Planning & Assessment Act (EP&A Act)*. Consideration of the specific objectives listed in *PBP* for special fire protection purpose developments (SFPP) are to be considered for the Class 9b buildings to ensure they comply with the aims and objectives of *PBP.*

This proposal has been prepared in accordance with the pre-release version of *PBP 2018* in its entirety and the development complies with all relevant performance criteria in this version of *PBP.*

At the time of submitting this report, the pre-release version of *PBP 2018* was not a legislated document and therefore the application cannot be certified as meeting the specifications and requirements of *PBP 2006*. As a result, this application must be referred to the RFS in accordance with Section 4.14.

Our assessment found that bushfire can potentially affect the proposed buildings from the Coastal Valley Grassy Woodland and Coastal Floodplain Wetland communities proposed to be retained and / or rehabilitated on site, resulting in possible ember and radiant heat attack.

However, the bushfire risk posed to the buildings will be reduced to an acceptable level of risk as an appropriate combination of bushfire protection measures can be applied to the development in accordance with *PBP*.

The assessment has concluded that the proposed development will provide compliance with *Planning for Bush Fire Protection* (*PBP) 2018* with the following proposed alternative solutions:

- Road carriageway widths of 6.5m (two-way) for all roads. Perimeter road standards have not been applied, based on the proposed use (Class 9b building), low occupancy numbers, low overall bushfire risk and road design which provides adequate access opportunities for emergency services.
- The proposed buildings will be provided with hydrants in accordance with the relevant *Australian Standard*. Hydrants are not proposed to be installed within the remainder of the road system.
- The bushfire attack assessment has been undertaken and will be applied in accordance with *PBP 2018* with an alternative solution approach undertaken for the chapel (based on upslope topography).

GLOSSARY OF TERMS

APZ	asset protection zone
AS	*Australian Standard*
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
BSA	bushfire safety authority
DA	development application
EEC	endangered ecological community
EP&A Act	*Environmental Planning & Assessment Act 1979*
FDI	fire danger index
IPA	inner protection area
LGA	local government area
m	metres
OPA	outer protection area
PCT	plan community type
PBP	*Planning for Bush Fire Protection 2018*
NCC	National Construction Code
RFS	NSW Rural Fire Service
SFPP	special fire protection purpose
VMP	vegetation management plan

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Introduction 1

Travers bushfire & ecology has been requested to undertake a bushfire protection assessment for the proposed Wallacia Golf Course redevelopment at No. 13 Park Road, Wallacia.

The property is located on land that is mapped by Penrith City Council as being bushfire prone. This triggers a formal assessment by Council in respect of the NSW Rural Fire Service (RFS) policy against the provisions of *Planning for Bush Fire Protection (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

The proposed Wallacia Golf Course redevelopment essentially involves three (3) parts:

- Redesign of the existing golf course and retention of the existing workshop / maintenance shed (refer Figure 1.1). This will involve rehabilitation of the creek line vegetation and endangered ecological communities (EEC) throughout the site.
- Alterations and additions to the existing club. As depicted in Figures 1.2 & 1.3 the proposed extension will include a new pool, gym, deck and terrace with internal refurbishments including a golf pro shop, function rooms, lounge and gaming area; and
- The development of Nepean Memorial Park within the eastern portion of the site. This will include the construction of a multipurpose chapel and administration office, burial sites as well as the associated road network (refer Figure 1.4).

Schedule 1 attached depicts the bushfire constraints and the APZs provided for the proposed built assets on site.

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Figure 1.1 – Site plan
(Source: *Harrison Golf*, dated 06/11/2019)

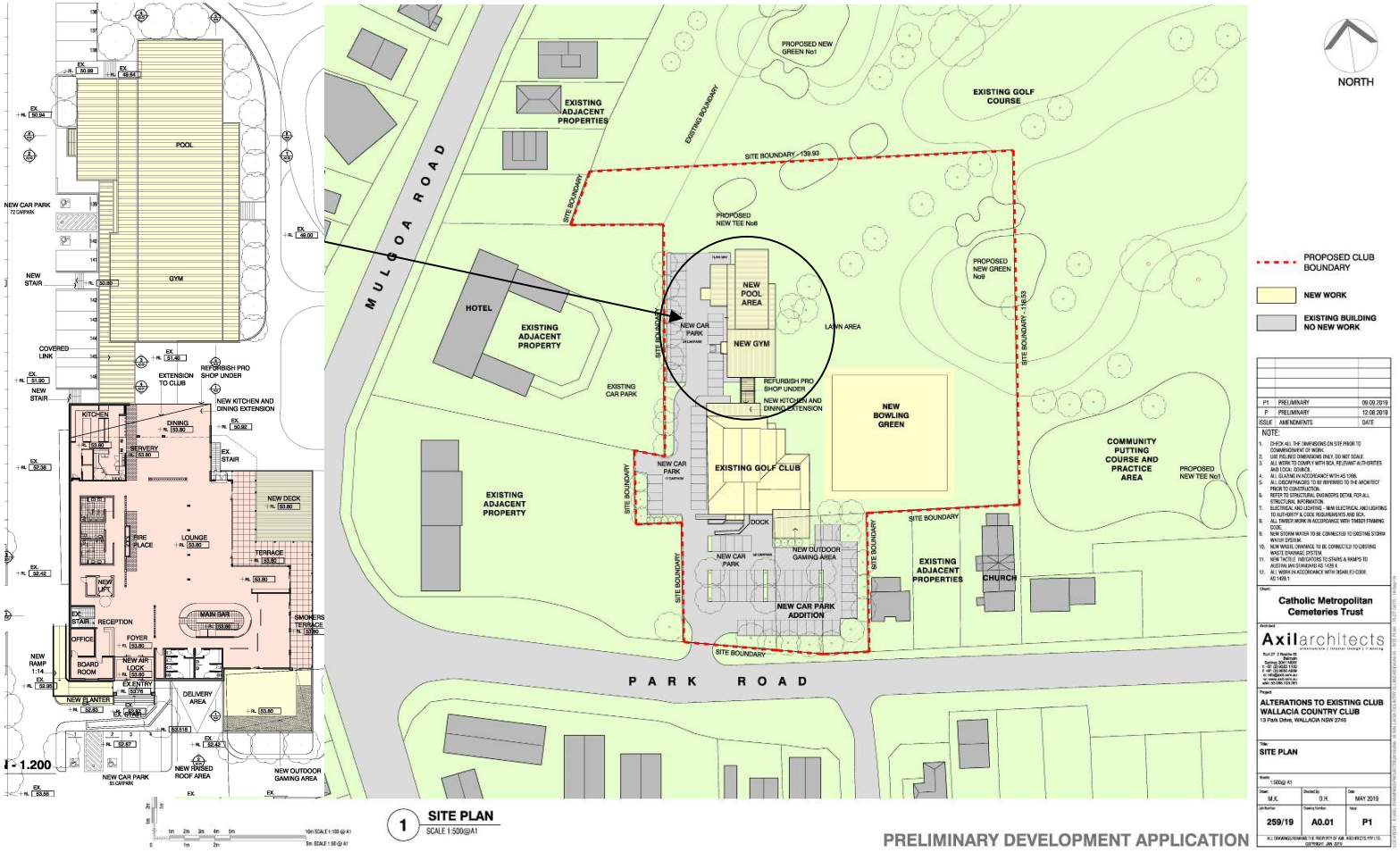


Figure 1.2 – Site plan for club (details of pool and gym extension)
(Source: *Axil Architects*, dated 2/12/2019)

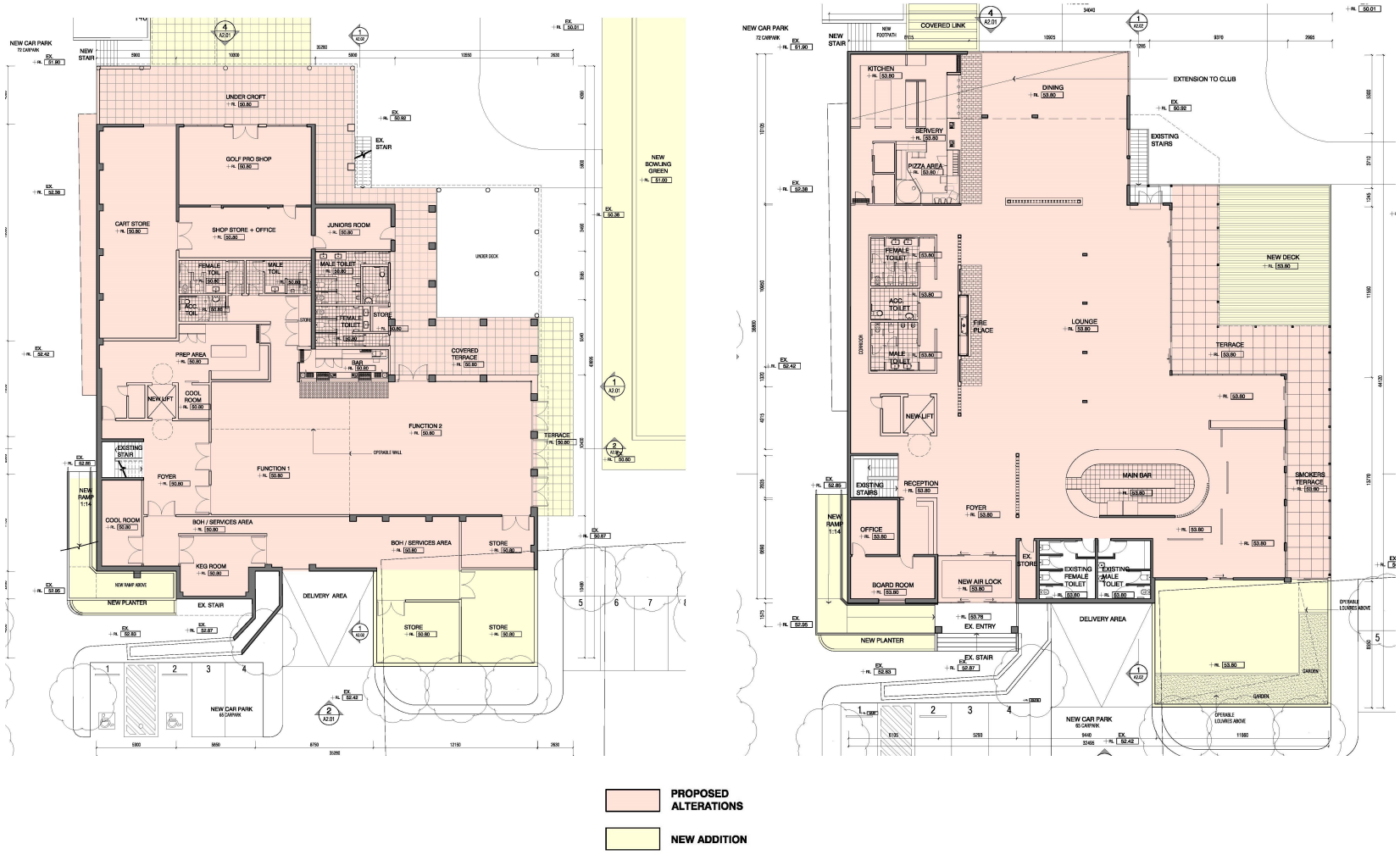


Figure 1.3 – Floor plans for clubhouse
(Source: *Axil Architects,* dated 02/12/2019)

Figure 1.4 – Nepean Gardens Masterplan (eastern portion of site)
(Source: *Florence Jaquet Landscape Architects*, dated 05/12/2019)

1.3 Information collation

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

- site and floor plans – Alternations to the existing Wallacia Country Golf Club prepared by *Axil Architects*, Job number 259/19, dated 02/12/2019.
- landscape drawings – Nepean Gardens Wallacia prepared by *Florence Jaquet Landscape Architects*, Job no. 1703, dated 05/12/2019
- Golf Course Grassing and Landscape Plans, prepared by *Harrison Golf Pty Ltd*, Drawing no; W917-DA-09, dated 03/11/19.
- Flora and fauna report prepared by *Travers bushfire & ecology, December 2019*
- Local environmental plans
- *NearMap* aerial photography
- topographical maps DLPI of NSW 1:25,000
- Australian Standard 3959 *Construction of buildings in bushfire-prone areas*
- *Planning for Bush Fire Protection 2018 (NSW RFS) (PBP)*

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

1.4 Site description

The property is approximately 44ha in size and is located north of Park Road and west of Mulgoa Road, within the local government area (LGA) of Penrith. The property currently accommodates Panthers Wallacia Golf Course which includes golf course greens, a clubhouse building, maintenance shed and car parking (refer Figure 1.5).

Bushland vegetation is restricted to the northern boundary of the site and within the riparian corridors. The bushfire risk is further mitigated by the proposed establishment of burial spaces within the eastern portion of the site which will ensure that the majority of this land (outside of the proposed conservations areas) and surrounding the road network will consist of mown / landscaped / managed land.

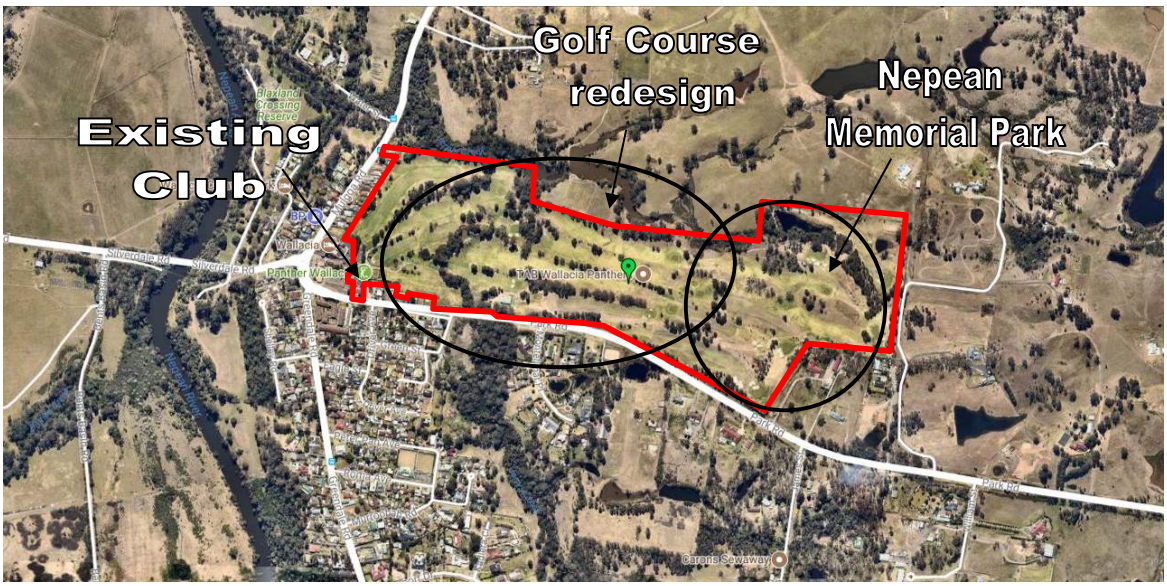


Figure 1.5 – Aerial appraisal

1.5 Legislation and planning instruments

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

The *EP&A Act* governs environmental and land use planning and assessment within New South Wales. It provides for the establishment of environmental planning instruments, development controls and the operation of construction controls through the National Construction Code (NCC). The identification of bushfire prone land is required under Section 10.3 of the *EP&A Act*.

Section 4.14 of the *EP&A Act* states that development consent cannot be granted for the carrying out of development for any purpose on bushfire prone land unless the consent authority:

- is satisfied that the development conforms to the specifications and requirements of *PBP*
- has consulted with the Commissioner of the NSW RFS concerning measures to be taken with respect to the development to protect persons, property and the environment from danger that may arise from a bushfire.

1.5.2 Bushfire prone land

Bushfire prone land maps provide a trigger for the development assessment provisions. The proposed development is located on land that is mapped by Penrith City Council as being bushfire prone (refer Figure 1.6).

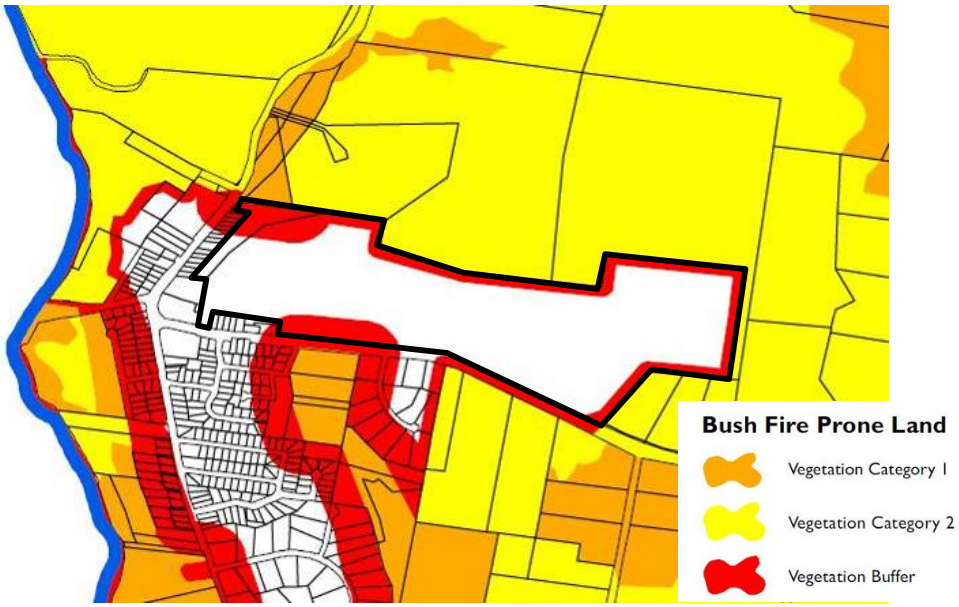


Figure 1.6 – Bushfire prone land map

1.5.3 Local Environmental Plan (LEP)

An LEP provides for a range of zonings and lists development that is permissible, or not permissible, as well as the objectives for development within a zone.

The majority of the site is zoned under the Penrith LEP 2010 as E3 Environmental Management with a small portion of RU5 Village and SP2 – Infrastructure. The proposal, including the provision of APZs, is consistent with the objectives of the zoning.

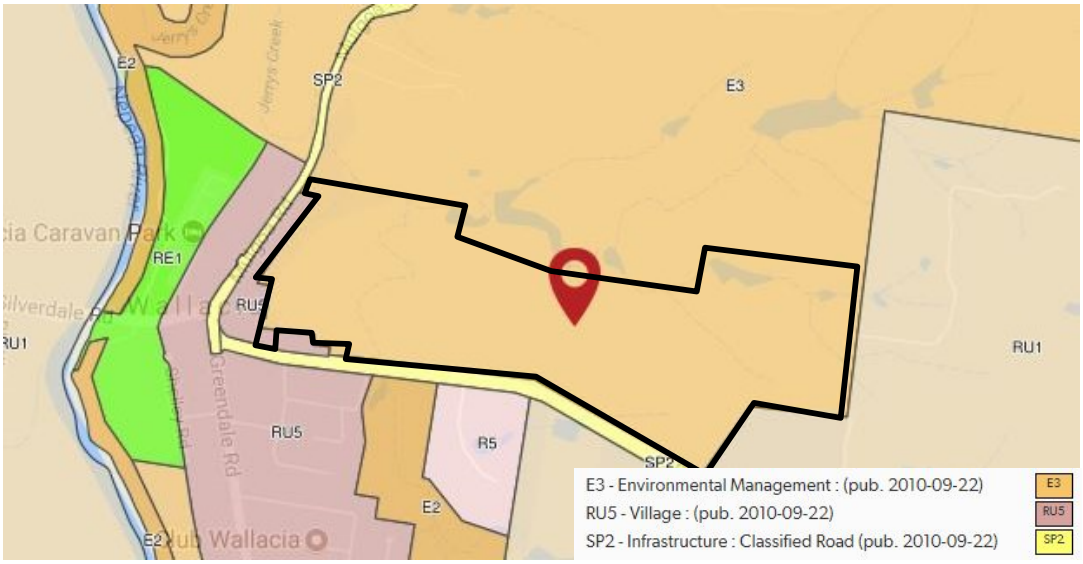


Figure 1.7 – Zoning map

1.5.4 Pre-release Planning for Bush Fire Protection 2018 (PBP)

Bushfire protection planning requires the consideration of the RFS planning document entitled *Planning for Bush Fire Protection. 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. *PBP* outlines the following specific objectives for infill development.

1. afford buildings and their occupants 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, minimises material ignition;
4. ensure that appropriate operational access and egress for emergency service personnel and residents is available;
5. provide for ongoing management and maintenance of bushfire protection measures;
6. ensure that utility services are adequate to meet the needs of firefighters.

Although the multipurpose chapel and clubhouse is not classified as a SFPP, the following objectives are required to be considered;

7. minimise levels of radiant heat, smoke and ember attack through increased APZ, building design and siting;
8. provide an appropriate operational environment for emergency service personnel during firefighting and emergency management;
9. ensure the capacity of existing infrastructure (such as roads and utilities) can handle the increase in demand during emergencies as a result of the development; and
10. ensure emergency evacuation procedures and management which provides for the special characteristics and needs of occupants.

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;
- emergency management arrangements.

1.5.6 National Construction Code (NCC) and the Australian Standard AS3959 – 2009

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

In NSW, the construction of buildings in bushfire prone areas relates to Classes 1, 2, 3, 4 & 9 buildings that are a SFPP development or a Class 10a building or deck associated with the aforementioned building classes. The design and construction manual for the deemed to satisfy requirements is the Australian Standard AS3959 *Construction of buildings in bushfire-prone areas 2009 (AS3959).* These classes of buildings must therefore be constructed in accordance with *AS3959.*

The NCC does not provide for any bushfire specific performance requirements for commercial and industrial buildings (Classes 5-8) and, as such, *AS3959* does not apply as a set of deemed to satisfy provisions. The general fire safety construction provisions are taken as acceptable solutions.

Section 2.3 provides an assessment for each of these building classes. The proposed multi-purpose chapel and clubhouse is in part a Class 9b building and is required to comply with *AS3959.*

1.6 Environmental constraints

Travers bushfire & ecology has prepared a Flora and Fauna Assessment Report for the property.

The report has recommended the following measures to mitigate adverse ecological impacts:

To mitigate adverse ecological impacts, the following avoid, reduce and minimise measures are proposed:

- The impacts on Cumberland Plain Woodland should be avoided and minimised and residual impacts offset through combination of onsite conservation / restoration measures or offsite offsetting

- A vegetation management plan (VMP) is to be prepared and should aim to restore the riparian zone using locally occurring (endemic) native vegetation species from the communities.

- Landscaping should consider the use of locally occurring (endemic) native species commensurate with Cumberland Plain Woodland on non-floodplain areas, and River-flat Eucalypt Forest on Coastal Floodplains in floodplain areas adjacent to watercourses.

The APZs recommended in the report take into account the vegetation management strategy.

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) if using the simplified acceptable solutions in the Pre-release version of *PBP 2018*, or alternatively the vegetation class if adopting the comprehensive vegetation fuel loads. The hazardous vegetation is calculated for a distance of at least 140m from a proposed building envelope.

Extensive vegetation survey of the development site has been undertaken by *Travers bushfire & ecology* with the preparation of a Flora and Fauna Assessment Report for the development application (DA). The results of this assessment are detailed in Schedule 1 (attached) with the vegetation conversions identified in the following Table 2.1.

The vegetation posing a bushfire threat to the proposed development includes:

Table 2.1 – Vegetation

Vegetation community / plant community type (PCT)	Vegetation formation	Vegetation classification	Comprehensive fuel loads (t/ha)	Acceptable solution fuel loads (t/ha) *(PBP 2018)*
Cumberland Plain Woodland (PCT – 849)	Woodland	Coastal Valley Grassy Woodland	10/18.07	10.5/20.2
River-flat Eucalypt Forest on Coastal Floodplains (PCT 835)	Forested Wetland	Coastal Floodplain Wetland	8.2/15.1	8.2/15.1

The following assessment has adopted *PBP 2018* (column 5) fuel loads identified above in order to comply with the acceptable solutions.

Hazardous fuels within 140m of the proposed buildings include;

- Existing and proposed Coastal Floodplain Wetland located approximately 115m to the east of the clubhouse.
- Existing and proposed Coastal Floodplain Wetland to the west and beyond Park Road to the south of the existing maintenance building.
- Coastal Valley Grassy Woodland and proposed remnant riparian revegetation located over 37m north of the proposed chapel.
- Proposed remnant buffer plantings to the north of the proposed administration building.
- Woodland vegetation surrounding the existing communications tower.

Photo 1 – View north of proposed chapel

Photo 2 – Vegetation to the north of the chapel / upslope from creek line

Photo 3 – Vegetation beyond Park Road, to the south of the maintenance building

Photos 4 & 5 – Vegetation to the west of the maintenance building

Photo 6 – Planted vegetation to the north of the administration building

Photo 7 – Planted vegetation to the north of the clubhouse (existing building)

Photo 8 – Planted vegetation adjoining the communications tower

2.2 Effective slope

The effective slope is assessed for a distance of up to 100m. Effective slope refers to that slope which provides the most effect upon likely fire behaviour. A mean average slope may not in all cases provide sufficient information such that an appropriate assessment can be determined.

The effective slope within the hazardous vegetation is:

- level to upslope within the Coastal Valley Grassy Woodland vegetation to the north of the chapel (on the northern side of the creek line);
- level within the Coastal Floodplain Wetland vegetation to the south and west of the workshop.

2.3 Bushfire attack assessment

A fire danger index (FDI) of 100 has been used to calculate bushfire behaviour on the site using forest vegetation located within the Greater Sydney Region. Table 2.2 provides a summary of the bushfire attack assessment for the chapel and clubhouse which have been assessed as a SFPP development.

Table 2.2 – Bushfire attack assessment (Class 9b buildings)

Aspect	Vegetation formation within 140m of development	Effective slope of land	Minimum APZ required equivalent to 10kw/m^2 (metres)	APZ provided (metres)	BAL construction standard
Chapel (Class 9b building)					
North	Woodland (grassy & woody) (10.5 / 20.2 t/ha)	5 ^{0U}	37m (refer Note 1)	38m	BAL 12.5
North-east	Remnant Forest (10/13.2 t/ha) (refer Note 2)	Level	38m	38m	
South and east	Remnant patches of planted vegetation (refer Note 2)	0-5 ^{0D}	47m	47m	
East	Remnant patches of planted vegetation (refer Note 2)	0-5 ^{0D}	N/A	47m	
Clubhouse (Class 9b)					
North, south, east & west	The land surrounding the proposed function centre (existing building) will be maintained as lawns and landscaped gardens. There is no bushfire prone vegetation within 100m of the building and therefore bushfire attack level (BAL) standards do not apply. However, an APZ of 100m has been applied to guide landscaping design.				

Notes: * Slope is either 'u' meaning upslope or 'c' meaning cross slope or 'd' meaning downslope

Note 1: A performance-based assessment using Appendix B of *AS3959* was undertaken to determine the radiant heat impact on the buildings based on woodland vegetation on an upslope of 5^{o}. The results of the assessment, provided within Appendix 1, were prepared using the bushfire attack assess developed by *Flamesol.*

Note 2: *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 these aspects 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*.

There are no predetermined minimum APZ requirements for Class 5-8 or Class 10 buildings under *PBP*, however all development must meet the aims and objectives of *PBP* which includes preventing direct flame contact and material ignition. In addition the NCC does not provide for any bushfire specific performance requirements for Class 5-8 buildings and, as a result, *AS3959* does not apply as a set of deemed to satisfy provisions.

The following assessment seeks to comply with the aims and objectives of *PBP* and to provide appropriate defendable space for the buildings.

Table 2.2 – Bushfire attack assessment

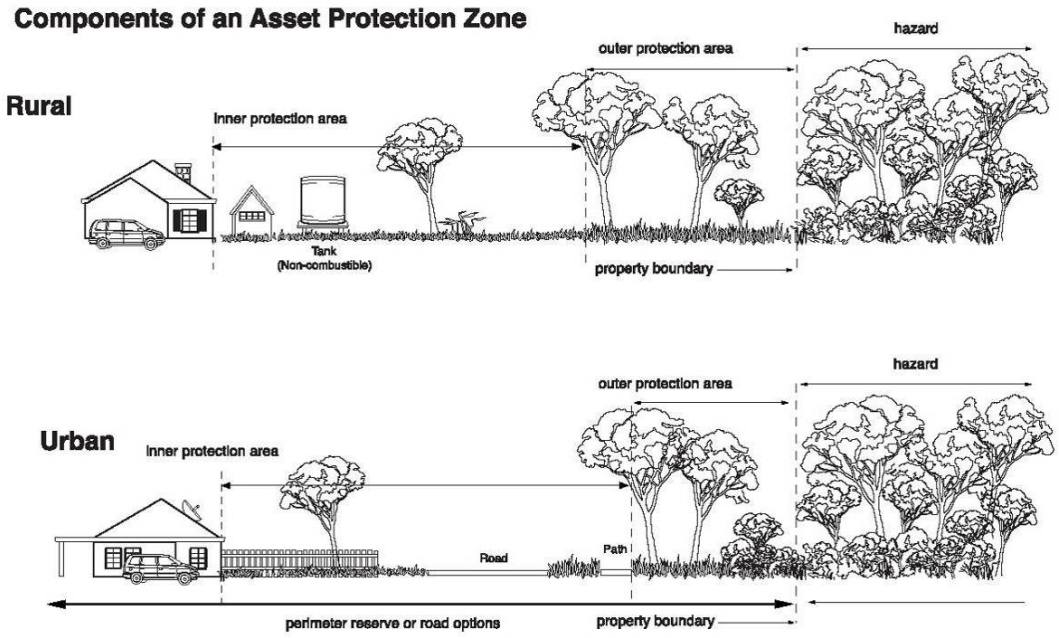
Aspect	Vegetation formation within 140m of development	Effective slope of land	Minimum APZ required (29kW/m2)	APZ provided (metres)	BAL construction standard recommended
Administration building (Class 5)					
North, south, east & west	The majority of the land surrounding the proposed administration building will be maintained as lawns and landscaped gardens, with a 15 – 40m wide landscaped planted buffer to the north-west. An APZ of 15m has been applied to prevent flame contact and material ignition (based on a remnant hazard).				
Maintenance building (Class 10) (existing)					
North & east	Managed land	0-5 ^{0D}	N/A	12	Not applicable. The Class 10 structure is located over 6m from other habitable buildings and therefore does not require compliance with *AS3959*.
South	Coastal Floodplain Wetland	0-5 ^{0D}	12	12	
West					
Communications tower (existing)					
In accordance with the *NSW RFS Community Resilience Practice Notes 1/11 – Telecommunication Towers in Bush Fire Prone Areas*, the existing tower on site is to be provided with an APZ of 10m. This APZ is to be free of surface fuel and elevated fuel and should have a minimum canopy.					

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, 2018)

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.

Although the chapel and clubhouse are not considered to be SFPP buildings, the aims and objectives of *PBP* should be considered with the provision of sufficient APZs to reduce radiant heat exposure to <10kWm^2. In addition, the Class 5-8 buildings have been provided with adequate APZs to fulfil the aims and objectives of *PBP* which includes the provision of defendable space and prevention of flame contact and material ignition.

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

Table 3.1 – Performance criteria for asset protection zones

Performance criteria		Acceptable solution	Acceptable solution	Performance solution	Comment
Asset Protection Zones (APZS)	Radiant heat levels of greater than 10kW/m² (calculated at 1200K) are not experienced by emergency service personnel and occupants during firefighting and emergency management.	The building is provided with an APZ in accordance with table A1.12.1 (See Appendix 1).	☐	☑	Complies. The chapel and clubhouse are not exposed to radiant heat thresholds >10kWm^2.
	Issues relating to slope are addressed: maintenance is practical, soil stability is not compromised and the potential for crown fires is negated.	The APZ is not located on lands with a slope exceeding 18°.	☑	☐	Complies
	APZs are managed and maintained to prevent the spread of a fire towards the building.	The APZ is managed in accordance with the requirements of Appendix 4 of this document, and is wholly within the boundaries of the development site.	☑	☐	Complies. Can be a condition of consent.
		Mechanisms are in place to provide for the maintenance of the APZ over the life of the development.	☑	☐	Complies. An 88b instrument is to apply to APZ areas.
		Other structures located within the APZ need to be located further than 6m from the refuge building.	☑	☐	Complies. Can be a condition of consent.
Landscaping	Landscaping is managed to minimise flame contact, reduce radiant heat levels, minimise embers and reduce the effect of smoke on residents and firefighters.	Landscaping is in accordance with *Asset protection zone standards* (see Appendix 4).	☑	☐	Complies. Can be a condition of consent.

3.2 Building protection

The NCC does not provide any bushfire specific requirements for Classes 5-8 industrial / commercial buildings. The general fire safety construction provisions are taken as acceptable solutions.

PBP recommends that bushfire construction standards for Classes 5-8 buildings should be considered on a case by case basis. Bushfire construction recommendations are dependent on the level of bushfire risk and the provision of adequate access opportunities.

Based on the proposed use, sufficient APZ and adequate access, the clubhouse, maintenance building and administration building will not require compliance with *AS3959.*

As outlined in Table 2.2 the chapel is to be constructed in accordance with BAL 12.5.

3.3 Hazard management

Should the development be approved, the owner of the property (or grounds maintenance staff) will be required to manage the APZ in accordance with RFS guidelines *Standards for Asset Protection Zones* (RFS, 2005) with landscaping to comply with Appendix 4 of *PBP*. In terms of implementing and / or maintaining APZs, there is no physical reason that would constrain hazard management from being successfully carried out by normal means (e.g. mowing / slashing / grazing). A summary of the guidelines for managing APZs is attached as Appendix 1 to this report.

3.4 Access for fire fighting operations

The intent of measures required by the RFS for internal roads is "*to provide safe operational access for emergency services personnel in suppressing a bush fire, while residents are accessing or egressing an area*".

The proposed road network has been designed to allow access to each of the built facilities and various burial and memorial sites throughout the development.

Table 3.2 below outlines the proposal's compliance with the performance criteria for internal roads.

Table 3.2 – Performance criteria for internal roads

Performance criteria		Acceptable solution	Acceptable solution	Performance solution	Comment
FIREFIGHTING VEHICLES	Firefighting vehicles are provided with safe, all-weather access to structures and hazard vegetation	SFPP access roads are two-wheel drive, all-weather roads.	☑	☐	Complies. Can be a condition of consent.
		Access is provided to all structures and hazard vegetation.	☑	☐	Complies
		Traffic management devices are constructed to not prohibit access by emergency services vehicles.	☑	☐	Complies. Can be a condition of consent.
		Access roads must provide suitable turning areas in accordance with Appendix 3.	☑	☐	Turning heads are to comply with Figure 3.1.
ACCESS ROAD CAPACITY	The capacity of access roads is adequate for firefighting vehicles	The capacity of road surfaces and any bridges/ causeways are sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes); bridges and causeways are to clearly indicate load rating.	☑	☐	Complies. Can be a condition of consent.
ACCESS TO WATER	There is appropriate access to water supply	Hydrants are located outside of parking reserves and road carriageways to ensure accessibility to reticulated water for fire suppression.	☑	☐	Complies. Can be a condition of consent.
		Hydrants are provided in accordance with *AS 2419.1:2005.*	☑	☐	Complies. Can be a condition of consent.
		There is suitable access for a Category 1 fire appliance to within 4m of the static water supply where no reticulated supply is available.			Not applicable

Performance criteria		Acceptable solution	Acceptable solution	Performance solution	Comment
PERIMETER ROADS	Perimeter access roads are designed to allow safe access and egress for medium rigid firefighting vehicles while occupants are evacuating as well as providing a safe operational environment for emergency service personnel during firefighting and emergency management on the interface.	There are two-way sealed roads.	☐	☑	There are no perimeter roads associated with this development based on land use and the location of the chapel. Expected occupant numbers will be low and safe operational access is provided to all bushfire hazard areas which are restricted to the outer perimeters of the site.
		8m carriageway width kerb to kerb.			
		Parking is provided outside of the carriageway width.			
		Hydrants are to be located clear of parking areas.			
		There are through roads, and these are linked to the internal road system at an interval of no greater than 500m.			
		Curves of roads have a minimum inner radius of 6m.			
		The maximum grade road is 15° and average grade is 10°.			
		The road crossfall does not exceed 3 degrees.			
		A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.			
NON-PERIMETER ROADS	Non-perimeter access roads are designed to allow safe access and egress for medium rigid firefighting vehicles while occupants are evacuating.	Minimum 5.5m width kerb to kerb.	☑	☐	Roads are 6.5m wide. The services road to the Chapel is 3.5m. This road is not required for firefighting operations as adequate access can be provided from the proposed internal road network.
		Parking is provided outside of the carriageway width.	☑	☐	2.1m wide parking bays are provided outside of the minimum 5.5m width.
		Hydrants are located clear of parking areas.	☑	☐	Can be a condition of consent
		There are through roads, and these are linked to the internal road system at an interval of no greater than 500m.	☑	☐	Dead end roads are short in length (i.e. <100m). The dead-end road in the east will access burial sites only (i.e. no buildings). Given the expected low usage rates, the 100m long road will provide safe access for fire fighters.
		Curves of roads have a minimum inner radius of 6m.	☑	☐	Can be a condition of consent

Performance criteria		Acceptable solution	Acceptable solution	Performance solution	Comment
		The maximum grade road is 15° and average grade is 10°.	☑	☐	Complies
		The road crossfall does not exceed 3°.	☑	☐	Can be a condition of consent
		A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.	☑	☐	Can be a condition of consent

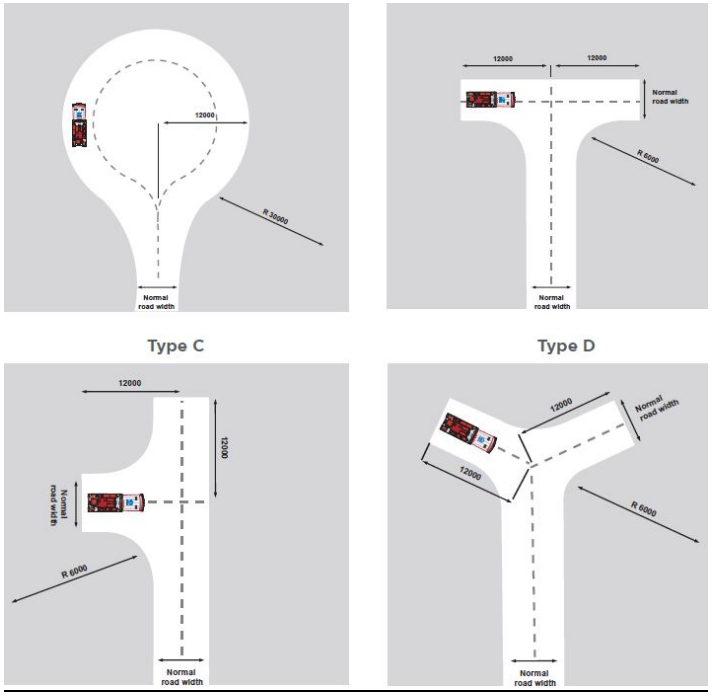


Figure 3.1 – Turning head dimensions
(Source: *Pre-release PBP*, 2018)

3.5 Water supplies

Table 3.3 outlines the proposal's compliance with the performance criteria for reticulated water supply.

Table 3.3 – Performance criteria for reticulated water supplies

Performance criteria	Acceptable solutions	Acceptable solution	Performance solution	Comment
Water supplies are located at regular intervals. The water supply is accessible and reliable for firefighting operations.	Fire hydrant spacing, design and sizing comply with the *Australian Standard AS2419.1:2005.*	☑	☐	Can be a condition of consent
	Hydrants are not located within any road carriageway.	☑	☐	Can be a condition of consent
	Reticulated water supply to SFPPs uses a ring main system for areas with perimeter roads.	☐	☑	Refer Note 1 below
Flows and pressure are appropriate.	Fire hydrant flows and pressures comply with *AS2419:2005.*	☑	☐	Can be a condition of consent
The integrity of the water supply is maintained.	All above-ground water service pipes external to the building are metal, including and up to any taps.	☑	☐	Can be a condition of consent

Note 1 - The proposed buildings (chapel, clubhouse and administration office) will be provided with hydrants in accordance with the requirements of the relevant *Australian Standard*. Hydrants will be located to ensure a 70m unobstructed path can be provided between the hydrant and all aspects of the buildings.

Hydrants are not proposed to be installed within the remainder of the road system. Given the extent of managed land surrounding the internal road network, the proposed use and limited built assets additional hydrants are not considered necessary.

3.6 Gas

Table 3.4 outlines the required performance criteria for the proposal's gas supply.

Table 3.4 – Performance criteria for gas supplies

Performance criteria	Acceptable solutions	Acceptable solution	Performance solution	Complies
Location and design of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.	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.	☑	☐	Can be a condition of consent
	All fixed gas cylinders are kept clear of all flammable materials to a distance of 10m and shielded on the hazard side connections to and from gas cylinders are metal.	☑	☐	Can be a condition of consent

Performance criteria	Acceptable solutions	Acceptable solution	Performance solution	Complies
	If gas cylinders need to be kept close to the building, safety valves are directed away from the building and at least 2m away from any combustible material, so they do not act as a catalyst to combustion.	☑	☐	Can be a condition of consent
	Polymer-sheathed flexible gas supply lines to gas meters adjacent to buildings are not used.	☑	☐	Can be a condition of consent
	above-ground gas service pipes external to the building are metal, including and up to any outlets.	☑	☐	Can be a condition of consent

3.7 Emergency and evacuation planning

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

Table 3.5 – Performance criteria for emergency and evacuation planning

Performance criteria		Acceptable solution	Acceptable solution	Performance solution	Comment
EMERGENCY MANAGEMENT	A bush fire emergency and evacuation management plan is prepared.	Bush fire emergency management and evacuation plan is prepared consistent with the: • The NSW RFS document: *A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan* • *Australian Standard AS 3745:2010 Planning for emergencies in facilities*	☑	☐	Can be a condition of consent
	Stable management arrangements are established for consultation and implementation of the bushfire emergency and evacuation management plan.	An Emergency Planning Committee is established to consult with staff in developing and implementing an Emergency Procedures Manual	☑	☐	Can be a condition of consent
		Detailed plans of all emergency assembly areas including 'on-site' and 'off-site' arrangements as stated in *AS 3745* are clearly displayed, and an annual (as a minimum) trial emergency evacuation is conducted.	☑	☐	Can be a condition of consent

Conclusion & Recommendations

4

4.1 Conclusion

Travers bushfire & ecology has been requested to undertake a bushfire protection assessment for the proposed Wallacia Golf Course Redevelopment at No. 13 Park Road, Wallacia.

Our assessment found that bushfire can potentially affect the proposed buildings from the Coastal Valley Grassy Woodland and Coastal Floodplain Wetland communities proposed to be retained and / or rehabilitated on site, resulting in possible ember and radiant heat attack.

However, the bushfire risk posed to the buildings will be reduced to an acceptable level of risk as an appropriate combination of bushfire protection measures can be applied to the development in accordance with *PBP*.

The assessment has concluded that the proposed development will provide compliance with *Planning for Bush Fire Protection* (*PBP) 2018* with the following proposed alternative solutions:

- Road carriageway widths of 6.5m (two-way) for all roads. Perimeter road standards have not been applied, based on the proposed use (Class 9b building), low occupancy numbers, low overall bushfire risk and a road design which provides adequate access opportunities for emergency services.
- The proposed buildings will be provided with hydrants in accordance with the relevant *Australian Standard*. Hydrants are not proposed to be installed within the remainder of the road system.
- The bushfire attack assessment has been undertaken and will be applied in accordance with *PBP 2018* with an alternative solution approach undertaken for the chapel (based on upslope topography).

Building construction standards have not been recommended for the administration building, maintenance building or clubhouse due to the surrounding managed land and / building use.

4.2 Recommendations

Recommendation 1 – APZs are to be provided to the proposed development as outlined in Table 2.1 & 2.2 and depicted in Schedule 1.

Recommendation 2 – Fuel management within the APZs is to be maintained by regular maintenance of the landscaped areas, mowing of lawns in accordance with the guidelines provided in Appendix 1, and / or as generally advised by the RFS in their publications.

Recommendation 3 – Building construction standards are to be applied in accordance with *AS3959 Construction of buildings in bushfire prone areas (2009)* with additional construction requirements as listed within Section A3.7 of Addendum Appendix 3 *PBP*.

Based on the proposed use, sufficient APZ and adequate access, the administration building, maintenance building and clubhouse will not require compliance with *AS3959.*

The multipurpose chapel is to be constructed in accordance with BAL 12.5.

Recommendation 4 – Water supply is to comply with the performance criteria outlined in Table 6.4b of *PBP 2018*.

The proposed and existing buildings are to be provided with hydrants to ensure a 70m unobstructed path can be provided between the hydrant and all aspects of the buildings.

Recommendation 5 – Access is to comply with the performance criteria outlined Section 6.4.2 of *PBP 2018*. The internal road carriageway widths are 6.5m. The service road (chapel) has a carriageway width of 3.5m.

Recommendation 6 – Electricity and gas supply is to comply with the acceptable solutions as provided within Table 6.4b of *PBP 2018*.

Recommendation 7 – An emergency / evacuation plan will need to be prepared consistent with the *RFS Guidelines for the Preparation of Emergency / Evacuation Plan* prior to building occupation.

REFERENCES

Australian Building Codes Board (2019) – *National Construction Code*, Class 1 and Class 10 Buildings Housing Provisions Volume 2

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

Councils of Standards Australia AS3959 (2009) – *Australian Standard Construction of buildings in bush fire-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 (2018) – *Pre-release Planning for bushfire protection – a guide for councils, planners, fire authorities and developers*. NSW Rural Fire Service

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 : LiDAR)
- Creek (source : LPI)
- Asset Protection Zone (APZ)
- Inner Protection Area
- Outer Protection Area

Existing buildings

- Existing golf club
- Existing maintenance

Proposed buildings

- Gym/pool/Admin/kitchen

Revegetation Areas

- Existing wetland revegetation
- Proposed wetland revegetation
- Landscape planting
- Long rough tree planting

Vegetation Class

- Coastal Valley Grassy Woodland
- Coastal Floodplain Wetland

Non-EEC Vegetation

- Planted native vegetation

Vegetation Revegetation Areas

- Cumberland Plain Woodland (no mid-storey)(0.23ha)
- Cumberland Plain Woodland full reveg (0.21ha)
- River-flat Eucalypt Forest full reveg (1.05ha)

Managed to maximum height of 1m at golf course crossings

- River-flat Eucalypt Forest on Coastal floodplains (0.19ha)
- River-flat Eucalypt Forest full reveg (0.22ha)

Aerial source: Nearmap

0 25 50 m

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

PROJECT & MXD REFERENCE	DATE & ISSUE NUMBER	SCALE & COORDINATE SYSTEM
13 Park Rd Wallacia 18CMCT02_BF001	9/12/2019 Issue 1	1:2,000 @A3 GDA 1994 MGA Zone 56

TITLE

Schedule 1 - Bushfire Protection Measures (Golf Course Design)

Document Path: N:\GIS STORAGE\N Drive\18CMCT02_ParkRd_Wallacia\MXDs\18CMCT02_BF001.mxd

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Communications tower
10m
Chapel
37m
47m
47m
47m
Administration building
15m
15m
15m
15m

Aerial source: Nearmap

Legend

- Site boundary
- Contours 1m (source : LiDAR)
- Creek (source : LPI)
- Stormwater pipes & pits
- Asset protection zone

Bushfire Construction Standards AS3959 (2009)*

- BAL 12.5

Existing buildings

- Communications tower

Proposed buildings

- Administration building
- Chapel
- Landscape zone/ pavement
- Roads - proposed
- Existing wetland revegetation
- Proposed wetland revegetation
- Landscape planting
- Long rough tree planting

Vegetation Class

- Coastal Valley Grassy Woodland
- Coastal Floodplain Wetland

Non-EEC Vegetation

- Planted native vegetation (5.50ha)

Revegetation Areas

- Cumberland Plain Woodland full reveg (0.91ha)
- River-flat Eucalypt Forest full reveg (2.59ha)

EEC Regeneration Areas

- Cumberland Plain Woodland (1.38ha)
- River-flat Eucalypt Forest on Coastal floodplains (1.57ha)

0 50 100 m

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

PROJECT & MXD REFERENCE	DATE & ISSUE NUMBER	SCALE & COORDINATE SYSTEM
13 Park Rd Wallacia 18CMCT02_BF002	9/12/2019 Issue 1	1:2,000 @A3 GDA 1994 MGA Zone 56

TITLE

Schedule 1 - Bushfire Protection Measures (Cemetery Design)

Document Path: N:\GIS STORAGE\N Drive\18CMCT02_ParkRd_Wallacia\MXDs\18CMCT02_BF002.mxd

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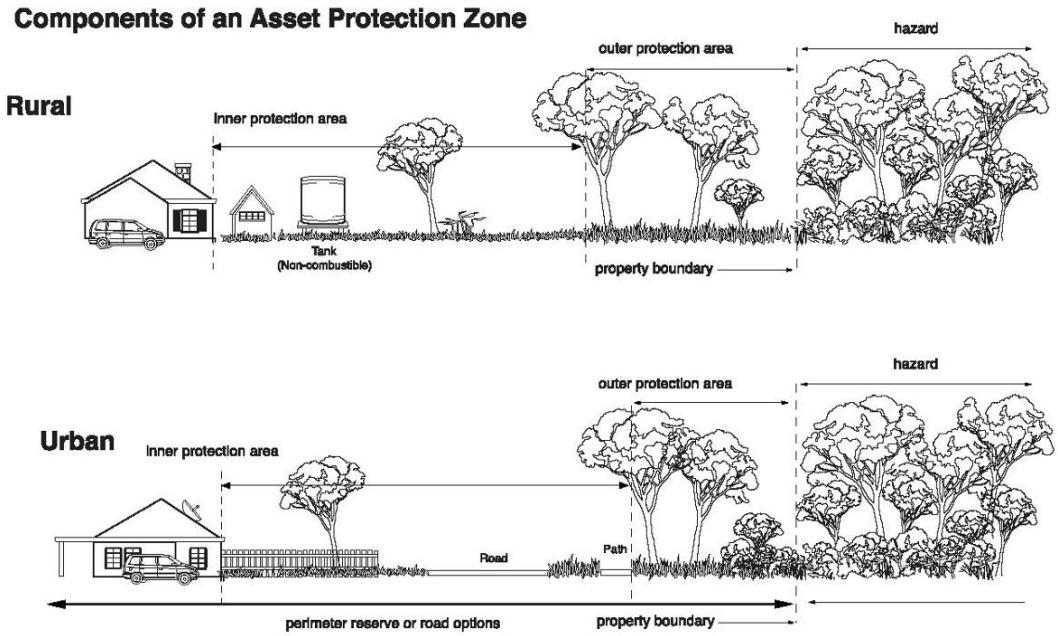
Management of Asset Protection Zones

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, 2018)

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 APZs are to be maintained as an IPA. The following provides maintenance advice for vegetation within the IPAs.

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 in the APZ area;
- 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 are removed.

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

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

Performance based assessment

A1

Calculated October 18, 2019, 4:39 pm (BALc v.4.8)

Wallacia (Chapel)

Bushfire Attack Level calculator - AS3959-2009 (Method 2)			
Inputs		Outputs	
Fire Danger Index	100	Rate of spread	0.89 km/h
Vegetation classification	Woodland	Flame length	8.220000000000001 m
Surface fuel load	10.5 t/ha	Flame angle	88 °
Overall fuel load	20.2 t/ha	Panel height	8.210000000000001 m
Vegetation height	n/a	Elevation of receiver	0.22 m
Effective slope	-5 °	Fire intensity	9,313 kW/m
Site slope	6 °	Transmissivity	0.799
Distance to vegetation	37 m	Viewfactor	0.0992
Flame width	100 m	Radiant heat flux	8.859999999999999 kW/m²
Windspeed	n/a	Bushfire Attack Level	BAL-12.5
Heat of combustion	18,600 kJ/kg		
Flame temperature	1,200 K		

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

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

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

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