

# Bushfire

Services

## **Bushfire Protection Assessment**

St Marys Western and Central Precincts  
Maryland Development Company

Penrith City Council

April 2009

Our Reference: B2070138



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for

Maryland Development Company

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## **PART A Introduction and objectives**

Maryland Development Company commissioned Bushfire and Environmental Services Pty Ltd (BES) to prepare a Bushfire Protection Assessment of the Western Precinct and Central Precinct for future development of residential and employment lands. The location and aerial photograph of both Precincts is provided within Figure 1.

The aim of this assessment is to provide Maryland Development Company with a single document on bushfire protection measures required under the Sydney Regional Environmental Plan No. 30 – St Marys (SREP 30) 'Planning for Bushfire Protection' (NSW Rural Fire Service 2006a) for both the Western and Central Precincts, and at a detail sufficient enough to address the necessary bushfire planning requirements of subsequent stages of the planning process including future subdivision and development applications. This assessment has been prepared in support of the draft Western and Central Precinct Plans.

The objectives of this assessment are to:

- Provide accurate and detailed information at a Precinct Plan scale for Asset Protection Zones required at bushland interface locations and any internal bushland areas such as riparian corridors;
- Provide a guide on the requirements for access in bushfire prone areas which includes road layout, design and construction standards;
- Provide a guide on the requirements for services in bushfire prone areas which includes the provision of a reticulated water supply and the location and installation of hydrants, other fire fighting infrastructure and electricity and gas;
- Provide detail necessary to assist Maryland Development Company in the preparation and provision of advice to prospective buyers on the application and implication of building construction standards and landscaping within designated Asset Protection Zones; and
- Provide detail necessary to assist Maryland Development Company in the preparation and execution of landscaping plans for the appropriate treatment of Asset Protection Zones in public space such as roadways, parks, and other open space areas.
- Provide a standard of bushfire protection that considers the Penrith City Council Sustainability Blueprint (PCC 2005), specifically Principles 1 and 2.

This report has been prepared to be used by Maryland Development Company, Penrith City Council, and NSW Rural Fire Service in guiding and assessing future development in regards to bushfire protection within both Precincts. Information specific to each Precinct pertaining to detailed assessment of Asset Protection Zones and building construction standards is contained within Tables 1 (page 14) and 2 (page 20), respectively. The proposed Framework Plans for the Western and Central Precincts that formed the basis of this assessment are included as Figures 2 and 3 respectively.

Figure 1: Location of Western and Central Precincts

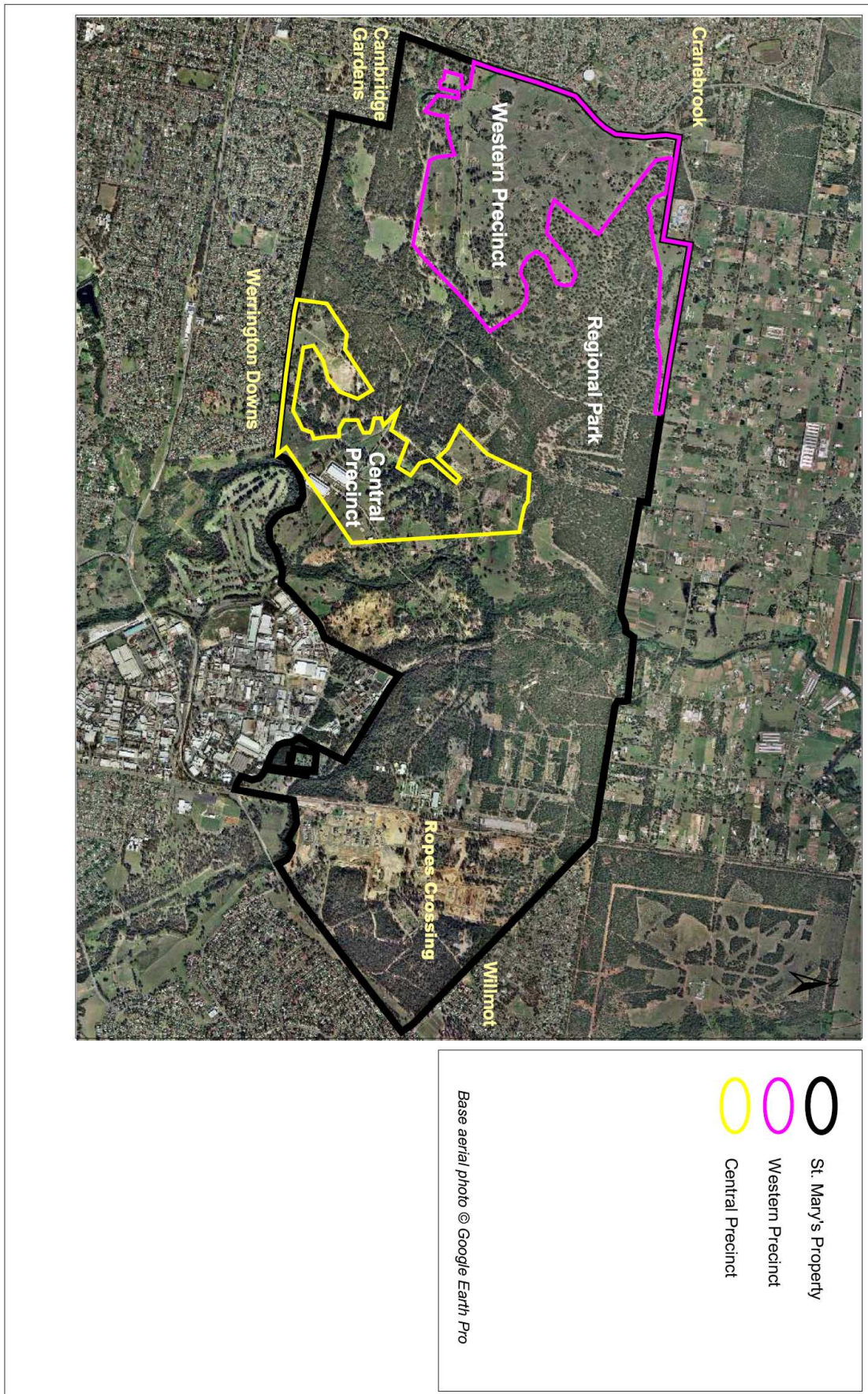




Figure 2: Proposed Framework Plan for Western Precinct

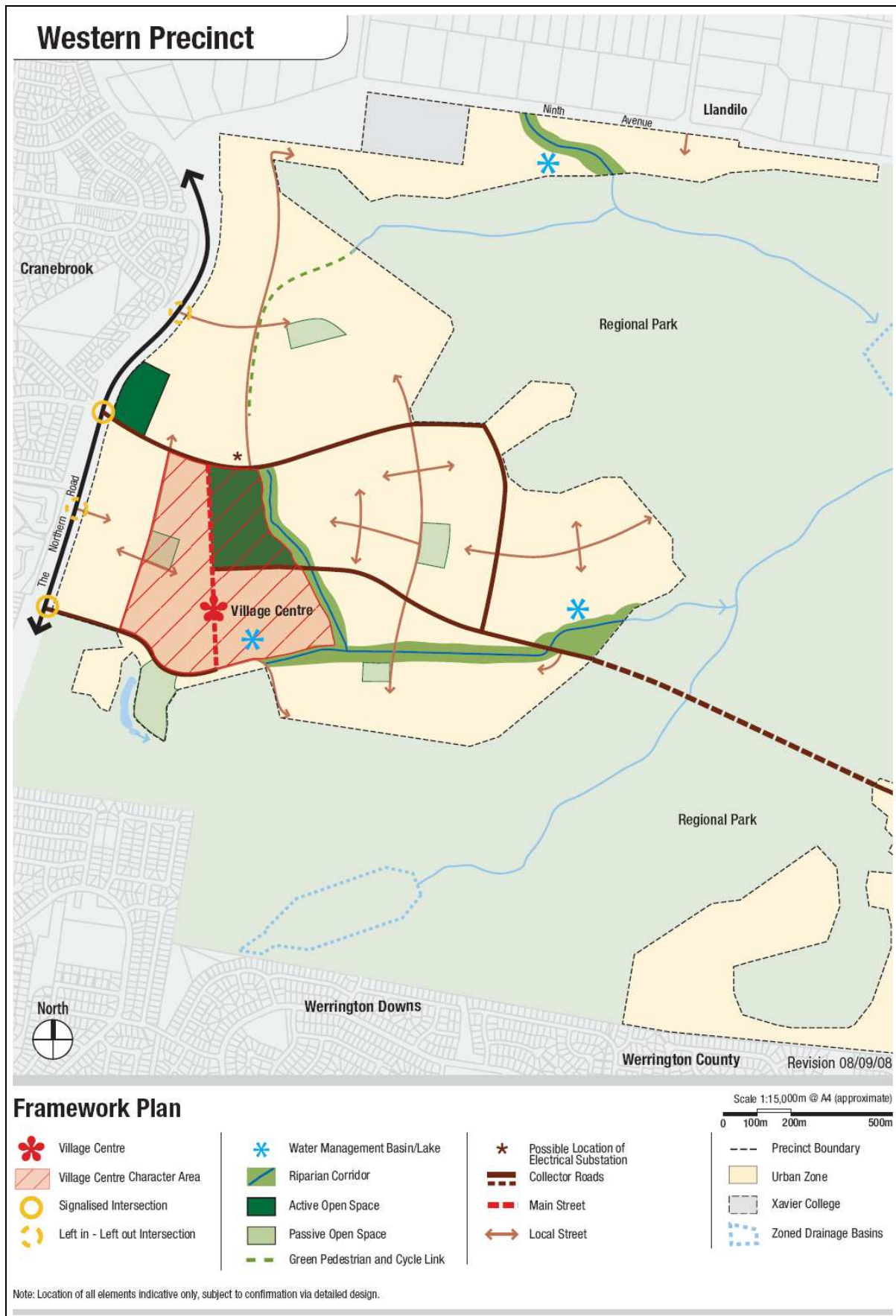
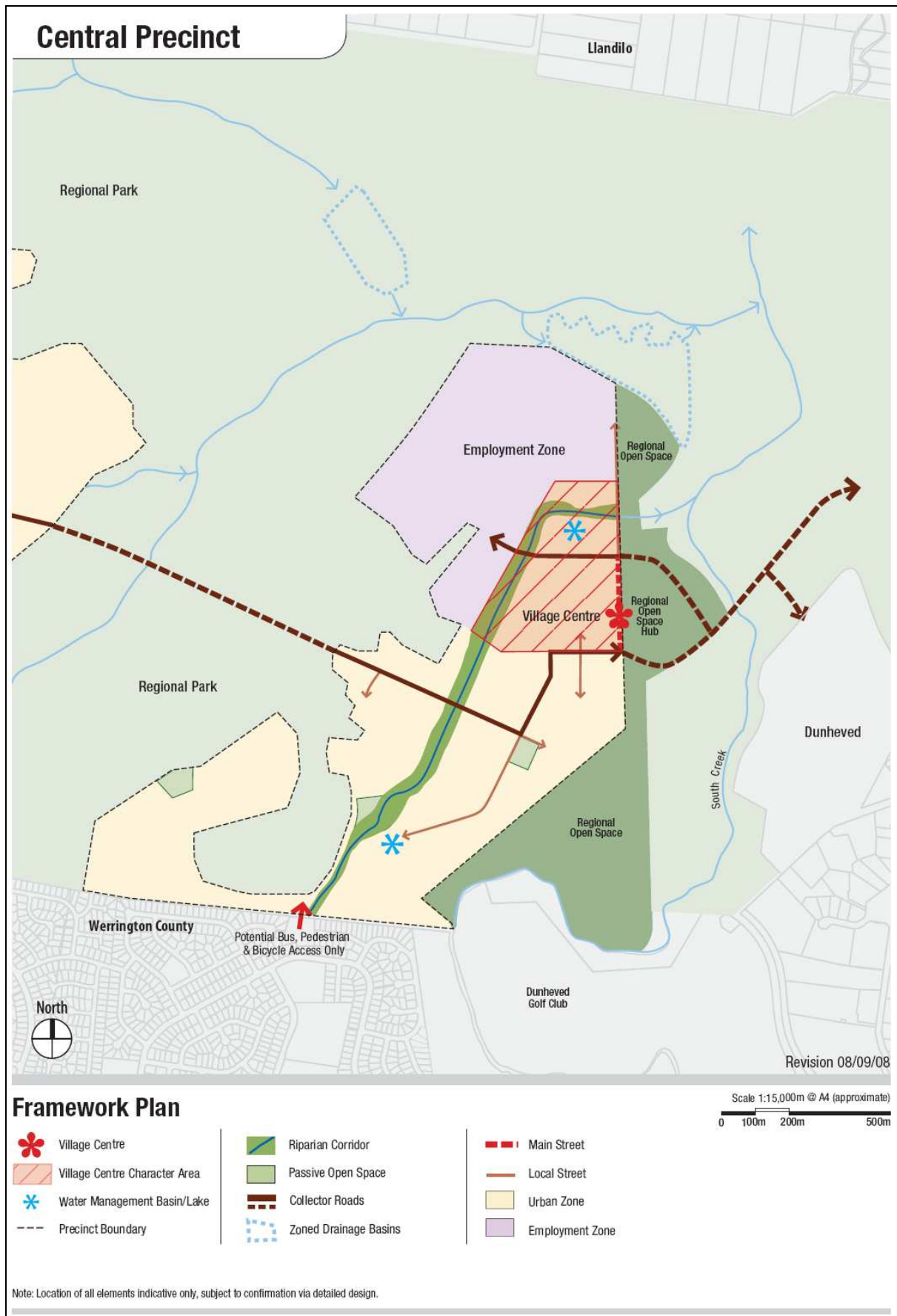


Figure 3: Proposed Framework Plan for Central Precinct





## **PART B      Legislation and bushfire protection assessment requirements**

Penrith City Council identifies both Precincts as bushfire prone land and the proposed development includes future subdivision of land for residential purposes and employment lands. A Bush Fire Safety Authority from the NSW Rural Fire Service is required for approval for integrated development (which includes residential subdivision and Special Fire Protection Purpose developments such as schools) and this authority is provided based on the details of a Bushfire Protection Assessment prepared in accordance with Section 100B of the *Rural Fires Act 1997*, clause 46 of the regulations, and the 'Planning for Bushfire Protection Guidelines' document (NSW Rural Fire Service 2006a), referred to within this report as 'PBP'.

Although a Bush Fire Safety Authority is not required for a Precinct Plan, this report provides the necessary detail to guide future development applications within the Western and Central Precincts. SREP 30 requires the Precinct Plan to incorporate fire management elements into development design such as fire protection zones and fire fighting infrastructure. Urban development adjoining bushland must incorporate fire protection zones and other fire control measures.

Bushfire risk and matters including Asset Protection Zones, building construction standards, access and services will be further addressed at the DA stage and, depending on the type of DA, in accordance with the requirements to obtain Rural Fire Service approval or to consult with the Rural Fire Service. This will include further consideration of the Asset Protection Zone widths identified in this precinct plan.

Future dwellings and development associated with proposed employment lands (e.g. commercial and industrial development) are to be assessed by Council under the provision of Section 79BA of the *Environmental Planning and Assessment Act 1979*, which includes the consideration of PBP.

This assessment was made based on the 'Specific Objectives' for each development type (i.e. residential, Special Fire Protection Purpose, and employment), taking into account the 'Standards for Bushfire Protection Measures' and compliance with the 'Acceptable Solutions' of PBP.

## **PART C      Environmental data**

This section details the environmental characteristics required to make informed decisions on the application of bushfire protection measures. The vegetation, ecological, topographical and land use data provided within this section was used to determine Asset Protection Zone location and dimension and the extent and level to which building construction standards are to be applied as required by the Acceptable Solutions within PBP.

### **C.1. Vegetation types and coverage**

The vegetation communities across the St Marys Property have been mapped by National Parks and Wildlife Service (2002) from aerial photograph interpretation and ground truthed and mapped in detail by Cumberland Ecology (2008a; 2008b) as shown in Figure 4.

The bushfire hazard (unmanaged bushland) is primarily the woodlands and open forest contained within the land zoned Regional Park as identified in Figure 1. The predominant vegetation within 140 m (PBP vegetation assessment area) of the Precinct boundaries subject to development is Shales Plains Woodland (Cumberland Plain Woodland) (NPWS 2002, Cumberland Ecology 2008a; Cumberland Ecology 2008b), which is classified as grassy woodland under PBP. There are sections of the Precinct boundaries that are adjacent to, or within 140 m of, open forest located along the alluvial riparian areas of the Regional Park. These areas are noted as being Alluvial Woodland according to NPWS (2002), however should be categorised as dry sclerophyll forest (shrub/grass formation) due to the presence of Swamp Oak Forest and River-flat Eucalypt Forest (Cumberland Ecology 2008a; Cumberland Ecology 2008b). Patches of Shale/Gravel Transition Forest also exist proximate to the Precinct boundaries as surveyed by Cumberland Ecology (2008a; 2008b). Figure 3 maps the vegetation within the Regional Park surrounding both Precincts.

Table 1 details those Western and Central Precinct boundaries affected by grassy woodland and dry sclerophyll forest.

In addition to the vegetation within the Regional Park, vegetation is proposed to be retained within the Precincts in the form of riparian areas and parks. Parks and riparian areas adjoined to the bushland of the Regional Park at the Precinct boundary will contain either grassy woodland or will be managed in a way that the park will not act as a bushfire hazard. Parcels of vegetation in all proposed parks and riparian areas located away from the Precinct boundary and Regional Park will be of a size or width suitable to be categorised as 'low hazard' vegetation (NSW Rural Fire Service 2006a; pg 52). 'Low hazard' vegetation may have Asset Protection Zones and building construction standards assessed using a vegetation categorisation of 'rainforest' as a surrogate.

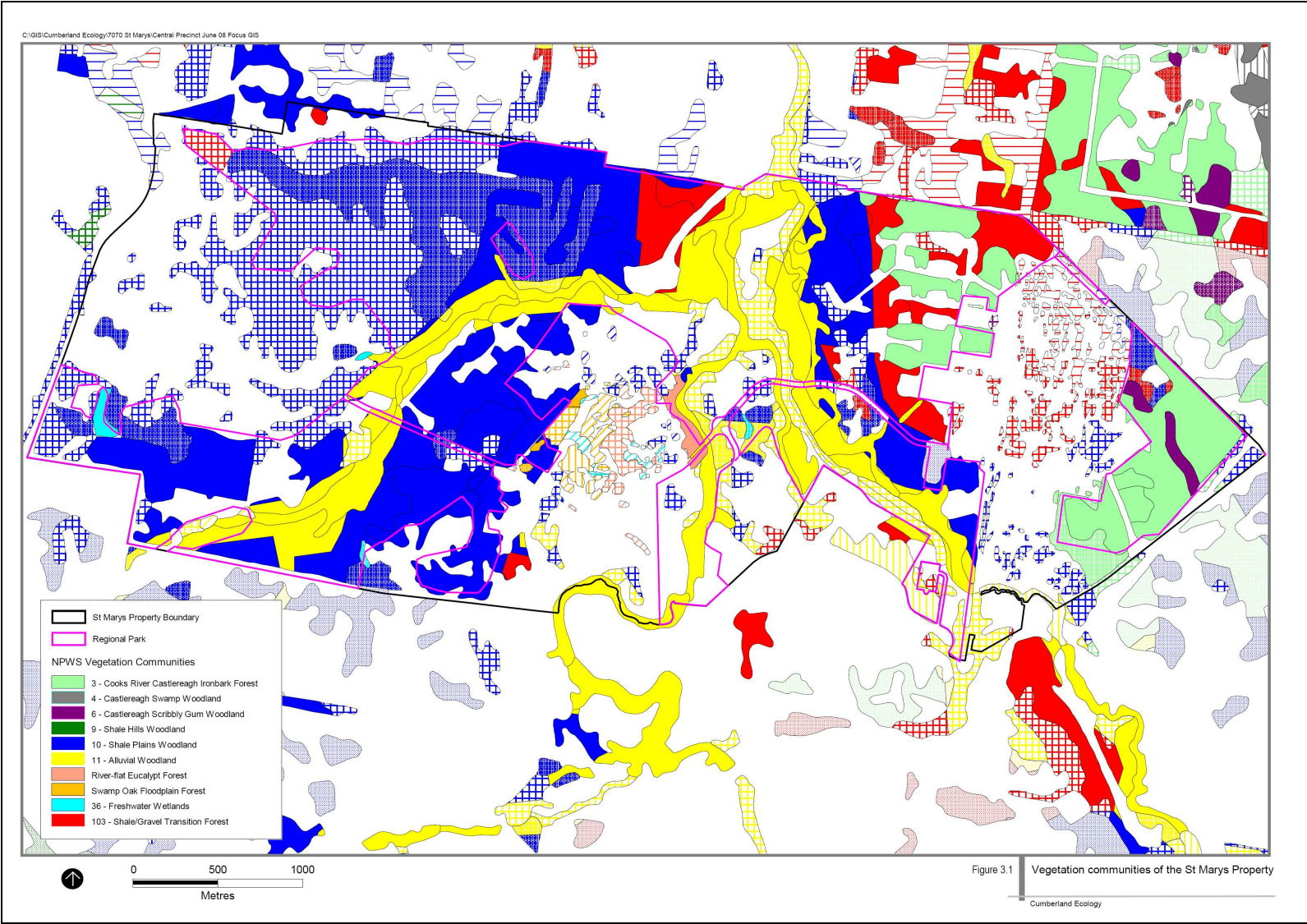
## **C.2. Slopes influencing fire behaviour**

In accord with PBP the slopes that would most significantly influence fire behaviour was determined for a distance of at least 100 m out from the Precinct boundaries in the direction of the bushfire hazard within the Regional Park. This assessment was made using a detailed survey with 1 m contour intervals prepared by Whelan Insites (2008a; 2008b).

The land rises very gently from the South Creek channel to the east of the Central Precinct (Penrith LGA and Blacktown LGA boundary) to the Northern Road to the west of the Western Precinct. Much of both Precincts are relatively flat and consist of slight undulating terrain at the most steepest points flat. There are no predominant or significant landscape terrain patterns and all Precinct – Regional Park boundary locations are within the PBP slope class of either 'upslope' or 'downslope >0-5 degrees'.

Table 1 details those Western and Central Precinct boundaries affected by either 'upslope' or 'downslope >0-5 degrees'.

Figure 4: Vegetation mapping of Western and Central Precincts by Cumberland Ecology (2008a; 2008b)



## **PART D Bushfire Protection Measures**

This section details the bushfire protection measures recommended for future development within both the Western and Central Precincts as required within the Acceptable Solutions of PBP. The bushfire protection measures include Asset Protection Zones (APZ), building construction standards, access, and services (such as water supply).

### **D.1. Asset Protection Zones (APZ)**

This section outlines the location and minimum dimension of Asset Protection Zones (APZ) within both the Western and Central Precincts.

PBP identifies three groups or types of development, each requiring a different level of bushfire protection, hence requiring a different method of assessment and application of Asset Protection Zones (APZ):

1. APZ for residential subdivision can be based on the Acceptable Solutions contained within Appendix 2, Table A2.4 of PBP;
2. APZ for Special Fire Protection Purpose Development (SFPP) can be based on the Acceptable Solutions within Appendix 2, Table A2.6 of PBP; and
3. APZ for Class 5 to 8 and 10 buildings (such as commercial and industrial development) is not specified within PBP, however aims and objectives of PBP to be satisfied which includes an appropriate separation from the bushfire hazard, defendable space and adequate access.

As it is proposed to have predominantly housing at the Precinct boundaries with Regional Park bushland interface areas, this assessment focuses on the bushfire protection standard for residential subdivision, however the detail necessary for the planning of SFPP developments (such as schools) and other developments (such as shopping centres and employment lands) is also included.

APZs will be further addressed at the DA stage and, depending on the type of DA, in accordance with the requirements to obtain Rural Fire Service approval or to consult with the Rural Fire Service. This will include further consideration of the Asset Protection Zone widths identified in this precinct plan.

#### **D.1.1. Residential subdivision**

Residential subdivision means the subdivision of land for future housing and may include multi-housing developments such as townhouses. Subdivision is integrated development as recognised under Section 100B of the *Rural Fires Act 1997*, and therefore an application is to be referred to the NSW Rural Fire Service for assessment and the issuing of a Bush Fire Safety Authority. Development applications for single dwellings are assessed by the local council under the *Environmental Planning and Assessment Act 1979* which calls for an assessment of the proposed development against PBP.

Appendix 2, Table A2.4 of PBP requires a minimum APZ ranging from 10 m to 25 m for residential development adjacent the Regional Park depending on the vegetation type and slope. Table 1 and Figure 5 identifies the required minimum APZ for those Western and Central Precinct boundaries adjoining the Regional Park.

Unless managed accordingly, internal parks sharing a boundary with the Regional Park will require an APZ the same width as that of the adjoining Regional Park boundary. Riparian areas will also require the same APZ width for a distance of at least 100 m from the Regional Park boundary. Internal parks separated from the Regional Park and riparian areas greater than 100 m from the Regional Park boundary may have an APZ of 10 m regardless of slope. This is due to the 'low hazard' vegetation categorisation for these minor bushland areas.

#### **D.1.2. Special Fire Protection Purpose (SFPP) developments**

Special Fire Protection Purpose (SFPP) developments require a higher standard of bushfire protection due to the vulnerability of the occupants and the potential need for assisted evacuation. The *Rural Fires Act 1997* and *Rural Fires Regulation 2002* identify SFPP developments to include:

- School;
- Child care centre;
- Hospital;
- Hotel, motel or other tourist accommodation;
- Building for mentally incapacitated persons;
- Housing for older people (SEPP Seniors Living) or disability (SEPP 5);
- Group homes (SEPP 9);
- Retirement village;
- Estates under SEPP 36;
- Employment areas solely for employees with disabilities;
- Respite care centres or similar; and
- Accommodation associated with an educational institution.

These types of developments are recognised under Section 100B of the *Rural Fires Act 1997* as integrated development, and therefore a development application is to be referred to the NSW Rural Fire Service head office for assessment and the issuing of a Bush Fire Safety Authority.

Appendix 2, Table A2.6 of PBP requires a minimum APZ ranging from 40 m to 70 m for SFPP development adjacent the Regional Park depending on the vegetation type and slope. Table 1 and Figure 5 identifies the required minimum APZ for those Western and Central Precinct boundaries adjoining the Regional Park, and indicates APZs that may be required for internal parks and riparian areas.



### **D.1.3. Other development**

The BCA does not provide for any bushfire specific performance requirements for non-habitable buildings such as Class 5, 6, 7, 8 and 10 buildings (which include offices, factories, warehouses and other commercial or industrial facilities), and as such building construction standards under AS 3959 'Construction of Buildings in Bushfire Prone Areas' (Standards Australia 2000) does not apply as a set of deemed to satisfy provisions. The general fire safety constructions provisions within the BCA are taken as acceptable solutions, but the aim and objectives of PBP apply in relation to other matters such as access, water and services, emergency planning, and landscaping/vegetation management. The objectives of PBP (NSW Rural Fire Service 2006a; pg 1) are:

- a) *Afford occupants of any building adequate protection from exposure to bushfire;*
- b) *Provide for defensible space to be located around buildings;*
- c) *Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent direct flame contact and material ignition;*
- d) *Ensure that safe operation access and egress for emergency service personnel and residents is available;*
- e) *Provide for ongoing management and maintenance of bushfire protection measures, including fuel loads in the asset protection zone (APZ); and,*
- f) *Ensure that utility services are adequate to meet the needs of firefighters (and others assisting in bushfire fighting).*

To satisfy the above objectives, the acceptable solution would be to provide an Asset Protection Zone as for residential development to prevent flame contact and ignition of external building materials (see objective c). An alternative option is to provide an APZ of a size where it acts as 'defensible space' only. PBP defines 'defensible space' as "*an area within the asset protection zone that provides an environment in which a person can undertake property protection after the passage of a bushfire within some level of safety*". This option relies on the high standard of construction (with respect to bushfire protection) inherent within light industrial and commercial buildings common to employment lands, and is appropriate for the style of the development (i.e. not a dwelling or SFPP development). A minimum defensible space of 10 m is recommended and is to consist of a perimeter road compliant with the acceptable solutions listed in Part D.3, Table 3.

Table 1 and Figure 5 identifies the recommended minimum defensible space adjoining the Regional Park for the proposed employment lands within the Western and Central Precincts.

#### **D.1.4. APZ management (vegetation, fuel and separated built structures)**

The management of an APZ is to be considered in three ways. Firstly: the separation of a building from the bushfire source; secondly, the provision of access or defendable space between the building and bushfire source; and thirdly, the continual maintenance of fuels within the APZ.

APZs can contain managed vegetation and can be utilised as areas of public open space, recreational areas such as sportsgrounds, access ways such as roads, and ancillary parts of development such as yards and car parks. The APZ is to be measured from the edge of the unmanaged bushland to the most external building point. In most cases for the Western and Central Precincts, the APZ would be measured from the Regional Park boundary or internal park boundary to produce a building line.

Landscaping within the APZ may differ between the Outer Protection Area (OPA) and Inner Protection Area (IPA) for forest vegetation. The OPA is a relatively smaller portion of the total APZ and extends from the bushfire source towards the IPA, which is adjacent the building. The purpose of the OPA is to reduce the rate of spread of fire, and reduce the likelihood of crown fire whilst providing a slightly denser tree canopy than the IPA to filter embers. The IPA offers more protection for defendable space and managing heat intensities at the building. The dimension of the OPA depends on the type of development and effective slope. These dimensions are indicated for specific locations in Table 1.

**Table 1: APZ calculation, location and dimensions for Western and Central Precincts**

Precinct boundary location (Figure 5)	Slope class of most influence <sup>1</sup>	Predominant vegetation community <sup>2</sup>	Residential APZ <sup>3</sup>	SFPP APZ <sup>4</sup>	Comment
<b>Western Precinct</b>					
1	Downslope >0 - 5°	Grassy Woodland	15 m (OPA not allowed)	50 m (OPA not allowed)	
2	Downslope >0 - 5°	Dry Sclerophyll Forest	25 m (OPA 10 m)	70 m (OPA 20 m)	Presence of Shale/Gravel Transition Forest as surveyed by Cumberland Ecology (2008b).
3	Downslope >0 - 5°	Grassy Woodland	15 m (OPA not allowed)	50 m (OPA not allowed)	
4	Downslope >0 - 5°	Grassy Woodland	15 m (OPA not allowed)	50 m (OPA not allowed)	
5	Upslope	Grassy Woodland	10 m (OPA not allowed)	40 m (OPA not allowed)	
6	Downslope >0 - 5°	Grassy Woodland	15 m (OPA not allowed)	50 m (OPA not allowed)	
7	Upslope	Grassy Woodland	10 m (OPA not allowed)	40 m (OPA not allowed)	
8	Downslope >0 - 5°	Dry Sclerophyll Forest	25 m (OPA 10 m)	70 m (OPA 20 m)	Presence of Swamp Oak Forest and River-flat Eucalypt Forest along the Regional Park riparian areas as surveyed by Cumberland Ecology (2008b).
9	Upslope	Grassy Woodland	10 m (OPA not allowed)	40 m (OPA not allowed)	
10	Downslope >0 - 5°	Grassy Woodland	15 m (OPA not allowed)	50 m (OPA not allowed)	
11	Upslope	Grassy Woodland	10 m (OPA not allowed)	40 m (OPA not allowed)	

Precinct boundary location (Figure 5)	Slope class of most influence <sup>1</sup>	Predominant vegetation community <sup>2</sup>	Residential APZ <sup>3</sup>	SFPP APZ <sup>4</sup>	Comment
12	Downslope >0 - 5°	Grassy Woodland	15 m (OPA not allowed)	50 m (OPA not allowed)	
13	Downslope >0 - 5°	Freshwater Wetlands	10 m (OPA not allowed)	35 m (OPA not allowed)	Wetland present within Regional Park.
14	Downslope >0 - 5°	Grassy Woodland	15 m (OPA not allowed)	50 m (OPA not allowed)	
15	Upslope	Grassy Woodland	10 m (OPA not allowed)	40 m (OPA not allowed)	
16	Downslope >0 - 5°	Grassy Woodland	15 m (OPA not allowed)	50 m (OPA not allowed)	
<b>Central Precinct</b>					
1	Downslope >0 - 5°	Grassy Woodland	15 m (OPA not allowed)	50 m (OPA not allowed)	
2	Upslope	Grassy Woodland	10 m (OPA not allowed)	40 m (OPA not allowed)	
3	Downslope >0 - 5°	Grassy Woodland	15 m (OPA not allowed)	50 m (OPA not allowed)	
4	Upslope	Grassy Woodland	10 m (OPA not allowed)	40 m (OPA not allowed)	
5	Downslope >0 - 5°	Grassy Woodland	15 m (OPA not allowed)	50 m (OPA not allowed)	
6	Upslope	Dry Sclerophyll Forest	20 m (OPA 10 m)	60 m (OPA 20 m)	Presence of Shale/Gravel Transition Forest as surveyed by Cumberland Ecology (2008b).

Precinct boundary location (Figure 5)	Slope class of most influence <sup>1</sup>	Predominant vegetation community <sup>2</sup>	Residential APZ <sup>3</sup>	SFPP APZ <sup>4</sup>	Comment
7	Upslope	Dry Sclerophyll Forest	20 m (OPA 10 m)	60 m (OPA 20 m)	Presence of Shale/Gravel Transition Forest as surveyed by Cumberland Ecology (2008b).
8	Downslope >0 - 5°	Dry Sclerophyll Forest	25 m (OPA 10 m)	70 m (OPA 20 m)	Presence of Shale/Gravel Transition Forest as surveyed by Cumberland Ecology (2008b).
9	Upslope	Grassy Woodland	10 m (OPA not allowed)	40 m (OPA not allowed)	
10	Downslope >0 - 5°	Grassy Woodland	15 m (OPA not allowed)	50 m (OPA not allowed)	
11	Downslope >0 - 5°	Dry Sclerophyll Forest	25 m (OPA 10 m)	70 m (OPA 20 m)	Presence of Swamp Oak Forest and River-flat Eucalypt Forest along the Regional Park riparian areas as surveyed by Cumberland Ecology (2008b).
12	Detention basin		APZ not required		APZ not required if detention basin is managed. If not managed a 25 m APZ will be required (dry sclerophyll forest; downslope >0 - 5°) within the Precinct or could be offset within the detention basin.
13	Regional Park Open Space		APZ not required		APZ not required as Regional Park Open Space will be managed.

<sup>1</sup> Slope class most significantly influencing fire behaviour where the vegetation (bushfire hazard) is found over 100 m from the Precinct boundary.

<sup>2</sup> Predominant vegetation is the most predominant and problematic vegetation over 140 m from the Precinct boundary.

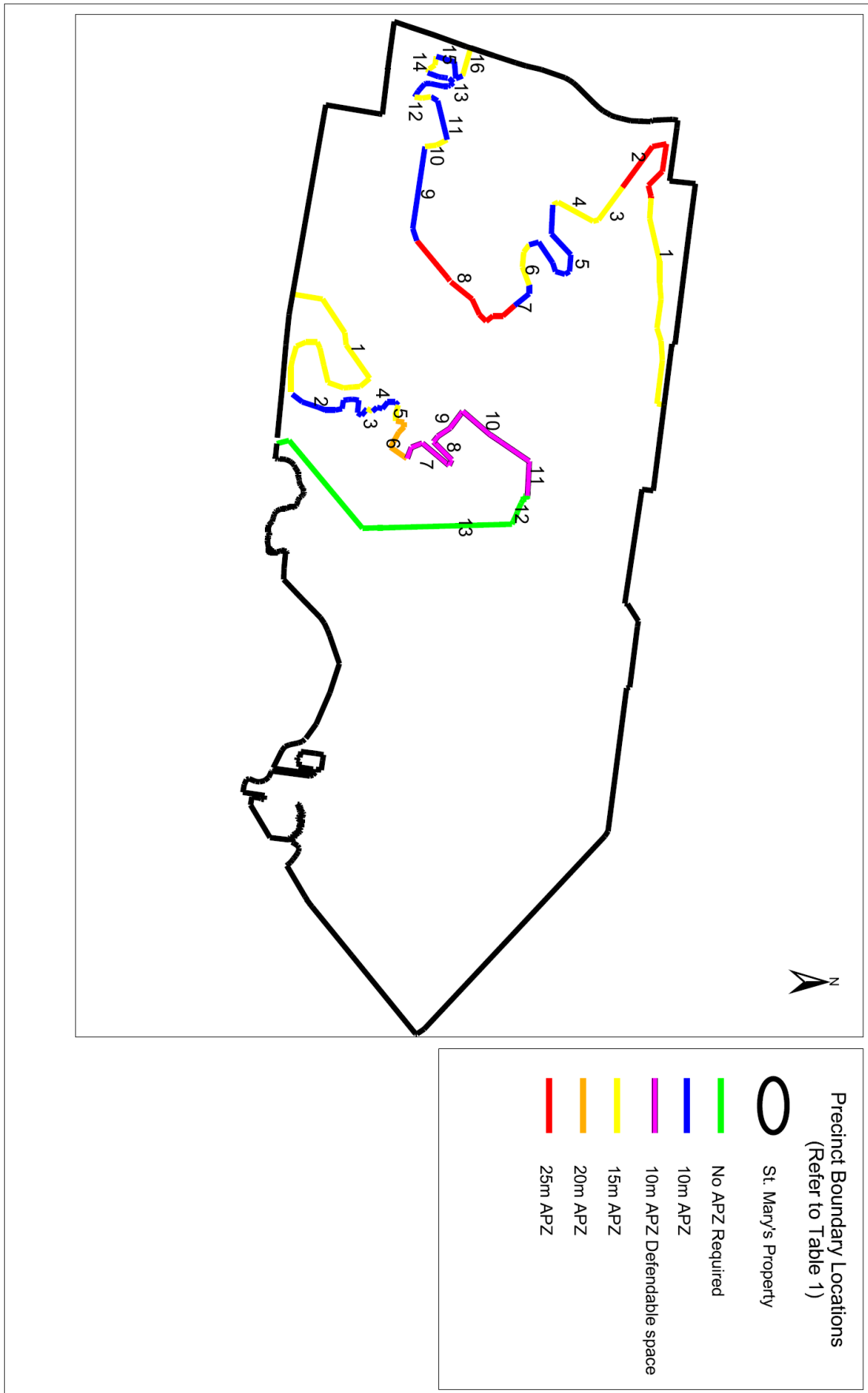
<sup>3</sup> PBP required setback for residential subdivision.

<sup>4</sup> PBP required setback for Special Fire Protection Purpose (SFPP) development.

\*Asset Protection Zones will be further addressed at the DA stage and, depending on the type of DA, in accordance with the requirements to obtain Rural Fire Service approval or to consult with the Rural Fire Service. This will include further consideration of the Asset Protection Zone widths identified in this precinct plan.



Figure 5: APZ locations and dimensions for Western and Central Precincts



The APZ, including differences in OPA and IPA management, is to be landscaped and managed in the following manner:

- No part of a building is to be within the APZ.
- Mature canopy trees may be within the OPA providing the canopy cover is less than 30% (which may include small clumps of crowns or a single grove of trees).
- Mature canopy trees may be within the IPA providing the canopy cover is less than 15% (which may include small clumps of crowns or a single grove of trees).
- Understorey saplings, shrubs and groundcovers within both the OPA and IPA are to be managed in the following manner:
  - The saplings provide a sparse scatter of individuals useful for the long-term replacement of canopy species typically retained within the APZ;
  - The saplings and shrubs are well spread out and do not form a contiguous pathway from the bushfire source to a dwelling;
  - A minimal ground fuel is to be maintained to include either mown/slashed grass, mulch, managed groundcovers, organic matter, bare or sealed ground, providing the final groundcover does not exceed 4 tonnes per hectare of fine fuel (*i.e.* material less than 6 millimetres in diameter). The OPA may have up to 8 tonnes per hectare of fine fuel;
  - Landscaped and garden areas with higher fuel loads can be within the APZ providing they are within well-defined and managed garden beds that do not provide a continuous pathway of fuels from the bushfire source to a dwelling.

The placement and management of built landscaping structures within the APZ also requires consideration. There is the potential for structures to ignite and significantly add to the radiant heat output of a fire front.

Solid fences should be constructed from non-combustible materials (e.g. masonry, steel etc) or may have wire construction (with timber posts allowed). Other structures should be separated from the dwelling and if constructed from timber, should be constructed from a hardwood species accepted as fire-retardant treated timber. Sheds are permitted within the APZ and should be constructed to meet the expected category of bushfire attack or radiant heat output. The assessment of sheds and the like will be made at the time of a development application (if applicable) for that structure.

Other items that are not combustible, but may perish during a fire may include play equipment, garden lighting and irrigation systems. Such items do not contribute to the radiant heat load or transfer of a fire and are therefore permitted within the APZ. An exception to this general rule is for plastic water tanks. All water tanks in bushfire prone areas (*i.e.* within 100 m of bushland) are to be either metal or concrete so that the stored water may be used during times of fire.

### **D.1.5. Perimeter access**

All bushland/development interface areas within the Western and Central Precincts are to be accessible by a perimeter access road linked to the internal road network at regular intervals. These roads may be in the form of public perimeter roads or fire trails, including fire trails within the Regional Park accessed by the Precinct road network. Some shorter sections of the interface may adjoin the bushland within the Regional Park without a public perimeter road in between, but these areas are to be limited where possible, and short in distance (e.g. a maximum of 140 m in length between possible hydrant locations in the public road network at either end).

The Part D.3 of this report provides further road design and construction information for perimeter roads.

### **D.1.6 APZ management responsibility**

The management responsibility of the APZ is to be designated to a responsible party. This may consist of:

- The individual allotment owners or managers (if leased) for those portions of the APZ within private residential allotments;
- Maryland Development Company (or other land manager) where an APZ occurs within parkland, open space or a temporary APZ until such time that construction and landscaping is complete and the ownership/management of the land is transferred over to Penrith City Council; or
- Penrith City Council where an APZ occurs within a road reserve, parkland or open space..

## **D.2. Building construction**

The building construction standard for future dwellings within the Western and Central Precincts is based on the separation distance between the building and the bushfire source, and the vegetation type and slopes, as determined for the APZ. Using Table A3.3 within PBP, this information results in the determination of a category of bushfire attack potentially received by a dwelling within 100 m of the bushfire source. The range of these categories is 'extreme', 'high', 'medium' and 'low'. These categories relate specifically to a level of building construction standard found in Section 3 of AS3959-1999 'Construction of buildings in bushfire-prone areas', being Level 3, Level 2, Level 1 and no requirement, respectively. Appendix 1 contains a summary of the levels of construction within AS3959-1999 and how they differ from each other.

The assessment of building construction standard is usually undertaken at the development application stage for a particular building as aspects of the building and its location with respect to the bushfire hazard and surrounding buildings can alter the required standard. The following information provides as much detail as possible at this stage of the planning process. Detail is provided on the areas affected by the three levels of construction, and their application to individual buildings.

**Table 2: Areas affected by construction standards (AS3959-1999) at Western and Central Precincts**

APZ locations (refer to Table 1 and Figure 5 for locations)	Level 3	Level 2	Level 1	No requirement
10 m APZ for freshwater wetland, downslope	10 to <15 m from the bushfire source	15 to <22 m from the bushfire source	22 to 50 m from the bushfire source	> 50 m from the bushfire source
10 m APZ for grassy woodland, upslope	11 to <16 m from the bushfire source	16 to <23 m from the bushfire source	23 to 100 m from the bushfire source	> 100 m from the bushfire source
15 m APZ for grassy woodland, downslope 0 - 5°	14 to <20 m from the bushfire source	20 to <29 m from the bushfire source	29 to 100 m from the bushfire source	> 100 m from the bushfire source
20 m APZ for dry sclerophyll forest, upslope	20 to <29 m from the bushfire source	29 to <40 m from the bushfire source	40 to 100 m from the bushfire source	> 100 m from the bushfire source
25 m APZ for dry sclerophyll forest, downslope 0 - 5°	25 to <36 m from the bushfire source	36 to <49 m from the bushfire source	49 to 100 m from the bushfire source	> 100 m from the bushfire source
10 m APZ for 'low hazard' Vegetation, upslope	9 to <13 m from the bushfire source	13 to <19 m from the bushfire source	19 to 50 m from the bushfire source	> 50 m from the bushfire source
10 m APZ for 'low hazard' Vegetation, downslope 0 - 5°	10 to <16 m from the bushfire source	16 to <24 m from the bushfire source	24 to 50 m from the bushfire source	> 50 m from the bushfire source
NB: Where two interface areas meet so that a particular allotment is potentially affected by two construction standards, the higher construction standard is to prevail.				

The application of the construction requirements to a particular dwelling is governed by the following rules developed by the NSW Rural Fire Service (2005; 2006b; 2006c) and contained within PBP:

- Those elevations or sections of a dwelling with direct exposure to the bushfire source (i.e. if there is a direct line of sight between the building element and the bushfire source) are required to be constructed to the corresponding standard as indicated within Table 2 (i.e. either Level 3, 2 or 1);
- Those elevations or sections of a dwelling that do not have direct exposure to the bushfire source may be constructed to a lower level of construction, with Level 1 being the lowest level;
- For dwellings affected by a Level 1 construction standard requirement only, the entire dwelling is to be constructed to Level 1, no matter how small the part of the dwelling affected;
- The entire roof of the dwelling is to be constructed to the highest corresponding construction standard; and
- 'Fire retardant treated timber' under AS 3959-1999 is to be hardwood species as recommended in the NSW Rural Fire Service 'Development Control Practice Note 2/06 Fire Retardant Treated Timber' (NSW Rural Fire Service 2006c) and the 'Warrington Report' (WFRA 2001).

The information provided within Table 2 and the above set of rules are prescriptive and quite detailed for the precinct level of planning. There is more flexibility on how the construction standard requirements can be applied to the elevations of an individual dwelling based on a dwelling plan at development application stage. For example, a dwelling affected by a Level 3 construction standard would, under the general rules outlined above, have to satisfy a Level 3 standard for the front and two side elevations, with a lower level applied to the elevation facing away from the bushfire source. Based on a dwelling plan, certain parts of a side facing elevation that may not be exposed directly to the bushfire source (e.g. due to a specific dwelling design such as a return in the facade). This level of flexibility can only be assessed and approved by Council based on the submission of a Bushfire Protection Assessment of the proposed dwelling plans (at development application stage) based on the provisions of PBP and AS 3959-1999.

### **D.3. Access**

Public roads within 100 m of the Regional Park boundary (i.e. bushfire prone land as defined by PBP) in both the Western and Central Precincts are recommended to meet the accepted solutions within PBP (NSW Rural Fire Service 2006a; pg 21), as listed in Table 3 and 4 below. Collector and main roads servicing those parts of the Precincts within 100 m of the Regional Park Boundary are also recommended to satisfy the acceptable solutions listed within Table 3 and 4.

Perimeter fire trails are recommended to meet the accepted solutions for fire trails within PBP (NSW Rural Fire Service 2006a; pg 23), as listed in Table 5 below. The performance criterion of the road system is to allow safe access for firefighters while residents are evacuating the area. Part D.1.5 allows for short lengths of the bushland interface to be without a public perimeter road providing certain performance criteria are satisfied.



**Table 3: Accepted solutions for public road design and construction in bushfire prone areas**

<b>PBP 2006 Public roads acceptable solutions</b>
<ul style="list-style-type: none"> <li>• Public roads are two-wheel drive, all weather roads</li> <li>• Urban perimeter roads are two-way, that is, at least two traffic lane widths (carriageway 8 metres minimum kerb to kerb), allowing traffic to pass in opposite directions. Roads that are not perimeter roads can comply with the road widths within Table 4 below.</li> <li>• The perimeter road is linked to the internal road system at an interval of no greater than 500 metres in urban areas.</li> <li>• Traffic management devices are constructed to facilitate access by emergency services vehicles.</li> <li>• Public roads have a cross fall not exceeding 3 degrees.</li> <li>• Public roads are through roads. Dead end roads are not recommended, but if unavoidable, dead ends are not more than 200 metres in length, incorporate a minimum 12 metres outer radius turning circle, and are clearly sign posted as a dead end and direct traffic away from the hazard.</li> <li>• Curves of roads (other than perimeter roads) are a minimum inner radius of six metres and minimal in number, to allow for rapid access and egress.</li> <li>• The minimum distance between inner and outer curves is 6 metres.</li> <li>• Maximum grades for sealed roads do not exceed 15 degrees and an average grade of not more than 10 degrees or other gradient specified by road design standards, whichever is the lesser gradient.</li> <li>• There is a minimum vertical clearance to a height of 4 metres above the road at all times.</li> <li>• The capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles (approximately 15 tonnes for areas with reticulated water, 28 tonnes or 9 tonnes per axle for all other areas). Bridges clearly indicated load rating.</li> <li>• Public roads greater than 6.5 metres wide to locate hydrants outside of parking reserves to ensure accessibility to reticulated water for fire suppression.</li> <li>• Public roads between 6.5 metres and 8 metres wide are No Parking on one side with the services (hydrants) located on this side to ensure accessibility to reticulated water for fire suppression.</li> <li>• Public roads up to 6.5 metres wide provide parking within parking bays and located services outside of the parking bays to ensure accessibility to reticulated water for fire suppression.</li> <li>• One way only public access roads are no less than 3.5 metres wide and provide parking within parking bays and located services outside of the parking bays to ensure accessibility to reticulated water for fire suppression.</li> <li>• Parking bays are a minimum of 2.6 metres wide from kerb to kerb edge to road pavement. No services or hydrants are located within the parking bays.</li> <li>• Public roads directly interfacing the bush fire hazard vegetation provide roll top kerbing to the hazard side.</li> </ul>

**Table 4: Minimum road widths for roads that are not perimeter roads**

<b>Curve radius (inside edge)</b>	<b>Swept path width</b>	<b>Single lane width</b>	<b>Two way width</b>
< 40 m	3.5 m	4.5 m	8.0 m
40 – 69 m	3.0 m	3.9 m	7.5 m
70 – 100 m	2.7 m	3.6 m	6.9 m
> 100 m	2.5 m	3.5 m	6.5 m

**Table 5: Accepted solutions for fire trail design and construction in bushfire prone areas**

<b>PBP 2006 Fire trail acceptable solutions</b>
<ul style="list-style-type: none"> <li>• A minimum carriage way width of four metres with an additional one metre strip each side of the trail (clear of bushes and long grass) is provided.</li> <li>• The trail is a maximum grade of 15 degrees if sealed and not more than 10 degrees if unsealed.</li> <li>• A minimum vertical clearance of four metres to any overhanging obstructions, including tree branches is provided.</li> <li>• The crossfall of the trail is not more than 10 degrees.</li> <li>• The trail has the capacity for passing by reversing bays using the access to properties to reverse fire tankers, which are six metres wide and eight metres deep to any gates, with a inner minimum turning radius of six metres and outer minimum radius of 12 metres; and/or a passing bay every 200 metres, 20 metres long by three metres wide, making a minimum trafficable width of seven metres at the passing bay (Note: some short constrictions in the access may be accepted where they are not less than the minimum (3.5 m) and extend to no more than 30 m and where obstruction cannot be reasonably avoided or removed).</li> <li>• The fire trail is accessible to firefighters and maintained in a serviceable condition by the owner of the land.</li> <li>• Appropriate drainage and erosion controls are provided.</li> <li>• The fire trail system is connected to the property access road and/or to the through road system at frequent intervals of 200 metres or less.</li> <li>• Fire trails do not traverse a wetland or other land potentially subject to periodic inundation (other than a flood or storm surge).</li> <li>• Gates for fire trails are provided and locked with a key/lock system authorised by the local RFS.</li> <li>• Fire trail design does not adversely impact on natural hydrological flows.</li> <li>• Fire trail design acts as an effective barrier to the spread of weeds and nutrients.</li> <li>• Fire trail construction does not expose acid-sulphate soils.</li> </ul>

#### **D.4. Services**

##### **D.4.1 Water supply**

Reticulated water (e.g. hydrant spacing, sizing and pressures) is to be supplied throughout the Western and Central Precincts in accordance with Australian Standard AS 2419-2005 'Fire hydrant installations – System design, installation and commissioning' (Standards Australia 2005). Hydrants are not to be located within any road carriageway and the provisions of parking and hydrant locations in the public road access Table 3 above are to be met.

#### **D.4.2 Electricity**

Where practicable, electrical transmission lines are to be underground. If above ground, they are to be installed with short pole spacing (e.g. 30 metres) and no part of a tree is closer to a powerline than the distance set out in accordance with the specifications in 'Vegetation Safety Clearances' issued by Energy Australia (NS179, April 2002).

#### **D.4.3 Gas**

Reticulated or bottled gas is installed and maintained in accordance with Australian and New Zealand Standard AS/NZS 1596 'The storage and handling of LP gas' (Standards Australia 2002) and the requirements of relevant authorities.

### **PART E PCC Sustainability Blueprint for Urban Release Areas**

The relevant principles (1 and 2) of the PCC Sustainability Blueprint for Urban Release Areas (PCC 2005) have been considered and the recommendations within this assessment conform to the objectives, design approach and performance criteria of those Principles. The required and recommended bushfire protection measures (NSW Rural Fire Service 2006a) are proposed to be considered as part of the overall development and will be located outside of areas of significant vegetation, such as the Regional Park and any other areas internal to the Western and Central Precincts. Bushfire protection measures such as Asset Protection Zones (APZ), perimeter roading and utility services will not be offset into natural landscape areas, and will be incorporated into the overall development design in accordance with the entire suite of Principles (PCC 2005).

### **PART F Conclusion**

In the author's professional opinion the recommendations within this report will provide an appropriate standard of bushfire protection for future development within the Western and Central Precincts consistent with 'Planning for Bushfire Protection' (NSW Rural Fire Service 2006a).



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**Appendix 1 – Summary of levels of construction within AS3959-1999 ‘Constructions of buildings in bushfire-prone areas’**

<b>Building Components</b>	<b>A summary of levels of construction standards from AS3959-1999 ‘Construction of buildings in bushfire-prone areas’</b> <b>Please Note: This table is a summary of AS 3959-1999 prepared by Bushfire &amp; Environmental Services Pty Ltd (BES). This table may not include all aspects of AS3959-1999 and therefore should be used as a guide only. Please refer to the complete standard for more information. BES does not take responsibility for errors or omissions, nor any loss or damage that may result from the use of this information.</b>		
	<b>Level 1</b>	<b>Level 2</b>	<b>Level 3</b>
<b>Flooring systems</b>	Concrete slab on ground, or Suspended concrete floor, or Framed floor with joists/bearers >600mm above ground, or Framed floor with joists/bearers <600mm above ground must have either a) fire retardant treated timber, or b) subfloor space enclosed by a complying wall, or c) subfloor space enclosed by non-combustible sheet material.	Same as Level 1.	Same as Level 1 except a framed floor with joists/bearers >600mm above ground and the floor is not enclosed, must have either a) fire retardant treated timber, or b) timber sheeted underneath with non-combustible material.
<b>Posts, columns, stumps, piers, poles</b>	Non-combustible material, or Fire retardant treated timber up to 400mm above ground, or Metal stirrups with 75mm clearance above ground.	Same as Level 1.	Same as Level 1 except all timber used is fire retardant treated.
<b>External walls</b>	Masonry, concrete, mudbrick, or Framed wall with either a) low flammability sarking, or b) appropriate insulation, or Timber logs with sealed joints, or Combustible sheet cladding with first 400mm from ground covered/substituted with either a) non-combustible sheet material, or b) fire retardant treated timber.	Same as Level 1 except a) can't use PVC cladding, b) all timber cladding must be fire retardant treated.	Same as Level 2.
<b>Windows</b>	Openable part of windows screened with 1.8mm aperture steel, bronze or aluminium mesh.	Same as Level 1 except a) timber must be fire retardant treated or protected by non-combustible shutters, b) leadlight windows must be protected by non-combustible shutters or of toughened glass, b) can't use aluminium screens.	Same as Level 2 except windows must either be protected by non-combustible shutters or glazed with toughened glass.



<b>Building Components</b>	<p align="center"><b>A summary of levels of construction standards from AS3959-1999 ‘Construction of buildings in bushfire-prone areas’</b></p> <p align="center"><b>Please Note: This table is a summary of AS 3959-1999 prepared by Bushfire &amp; Environmental Services Pty Ltd (BES). This table may not include all aspects of AS3959-1999 and therefore should be used as a guide only. Please refer to the complete standard for more information. BES does not take responsibility for errors or omissions, nor any loss or damage that may result from the use of this information.</b></p>		
	<b>Level 1</b>	<b>Level 2</b>	<b>Level 3</b>
<b>External doors</b>	<p>Must have weather strips/draught excluders.</p> <p>Screened with 1.8mm aperture steel, bronze or aluminium mesh.</p>	<p>Same as Level 1 except a) can't use aluminium screens, b) leadlight panels must be protected by non-combustible shutters or of toughened glass.</p>	<p>Same as Level 2 except a) timber doors must be fire retardant treated or have non-combustible covering, or b) must be protected by non-combustible shutters, or c) must be solid core having a minimum thickness of 35mm.</p>
<b>Vents &amp; weepholes</b>	<p>Must be screened with 1.8mm aperture steel, bronze or aluminium mesh.</p>	<p>Same as Level 1 except can't use aluminium mesh.</p>	<p>Same as Level 2.</p>
<b>Roof covering, eaves &amp; fascias</b>	<p>Can't use timber shakes/shingles</p> <p>Sheet roofing must be metal or fibre-reinforced cement</p> <p>Gaps under corrugations/ribs of sheet roofing must be sealed/protected at the wall or fascia line by either a) fully sarking the roof, or b) using 1.8mm aperture steel or bronze mesh, or profiled metal sheet, or neoprene seal, or compressed mineral wool</p> <p>Rib caps/ridge capping on sheet roofs preformed, or gaps protected as per previous point</p> <p>The roof/wall junction to be sealed by either a) fascia and eaves lining, or b) sealing gaps between rafters at the wall with a non-combustible material</p> <p>Tile roofs fully sarked including the ridge, directly below the tiling battens</p> <p>Any sarking used must be low flammability</p>	<p>Same as Level 1 except a) all roof sheeting must be non-combustible and sarked, b) Eaves lining/joining strips and fascias must be non-combustible or of fire retardant treated timber.</p>	<p>Same as Level 2 except a) can't use fibre-reinforced cement or aluminium sheet for roofs or fascias, b) can't use aluminium eaves linings.</p>
<b>Rooflights</b>	<p>Penetrations/shafts sealed with non-combustible sleeve/lining</p> <p>Can be thermoplastic in metal frame provided the ceiling level diffuser is of wired or toughened glass in a metal frame</p> <p>Any openings screened with 1.8mm aperture steel or bronze mesh.</p>	<p>Same as Level 1 except can't use thermoplastic or toughened glass, must use wired glass.</p>	<p>Same as Level 2.</p>

Building Components	A summary of levels of construction standards from AS3959-1999 'Construction of buildings in bushfire-prone areas'		
	Please Note: This table is a summary of AS 3959-1999 prepared by Bushfire & Environmental Services Pty Ltd (BES). This table may not include all aspects of AS3959-1999 and therefore should be used as a guide only. Please refer to the complete standard for more information. BES does not take responsibility for errors or omissions, nor any loss or damage that may result from the use of this information.		
	Level 1	Level 2	Level 3
<b>Roof ventilators</b>	All components made of non-combustible materials Any openings screened with 1.8mm aperture steel or bronze mesh.	Same as Level 1.	Same as Level 1.
<b>Roof mounted evaporative cooling units</b>	Any openings screened with 1.8mm aperture steel or bronze mesh.	Same as Level 1 except outer case of unit is non-combustible.	Same as Level 2.
<b>Gutters &amp; downpipes</b>	Any gutter guards used must be low flammability	Same as Level 1.	Same as Level 1.
<b>Service pipes (water &amp; gas)</b>	Buried 300mm below ground, or Be metal.	Same as Level 1.	Same as Level 1.
<b>Verandahs &amp; decks</b>	Slab on ground or suspended concrete slab, or Sheeting or tongue & grooved solid flooring which complies with "Flooring systems" requirements, or Spaced timber deck flooring with a) gaps 5mm+, b) perimeter of deck not enclosed or access to space under deck impeded, c) deck flooring separated from building in manner to stop spread of fire Any posts or columns to comply with "Posts, columns, stumps, piers, poles" requirements Any supporting walls to comply with "External walls" requirements.	Same as Level 1 except spaced timber decking material must be fire retardant treated timber.	Same as Level 2 except all materials (including balustrades) must be either non-combustible or fire retardant treated timber.