




BUSHFIRE HAZARD ASSESSMENT REPORT

REPORT PREPARED IN RELATION TO:	PROPOSED REZONING & RESIDENTIAL SUBDIVISION (STAGE 1) MINISTERIAL DIRECTIONS UNDER THE EP&A ACT (SECTION 117, 4.4 BUSHFIRE PROTECTION)
PROPERTY DESCRIPTION:	WILTON SOUTH EAST PRECINCT, WILTON, NSW.
REPORT COMMISSIONED BY: (my Client)	Walker Corporation.
	 DATE ISSUED: 3 December 2018

IMPORTANT NOTICE

Site inspections, and the results found herein, are carried out in accordance with the methodology as set out in the document "*Planning for Bushfire Protection 2006*".

The results of the site inspections and their correlation with *PBP-2006* are based on information provided by the "Reference Documents" and information provided by the Client (or his/her agents).

Holiday Coast Bushfire Solutions Pty Ltd will not be held liable for the omission to provide, or restrict access to, critical information (such as restrictions on property Title, easements, relevant consultant reports, etc) relevant to this development proposal.

The author of this Report, S. Ellis, possesses qualifications that include Graduate Diploma in Design for Bushfire Prone Areas (UWS) and Certificate 2 & 3 in Firefighting Operations and Certificate 4 in Firefighting Supervision.

VERSION	REVISION
2	Amended layout. Staged subdivision release.
3	Amended plan. Plan added as Appendix B (A3 size).
4	Stage 1 area identified and temporary APZ / fire trails proposed.
5	Amended Stage 1 area identified and temporary APZ / fire trails proposed.
6	Amended layout plans - 15/11/18 & 22/11/18.
7	Plan added for Stage 1 BAL-29 and <i>Special Fire Protection Purpose</i> zones with temporary APZs.

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Glossary

APZ	- Asset protection zone. An area surrounding a development managed to reduce the bush fire hazard to an acceptable level. The APZ, consisting of an area maintained to minimal fuel loads and, for subdivision, comprising a combination of perimeter road, fire trail, rear yard or a reserve, so that a fire path is not created between the hazard and the building.
AS 3959	- Australian Standard AS3959 Construction of buildings in bushfire-prone areas, Standards Australia, 2009, that outlines construction standards applicable to residential developments in bush fire prone areas.
BAL	- Bushfire Attack Level – refer to CoBA below.
BCA	- Building Code of Australia.
BPM	- Bushfire protection measures. A range of measures (controls) available to minimise the risk arising from a bushfire. BPMs include APZs, construction standards, suitable access arrangements, water and utility services, emergency management arrangements and landscaping.
Bushfire hazard	- The potential severity of a bushfire. Usually measured in terms of intensity (kW/m), the factors that influence a bush fire hazard include climate and weather patterns, vegetation (fuel quantity, distribution and moisture) and slope.
Bushfire-prone area / land	- An area of land that can support a bushfire or is likely to be subject to bushfire attack. In general, a bushfire-prone area is an area mapped for a local government area that identifies the vegetation types and associated buffer zones. Bushfire prone land maps are prepared by local councils and certified by the Commissioner of the RFS.
Bushfire risk	- Is the chance of a bushfire igniting, spreading and causing damage to assets of value to the community. Risk may be rated as being extreme, major, moderate, minor or insignificant and is related to the vulnerability of the asset.



CoBA	- Category of Bushfire Attack. Either BAL-12.5, BAL-19, BAL-29, BAL-40, or BAL-FLAME ZONE. The degree to which a (proposed) building is subject to the modelled RHF from a potential bushfire. The CoBA determines the construction standards applicable.
Contagious Ignition	- The ignition of one building by an adjoining flaming building (or material) <u>other than</u> by the direct ignition from the flaming bushfire hazard.
Defendable Space	- An area within the APZ that provides an environment in which a person can undertake property protection after the passage of a bushfire with some level of safety.
D-T-S	- Deemed to Satisfy (prescriptive requirements of either the BCA or PBP-2006).
DE	- Dwelling or Building Envelope. The foot print of a (proposed) structure.
FFDI	- Forest fire danger index.
Flame Zone	- The distance from a bushfire at which it is calculated for the purposes of this document that there is significantly increased likelihood for flame contact to a building. Determined by the calculated distance at which the radiant heat received by the proposed building exceeds 40kW/m ² or calculated by the point of potential flame contact, whichever occurs first.
IFEG-2005	- International Fire Engineering Guidelines (Edition 2005).
Infill Development	- The development of land by the erection of or addition to a residential building (or buildings) which does not require the spatial extension of services including public roads, electricity, water or sewerage and is within an existing allotment.
Inner Protection Area	- The inner component of an asset protection zone, consisting of an area maintained to minimal fuel loads and comprising a combination of perimeter road, fire trail, rear yard or reserve, so that a fire path is not created between the hazard and the building.
Outer Protection Area	- The outer component of an asset protection zone, where fuel loads are maintained at a level (usually less than 8 t/ha) where the intensity of an approaching bushfire would be significantly reduced.
<i>Required</i>	- Required by PBP-2006 or other legislative requirements.
Setback	- The distance required through planning provisions to separate a building from the bushfire hazard, street frontage or from adjacent buildings. In most cases the land within the setback will also be within the Flame Zone.

1.0 GENERAL DESCRIPTION OF LAND AND PROPOSAL

1.1 The Land

The site is located at Wilton on the south-western outskirts of Sydney. The site is located immediately east of the Hume Highway, and immediately south of Picton Road. The site is composed of numerous lots with numerous tenures.

The site is elongated with the long northern perimeter fronting Picton Road, and the long southern perimeter fronting the Upper Nepean State Conservation Area. This SCA is the subject of a Fire Management Strategy, discussed in further detail throughout this Report.

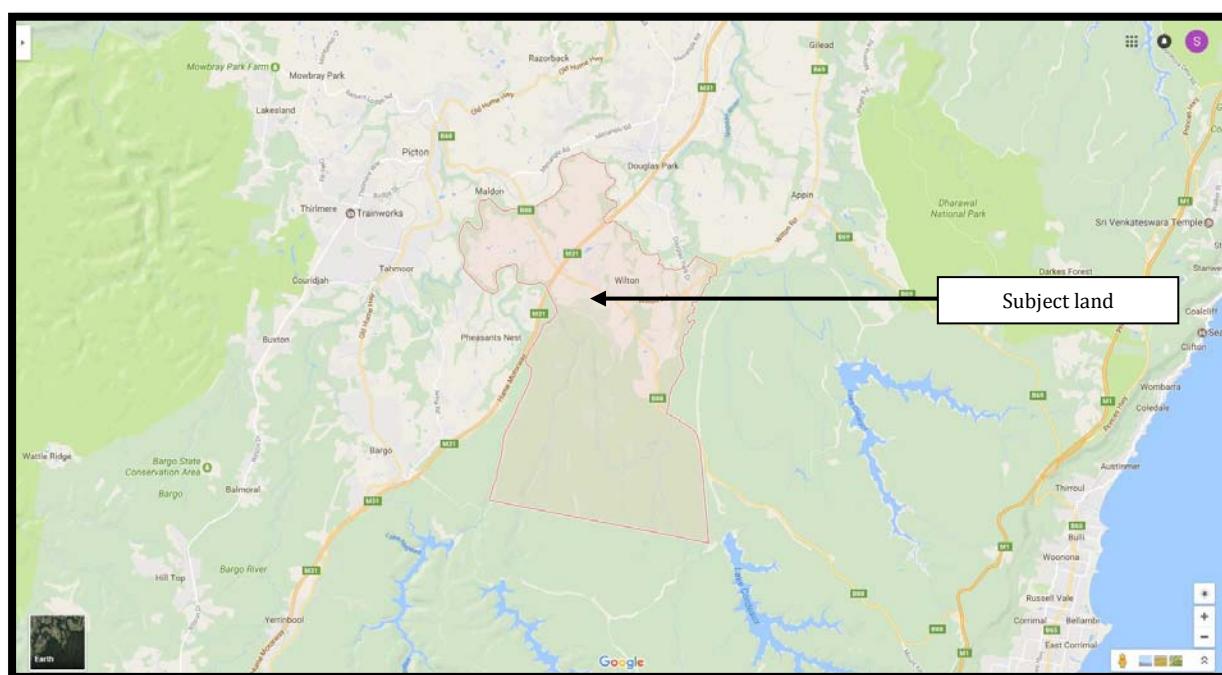


Figure 1: map showing general locality of subject site, within suburb of Wilton (© Google Maps 2017)

The site has an area of approximately 3.2 km², and a total site perimeter of approximately 11.5 km. Approximately ½ of the northern perimeter of the site fronts existing development on the northern side of Picton Road.

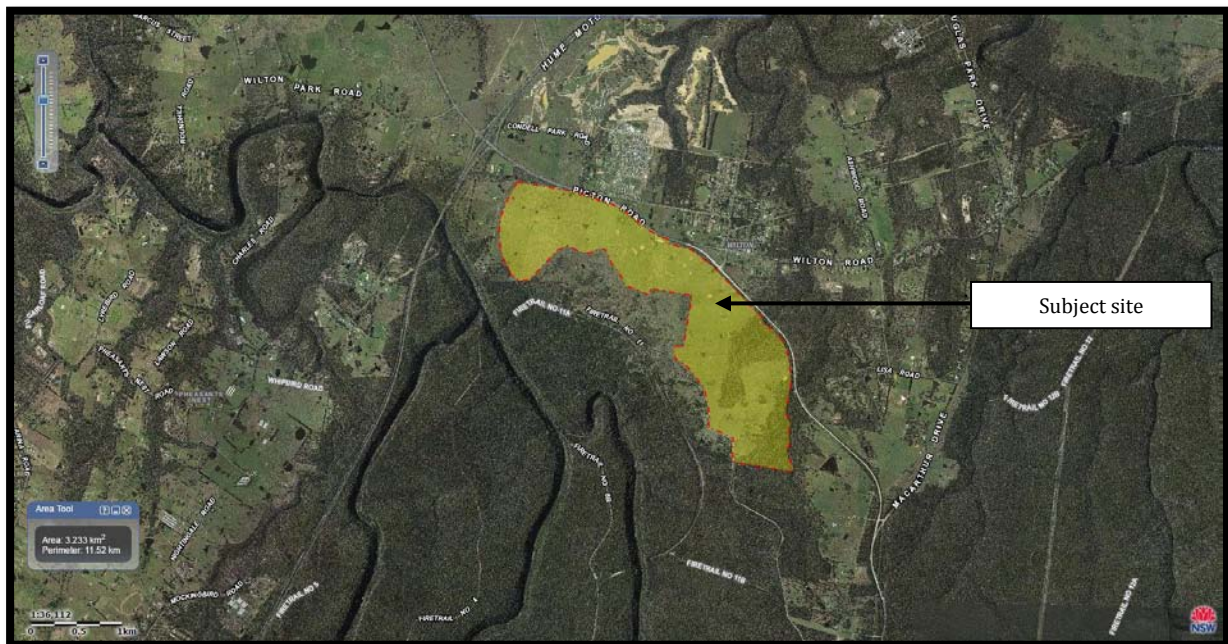


Figure 2: aerial image of property (© NSW Lands, 2017)

Bushfire prone land maps provide the trigger for the various development assessment provisions. The identification of bushfire-prone areas in NSW is required under section 146 of the *EP&A Act*. The NSW Rural Fire Service designates, through separate guidelines, what constitutes a bushfire-prone area and how it is to be mapped. Each Council then prepares a map in accordance with the guidelines and submits the map for approval by the NSW Rural Fire Service.

The subject site has been identified as bushfire-prone land by the Wollondilly Shire Council's Bushfire Prone Land Map, an extract of which is provided below.

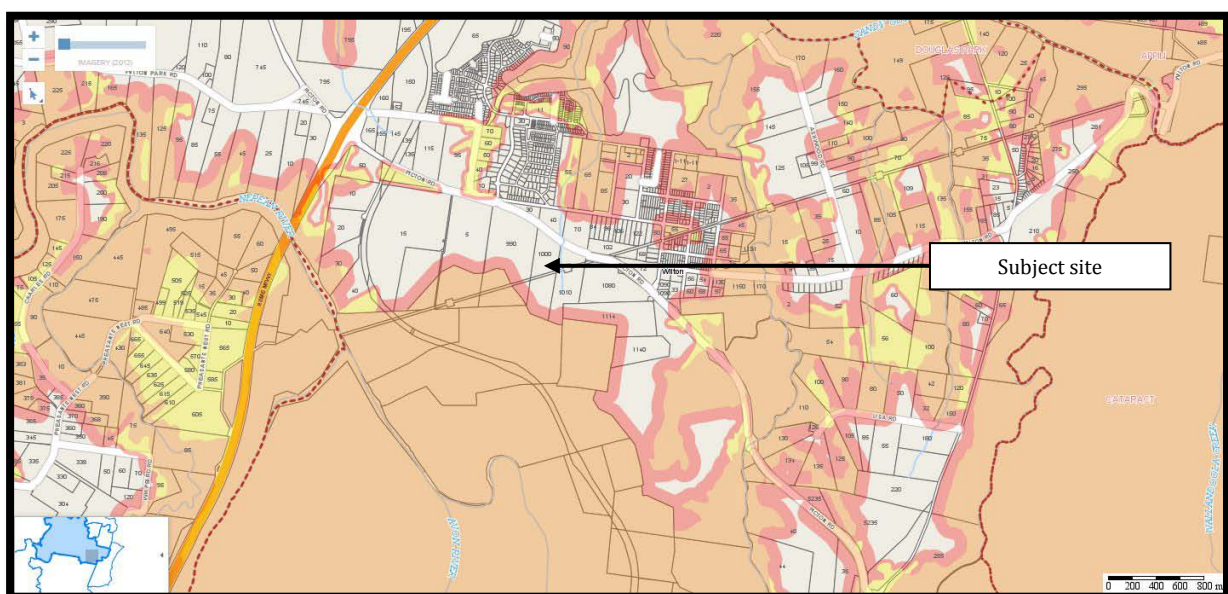


Figure 3: extract of Wollondilly Shire Council's BPLM (© WSC, 2017)



1.2 The Proposal

Holiday Coast Bushfire Solutions Pty Ltd has been engaged by the Client to provide a Bushfire Hazard Assessment Report to support a rezoning application and a Staged subdivision of the land.



Figure 4: Concept plan by Walker Corp, 22/11/18

The proposal will be measured against the specific requirements outlined in s.9.1 (Ministerial Directions, provided below) of the *EP&A Act 1979*, as well as the residential subdivision provisions of *PBP-2006*.

Section 9.1 of the Environmental Planning & Assessment Act 1979

4.4 Planning for Bushfire Protection

Objectives

- (1) The objectives of this direction are:
- (a) to protect life, property and the environment from bush fire hazards, by discouraging the establishment of incompatible land uses in bush fire prone areas, and
 - (b) to encourage sound management of bush fire prone areas.

Where this direction applies

- (2) This direction applies to all local government areas in which the responsible Council is required to prepare a bush fire prone land map under section 146 of the Environmental Planning and Assessment Act 1979 (the EP&A Act), or, until such a map has been certified by the Commissioner of the NSW Rural Fire Service, a map referred to in Schedule 6 of that Act.

When this direction applies

- (3) This direction applies when a relevant planning authority prepares a planning proposal that will affect, or is in proximity to land mapped as bushfire prone land.

What a relevant planning authority must do if this direction applies

- (4) In the preparation of a planning proposal the relevant planning authority must consult with the Commissioner of the NSW Rural Fire Service following receipt of a gateway determination under section 56 of the Act, and prior to undertaking community consultation in satisfaction of section 57 of the Act, and take into account any comments so made,
- (5) A planning proposal must:
- (a) have regard to Planning for Bushfire Protection 2006,
 - (b) introduce controls that avoid placing inappropriate developments in hazardous areas, and
 - (c) ensure that bushfire hazard reduction is not prohibited within the APZ.
- (6) A planning proposal must, where development is proposed, comply with the following provisions, as appropriate:
- (a) provide an Asset Protection Zone (APZ) incorporating at a minimum:
 - (i) an Inner Protection Area bounded by a perimeter road or reserve which circumscribes the hazard side of the land intended for development and has a building line consistent with the incorporation of an APZ, within the property, and
 - (ii) an Outer Protection Area managed for hazard reduction and located on the bushland side of the perimeter road,
 - (b) for infill development (that is development within an already subdivided area), where an appropriate APZ cannot be achieved, provide for an appropriate performance standard, in consultation with the NSW Rural Fire Service. If the provisions of the planning proposal permit Special Fire Protection Purposes (as defined under section 100B of the Rural Fires Act 1997), the APZ provisions must be complied with,
 - (c) contain provisions for two-way access roads which links to perimeter roads and/or to fire trail networks,
 - (d) contain provisions for adequate water supply for firefighting purposes,
 - (e) minimise the perimeter of the area of land interfacing the hazard which may be developed,
 - (f) introduce controls on the placement of combustible materials in the Inner Protection Area.

Consistency

- (7) A planning proposal may be inconsistent with the terms of this direction only if the relevant planning authority can satisfy the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General) that the council has obtained written advice from the Commissioner of the NSW Rural Fire Service, to the effect that, notwithstanding the noncompliance, the NSW Rural Fire Service does not object to the progression of the planning proposal.



2.0 VEGETATION AND SLOPE ASSESSMENT

The following procedure is to be adopted when assessing a development at a defined precinct level in order to determine whether the development is bush fire prone and if so, which setbacks will be appropriate:

- (a) *Determine vegetation formations, as follows:*
 - (i) *identify all vegetation in all directions from the site for a distance of 140 metres;*
 - (ii) *consult Table A2.1 of PBP-2006 to determine the predominant vegetation type; and*
 - (iii) *select the predominant vegetation formation as described in Table A2.1 of PBP-2006.*
- (b) *Determine the effective slope of the land under the Predominant Vegetation Class and the site.*
- (c) *Determine the appropriate fire (weather) area in Table A2.3 of PBP-2006 and note the relevant FDI.*
- (d) *Consult Tables A2.4–2.7 of PBP-2006 and determine the appropriate setback for the assessed land use, vegetation group and slope range.*

The majority of the vegetation and slope assessment used for this Report is based on previous assessments carried out by Whelans Insites, dated 4/6/14, provided to **HCBS Pty Ltd** by the Client. The Client acknowledges that an additional site assessment has not been carried out by **HCBS Pty Ltd**. Further, an additional slope analysis was conducted on the retained native vegetation located within the site in the south-eastern corner. This was undertaken using detailed contour plans provided by the client on 5/4/2017.

The following pages set out a summary of the vegetation and slope assessment derived from those assessments undertaken above.

Table 1

Sector	Description	Vegetation	Slope	BAL-29 Setback	<i>Special Fire Protection Purpose Setback</i>
01	Triangular block opposite Janderra Lane	Woodland / Forest	>0° - 5° downslope	32m	50m / 70m
02	Existing development from Condell Park Road to Almond Street	Managed Grasslands (wall on northern side of street for part of exposure)	N/A	N/A	N/A
02.5	Remnant to north of road	Remnant	>0° - 5° downslope	14	40
03	Small area south of Almond Street	Managed Grasslands	N/A	N/A	N/A
04	Forest to south of Almond Street	Forest (opposite road) or Remnant s-w of road)	>0° - 5° downslope (insites' plan)	32m or 14m	70m Or 40m
05	Retained forest within site	Forest	>5° - 10° downslope (insites' plan)	39m	85m
06	Retained forest within site	Forest	>5° - 10° downslope (insites' plan)	39m	85m
07	Retained forest within site	Forest Remnant if less than 50m wide	>5° - 10° downslope (insites' plan)	39m / 18m	85m / 50m
08	Retained forest within site	Forest Remnant if less than 50m wide	>5° - 10° downslope (insites' plan)	39m / 18m	85m / 50m
09	Retained forest within site	Forest Remnant if less than 50m wide	>5° - 10° downslope (insites' plan)	39m / 18m	85m / 50m
10	Retained forest within site	Forest	>0° - 5° downslope (insites' plan)	32m	70m



11	Forest opposite Picton Road	Forest (amended 18/12/17)	>0° - 5° downslope (insites' plan)	32m	70m
12	Retained forest within site	Forest	>0° - 5° downslope (insites' plan)	32m	70m
13	Retained forest within site	Forest	>0° - 5° downslope (insites' plan)	32m	70m
14	Retained forest within site	Forest	>0° - 5° downslope (insites' plan)	32m	70m
15	Retained forest within site	Forest	>0° - 5° downslope (insites' plan)	32m	70m
16	Retained forest within site	Forest	>0° - 5° downslope (insites' plan)	32m	70m
17	Forest/woodland to west of Fire Trail N ^o 11 at south-western corner	Woodland / Forest	>0° - 5° downslope (insites' plan)	32m	70m
18	Forest/woodland between site and Fire Trail N ^o 11	Woodland / Forest (consider relocating fire trail to along site boundary)	>0° - 5° downslope (insites' plan)	32m	70m
19	Western boundary grasslands	Grasslands (consider relocating fire trail to along site boundary)	>0° - 5° downslope (insites' plan)	10m (32m for forest)	≈36m (70m for forest)
20	Southern boundary grasslands	Grasslands (consider relocating fire trail to along site boundary)	>0° - 5° downslope (insites' plan)	10m (32m for forest)	≈36m (70m for forest)



21	South-western boundary Forest/woodlands	Woodland / Forest (consider relocating fire trail to along site boundary)	>0° - 5° downslope (insites' plan)	32m	70m
22	Southern boundary Forest/woodlands	Grasslands (consider relocating fire trail to along site boundary)	>0° - 5° downslope (insites' plan)	10m (32m for forest)	≈36m (70m for forest)
23	South-eastern boundary Forest/woodlands	Woodlands / Forest	>0° - 5° downslope (insites' plan)	32m	70m
24	Southern boundary forest	Forest	>0° - 5° downslope (insites' plan)	32m	70m
25	Western boundary rail corridor forest	Forest (consider clearing rail corridor now rather than later to avoid loss of land yield)	>5° - 10° downslope (insites' plan)	39m	85m
26	Western boundary motorway grasslands	Managed Grasslands	>5° - 10° downslope (insites' plan)	N/A	N/A



Figure 5

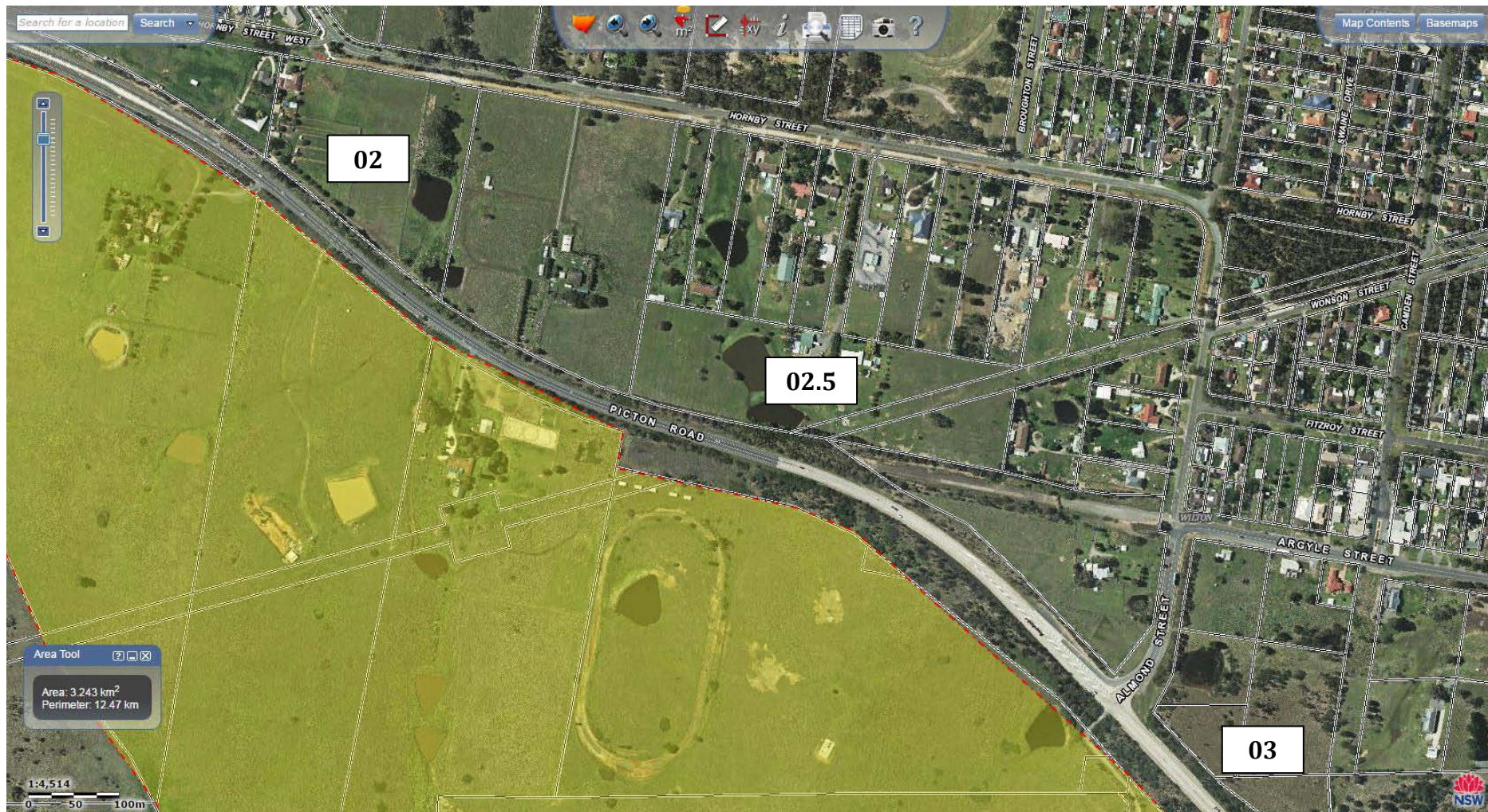


Figure 6



Figure 7

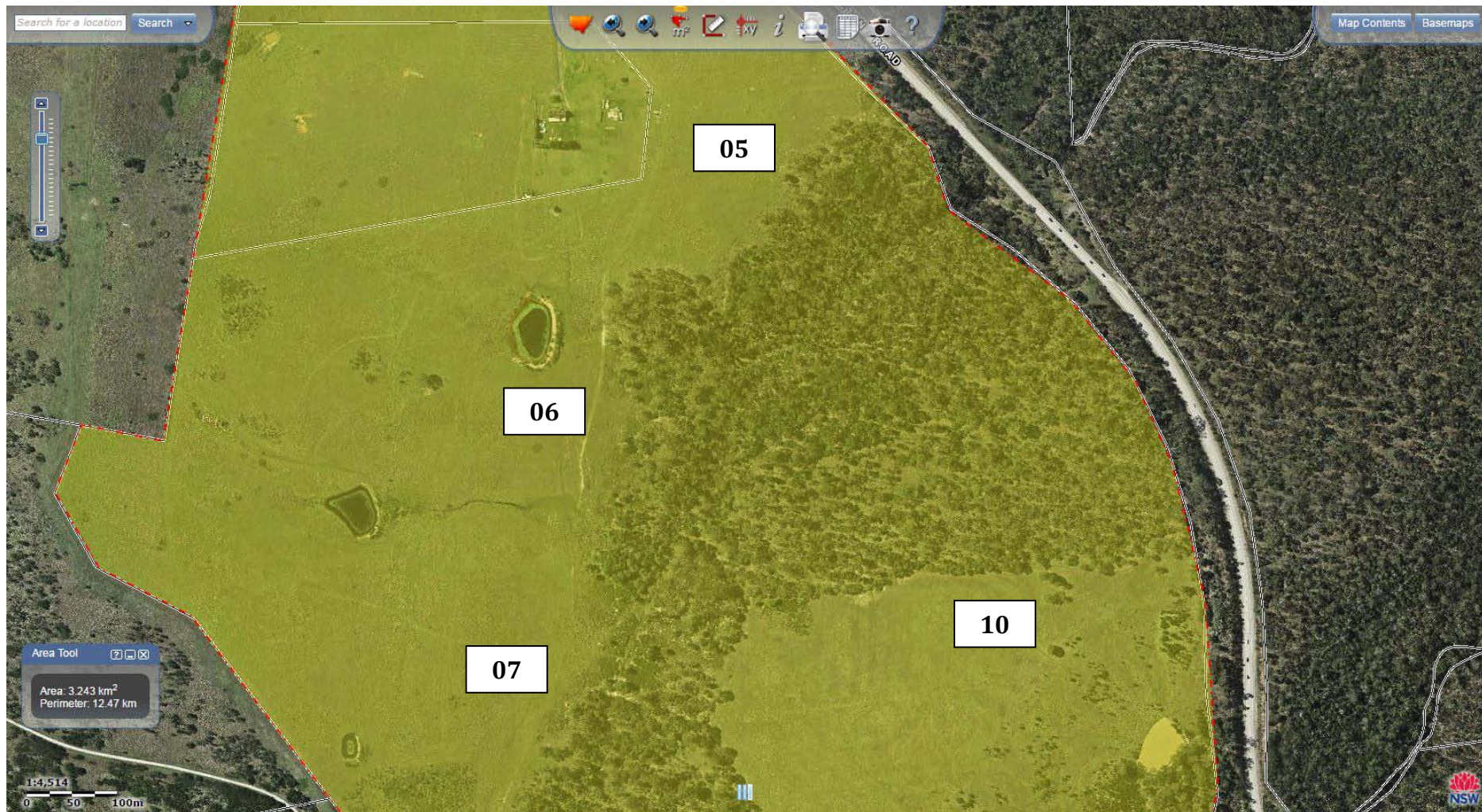


Figure 8

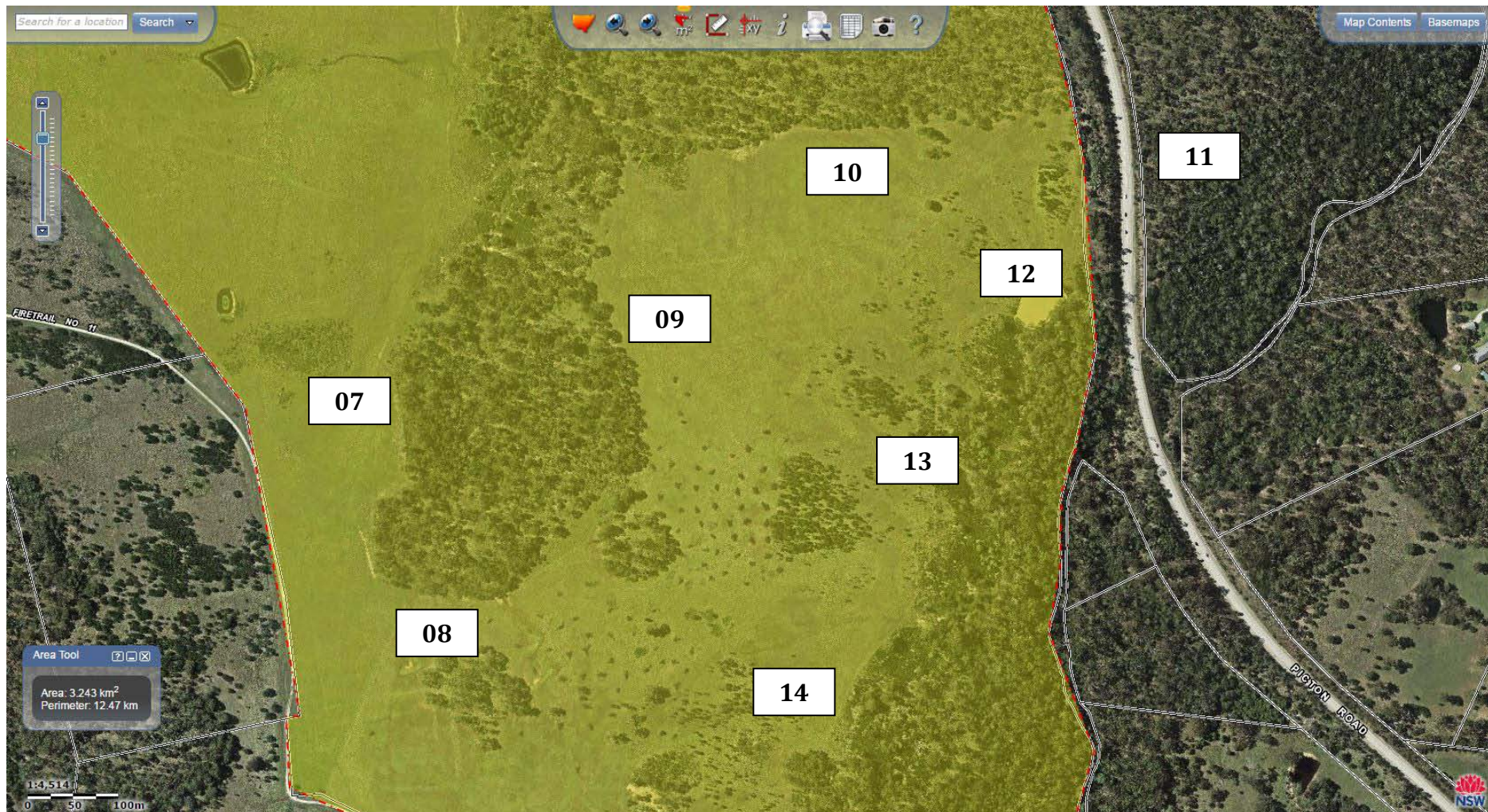


Figure 9

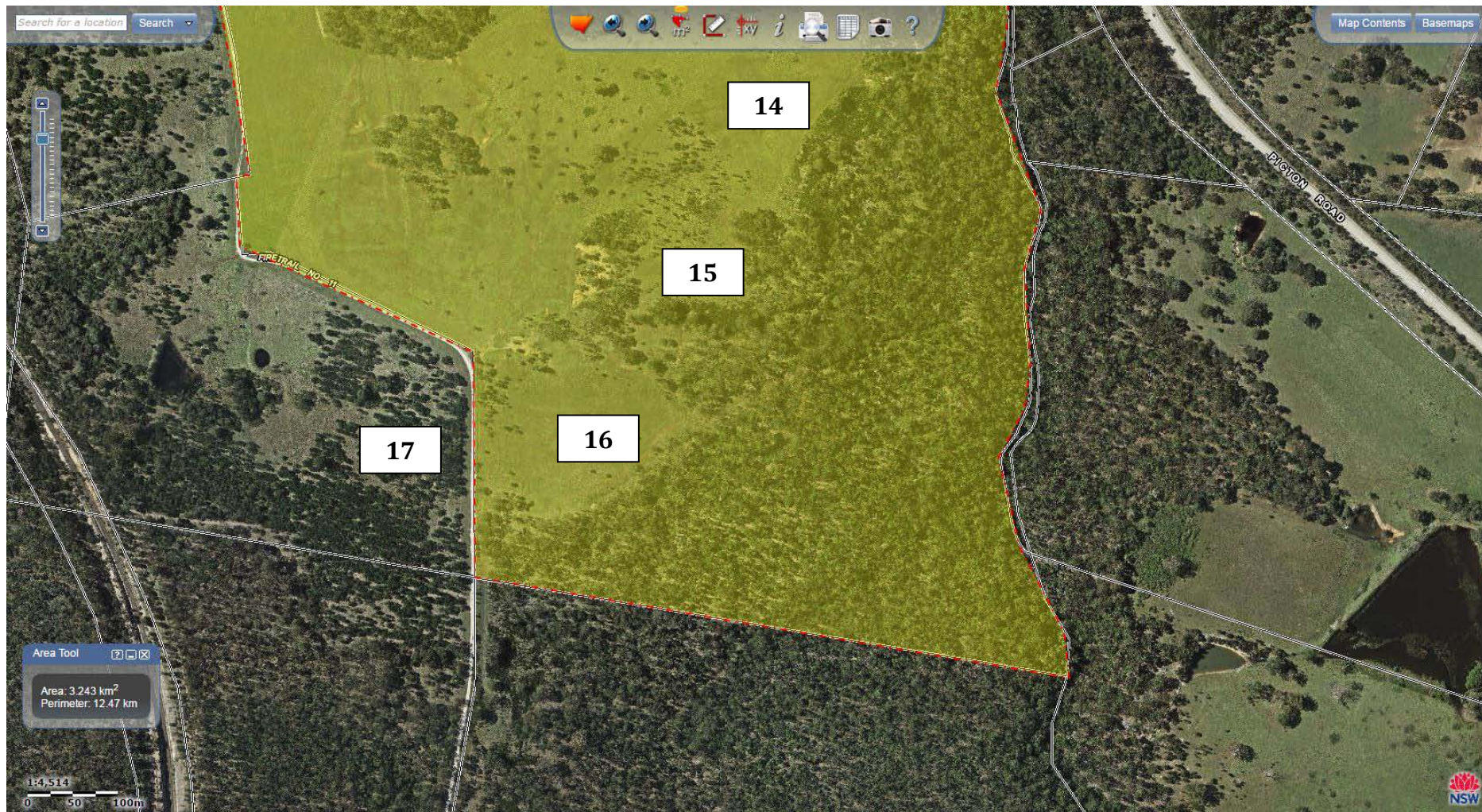


Figure 10

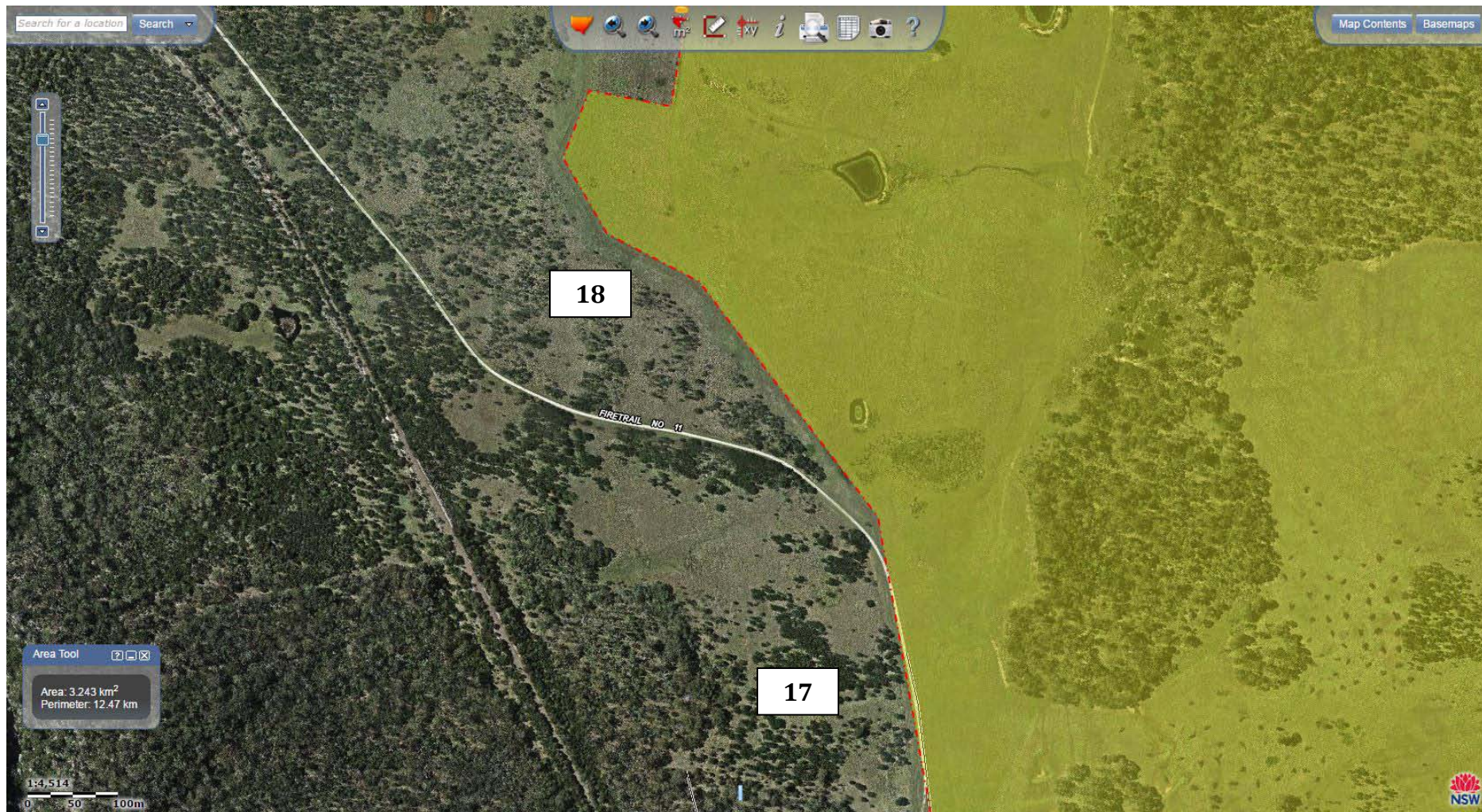


Figure 11

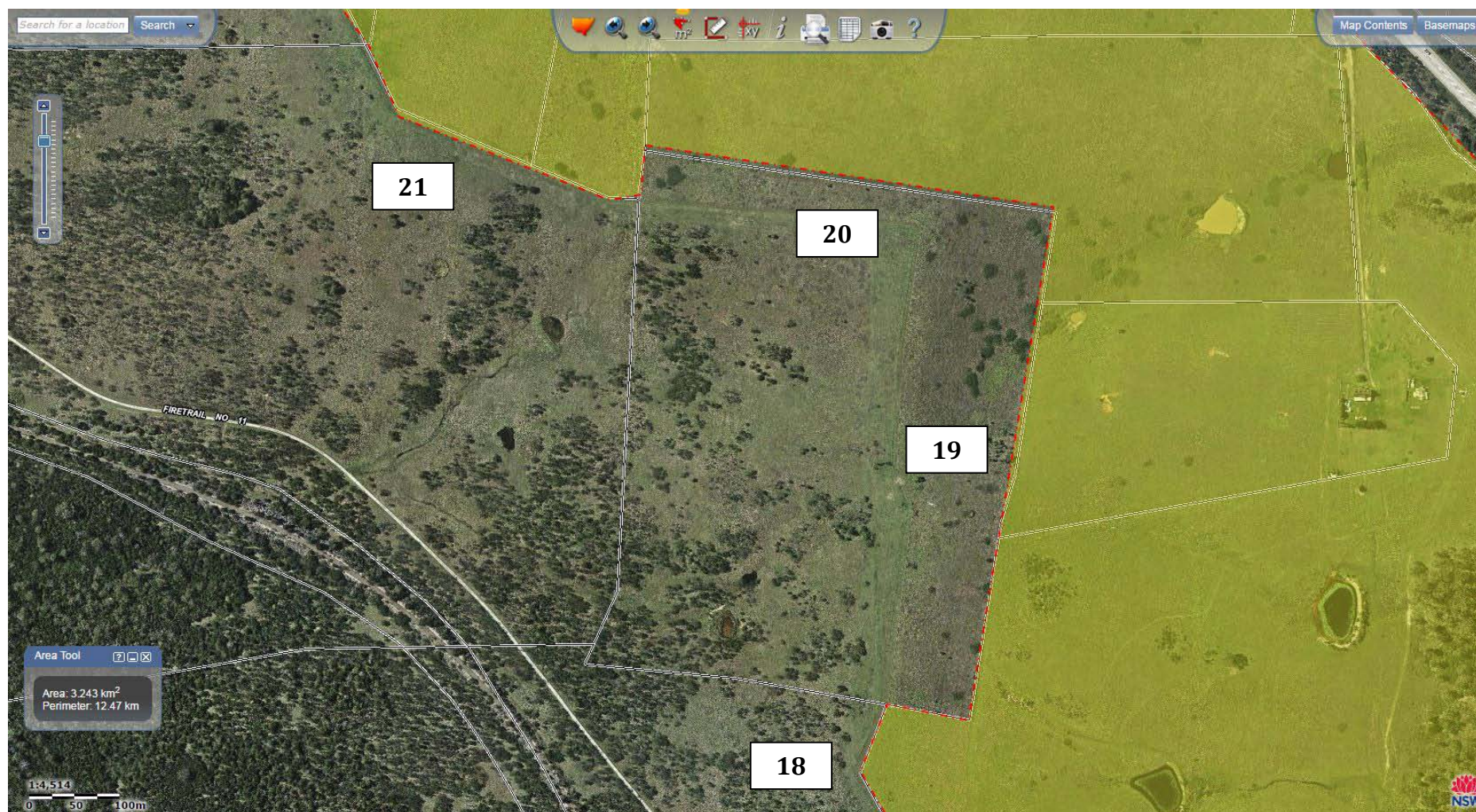


Figure 12

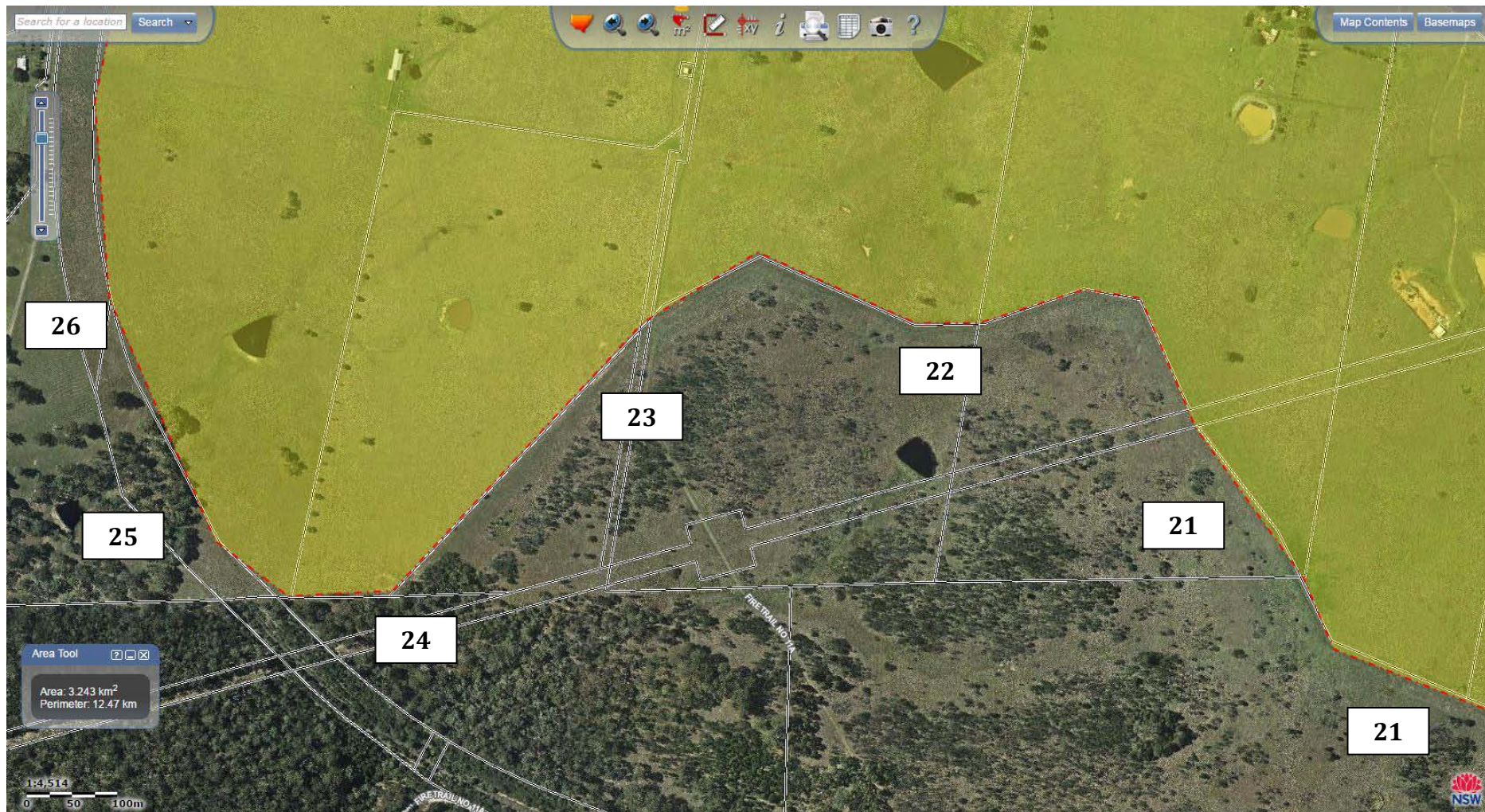


Figure 13

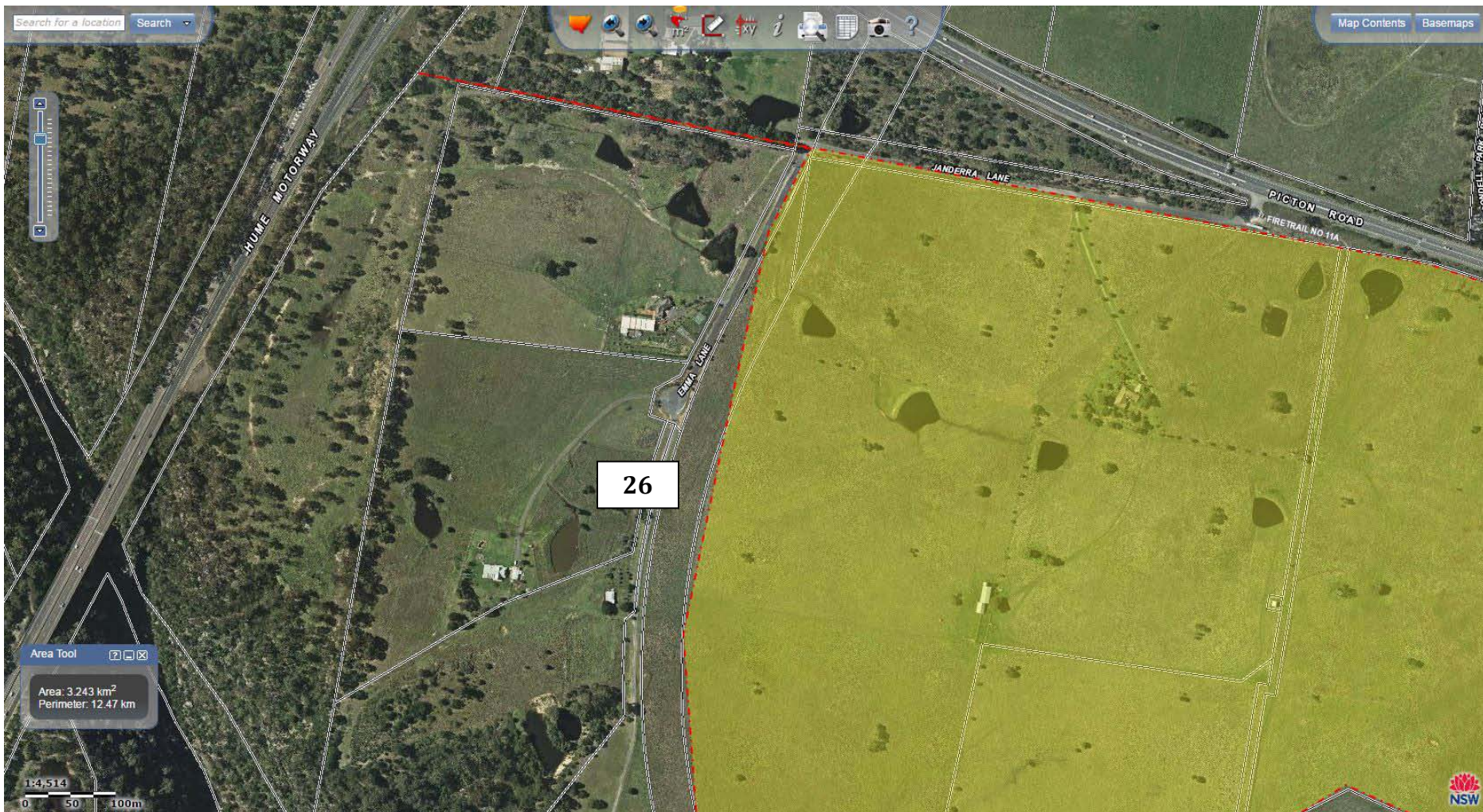


Figure 14



3.0 BUSHFIRE ASSESSMENT MATTERS

3.1 Section 117(2) Ministerial Directions

The following sub-sections of this Report will be formulated from the requirements of the Ministerial Directions as stipulated in s.9.1 of the *EP&A Act*.

3.1.1 A draft LEP shall have regard to *PBP-2006*.

This Report will aim to address the requirements of the *EP&A Act* and *PBP-2006* as they relate to the bushfire constraints of the site.

It should be pointed out that *PBP-2006* is primarily concerned with residential development and *Special Fire Protection Purpose (SFPP)* developments. Apart from s.4.3.6(f), *PBP-2006* is essentially silent in relation to commercial or industrial land. Whilst commercial and industrial developments do not ordinarily accommodate residential uses, the bushfire-resilience of these types of developments should be no less important from a business-continuity and community-recovery perspective.

It could be argued that the quantity of firefighting resources required to protect commercial or industrial complexes involved in a bushfire emergency event are greater than that required for residential purposes. Fuel loads in some industrial/manufacturing complexes could far exceed the fuel loads associated with residential development, and many industrial complexes also possess a significant number of hazards / risks as well. *PBP-2006* seems to largely ignore these concerns.

PBP-2006 defines a 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 bush fire with some level of safety.

The defensible space is only part of the APZ, therefore only forms a minor part of separation between the bushfire hazard and the future assets. Care needs to be taken for buildings of Class 5 - 8 & 10 of the BCA. These types of development can be provided with zero boundary setbacks where the general fire safety provisions of the BCA are applied. In some instances this can result in no defensible spaces being provided between the building and the property boundary or bushfire hazard.

PBP-2006 sets out minimum asset protection zone distances for various development types. The size of the APZ is based on the indicative vegetation classification of the bushfire hazard and the slope of the land on which the bushfire hazard vegetation is located. The minimum setback for residential development, and *Special Fire Protection Purpose* developments, is identified in the following plan (Figure 15). Also refer to Stage 1 plan as Figure 18 of this Report.

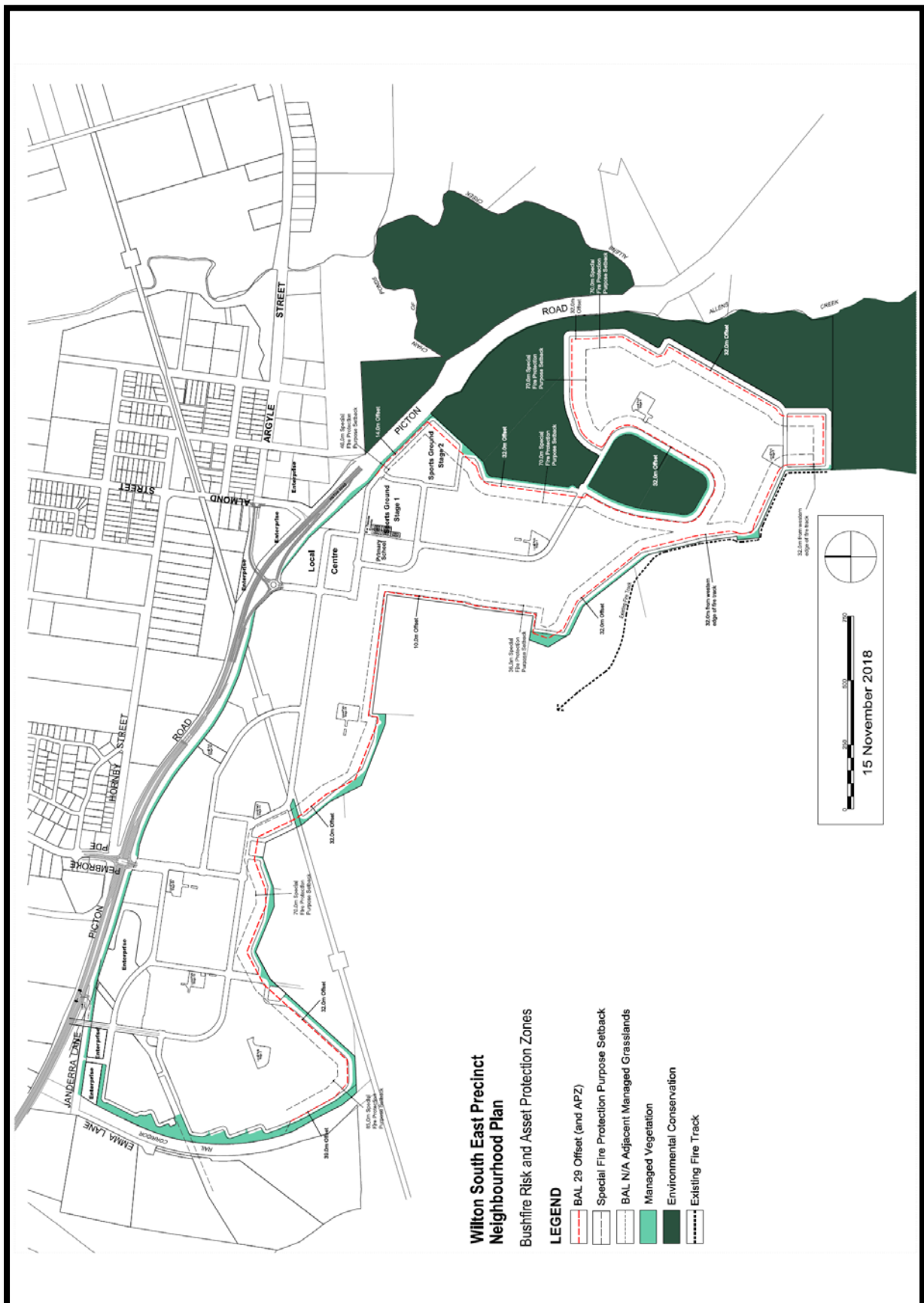


Figure 15: plan showing BAL-29 & SFPP setbacks over concept plan (15/11/18)

Section 3.2 will address the residential subdivision requirements of *PBP-2006* in more detail.

3.1.2 A draft LEP shall introduce controls that avoid placing inappropriate developments in hazardous areas.

PBP-2006 and *PBP-2001* provide lists of development types that are both suitable, and unsuitable, for bushfire-prone areas, summarised as follows:

Table 2

Not Desirable	Desirable
<ul style="list-style-type: none"> • Camping grounds • Assembly buildings • Land sharing communities • Commercial and retail premises • Education premises • Prisons • Premises for people with mental or physical incapacities • Hospitals • Flammable material bulk storage • Stock / sale yards • Timber yards • Factories / warehouses • Plantations • Waste disposal / landfill depots • Power generating works • Sawmills • Junk yards • Liquid fuel depots • Offensive and hazardous industries • Chemical industries • Service stations • Ammunition storage/manufacture • Fireworks manufacture/storage 	<ul style="list-style-type: none"> • Tennis courts • Golf courses • Swimming pools • Cemeteries • Airstrips • Cleared open space / recreation areas

The LEP should prohibit the listed undesirable developments within the bushfire-prone areas (land within 100m of identified bushfire hazard vegetation) of the subject site.

3.1.3 A draft LEP shall ensure that bushfire hazard reduction is not prohibited within the APZ.

The plans provided as Figure 4 and Figure 15 above have identified vegetation that is to be retained and left in an unmanaged state. The edge of these unmanaged vegetated

areas have been identified on the plans, and the appropriately-sized APZs have been located offset from these bushfire constraint lines.

All of the land on the subject site other than the retained native vegetation should have no restriction placed on it that prohibits APZ maintenance. This will include restrictions such as "tree preservation orders" and the like.

Any development consent of future developments on the bushfire-prone land should impose conditions that require the management of vegetation within the development site to ensure that bushfire hazard vegetation does not regenerate on the site.

Also refer to section 3.2.1 below.

3.1.4 For infill development (that is development within an already subdivided area), where an appropriate APZ cannot be achieved, provide for an appropriate performance standard, in consultation with the NSW Rural Fire Service. If the provisions of the draft LEP permit Special Fire Protection Purposes (as defined under section 100B of the *Rural Fires Act 1997*), the APZ provisions must be complied with.

There are seven (7) existing assets identified on the site from aerial photography (Six Maps, NSW Lands). These 7 assets are indicated on the following image.

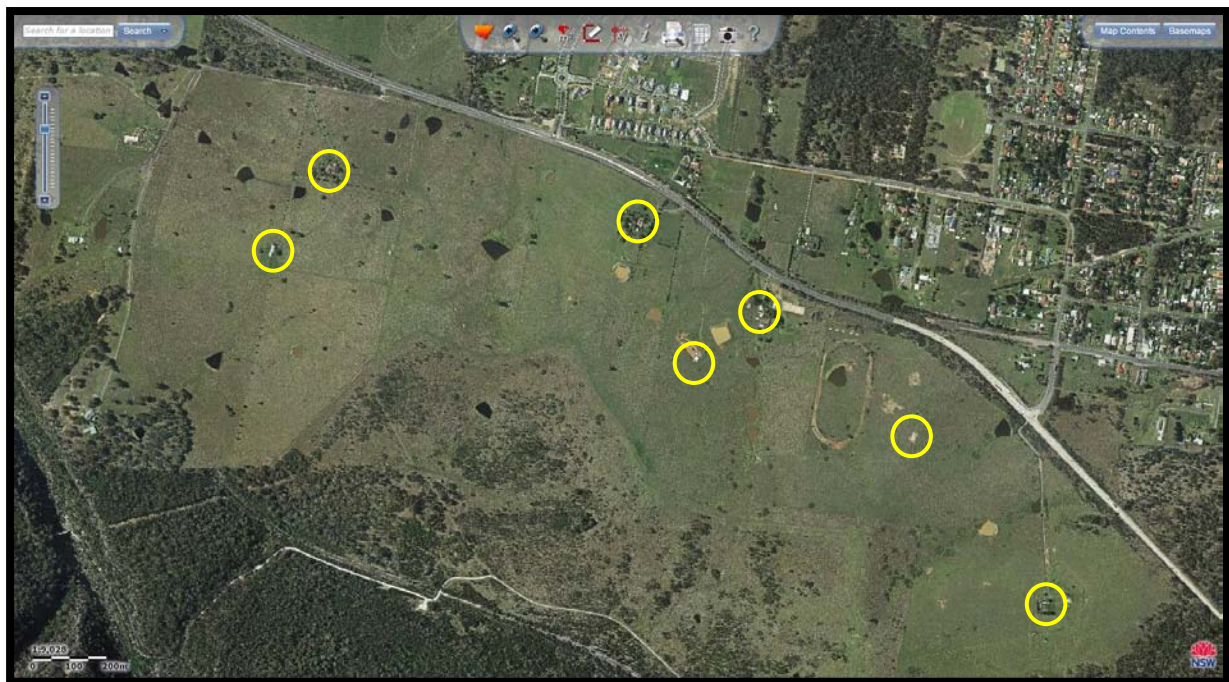


Figure 16: aerial image indicating existing assets



None of these 7 assets will be located within 100m of an area containing unmanaged bushfire hazard vegetation, therefore none of these assets will be subject to the legislated bushfire protection requirements.

3.1.5 Contain provisions for two-way access roads which links to perimeter roads and/or to fire trail networks.

The NSW Rural Fire Service prefers to have roads interfacing with unmanaged bushfire hazard vegetation rather than individual lots, where practical. These perimeter road reserves require little or no maintenance to keep bushfire fuel loads low, should be at least 8m wide kerb-to-kerb, line-marked, linked with internal roads at intervals of <500m, and do not create dead-ends (*cul-de-sacs*) longer than 200m.

In addition, the road network should be designed in such a way that traffic pinch-points are not created where large volumes of traffic pass through narrow constrictions of bushfire hazard vegetation. There is only 1 pinch-point created within the concept plan. This is located in the south-east of the precinct where a proposed road passes between an area of unmanaged forest in the north and a remnant of forest to the south. The pinch-point is created due to having to retain an area of native vegetation. There are alternative routes around this pinch-point, and the affected area is relatively small. It is my opinion that this risk has been adequately dealt with.

In practical terms however, perimeter roads can create the same issues that pinch-points create. Perimeter roads are located in the most hazardous area of a subdivision - at the bushfire hazard interface. A perimeter road carries traffic away from the properties facing the hazard. This length of perimeter road could be as long as 500m until an internal road can be accessed (*PBP-2006 Acceptable Solution*). A perimeter road has a greater chance of being blocked by smoke or fallen trees than a narrow pinch-point. With this in mind, the risks associated with pinch-points need to be considered in light of the greater inherent risks associated with perimeter roads.

Where perimeter roads are impractical a fire trail should be provided along the interface as an alternative.

Even though much of the precinct will remain outside bushfire-prone land, the road network should link with the existing major public roads with roads of a commensurate width, i.e., road widths do not diminish from the interface to the existing public roads. All other road widths should comply with the following Table (road widths for medium-rigid vehicles).

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

Figure 17: road widths required by PBP-2006 (Source: AS 2890.2 – 2002)

Issues surrounding perimeter roads were raised by the NSW Rural Fire Service in its letter of 20/7/18, and responded to in my letter dated 20/9/18)

3.1.6 Contain provisions for adequate water supply for firefighting purposes.

Fire hydrants should be located within the footpaths / nature strips at intervals not exceeding 90m. An hydraulic analysis should be undertaken to ensure that flow rates and pressures are commensurate with *AS 2419.1-2005 Fire hydrant installations - System design, installation and commissioning* (10 L/s at 150 kPa from Table 2.2).

3.1.7 Minimise the perimeter of the area of land interfacing the hazard which may be developed.

The perimeter of the site that interfaces with bushfire hazard vegetation is unable to be altered. Perimeter roads locate the future development further from the interface, but the area of land interfacing with the existing or eventual bushfire hazard vegetation, surrounding and within the site, is unable to be significantly altered.

3.1.8 Introduce controls on the placement of combustible materials in the Inner Protection Area.

Perimeter roads or open space recreation areas (such as sporting fields, golf courses and the like) would enable bushfire fuel loads within the IPA to be minimised. Such planning would enable routine management of those areas to maintain bushfire fuel loads to an acceptable level.

Additionally, prohibiting certain development (refer to list as Table 2) on bushfire-prone land provides another means to limit the possibility of compromising the effectiveness of an APZ.



3.2 CHAPTER 4 OF *PBP-2006*.

3.2.1 Asset Protection Zones

Table 3

ASSET PROTECTION ZONES Intent of measures: to provide sufficient space and maintain reduced fuel loads, so as to ensure radiant heat levels at buildings are below critical limits and to prevent direct flame contact with a building.		COMPLIES / DOES NOT COMPLY
Performance Criteria	Acceptable solutions	
The intent may be achieved where:		
<ul style="list-style-type: none"> • Radiant heat levels at any point on a proposed building will not exceed 29 kW/m². 	<p>(1) An APZ is provided in accordance with the relevant tables/ figures in Appendix 2 of <i>PBP-2006</i>.</p> <p>(2) The APZ is wholly within the boundaries of the development site. Exceptional circumstances may apply [see section 3.3]</p>	<p>Complies</p> <p>Complies</p>
<ul style="list-style-type: none"> • APZs are managed and maintained to prevent the spread of a fire towards the building. 	<p>(3) In accordance with the requirements of Standards for Asset Protection Zones (RFS, 2005)</p> <p><i>Note: A Monitoring and Fuel Management Program should be required as a condition of development consent.</i></p>	<p>Complies</p>
<ul style="list-style-type: none"> • APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is negated. 	<p>(4) The APZ is located on lands with a slope less than 18°.</p>	<p>Complies</p>

In relation to *Acceptable Solution 1*, the minimum separation / APZ required by *PBP-2006* are provided in Table 1 on page 12, and summarised in the plan as Figure 15. These setbacks are based on a BAL-29 construction standard under *AS3959-2009 Construction of buildings in bushfire-prone areas*. In addition, the same plan shows the required setback for *Special Fire Protection Purpose* developments, based on a radiant heat flux of 10 kW/m². Each "Stage" will be dealt with in more detail. To this end, the following plan shows the latest lot layout for Stage 1 of the precinct with the 29 kW/m² and 10 kW/m² radiant heat zones overlayed.

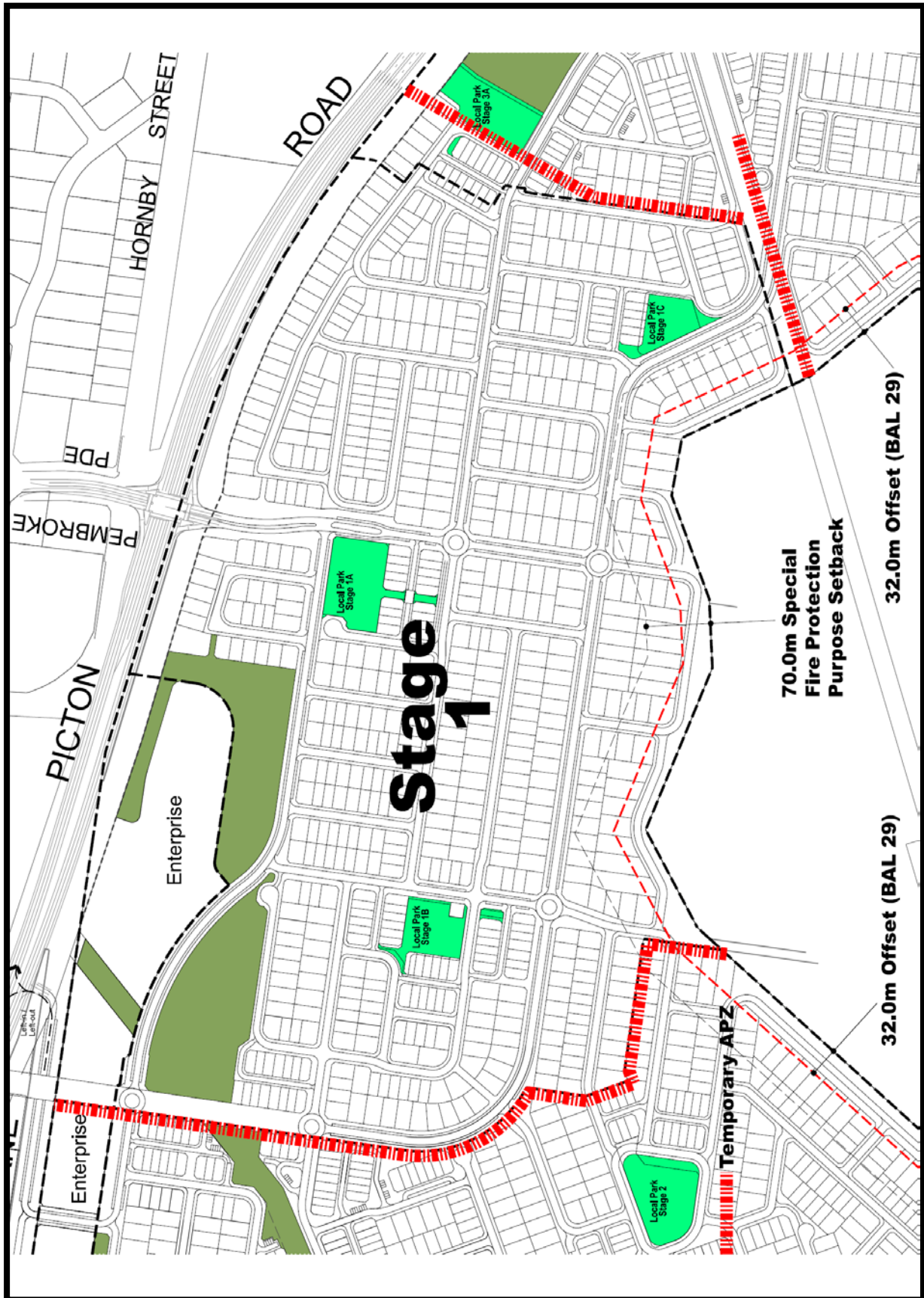


Figure 18: Stage 1 BAL-29 & SFPP setbacks

By maintaining overall fuel hazards at "high" or below, the primary objectives of SFAZs are able to be met, which are:

- reduce potential wildfire intensity and spotting distance;
- reduce probability of wildfires being ignited in high bushfire risk areas;
- compliment APZs and strengthen existing wildfire control advantages;
- restrict the movement of wildfire from one tenure to another;
- restrict the movement of wildfire between fire management zones;
- break-up large neighbouring areas of high wildfire risk;
- achieve a fire regime that is consistent with the Reserve's fire management objectives.

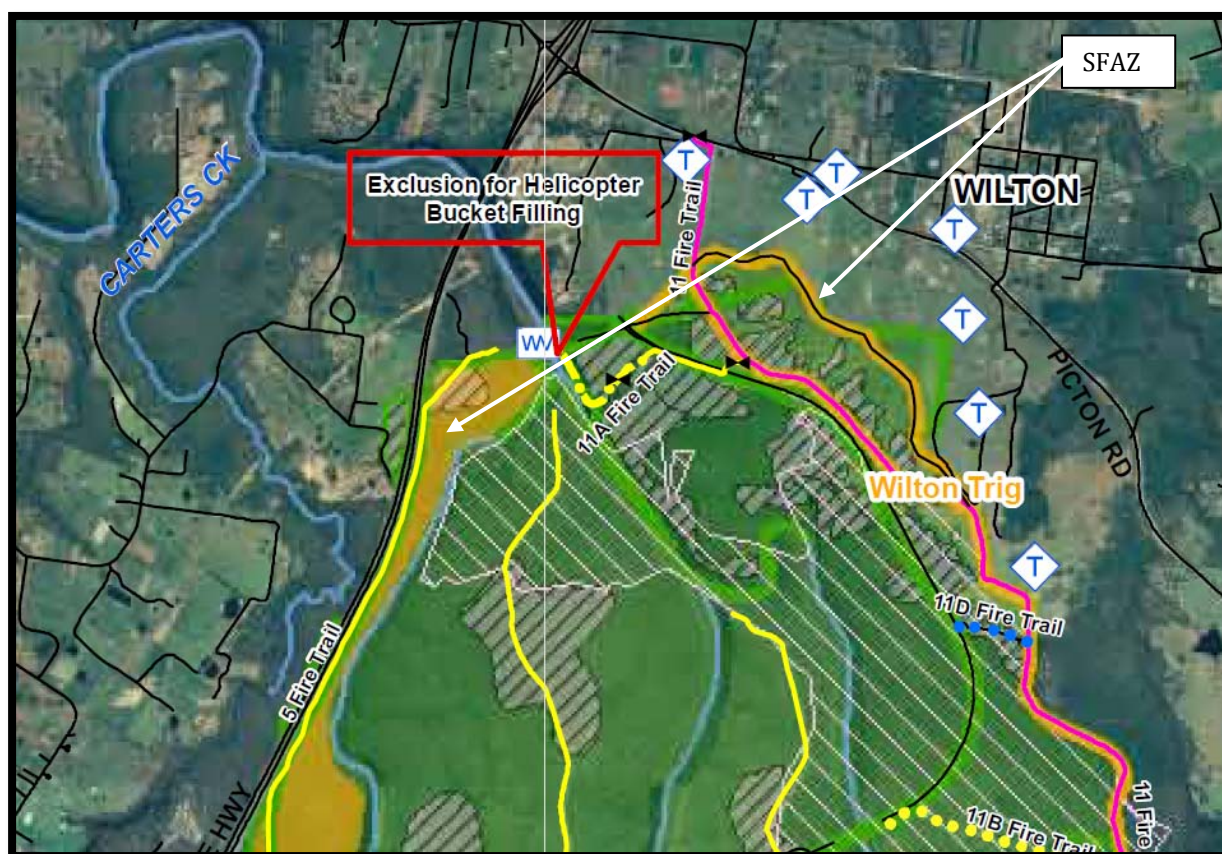


Figure 19: extract from Upper Nepean State Conservation Area Fire Management Strategy

From a "landscape" perspective, this SFAZ should continue to be maintained to provide an enhanced level of protection to the future precinct. Every endeavour should be made to ensure that the "woodland" nature of the vegetation structure within the Upper Nepean State Conservation Area along the interface with the precinct. This more 'open' and 'sparse' vegetation arrangement will help to reduce the intensity of wildfires that



may impact on the future development. The plan as Figure 19 of this Report shows that the SFAZ has not been included as part of the required APZ for the development, and all of the required APZs have been provided within the development site.

In relation to *Acceptable Solution 3*, a Vegetation Management Plan should be developed for the precinct. The purpose of the VMP is to formalise the vegetation management regime over the site where the development is 'Staged'. Essentially the goal for the release of the land should be to provide a perimeter road or temporary fire trail separating the Stage from the un-developed part of the site, and to ensure that regular management occurs on the un-developed land to ensure bushfire hazard vegetation does not regenerate on the site (the remainder of the site should be managed as an "outer protection area" as described in the NSW Rural Fire Service document titled "Standards for Asset Protection Zones" and Appendix 5 of *PBP-2006*, provided as Appendix A of this Report). The temporary APZ should be created and maintained on land owned by the developer, or by other legally-binding arrangement such as s.88B of the *Conveyancing Act 1919*.

More specifically, the proposed layout for Stage 1 is provided as Figure 18 above, showing the temporary APZs.

The layout shows that a temporary APZ is proposed to be provided along the western and eastern perimeters of the Stage. The plan is conceptual only, as the temporary APZ is not needed where a road forms a temporary perimeter road, as the temporary perimeter road serves the purpose and intent of the APZ. In areas where a public road does not form a temporary perimeter road, the Stage should be provided with a temporary fire trail that links with the temporary perimeter roads.

As the Vegetation Management Plan will deal with maintaining existing non-forested areas in a non-hazard state, the width of these temporary APZs need not be greater than 10m, which provides an appropriate level of protection for the risk associated with a grassland environment.

3.2.2 Public Roads

Table 4

ACCESS – PUBLIC ROADS Intent of measures: to provide safe operational access to structures and water supply for emergency services, while residents are seeking to evacuate from an area.		COMPLIES / DOES NOT COMPLY
Performance Criteria	Acceptable solutions	
The intent may be achieved where:		
<ul style="list-style-type: none"> Firefighters are provided with safe all weather access to structures (thus allowing more efficient use of firefighting resources). 	(5) Public roads are two-wheel drive, all weather roads.	Complies

<ul style="list-style-type: none"> Public road widths and design that allow safe access for firefighters while residents are evacuating an area. 	<p>(6) Urban perimeter roads are two-way, that is, at least two traffic lane widths (carriageway 8m minimum kerb to kerb), allowing traffic to pass in opposite directions. Non-perimeter roads comply with Table 4.1 – Road widths for Category 1 Tanker (Medium Rigid Vehicle).</p> <p>(7) The perimeter road is linked to the internal road system at an interval of no greater than 500m in urban areas.</p> <p>(8) Traffic management devices are constructed to facilitate access by emergency services vehicles.</p> <p>(9) Public roads have a cross fall not exceeding 3°.</p> <p>(10) All roads are through-roads. Dead-end roads are not recommended, but if unavoidable, dead-ends are not more than 200m in length, incorporate a minimum 12m outer radius turning circle, and are clearly sign posted as a dead-end and direct traffic away from the hazard.</p> <p>(11) Curves of roads (other than perimeter roads) are a minimum inner radius of 6m and minimal in number, to allow for rapid access and egress.</p> <p>(12) The minimum distance between inner and outer curves is 6m.</p> <p>(13) Maximum grades for sealed roads do not exceed 15° and an average grade of not more than 10° or other gradient specified by road design standards, whichever is the lesser gradient.</p> <p>(14) There is a minimum vertical clearance to a height of 4m above the road at all times.</p>	<p>Complies</p> <p>Complies</p> <p>Complies</p> <p>Complies</p> <p>Complies</p> <p>Complies</p> <p>Complies</p>
<ul style="list-style-type: none"> The capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles. 	<p>(15) 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 indicate load rating.</p>	<p>Complies</p>
<ul style="list-style-type: none"> Roads that are clearly sign- posted (with easily distinguishable names) and buildings/properties that are clearly numbered. 	<p>(16) Public roads greater than 6.5m wide to locate hydrants outside of parking reserves to ensure accessibility to reticulated water for fire suppression.</p> <p>(17) Public roads between 6.5m and 8m wide are “No Parking” on one side with the services (hydrants) located on this side to ensure accessibility to reticulated water for fire suppression.</p>	<p>Complies</p> <p>Complies</p>

<ul style="list-style-type: none"> • There is clear access to reticulated water supply. 	<p>(18) Public roads up to 6.5m wide provide parking within parking bays and locate services outside of the parking bays to ensure accessibility to reticulated water for fire suppression.</p> <p>(19) One-way only public access roads are no less than 3.5m wide and provide parking within parking bays and locate services outside of the parking bays to ensure accessibility to reticulated water for fire suppression.</p>	<p>Complies</p> <p>Complies</p>
<ul style="list-style-type: none"> • Parking does not obstruct the minimum paved width. 	<p>(20) Parking bays are a minimum of 2.6m wide from kerb edge to road pavement. No services or hydrants are located within the parking bays.</p> <p>(21) Public roads directly interfacing the bush fire hazard vegetation provide roll top kerbing to the hazard side of the road.</p>	<p>Complies</p> <p>Complies</p>

Perimeter roads are proposed for almost the entire perimeter of the site, only a couple of instances occur where lots (private property) interface with the perimeter of the site, and these are only where there is an existing fire trail and SFAZ located on the adjoining land.

Issues surrounding perimeter roads were raised by the NSW Rural Fire Service in its letter of 20/7/18, and responded to in my letter dated 20/9/18)

3.2.3 Property Access Roads

Table 5

ACCESS - PROPERTY ACCESS Intent of measures: to provide safe access to/from the public road system for firefighters providing property protection during a bush fire and for occupants faced with evacuation.		COMPLIES / DOES NOT COMPLY
Performance Criteria	Acceptable solutions	
The intent may be achieved where:		
<ul style="list-style-type: none"> • Access to properties is provided in recognition of the risk to fire fighters and/or evacuating occupants. 	<p>(22) At least one alternative property access road is provided for individual dwellings (or groups of dwellings) that are located more than 200m from a public through-road.</p>	<p>Not applicable</p>
<ul style="list-style-type: none"> • The capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles. 	<p>(23) Bridges clearly indicate load rating and pavements and bridges are capable of carrying a load of 15 tonnes.</p>	<p>Not applicable</p>
<ul style="list-style-type: none"> • All weather access is provided. 	<p>(24) Roads do not traverse a wetland or other land potentially subject to periodic inundation (other than a flood or storm surge).</p>	<p>Not applicable</p>

<ul style="list-style-type: none"> • Road widths and design enable safe access for vehicles 	<p>(25) A minimum carriageway width of 4m for rural-residential areas, rural landholdings or urban areas with a distance of greater than 70m from the nearest hydrant point to the most external part of a proposed building (or footprint).</p>	Not applicable
	<p>(26) In forest, woodland and heath situations, rural property access roads have passing bays every 200m that are 20m long by 2m wide, making a minimum trafficable width of 6m at the passing bay.</p>	Not applicable
	<p>(27) A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches.</p>	Not applicable
	<p>(28) Internal roads for rural properties provide a loop road around any dwelling or incorporate a turning circle with a minimum 12m outer radius.</p>	Not applicable
	<p>(29) Curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress.</p>	Not applicable
	<p>(30) The minimum distance between inner and outer curves is 6m.</p>	Not applicable
	<p>(31) The cross-fall is not more than 10°.</p>	Not applicable
	<p>(32) Maximum grades for sealed roads do not exceed 15° and not more than 10° for unsealed roads.</p> <p><i>Note: Some short constrictions in the access may be accepted where they are not less than the minimum (3.5m), extend for no more than 30m and where the obstruction cannot be reasonably avoided or removed. The gradients applicable to public roads also apply to community style development property access roads in addition to the above.</i></p> <p>(33) Access to a development comprising more than 3 dwellings have formalised access by dedication of a road and not by right of way.</p>	Not applicable

In relation to property access roads (driveways), *PBP-2006* provides the following concession for urban areas supplied with a reticulated water supply.

Note: No specific access requirements apply in a urban area where a 70m unobstructed path can be demonstrated between the most distant external part of the proposed dwelling and the nearest part of the public access road (where the road speed limit is not greater than 70kph) that supports the operational use of emergency firefighting vehicles (i.e. a hydrant or water supply).

The property access road provisions of *PBP-2006* will generally not apply to the site. Additionally, the LEP should ensure that future development complies with the guidelines contained in the Fire & Rescue NSW document "*Fire Safety Guideline - Fire Hydrants for Minor Residential Development*".

(http://www.fire.nsw.gov.au/gallery/files/pdf/guidelines/guidelines_for_minor_residential.pdf)

3.2.4 Fire Trails

Table 6

ACCESS – FIRE TRAILS Intent of measures: to provide suitable access for fire management purposes and maintenance of APZs.		COMPLIES / DOES NOT COMPLY
Performance Criteria	Acceptable solutions	
The intent may be achieved where:		
<ul style="list-style-type: none"> The width and design of the fire trails enables safe and ready access for firefighting vehicles 	<p>[34] A minimum carriageway width of 4m with an additional 1m wide strip on each side of the trail (clear of bushes and long grass) is provided.</p> <p>[35] The trail is a maximum grade of 15° if sealed and not more than 10° if unsealed.</p> <p>[36] A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches is provided.</p> <p>[37] The cross-fall of the trail is not more than 10°.</p> <p>[38] The trail has the capacity for passing by:</p> <ul style="list-style-type: none"> - reversing bays using the access to properties to reverse fire tankers, which are 6m wide and 8m deep to any gates, with an inner minimum turning radius of 6m and outer minimum radius of 12m; and/or - a passing bay every 200m, 20m long by 3m wide, making a minimum trafficable width of 7m at the passing bay. <p><i>Note: Some short constrictions in the access may be accepted where they are not less than the minimum (3.5m) and extend for no more than 30m and where obstruction cannot be reasonably avoided or removed.</i></p>	<p>Able to comply</p> <p>Able to comply</p> <p>Able to comply</p> <p>Able to comply</p> <p>Able to comply</p>
<ul style="list-style-type: none"> Fire trails are trafficable under all weather conditions. Where the fire trail joins a public road, access shall be controlled to prevent use by non authorised persons. 	<p>[39] The fire trail is accessible to firefighters and maintained in a serviceable condition by the owner of the land.</p> <p>[40] Appropriate drainage and erosion controls are provided.</p> <p>[41] The fire trail system is connected to the property access road and/or to the through road system at frequent intervals of 200m or less.</p> <p>[42] Fire trails do not traverse a wetlands or other land potentially subject to periodic inundation (other than a flood or storm surge).</p>	<p>Able to comply</p> <p>Able to comply</p> <p>Able to comply</p> <p>Able to comply</p>

	[43] Gates for fire trails are provided and locked with a key/lock system authorized by the local RFS.	Able to comply
• Fire trails designed to prevent weed infestation, soil erosion and other land degradation.	[44] Fire trail design does not adversely impact on natural hydrological flows. [45] Fire trail design acts as an effective barrier to the spread of weeds and nutrients. [46] Fire trail construction does not expose acid-sulphate soils.	Able to comply Able to comply Able to comply

Where the interface is not provided with a perimeter road or shared-road, fire trails should be provided instead, in accordance with the *Acceptable Solutions* listed above.

Where a perimeter road or internal road is not provided on the boundary of a new Stage, a fire trail should be provided along the interface as a temporary measure.

Issues surrounding perimeter roads were raised by the NSW Rural Fire Service in its letter of 20/7/18, and responded to in my letter dated 20/9/18)

3.2.5 Utility Services (water, electricity, LPG)

Table 7

SERVICES – WATER, ELECTRICITY, GAS Intent of measures: to provide adequate services of water for the protection of buildings during and after the passage of a bush fire, and to locate gas and electricity so as not to contribute to the risk of fire to a building.		COMPLIES / DOES NOT COMPLY
Performance Criteria	Acceptable solutions	
The intent may be achieved where:		
Reticulated water supplies • Water supplies are easily accessible and located at regular intervals.	[47] Reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads. [48] Fire hydrant spacing, sizing and pressures comply with AS2419.1-2005. Where this cannot be met, the RFS will require a test report of the water pressures anticipated by the relevant water supply authority. In such cases, the location, number and sizing of hydrants shall be determined using fire engineering principles. [49] Hydrants are not located within any road carriageway.	Complies Complies Complies

	<p>(50) All above ground water and gas service pipes external to the building are metal, including and up to any taps.</p> <p>(51) The provisions of parking on public roads are met.</p>	<p>Complies</p> <p>Able to comply</p>
<p>Electricity Services</p> <ul style="list-style-type: none"> • Location of electricity services limits the possibility of ignition of surrounding bushland or the fabric of buildings • Regular inspection of lines is undertaken to ensure they are not fouled by branches. 	<p>(52) Where practicable, electrical transmission lines are underground.</p> <p>(53) Where overhead electrical transmission lines are proposed:</p> <ul style="list-style-type: none"> - lines are installed with short pole spacing (30m), unless crossing gullies, gorges or riparian areas; and - no part of a tree is closer to a power line than the distance set out in accordance with the specifications in 'Vegetation Safety Clearances' issued by Energy Australia (NS179, April 2002). 	<p>Complies</p>
<p>Gas services</p> <ul style="list-style-type: none"> • Location of gas services will not lead to ignition of surrounding bushland or the fabric of buildings 	<p>(54) Reticulated or bottled gas is installed and maintained in accordance with AS1596 and the requirements of relevant authorities. Metal piping is to be used.</p> <p>(55) All fixed gas cylinders are kept clear of all flammable materials to a distance of 10m and shielded on the hazard side of the installation.</p> <p>(56) If gas cylinders need to be kept close to the building, the release valves are directed away from the building and at least 2m away from any combustible material, so that they do not act as a catalyst to combustion. Connections to and from gas cylinders are metal.</p> <p>(57) Polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not used.</p>	<p>Complies</p> <p>Complies</p> <p>Complies</p> <p>Complies</p>

Fire hydrants should be located within the footpaths / nature strips at intervals not exceeding 90m. An hydraulic analysis should be undertaken to ensure that flow rates and pressures are commensurate with *AS 2419.1-2005 Fire hydrant installations - System design, installation and commissioning* (10 L/s at 150 kPa from Table 2.2).

In relation to electricity supplies, the services should be located underground, along with other services such as phone/internet.

All of the *Acceptable Solutions* regarding LPG supplies listed above are able to be addressed at the time of construction of the future dwellings.

3.3 NSW Rural Fire Service Correspondence

The following matters were raised by the NSW Rural Fire Service in its letter dated 30/1/2017.

In summary, any progression of this proposal should be accompanied by a plan which demonstrates:

- The proposed asset protection zones (which should provide future dwellings the ability to achieve Bushfire Attack Level (BAL) 29 or less under AS3959-2009 'Construction of buildings in Bushfire-prone areas');
- The width and location of access roads, and provide perimeter roads (where developable land adjoins any hazard) complying with Section 4.1.3 (1) of *Planning for Bush Fire Protection 2006 (PBP)* ;
- Future connections to water, gas and electricity services that comply with Section 4.1.3 of *PBP* when located on bush fire prone land;
- Any staging should include provision of suitable access and APZs for earlier stages over later stages where appropriate; and
- Any reserves (including 'screening' reserves) shall be provided with either future management of reserves as an APZ or provision of suitable APZs and setbacks.

NOTE - Servicing and infrastructure delivery for the proposal should include the consideration of operational response of fire fighting agencies to ensure appropriate fire service coverage is available to the new community of Wilton South East Precinct. In considering future operational fire fighting infrastructure, the proponents should;

- identify what proposed servicing arrangements are required for the future community;
- identify whether proposed servicing arrangements for the community are practical;
- discuss any issues that may result from the interplay of service delivery options;
- identify any infrastructure issues including financial contributions;
- identify timelines for the finalisation of proposed servicing arrangements.

In relation to dot-point 1, the plan provided as Figure 15 of this Report addresses this concern.

In relation to dot-point 2, sections 3.1.5 and 3.2.2 of this Report deal with the public road provisions of the precinct.

In relation to dot-point 3, sections 3.1.6 and 3.2.5 of this Report deal with the water supply and utility services to the precinct.

In relation to dot-point 4, section 3.2.1 and 3.2.4 deals with this concern.

In relation to dot-point 5, section 3.1.3 deals with this concern.

In relation to the "NOTE", it would be prudent from a planning perspective that this matter should be addressed having regard for the other precincts of the Wilton Planning proposals, i.e., "Wilton Junction" expansion in conjunction with the further expansion of Bingara Gorge. The Wilton South precinct is only one area of a wider area that has been identified for urban growth.

The current state infrastructure contributions guidelines would provide a mechanism for imposing a financial contribution towards enhancing fire service coverage to the



Wilton Junction area. There would be an expectation that each Wilton Precinct would make a contribution to that scheme. The timing of the delivery of those enhancements would be dependent on the rate of urban expansion.

The *Fire Services Joint Standing Committee* is a committee comprising representatives from the NSW Rural Fire Service and Fire & Rescue NSW. Amongst other things, the FSJST is tasked with advising the Minister for Emergency Services on the balanced and co-ordinated delivery of urban and rural fire services, and advising the Minister for Emergency Services on strategies to minimise duplication between services.

The scale of development proposed would place a considerable demand on any volunteer service, be it NSW Rural Fire Service, State Emergency Service, Volunteer Rescue Association. There are approximately 3400 homes, in addition to the other commercial and industrial lots, proposed in the Wilton South precinct alone. The planned population of the greater Wilton area will be around 45,000 people, which is approximately $\frac{1}{3}$ the population of the entire Campbelltown LGA.

Notwithstanding the provision of fire service coverage, the issue of "rescue" should also be considered as the two are not mutually exclusive. Road crash rescue capability on the Hume Highway would also be improved with the enhancement of fire service coverage in the Wilton Junction precinct.

With the expanding urban area of Appin to the south of Campbelltown, and now Wilton Junction, the enhancement of fire, rescue and hazardous material response capability should be seriously considered.

4.0 SUMMARY / CONCLUSION / RECOMMENDATIONS

1. The LEP should prohibit the undesirable developments, listed in Table 2 of this Report, within the bushfire-prone areas (land within 100m of identified bushfire hazard vegetation) of the subject site.
2. All of the land on the subject site other than the retained native vegetation should have no restriction placed on it that prohibits APZ maintenance. This will include restrictions such as "tree preservation orders" and the like.
3. A Vegetation Management Plan should be prepared for the site. The Vegetation Management Plan should address temporary APZs for Staged development, ongoing management of non-vegetated areas to ensure bushfire hazard vegetation does not regenerate on the site.
4. The LEP should provide a mechanism to ensure the Fire & Rescue NSW document "*Fire Safety Guideline - Fire Hydrants for Minor Residential Development*" is included as a policy for future development within the site.

4.1 Limitation

- 4.1.1 This Report and the subsequent recommendations reflect the reasonable and practical efforts of the author. It is important to note that the author (and State and Local Government authorities) cannot guarantee that bushfire ignition and subsequent bushfire damage will not occur.
- 4.1.2 Current legislation is essentially 'silent' in relation to the maintenance of bushfire protection measures. Maintenance is a major factor in the effectiveness of any BPM provided/installed. The extent to which the BPMs are implemented and maintained will affect the probability of achieving adequate bushfire safety margins.
- 4.1.3 Given the natural phenomenon of bushfires, and limitations in technology and research, a system to guarantee the survival of life and property cannot be made. This is reflected in the following statements of limitations:

The goal of 'absolute' or '100%' safety is not attainable and there will always be a finite risk of injury, death or property damage. (IFEG-2005)

No development in a bushfire prone area can be guaranteed to be entirely safe from bushfires. (PBP-2001)

Notwithstanding the precautions adopted, it should always be remembered that bushfires burn under a wide range of conditions and an element of risk, no matter how small, always remains. (PBP-2001)



5.0 REFERENCES

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6.0 APPENDICES

Appendix A - Standards for APZs (RFS 2005) and Appendix 5 of *PBP-2006*.

Appendix B - Plans incorporating BAL-29 construction offset and *Special Fire Protection Purpose* offset and temporary APZs (15/11/2018 & 3/12/2018)

WILTON SOUTH PRECINCT-2017-08 APPENDIX A

STANDARDS FOR ASSET PROTECTION ZONES

PROPOSED REZONING APPLICATION & SUBDIVISION

**WILTON JUNCTION
SYDNEY.**

protection

NSW RURAL FIRE SERVICE



STANDARDS FOR ASSET PROTECTION ZONES

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INTRODUCTION

For thousands of years bush fires have been a natural part of the Australian landscape. They are inevitable and essential, as many Australian plants and animals have adapted to fire as part of their life cycle.

In recent years developments in bushland areas have increased the risk of bush fires harming people and their homes and property. But landowners can significantly reduce the impact of bush fires on their property by identifying and minimising bush fire hazards. There are a number of ways to reduce the level of hazard to your property, but one of the most important is the creation and maintenance of an Asset Protection Zone (APZ).

A well located and maintained APZ should be used in conjunction with other preparations such as good property maintenance, appropriate building materials and developing a family action plan.

WHAT IS AN ASSET PROTECTION ZONE?

An Asset Protection Zone (APZ) is a fuel reduced area surrounding a built asset or structure. This can include any residential building or major building such as farm and machinery sheds, or industrial, commercial or heritage buildings.

An APZ provides:

- a buffer zone between a bush fire hazard and an asset;
- an area of reduced bush fire fuel that allows suppression of fire;
- an area from which backburning may be conducted; and
- an area which allows emergency services access and provides a relatively safe area for firefighters and home owners to defend their property.

Potential bush fire fuels should be minimised within an APZ. This is so that the vegetation within the planned zone does not provide a path for the transfer of fire to the asset either from the ground level or through the tree canopy.

WHAT WILL THE APZ DO?

An APZ, if designed correctly and maintained regularly, will reduce the risk of:

- direct flame contact on the asset;
- damage to the built asset from intense radiant heat; and
- ember attack on the asset.

WHERE SHOULD I PUT AN APZ?

An APZ is located between an asset and a bush fire hazard.

The APZ should be located wholly within your land. You cannot undertake any clearing of vegetation on a neighbour's property, including National Park estate, Crown land or land under the management of your local council, unless you have written approval.

If you believe that the land adjacent to your property is a bush fire hazard and should be part of an APZ, you can have the matter investigated by contacting the NSW Rural Fire Service (RFS).

There are six steps to creating and maintaining an APZ. These are:

1. Determine if an APZ is required;
2. Determine what approvals are required for constructing your APZ;
3. Determine the APZ width required;
4. Determine what hazard reduction method is required to reduce bush fire fuel in your APZ;
5. Take measures to prevent soil erosion in your APZ; and
6. Landscape and regularly monitor in your APZ for fuel regrowth.

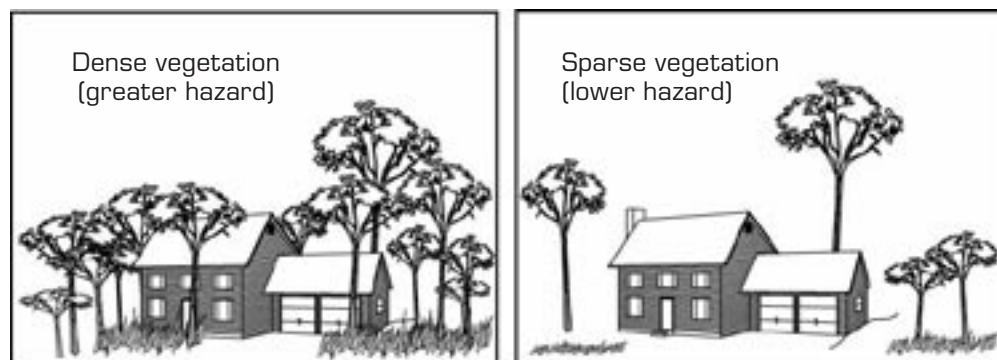
STEP 1. DETERMINE IF AN APZ IS REQUIRED

Recognising that a bush fire hazard exists is the first step in developing an APZ for your property.

If you have vegetation close to your asset and you live in a bush fire prone or high risk area, you should consider creating and maintaining an APZ.

Generally, the more flammable and dense the vegetation, the greater the hazard will be. However, the hazard potential is also influenced by factors such as slope.

- A large area of continuous vegetation on sloping land may increase the potential bush fire hazard.
- The amount of vegetation around a house will influence the intensity and severity of a bush fire.
- The higher the available fuel the more intense a fire will be.



Isolated areas of vegetation are generally not a bush fire hazard, as they are not large enough to produce fire of an intensity that will threaten dwellings.

This includes:

- bushland areas of less than one hectare that are isolated from large bushland areas; and
- narrow strips of vegetation along road and river corridors.

If you are not sure if there is a bush fire hazard in or around your property, contact your local NSW Rural Fire Service Fire Control Centre or your local council for advice.

STEP 2. DETERMINE WHAT APPROVALS ARE REQUIRED FOR CONSTRUCTING YOUR APZ

If you intend to undertake bush fire hazard reduction works to create or maintain an APZ you must gain the written consent of the landowner.

Subdivided land or construction of a new dwelling

If you are constructing an APZ for a new dwelling you will need to comply with the requirements in *Planning for Bushfire Protection*. Any approvals required will have to be obtained as part of the Development Application process.

Existing asset

If you wish to create or maintain an APZ for an existing structure you may need to obtain an environmental approval. The RFS offers a free environmental assessment and certificate issuing service for essential hazard reduction works. For more information see the RFS document *Application Instructions for a Bush Fire Hazard Reduction Certificate* or contact your local RFS Fire Control Centre to determine if you can use this approval process.

Bear in mind that all work undertaken must be consistent with any existing land management agreements (e.g. a conservation agreement, or property vegetation plan) entered into by the property owner.

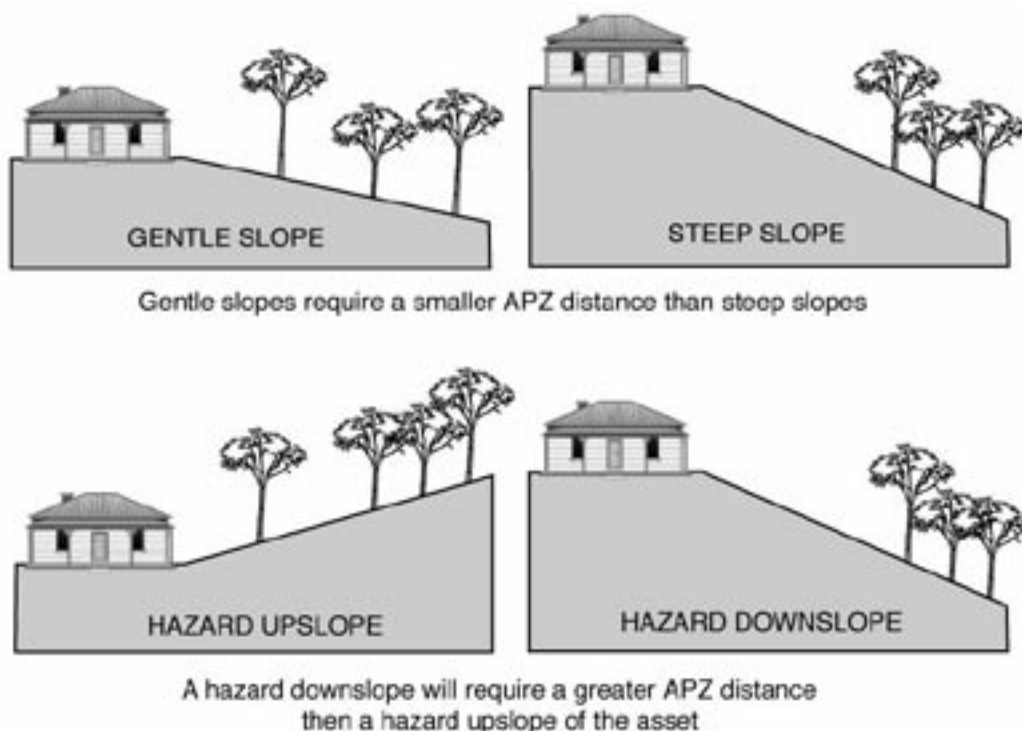
If your current development consent provides for an APZ, you do not need further approvals for works that are consistent with this consent.

If you intend to burn off to reduce fuel levels on your property you may also need to obtain a Fire Permit through the RFS or NSW Fire Brigades. See the RFS document *Before You Light That Fire* for an explanation of when a permit is required.

STEP 3. DETERMINE THE APZ WIDTH

The size of the APZ required around your asset depends on the nature of the asset, the slope of the area, the type and structure of nearby vegetation and whether the vegetation is managed.

Fires burn faster uphill than downhill, so the APZ will need to be larger if the hazard is downslope of the asset.



Different types of vegetation (for example, forests, rainforests, woodlands, grasslands) behave differently during a bush fire. For example, a forest with shrubby understorey is likely to result in a higher intensity fire than a woodland with a grassy understorey and would therefore require a greater APZ width.

A key benefit of an APZ is that it reduces radiant heat and the potential for direct flame contact on homes and other buildings. Residential dwellings require a wider APZ than sheds or stockyards because the dwelling is more likely to be used as a refuge during bush fire.

Subdivided land or construction of a new dwelling

If you are constructing a new asset, the principles of *Planning for Bushfire Protection* should be applied. Your Development Application approval will detail the exact APZ distance required.

Existing asset

If you wish to create an APZ around an existing asset and you require environmental approval, the Bush Fire Environmental Assessment Code provides a streamlined assessment process. Your Bush Fire Hazard Reduction Certificate (or alternate environmental approval) will specify the maximum APZ width allowed.

For further information on APZ widths see *Planning for Bushfire Protection* or the *Bush Fire Environmental Assessment Code* (available on the RFS website), or contact your local RFS Fire Control Centre.

STEP 4. DETERMINE WHAT HAZARD REDUCTION METHOD IS REQUIRED TO REDUCE BUSH FIRE FUEL IN YOUR APZ

The intensity of bush fires can be greatly reduced where there is little to no available fuel for burning. In order to control bush fire fuels you can reduce, remove or change the state of the fuel through several means.

Reduction of fuel does not require removal of all vegetation, which would cause environmental damage. Also, trees and plants can provide you with some bush fire protection from strong winds, intense heat and flying embers (by filtering embers) and changing wind patterns. Some ground cover is also needed to prevent soil erosion.

Fuels can be controlled by:

1. raking or manual removal of fine fuels

Ground fuels such as fallen leaves, twigs (less than 6 mm in diameter) and bark should be removed on a regular basis. This is fuel that burns quickly and increases the intensity of a fire.

Fine fuels can be removed by hand or with tools such as rakes, hoes and shovels.

2. mowing or grazing of grass

Grass needs to be kept short and, where possible, green.

3. removal or pruning of trees, shrubs and understorey

The control of existing vegetation involves both selective fuel reduction (removal, thinning and pruning) and the retention of vegetation.

Prune or remove trees so that you do not have a continuous tree canopy leading from the hazard to the asset. Separate tree crowns by two to five metres. A canopy should not overhang within two to five metres of a dwelling.

Native trees and shrubs should be retained as clumps or islands and should maintain a covering of no more than 20% of the area.

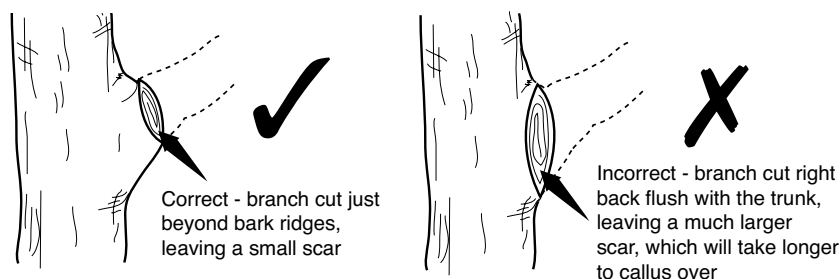
When choosing plants for removal, the following basic rules should be followed:

1. Remove noxious and environmental weeds first. Your local council can provide you with a list of environmental weeds or 'undesirable species'. Alternatively, a list of noxious weeds can be obtained at www.agric.nsw.gov.au/noxweed/;
2. Remove more flammable species such as those with rough, flaky or stringy bark; and
3. Remove or thin understorey plants, trees and shrubs less than three metres in height

The removal of significant native species should be avoided.

Prune in accordance with the following standards:

- Use sharp tools. These will enable clean cuts and will minimise damage to the tree.
- Decide which branches are to be removed before commencing work. Ensure that you maintain a balanced, natural distribution of foliage and branches.
- Remove only what is necessary.
- Cut branches just beyond bark ridges, leaving a small scar.
- Remove smaller branches and deadwood first.



There are three primary methods of pruning trees in APZs:

1. Crown lifting (skirting)

Remove the lowest branches (up to two metres from the ground). Crown lifting may inhibit the transfer of fire between the ground fuel and the tree canopy.

2. Thinning

Remove smaller secondary branches whilst retaining the main structural branches of the tree. Thinning may minimise the intensity of a fire.

3. Selective pruning

Remove branches that are specifically identified as creating a bush fire hazard (such as those overhanging assets or those which create a continuous tree canopy). Selective pruning can be used to prevent direct flame contact between trees and assets.

Your Bush Fire Hazard Reduction Certificate or local council may restrict the amount or method of pruning allowed in your APZ.

See the *Australian Standard 4373 (Pruning of Amenity Trees)* for more information on tree pruning.

4. Slashing and trittering

Slashing and trittering are economical methods of fuel reduction for large APZs that have good access. However, these methods may leave large amounts of slashed fuels (grass clippings etc) which, when dry, may become a fire hazard. For slashing or trittering to be effective, the cut material must be removed or allowed to decompose well before summer starts.

If clippings are removed, dispose of them in a green waste bin if available or compost on site (dumping clippings in the bush is illegal and it increases the bush fire hazard on your or your neighbour's property).

Although slashing and trittering are effective in inhibiting the growth of weeds, it is preferable that weeds are completely removed.

Care must be taken not to leave sharp stakes and stumps that may be a safety hazard.

5. Ploughing and grading

Ploughing and grading can produce effective firebreaks. However, in areas where this method is applied, frequent maintenance may be required to minimise the potential for erosion. Loose soil from ploughed or graded ground may erode in steep areas, particularly where there is high rainfall and strong winds.

6. Burning (hazard reduction burning)

Hazard reduction burning is a method of removing ground litter and fine fuels by fire. Hazard reduction burning of vegetation is often used by land management agencies for broad area bush fire control, or to provide a fuel reduced buffer around urban areas.

Any hazard reduction burning, including pile burns, must be planned carefully and carried out with extreme caution under correct weather conditions. Otherwise there is a real danger that the fire will become out of control. More bush fires result from escaped burning off work than from any other single cause.

It is YOUR responsibility to contain any fire lit on your property. If the fire escapes your property boundaries you may be liable for the damage it causes.

Hazard reduction burns must therefore be carefully planned to ensure that they are safe, controlled, effective and environmentally sound. There are many factors that need to be considered in a burn plan. These include smoke control, scorch height, frequency of burning and cut off points (or control lines) for the fire. For further information see the RFS document *Standards for Low Intensity Bush Fire Hazard Reduction Burning*, or contact your local RFS for advice.

7. Burning (pile burning)

In some cases, where fuel removal is impractical due to the terrain, or where material cannot be disposed of by the normal garbage collection or composted on site, you may use pile burning to dispose of material that has been removed in creating or maintaining an APZ.

For further information on pile burning, see the RFS document *Standards for Pile Burning*.

In areas where smoke regulations control burning in the open, you will need to obtain a Bush Fire Hazard Reduction Certificate or written approval from Council for burning. During the bush fire danger period a Fire Permit will also be required. See the RFS document *Before You Light that Fire* for further details.

STEP 5. TAKE MEASURES TO PREVENT SOIL EROSION

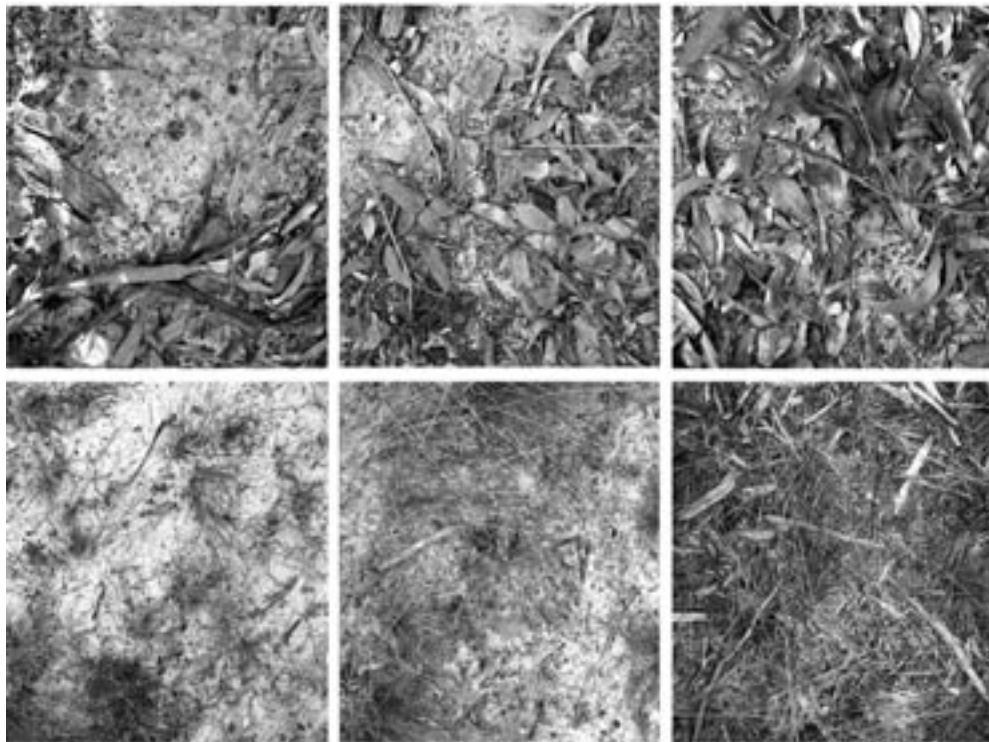
While the removal of fuel is necessary to reduce a bush fire hazard, you also need to consider soil stability, particularly on sloping areas.

Soil erosion can greatly reduce the quality of your land through:

- loss of top soil, nutrients, vegetation and seeds
- reduced soil structure, stability and quality
- blocking and polluting water courses and drainage lines

A small amount of ground cover can greatly improve soil stability and does not constitute a significant bush fire hazard. Ground cover includes any material which directly covers the soil surface such as vegetation, twigs, leaf litter, clippings or rocks. A permanent ground cover should be established (for example, short grass). This will provide an area that is easy to maintain and prevent soil erosion.

When using mechanical hazard reduction methods, you should retain a ground cover of at least 75% to prevent soil erosion. However, if your area is particularly susceptible to soil erosion, your Hazard Reduction Certificate may require that 90% ground cover be retained.



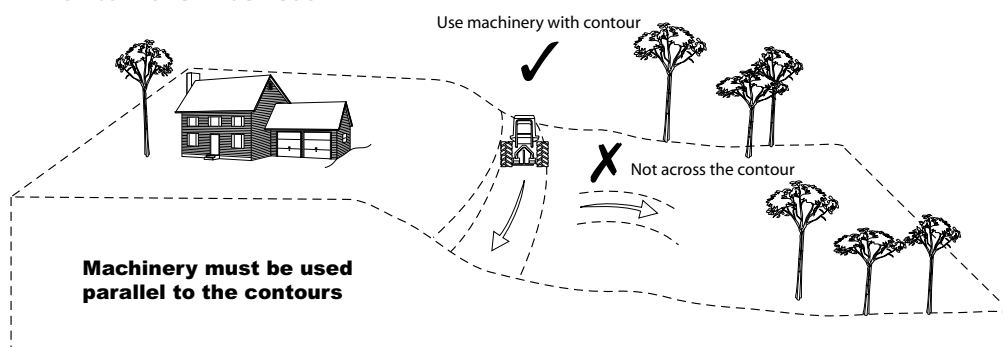
50%

75%

100%

Ground Cover

To reduce the incidence of soil erosion caused by the use of heavy machinery such as ploughs, dozers and graders, machinery must be used parallel to the contours. Vegetation should be allowed to regenerate, but be managed to maintain a low fuel load.



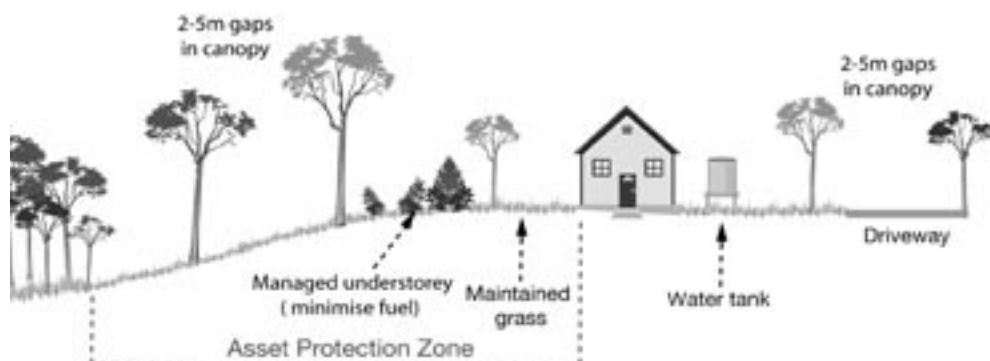
STEP 6. ONGOING MANAGEMENT AND LANDSCAPING

Your home and garden can blend with the natural environment and be landscaped to minimise the impact of fire at the same time. To provide an effective APZ, you need to plan the layout of your garden to include features such as fire resistant plants, radiant heat barriers and windbreaks.

Layout of gardens in an APZ

When creating and maintaining a garden that is part of an APZ you should:

- ensure that vegetation does not provide a continuous path to the house;
- remove all noxious and environmental weeds;
- plant or clear vegetation into clumps rather than continuous rows;
- prune low branches two metres from the ground to prevent a ground fire from spreading into trees;
- locate vegetation far enough away from the asset so that plants will not ignite the asset by direct flame contact or radiant heat emission;
- plant and maintain short green grass around the house as this will slow the fire and reduce fire intensity. Alternatively, provide non-flammable pathways directly around the dwelling;
- ensure that shrubs and other plants do not directly abut the dwelling. Where this does occur, gardens should contain low-flammability plants and non flammable ground cover such as pebbles and crush tile; and
- avoid erecting brush type fencing and planting “pencil pine” type trees next to buildings, as these are highly flammable.



Removal of other materials

Woodpiles, wooden sheds, combustible material, storage areas, large quantities of garden mulch, stacked flammable building materials etc. should be located away from the house. These items should preferably be located in a designated cleared location with no direct contact with bush fire hazard vegetation.

Other protective features

You can also take advantage of existing or proposed protective features such as fire trails, gravel paths, rows of trees, dams, creeks, swimming pools, tennis courts and vegetable gardens as part of the property's APZ.

PLANTS FOR BUSH FIRE PRONE GARDENS

When designing your garden it is important to consider the type of plant species and their flammability as well as their placement and arrangement.

Given the right conditions, all plants will burn. However, some plants are less flammable than others.

Trees with loose, fibrous or stringy bark should be avoided. These trees can easily ignite and encourage the ground fire to spread up to, and then through, the crown of the trees.

Plants that are less flammable, have the following features:

- high moisture content
- high levels of salt
- low volatile oil content of leaves
- smooth barks without “ribbons” hanging from branches or trunks; and
- dense crown and elevated branches.

When choosing less flammable plants, be sure not to introduce noxious or environmental weed species into your garden that can cause greater long-term environmental damage.

For further information on appropriate plant species for your locality, contact your local council, plant nurseries or plant society.

If you require information on how to care for fire damaged trees, refer to the Firewise brochure *Trees and Fire Resistance; Regeneration and care of fire damaged trees*.

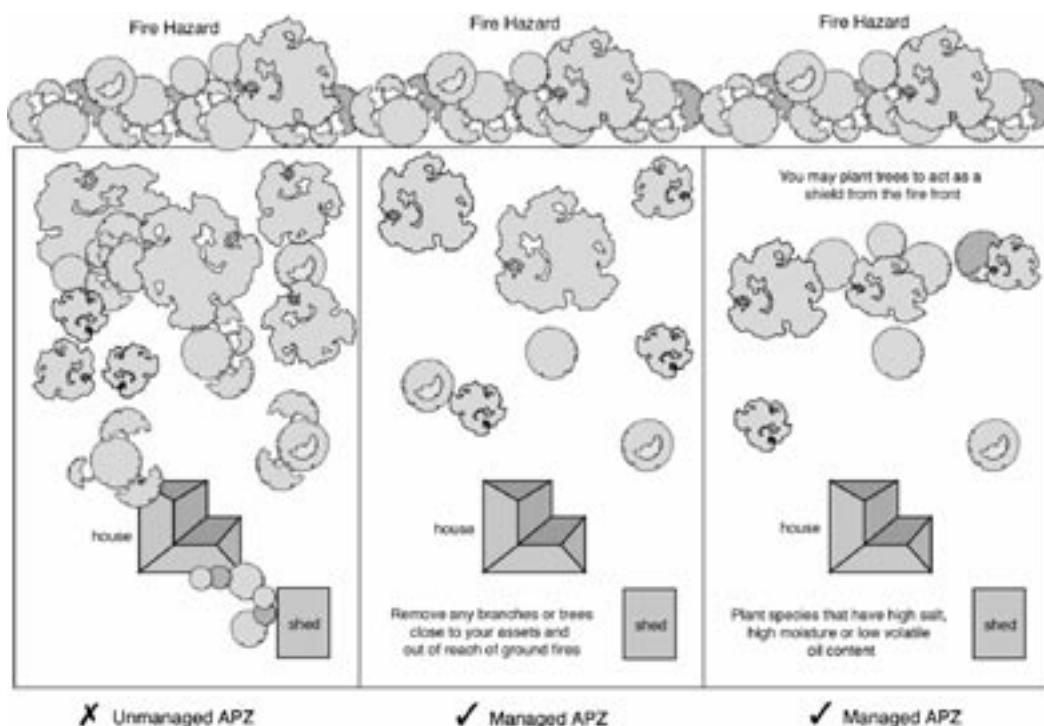
WIND BREAKS

Rows of trees can provide a wind break to trap embers and flying debris that could otherwise reach the house or asset.

You need to be aware of local wind conditions associated with bush fires and position the wind break accordingly. Your local RFS Fire Control Centre can provide you with further advice.

When choosing trees and shrubs, make sure you seek advice as to their maximum height. Their height may vary depending on location of planting and local conditions. As a general rule, plant trees at the same distance away from the asset as their maximum height.

When creating a wind break, remember that the object is to slow the wind and to catch embers rather than trying to block the wind. In trying to block the wind, turbulence is created on both sides of the wind break making fire behaviour erratic.



HOW CAN I FIND OUT MORE?

The following documents are available from your local Fire Control Centre and from the NSW RFS website at **www.rfs.nsw.gov.au**.

- Before You Light That Fire
- Standards for Low Intensity Bush Fire Hazard Reduction Burning
- Standards for Pile Burning
- Application Instructions for a Bush Fire Hazard Reduction Certificate

If you require any further information please contact:

- your local NSW Rural Fire Service Fire Control Centre.
Location details are available on the RFS website or
- call the NSW RFS Enquiry Line 1800 679 737
(Monday to Friday, 9am to 5pm), or
- the NSW RFS website at **www.rfs.nsw.gov.au**.

**Produced by the NSW Rural Fire Service, Locked Mail Bag 17,
GRANVILLE, NSW 2142. Ph. 1800 679 737**

www.rfs.nsw.gov.au

Appendix 5

Bush Fire Provisions - Landscaping and Property Maintenance

A5.1 Introduction

Bush fires are a natural and periodic event in the Australian landscape. Many Australian plants and animals have adapted to fire over thousands of years and require fire as part of their life cycle.

However, development adjacent to bushland areas has increased the risk of fire impacting on people and their assets. Fire management needs to strike a balance between the protection of life and property and the maintenance of ecological processes and systems.

In Australia, bush fires are inevitable and an essential aspect of the landscape.

However, the impact on property and life can be reduced with responsible preparation and management of bush fire hazards. This is the responsibility of all land managers, as well as communities and individuals taking responsibility for their own fire safety.

The level of protection for life or whether or not a house or other assets survive a bush fire ultimately depends on the landowner and their level of preparedness against bush fire attack.

The planning system can be used to better effect in protecting human life, property and environmental values from the impacts of bush fire events.

In some cases this will involve land use planning and development controls, construction standards, APZs and subdivision layout, siting, design and provision of services. It also involves careful and deliberate consideration of the environmental impacts of these and how we can recognise the need to protect our wetlands, rainforests, koala habitat and other biodiversity and cultural values.

However, the best planning can be undone by poor maintenance and lack of forethought when landscaping a development. Therefore house survival ultimately depends on the householder.

Some maintenance also depends upon adjoining neighbours and upon fuel management in adjacent bush land areas by the owners, occupiers or managers of that land. General housekeeping and maintenance of the grounds by the householder is equally important and, in some cases, may even be more so.

Experience from the Canberra 2003 fires suggests that house losses are greatest in the area up to 250 metres from the bush interface. Distances of

less than 100 metres are particularly vulnerable to flame contact, radiant heat and ember attack.

Hence it is within this distance that efforts should be made to prepare for the onslaught of major bush fire events.

While other legislation provides the impetus for planning objectives, the RF Act provides the legislative vehicle to achieve bush fire management objectives.

In this appendix consideration will be given to the principles for landscaping and management, and the role of property maintenance during the fire event.

A5.2 Principles of Protection

Bush fire attack takes essentially five forms;

- wind,
- smoke,
- ember,
- radiant heat and
- flame.

Evidence indicates ember attack is responsible for most bush fire related house fires. Strong winds resulting from severe bush fires will drive embers into vulnerable areas of a building, preheat and dry fuel ahead of a fire, lift roofing and extend flames along a more horizontal plane closer to building elements. Embers can also cause spotting in advance of the bush fire and provide piloted ignition to building elements. To effectively protect a building, strategies must be implemented that separate it from the hazard and reduce the intensity of bush fires to minimise the combined impact of ember, wind, flame and heat attack.

While smoke will cause minimal damage to property, it can severely affect the health of residents. Smoke is a significant factor in areas in which aged or disabled persons reside – hospitals and nursing homes - and more so where residents are susceptible to respiratory disorders.

Radiant heat (measured in kW/m²) can severely impair firefighting operations, the health of residents and the integrity of building elements. Radiant heat in excess of 10kW/m² can prevent emergency services personnel assisting residents of SFPP developments.

Flame attack will severely restrict firefighting operations, provide piloted ignition to building elements and threaten the health of residents and their capacity to evacuate the area.

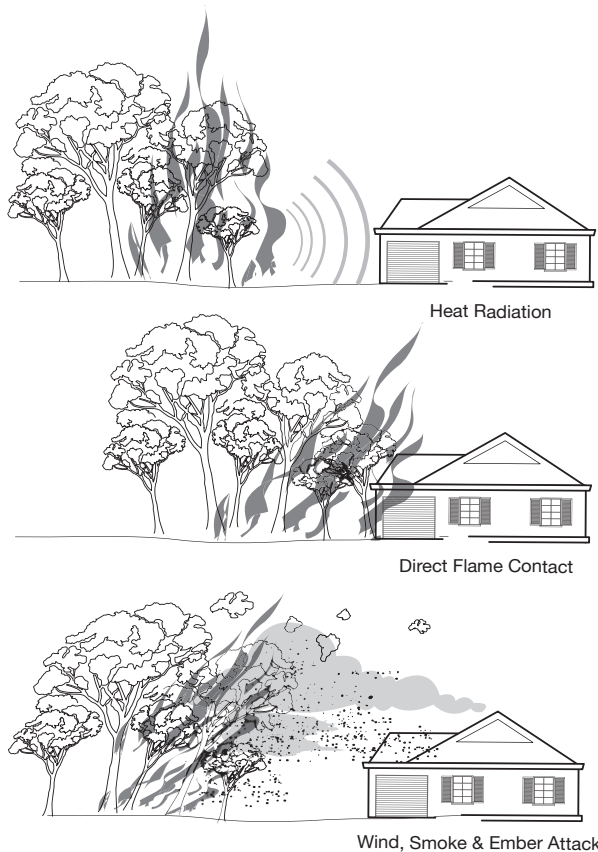


Figure A 5.1 Bush Fire Attack Mechanisms

Overall the intention of bush fire protection measures should be to prevent flame contact to a structure, reduce radiant heat to below the ignition thresholds for various elements of a building, to minimise the potential for wind driven embers to cause ignition and reduce the effects of smoke on residents and firefighters.

A5.3 Principles of Landscaping Properties for Bush Fire Protection

The principles of landscaping for bush fire protection aim to:

- Prevent flame impingement on the dwelling;
- Provide a defendable space for property protection;
- Reduce fire spread;
- Deflect and filter embers;
- Provide shelter from radiant heat; and
- Reduce wind speed.

(a) Vegetation choices

All vegetative material can burn under the influence of bush fire.

With this in mind, careful attention must be paid to species selection, their location relative to their flammability, avoidance of continuity of vegetation (horizontally and vertically), and ongoing maintenance to readily remove flammable fuels (leaf litter, twigs and debris).

In the paper “*Landscape and Building Design for Bushfire Areas*” G.C. Ramsay and L. Rudolph have provided 14 attributes of vegetation which affect bush fire attack. In summary these attributes are:

- Moisture content of leaves;
- Volatile oil content of leaves;
- Mineral content of leaves;
- Leaf fineness;
- Density of foliage;
- Continuity of plant form;
- Height of lowest foliage above ground;
- Size of plant;
- Dead foliage on the plant;
- Bark texture;
- Quantity of ground fuels;
- Fineness of ground fuels;
- Compaction ability of ground fuels; and
- Mineral content of ground fuel.

What is clear is that the higher moisture content of leaves (mesic), the less bark that will be available and the lower the leaf drop, all of which will assist with maintenance of the understorey and will also assist in reducing bush fire attack.

Work in the USA and elsewhere has also suggested that in addition to removal of understorey species, the trimming of lower limbs of trees also assists in reducing fire penetration into the canopy. Trees such as ‘pencil pines’ and African olive have been attributed with high fire propagation due to the high fine fuel and/or oil content captured within the canopy. This leads to significant flame height. Avoid such species in favour of rainforest species such as Figs and Syzygium.

When choosing plants, be sure not to introduce weed species into an area. Fire events may provide the opportunity for weed species to spread and may contribute fuel to an area of otherwise lower fuel loads.

Contact local councils, plant nurseries and plant societies to determine suitable species for your area.

(b) Trees as Windbreaks

The use of trees as windbreaks is a common practice but trees also provide a useful function, trapping embers and flying debris, which would otherwise reach the house. The tree crown will rarely carry fire unless there is a significant fuel loading on the ground.

By reducing the wind speed, a row of trees also slows the rate of spread of a bush fire and a dense foliage traps radiant heat, lowering bush fire radiant heat.

Because of the effect of turbulence, a balance has to be struck between a high density of trees (that

maximises the trapping of embers and radiant heat but also maximises turbulence) and a lower density (that allows more embers and radiant heat to pass through but minimises turbulence). A windbreak that allows 30–60% of the wind to pass through is ideal as less than this becomes too solid with ember laden winds being carried over the top of the break.

To be effective a windbreak must:

- be located on the side of the lot from which fire weather normally approaches;
- be of sufficient length (generally 100 metres minimum length);
- be located at a distance of one to three times the height of fully grown trees but not within the IPA;
- use smooth barked eucalypts, rainforest trees or deciduous trees;
- make sure there are no breaks of sufficient size to allow winds to funnel through; and
- be separated by sufficient distance from the hazard so as not to be consumed and become a hazard itself.

A5.4 Vegetation Management

Where APZs have been incorporated as part of the development approval for subdivision or for dwelling construction, the environmental aspects of the development should have already been taken into account.

In general, it is expected that APZs will be maintained by the owner of the land including maintenance of any fire trail constructed as part of the development.

It is accepted practice that after construction of a dwelling, gardens will be established and landscaping of the grounds will be undertaken. It is essential that efforts to reduce fuels on adjoining properties are therefore not negated by actions within the immediate curtilage of the building.

In terms of priorities of addressing bush fire attack, priority should be given to preventing flame impingement by not allowing fine debris to accumulate close to the building. Secondly, removal of understorey fuels aids in the reduction of flame heights and likely canopy fire, thereby reducing overall radiant heat. Removal of loose bark and fine fuels reduces both heat output and ember generation, while the retention of taller trees with canopies will also assist in filtering out embers.

To maintain a garden that does not contribute to the spread of bush fires, it is necessary to plan the layout of the garden beds and take an active decision to minimise certain features in favour of other features. These should include:

- maintaining a clear area of low cut lawn or pavement adjacent to the house;
- keeping areas under fences, fence posts and

- gates and trees raked and cleared of fuel;
- utilising non-combustible fencing and retaining walls
- breaking up the canopy of trees and shrubs with defined garden beds;
- organic mulch should not be used in bush fire prone areas and non flammable material should be used as ground cover, eg Scoria, pebbles, recycled crushed bricks.
- planting trees and shrubs such that:
 - the branches will not overhang the roof;
 - the tree canopy is not continuous; and
 - there is a windbreak in the direction from which fires are likely to approach.

The RFS has developed its document “Standards for Asset Protection Zones” which should be consulted for APZ specifications. This is also available on the RFS web page at www.rfs.nsw.gov.au.

A5.5 Maintenance of Property

Sensible arrangements for landscaping and maintenance of the property are critical in the prevention of losses.

In considering property maintenance the following items should therefore be implemented in advance of the bush fire season:

- removal of material such as litter from the roof and gutters;
- ensure painted surfaces are in good condition with decaying timbers being given particular attention to prevent the lodging of embers within gaps;
- check pumps and water supplies are available and in working order;
- driveways are in good condition with trees not being too close and forming an obstacle during smoky conditions;
- check tiles and roof lines for broken tiles or dislodged roofing materials;
- screens on windows and doors are in good condition without breaks or holes in flyscreen material and frames are well fitting into sills and window frames;
- drenching or spray systems are regularly tested before the commencement of the fire season;
- hoses and hose reels are not perished and fittings are tight and in good order;
- doors are fitted with draught seals and well maintained;
- mats are of non combustible material or in areas of low potential exposure; and
- woodpiles, garden sheds and other combustible materials are located downslope and well away from the house.

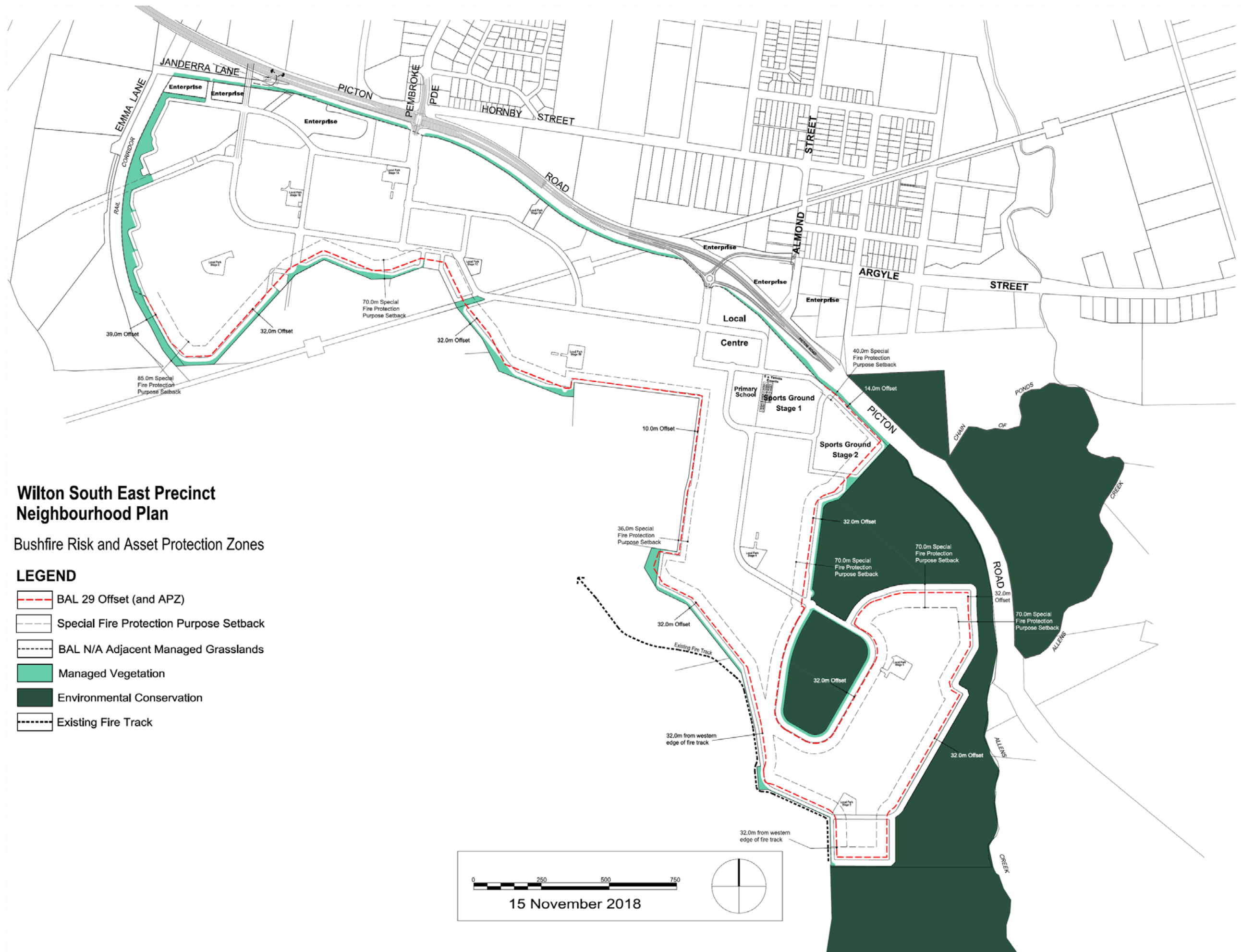
Trees and other vegetation in the vicinity of power lines and tower lines should be managed and trimmed in accordance with the specifications in “Vegetation Safety Clearances” issued by Energy Australia (NS179, April 2002).

WILTON SOUTH PRECINCT-2017-08 APPENDIX B

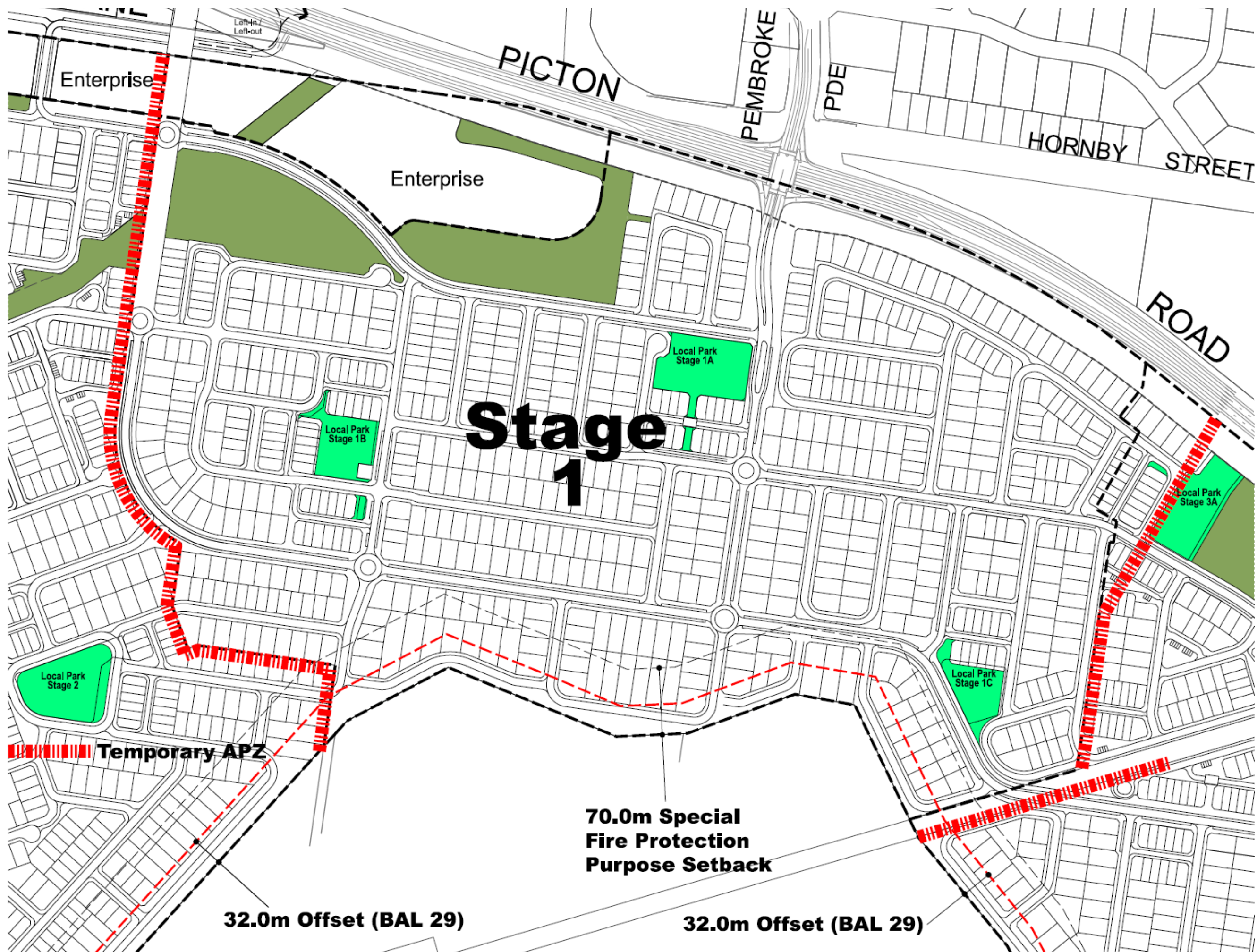
**PLAN INCORPORATING BAL-29 CONSTRUCTION OFFSET AND
SPECIAL FIRE PROTECTION PURPOSE DEVELOPMENT OFFSET**

PROPOSED REZONING APPLICATION & SUBDIVISION

**WILTON JUNCTION
SYDNEY.**



APPENDIX B. 1: BAL-29 & "Special Fire Protection Purpose" offsets on Concept Plan



APPENDIX B. 2: BAL-29 & "Special Fire Protection Purpose" offsets & temporary APZs on Stage 1 Plan