Photo 7: Dam / waterbody in the north-west

2.3 Bushfire attack assessment

The planning proposal involves residential and commercial development which are treated differently in terms of the bushfire assessment and the required asset protection zones adopted as outlined below.

Commercial

Commercial development is categorised by the NSW Rural Fire Service (RFS) planning policy document PBP as being 'other' development. The RFS requires that development applications should satisfy the aims and objectives of *PBP*, propose a combination of bushfire protection measures and provide evidence that the intent of each measure can be satisfied.

PBP does not provide predetermined minimum APZ requirements for commercial development under *PBP*. The distances provided in Table 2.2 will provide appropriate defendable space for the commercial building/s. The defendable space is designed to allow fire fighters room and safety to fight fires.

Residential

PBP dictates that the subsequent extent of bushfire attack that can potentially emanate from a bushfire must not exceed a radiant heat flux of 29kW/m^2 for residential (multiply occupancy) developments. This rating assists in determining the size of the APZ in

compliance with *PBP* to provide the necessary defendable space between hazardous vegetation and a building. The distances provided in Table 2.3 will provide appropriate APZ's in compliance with Appendix 2 of PBP to achieve approval for residential development.

Table 2.2 – Bushfire attack assessment (commercial development)

Aspect	Vegetation within 140m of development	Effective slope of land	Defendable space provided for commercial buildings (metres)
North & south-east	Managed land	N/A	N/A
North-east	Managed land / forested wetland	0-5^{0D}	20-60
West	Forested wetland	Level	10

*Notes: * Slope is either 'U' meaning upslope or 'C' meaning cross slope or 'D' meaning downslope*

Table 2.3 – Bushfire attack assessment (residential development)

Aspect	Vegetation within 140m of development	Effective slope of land	Minimum APZ required as per Appendix 2 of *PBP* (metres)	APZ provided for residential building (metres)
North & south-east	Managed land	N/A	N/A	N/A
North-east	Managed land / forested wetland	0-5^{0D}	20	20-60
West	Forested wetland	Level	20	24

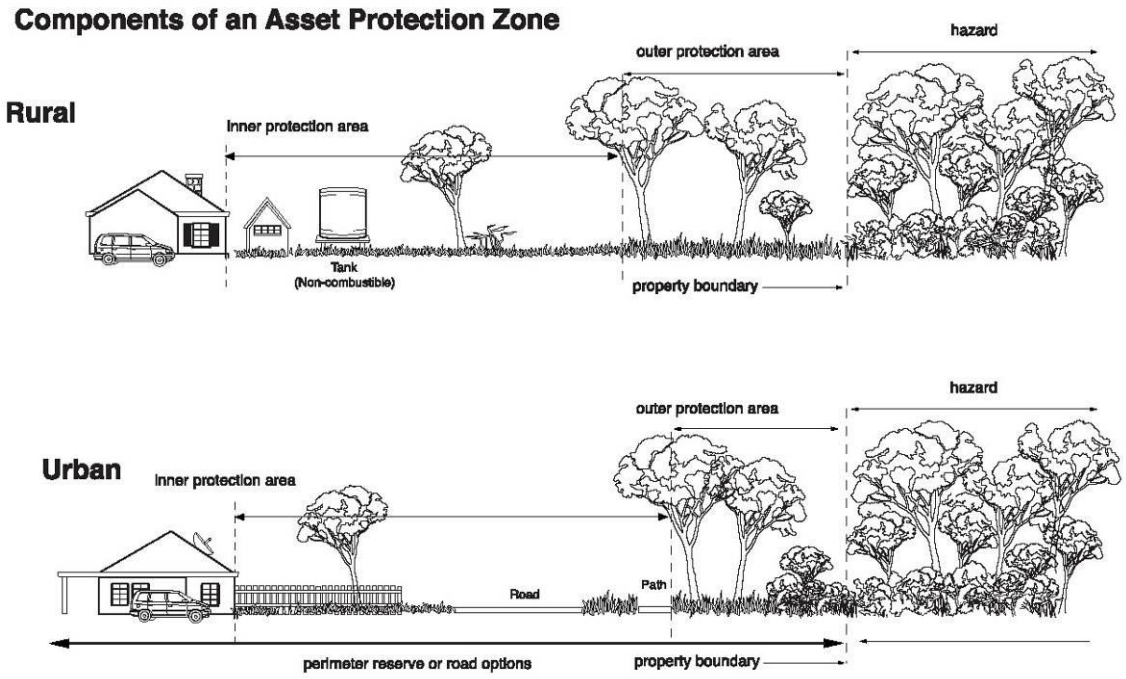
*Notes: * Slope is either 'U' meaning upslope or 'C' meaning cross slope or 'D' meaning downslope*

Specific Protection Issues

3

3.1 Asset protection zones (APZs)

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



APZs and progressive reduction in fuel loads (Source: RFS, 2006)

Note: Vegetation management as shown is for illustrative purposes only. Specific advice is to be sought in regard to vegetation removal and retention from a qualified and experienced expert to ensure APZs comply with the *RFS* performance criteria.

PBP dictates that the subsequent extent of bushfire attack that can potentially emanate from a bushfire must not exceed a radiant heat flux of 29kW/m^2 for residential developments. This rating assists in determining the size of the APZ in compliance with *PBP* to provide the necessary defendable space between hazardous vegetation and a building. Table 3.1 outlines the proposals compliance with the performance criteria for APZs in relation to residential development.

The 10m defendable space provided for the commercial development will consist of roadways, boardwalk and landscaped areas. The commercial development will be located

well over 10m from the residential development, however it is recommended that the boardwalk is constructed with non-combustible materials to ensure an appropriate defendable space for fire fighters (refer Section 3.2 for detail).

In accordance with *PBP,* appropriate defendable space has been provided between hazardous vegetation and the commercial development to comply with the aims and objectives of *PBP*.

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

Performance criteria	Acceptable solutions	Complies
Radiant heat levels at any point on a proposed building will not exceed 29kW/m^2.	APZs are provided in accordance with Appendix 2. APZs are wholly within the boundary of the development site.	Yes - refer Table 2.2. APZ's have been provided in compliance with Appendix 2. APZ's are contained within the development site.
APZs are managed and maintained to prevent the spread of fire towards the building.	In accordance with the requirements of *Standards for Asset Protection Zones* (*NSW RFS* 2005).	Yes - to be made a condition of consent.
APZ maintenance is practical , soil stability is not compromised and the potential for crown fires is negated.	The APZ is located on lands with a slope of less than 18^o.	Yes - Slopes are less than 18^o.

3.2 Building protection

Although not required in terms of rezoning, the following advice in relation to building construction levels can be used for future planning and development design.

The construction classification system is based on five (5) bushfire attack levels (BAL). These are BAL – Flame Zone (FZ), BAL 40, BAL 29, BAL 19 and BAL 12.5 AS3959 – *Construction of buildings in bushfire-prone areas*. The lowest level, BAL 12.5, has the longest APZ distance while BAL – FZ has the shortest APZ distance. These allow for varying levels of building design and use of appropriate materials.

Residential development

A 24m APZ is provided for the residential portion of the development. This will allow for a maximum BAL 29 building construction standard for those aspects fronting the bushfire hazard.

Commercial development

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

PBP recommends that bushfire construction standards for Classes 5-8 buildings (BCA) should be considered on a case by case basis. Bushfire construction recommendations are dependent on the level of bushfire risk and the provision of adequate access opportunities (as per PBP Section 2.6). The proposal has the capacity to provide for an emergency egress route around the perimeter of the site. In addition the following is to apply:

- The boardwalk will be constructed using non-combustible materials; and

- Undercroft parking for the southern most commercial building is proposed. The slabs provided are type A construction (i.e. 200mm thick slab above 180/180/180 FRL) and sprinklers will be provided so any fire would be contained for the FRL period).

3.3 Hazard management

In terms of implementing and / or maintaining APZs, there is no physical reason that would constrain hazard management from being successfully carried out by normal means (e.g. mowing / slashing).

The APZs are to be managed in accordance with the RFS guidelines *Standards for Asset Protection Zones (RFS, 2005),* with landscaping to comply with Appendix 5 of *PBP.*

A summary of the guidelines for managing APZs is attached as Appendix 1 to this report.

3.4 Access for fire fighting operations

Access and parking within the site will be provided directly from Boondah Road to the undercroft or rooftop of the commercial development and the basement of the residential building. Any further internal public access roads are to comply with Table 3.2 below and should be a minimum 6.5m wide, or 8m wide where fronting the bushfire hazard (i.e. perimeter road).

Emergency egress via a fire trail (i.e. no public access) for firefighting purposes is also an option. This should be provided via a minimum 4m wide fire trail which links to the internal public road. Any future fire trail is to comply with the requirements outlined in Table 3.4 and is to be used solely for emergency purposes (i.e. locked gates provided at either end). Any emergency access road is to be constructed to ensure it has the capacity to carry fully loaded fire fighting vehicles (approximately 15 tonnes).

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

Performance criteria	Acceptable solutions
Fire fighters are provided with safe all weather access to structures (thus allowing more efficient use of fire fighting resources).	Public roads are two-wheel drive, all weather roads.
Public road widths and design that allow safe access for fire fighters while residents are evacuating an area.	Urban perimeter roads are two way, that is, at least two traffic lane widths (carriageway 8m minimum kerb to kerb) allowing traffic to pass in opposite directions. Non perimeter roads comply with Table 3.3. Perimeter road is linked with the internal road system at an interval of no greater than 500m in urban areas. Traffic management devices are constructed to facilitate access by emergency services. Public roads have a cross fall not exceeding 3^{o}. All roads are through roads. If unavoidable, dead end roads are not more than 200m in length, incorporate a minimum 12m outer radius turning circle, sign posted dead end and direct traffic away from the hazard.

Performance criteria	Acceptable solutions
	Curves of roads (other than perimeter) have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress. The minimum distance between inner and outer curves is 6m. Maximum grades for sealed roads do not exceed 15^{o} and an average grade of not more than 10^{o}. Minimum vertical clearance of 4m above the road at all times.
The capacity of road surfaces and bridges is sufficient to carry fully loaded fire fighting vehicles.	The capacity of road surfaces and bridges is sufficient to carry fully loaded fire fighting vehicles (15 tonnes for reticulated water and 28 tonnes for all other areas). Bridges clearly indicate load rating.
Roads that are clearly sign posed (with easily distinguishable names) and buildings / properties that are clearly numbered.	Public roads >6.5m wide to locate hydrants outside of parking reserves to ensure accessibility to reticulated water. Public roads 6.5 - 8m wide are No Parking on one side with the hydrant located on this side to ensure accessibility to reticulated water. Public roads <6.5m wide provide parking within parking bays and locate services outside of parking bays to ensure accessibility to reticulated water. One way only public access are no less than 3.5m wide and provide parking within parking bays and locate services outside of parking bays to ensure accessibility to reticulated water.
There is clear access to reticulated water supply. Parking does not obstruct the minimum paved width	Parking bays are a minimum of 2.6m wide from kerb edge to road pavement. No services or hydrants are located within parking bays. Public roads directly interfacing the bushfire hazard are to provide roll top kerbing to the hazard side of the road.

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

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

Table 3.4– Performance criteria for fire trails (*PBP* guidelines pg. 24)

Performance criteria	Acceptable solutions
The width and design of the fire trails enables safe and ready access for fire fighting vehicles.	A minimum carriageway width of 4m with an additional 1m strip on each side of the trail clear of bushes and long grass. Sealed trails have a maximum grade of 15^{o} and not more than 10^{o} for unsealed roads. A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches. The cross fall of the trail is not more than 10^{o}. The trail has the capacity for passing by: • reversing bays using the access to properties to reverse fire tankers, which are 6m wide & 8m deep to any gates, with a minimum turning radius of 6m and outer minimum radius of 12m and / or • a passing bay every 200m, 20m long x 3m wide, making a minimum trafficable width of 7m at the passing bay.
Fire trails are trafficable under all weather conditions. Where the fire trail joins a public road, access shall be controlled to prevent use by unauthorised persons.	The fire trail is accessible to fire fighters and maintained in a serviceable condition by the owner of the land. Appropriate drainage and erosion controls are provided. The fire trail system is connected to the property access road and / or through road system at intervals of at least 200m. Fire trails do not traverse a wetland or other land subject to periodic inundation (other than a flood or storm surge). Gates for fire trails are provided and locked with a key / lock system authorised by the local RFS.
Fire trails designed to prevent weed infestation, soil erosion and other land degradation.	Fire trail design does not adversely impact on natural hydrological flows. Fire trail design acts as an effective barrier to the spread of weeds and nutrients. Fire trail construction does not expose acid-sulphate soils.

3.5 Water supplies

Town reticulated water supply is available to the property in the form of an underground reticulated water system. Table 3.5 outlines the performance criteria and acceptable solutions for reticulated water supply.

Table 3.5 – Performance criteria for reticulated water supplies (*PBP* guidelines pg. 27)

Performance criteria	Acceptable solutions
Water supplies are easily accessible and located at regular intervals.	Reticulated water supply to urban subdivision uses a ring main system for areas with perimeter roads. 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. Hydrants are not placed within any road carriageway. All above ground water and gas pipes external to the building are metal, including and up to taps. The provisions of parking on public roads are met.

3.6 Gas

Table 3.6 outlines the required performance criteria for the gas supply.

Table 3.6 – Performance criteria for gas supplies (*PBP* guidelines pg. 27)

Performance criteria	Acceptable solutions
Location of gas services will not lead to the ignition of surrounding bushland land or the fabric of buildings	Reticulated or bottled gas bottles are to be installed and maintained in accordance with AS1596 (2002) and the requirements of relevant authorities. Metal piping is to be used. All fixed gas cylinders are to be kept clear of flammable materials to a distance of 10m and shielded on the hazard side of the installation. If gas cylinders are to be kept close to the building the release valves must be 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. Polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not to be used.

3.7 Electricity

Table 3.7 outlines the required performance criteria for electricity supply.

Table 3.7 – Performance criteria for electricity services (*PBP* guidelines pg. 27)

Performance criteria	Acceptable solutions
Location of electricity services limit the possibility of ignition of surrounding bushland or the fabric of buildings Regular inspection of lines in undertaken to ensure they are not fouled by branches.	Where practicable, electrical transmission lines are underground Where overhead electrical transmission lines are proposed: • 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 specification in *Vegetation Safety Clearances* issued by *Energy Australia* (NS179, April 2002).

Conclusion & Recommendations

4

4.1 Conclusion

A bushfire protection assessment has been undertaken for the planning proposal involving a mixed use rezoning located at Lots 3 & 4 DP 26902 & Lot 9 DP 806132, 10 & 12 Boondah Road & 6 Jacksons Road, Warriewood.

Our assessment found that bushfire can potentially affect the site from the forested wetland vegetation located both within and external to the sites western and southern boundary. Bushfire risk also exists from the riparian corridor in the north-east beyond Boondah Road.

The bushfire risk posed to the planning proposal however can be mitigated if appropriate bushfire protection measures (including APZs) are put in place and managed in perpetuity.

The assessment has concluded that future development on site is capable of providing compliance with *Section 117 Direction 4.4*, the planning principles of *PBP* and *Community Resilience Practice Note 2/12 – Planning Instruments and Policies.*

Future development on site is to comply with the following planning principles.

Table 4.1 – Planning principles

Planning principles	Recommendations
Provision of a perimeter road with two way access which delineates the extent of the intended development.	A perimeter road is to be provided and can take the form of an emergency access trail. Use of this road is restricted to emergency vehicles only with locked gates provided.
Provision, at the urban interface, for the establishment of adequate APZs for future housing.	APZs have been recommended in compliance with Appendix 2 of PBP.
Specifying minimum residential lot depths to accommodate APZs for lots on perimeter roads.	Future development design is to allow for the minimum APZs as recommended within Table 2.2 (i.e. 10m for commercial development and 24m for residential development).
Minimising the perimeter of the area of land interfacing the hazard, which may be developed.	Complies
Introduction of controls which avoid placing inappropriate developments in hazardous areas.	Future development consists of residential and commercial development and is appropriate for the level of bushfire risk.
Introduction of controls on the placement of combustible materials in APZs.	Compliant – can be made a condition of consent.

The following recommendations are provided to ensure that future residential development is in accordance with, or greater than, the requirements of *PBP.*

4.2 Recommendations

Recommendation 1 - APZs are to be provided to the future development. APZs are to be measured from the exposed wall of the buildings toward the hazardous vegetation. The minimum APZ must be achievable within all buildings fronting the bushfire hazard as nominated in Table 2.2 and also as generally depicted in Schedule 1.

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

Recommendation 4 - Building construction standards are to be applied for future residential building in accordance with *Australian Standard AS3959 Construction of buildings in bushfire-prone areas (2009)* with additional construction requirements as listed within Section A3.7 of Addendum Appendix 3 of *PBP.*

Recommendation 5 – The boardwalk will be constructed using non-combustible materials.

Recommendation 6 – Undercroft parking for the southern most commercial building is proposed. The slabs provided are to be Type A construction (i.e. 200mm thick slab above 180/180/180 FRL) and sprinklers will be provided so any fire would be contained for the FRL period).

Recommendation 7 – Future access within the site is to comply with Tables 3.2 – 3.4 of this report. An emergency egress fire trail can be provided around the perimeter of the development. The emergency access road is to be constructed to ensure it has the capacity to carry fully loaded fire fighting vehicles (approximately 15 tonnes). It is to comply with Section 4.1.3 (3) of PBP with the provision of locked gates at either end with a key/lock system authorised by the local RFS.

Recommendation 8 – Water, electricity and gas supply is to comply with the acceptable solutions as provided within Section 4.1.3 of *PBP*.

REFERENCES

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

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

Councils of Standards Australia AS3959 (2009) – *Australian Standard Construction of buildings in bush fire-prone areas.*

Hon Brad Hazzard (7 June 2012) – *Planning proposal to rezone land at Boundary Road, Medowie from 1 (c1) Rural Small Holdings Zone to 1(c5) Rural Small Holdings, 1(c4) Rural Small Holdings and 7(a) Environmental Protection.*

Keith, David (2004) – *Ocean Shores to Desert Dunes – The Native Vegetation of New South Wales and the ACT*. The Department of Environment and Climate Change.

Rural Fire Service (2006) - *Planning for bushfire protection– a guide for councils, planners, fire authorities and developers*. NSW Rural Fire Service.

Rural Fire Service (2006) - Bushfire Attack Software on RFS Web site.

Tan, B., Midgley, S., Douglas, G. and Short (2004) - *A methodology for assessing bushfire attack.* RFS Development Control Service.

Travers, J. (2003) *The Ecological Management of Asset Protection Zones at Wallarah Peninsula – A Case Study*.

Plan of Bushfire Protection Measures

S1

Legend

- Site boundary (source: LPI, 2015)
- Contours - 1m (source: LiDAR)
- Water body
- Forested Wetland

Asset Protection Zone (APZ)

- APZ for residential development
- APZ for commercial development

Aerial source: Nearmap

Travers bushfire & ecology
www.traversecology.com.au

PROJECT & MXD REFERENCE
10 & 12 Boondah Road, Warriewood
A16179_BF001

DATE & ISSUE NUMBER
13/12/2016
Issue 1

SCALE & COORDINATE SYSTEM
1:2,000 @ A3
GDA 1994 MGA Zone 56

0 50 100 m

TITLE

Schedule 1 - Bushfire Protection Measures

Document Path: N:\GIS STORAGE\N Drive\A16179_BoondahRd_Warriewood\MXDs\A16179_BF001.mxd

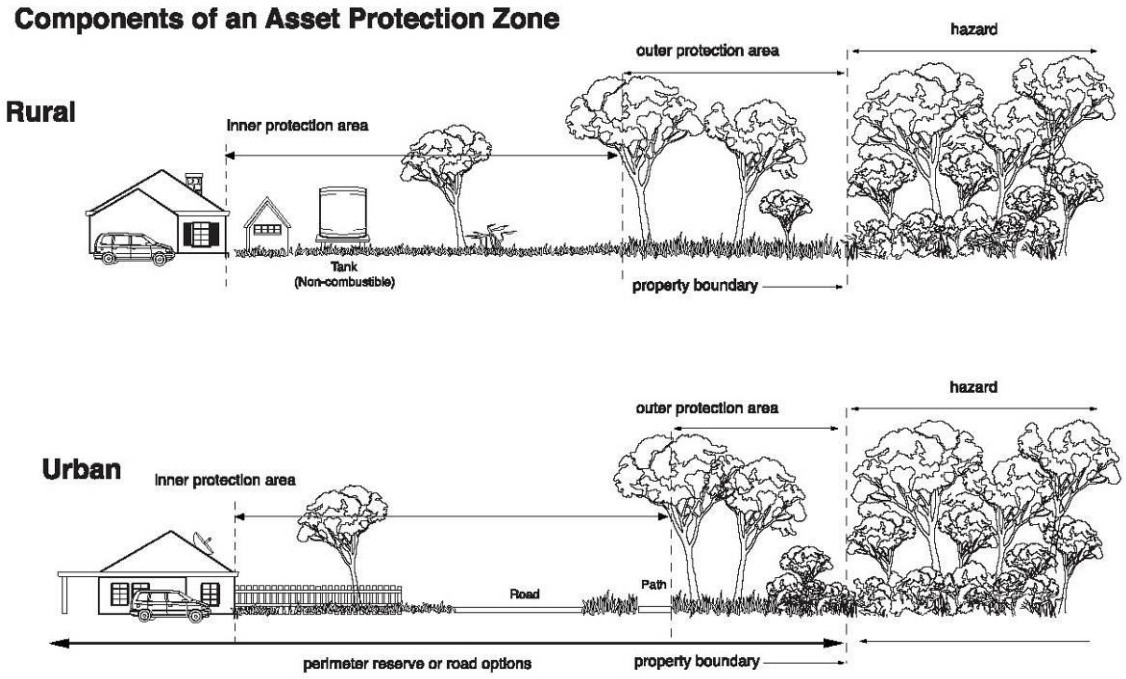
Disclaimer: The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered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

Management of Asset Protection Zones

A1

The RFS provides basic advice in respect of managing APZs through documents such as, *Standards for Asset Protection Zones* (RFS, 2005), with landscaping to comply with Appendix 5 of *PBP*.

The APZ generally consists of two subordinate areas, an inner protection area (IPA) and an outer protection area (OPA). The OPA is closest to the bush and the IPA is closest to the dwellings. A typical APZ is graphically represented below:



APZs and progressive reduction in fuel loads (Source: RFS, 2006)

Note: Vegetation management as shown is for illustrative purposes only. Specific advice is to be sought in regard to vegetation removal and retention from a qualified and experienced expert to ensure APZs comply with the RFS performance criteria.

The following provides maintenance advice for vegetation within the IPA and OPA.

Inner Protection Area (IPA)
Fuel loads within the IPA are to be maintained so it does not exceed 4t/ha.

Trees are to be maintained to ensure;

- Canopy cover does not exceed 15%
- Trees (at maturity) do not touch or overhang the building

- Tree canopies (at maturity) should be well spread out and not form a continuous canopy
- There should be no unmanaged vegetation within 10m of windows, doorways, eaves and gutters
- Lower limbs should be removed up to a height of 2m above ground

Shrubs are to be maintained to ensure;
- Large discontinuities or gaps in vegetation
- Shrubs should not be located under trees
- Shrubs should be in clumps no greater than $5m^2$
- Shrubs should be no closer than 10 metres from an exposed window or door.

Grass is to be maintained to ensure:
- A height of 10cm or less
- Leaves and debris is removed.

Outer Protection Area (OPA)
Fuel loads within the OPA are to be maintained so it does not exceed 8t/ha.

Trees are to be maintained to ensure;
- Canopy cover does not exceed 30% (trees may touch each other, however a separation is to be provided between the hazard the APZ)

Shrubs are to be maintained to ensure;
- They do not form a continuous canopy
- Shrubs should be in clumps no greater than $10m^2$
- Clumps of shrubs should be separated from each other by 10m

Grass is to be maintained to ensure:
- A height of 10cm or less
- Leaves and debris is removed.

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

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