



Vineyard Precinct

Bushfire Assessment

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1 Introduction

1.1 Background

Eco Logical Australia (ELA) has been engaged by the Department of Planning and Environment to investigate the current bushfire risk of the study area to inform the Vineyard Precinct Planning process within the North West Priority Growth Area (NWPGA). The aim of this assessment is to identify key bushfire features and constraints of the site as well as to provide recommendations on suitable bushfire protection measures.

An integrated assessment is being undertaken to identify key constraints, assess the impacts and provide input for the three stages of the Vineyard process:

- Stage 1 – flora and fauna field surveys, riparian location and habitat survey, assessment of bushfire threats, provision of a consolidated constraints analysis and provision of recommendations for incorporation into the Indicative Layout Plan (ILP);
- Stage 2 – assessment of the ILP, updated reporting, agency consultation and project team liaison,
- Stage 3 – input to finalisation of the ILP and associated reporting for public exhibition.

The Vineyard Precinct has been identified as being suitable for medium density housing and so it is assumed that a large proportion of the precinct will be zoned for residential uses. Key exceptions will be areas identified for environmental protection such as riparian corridors, recreation purposes (open space) and special infrastructure (e.g. transmission lines, drainage).

1.2 Study area

The Vineyard Precinct is approximately 588 ha and is located within the north-western corner of the NWPGA. The precinct lies entirely within the Hawkesbury City Council (HCC) Local Government Area (LGA) and is bounded by Commercial Road and Menin Road to the north, Boundary Road to the east, and Windsor Road and Bandon Road to the south. Stage 1 of the Precinct is expected to accommodate up to 2,400 dwellings for approximately 7,400 future residents.

The Precinct is currently zoned RU1 Primary Production, RU4 Primary Production Small Lots and SP2 Infrastructure under Hawkesbury LEP 2012 (HLEP) and comprises small rural holdings that are made up primarily of low density/rural residential development and farming lands including poultry, market garden, horticulture and mushroom production. There are also some fodder production and animal husbandry enterprises in the north western corner of the site. As a result, much of the precinct has been cleared; however, relatively large patches of remnant vegetation exist in the south western and south eastern corners of the precinct.

The study area is identified as bushfire prone on the Hawkesbury City Council Bush Fire Prone Land Map. In NSW, bushfire prone land maps identify areas that could support a bushfire and land potentially likely to be subject to bushfire attack, which is generally land that contains or is within 100 m of significant stands of bushland.

The Vineyard Precinct study area is shown in **Figure 1**.

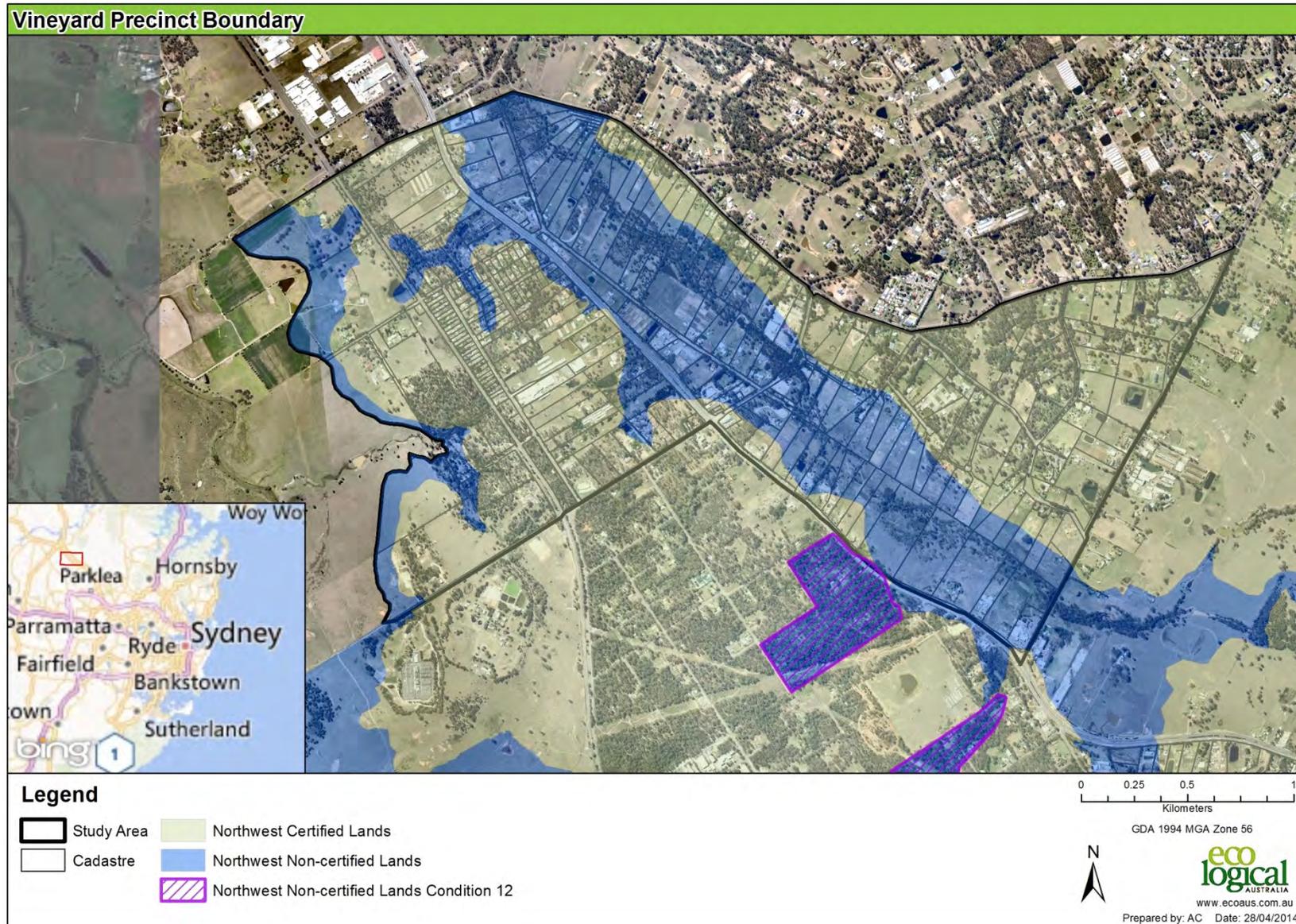


Figure 1: Precinct Boundary

1.3 Aim and structure of report

The overarching objective of this report is to identify all potential bushfire constraints to the future urban development of the subject land. The results of this assessment will directly support the preparation of necessary planning documentation. As such the objectives of this report are to:

- Ensure the statutory requirements for bushfire protection are identified and can be adequately met; and
- Achieve innovative management frameworks across bushfire, vegetation and riparian issues which enable long term conservation and management of these environmental values while facilitating safe urban development outcomes for the site.

This report assesses the potential bushfire hazard across the site, in the context of existing vegetation. It then identifies planning requirements as per NSW Rural Fire Service Planning for Bush Fire Protection (NSW RFS 2006).

Management of future Asset Protection Zones (APZ) and environmental areas are also considered. The location of emergency response services is mapped and the potential need for future emergency response resources is discussed. The result of this is the identification of potential planning controls that integrate with PBP 2006 as well as requirements for staged development.

1.4 Legislative requirements

1.4.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) is the principal planning legislation for NSW, providing a framework for the overall environmental planning and assessment of development proposals. A variety of other legislation and environmental planning instruments, such as the *Threatened Species Conservation Act 1995* (TSC Act), *Water Management Act 2000* and *Rural Fires Act 1997* (RF Act), are integrated with the EP&A Act.

1.4.2 Rural Fires Act 1997

Bushfire suppression and management is regulated by the RF Act. Both the EP&A Act and the RF Act were modified by the *Rural Fires and Environmental Assessment Legislation Amendment Act 2002* to enhance bushfire protection through the development assessment process. Key requirements of the RF Act include:

- The need for a bushfire safety authority to be issued by the RFS under section 100B of the RF Act for any development applications for subdivision (therefore considered integrated development);
- All landowners to exercise a duty of care to prevent bushfire from spreading on or from their land under section 63 of the RF Act. This relates to the appropriate provision and maintenance of APZs, landscaping and any retained vegetation when developing land.

1.4.3 Direction 4.4 Planning for Bushfire Protection

Section 117(2) of the EP&A Act allows the Minister for Planning to issue directions that are to be followed in the preparation of planning proposals for new local environmental plans. This applies to LEPs that propose to rezone land.

Direction 4.4 Planning for Bushfire Protection identifies matters for consideration for planning proposals that will affect, or are in proximity to land mapped as bush fire prone. In particular a planning proposal where development is proposed must:

- have regard to Planning for Bush Fire Protection 2006,
- provide an Asset Protection Zone (APZ) incorporating at a minimum:
 - 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
 - an Outer Protection Area managed for hazard reduction and located on the bushland side of the perimeter road,
- 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 RF Act), the APZ provisions must be complied with,
- contain provisions for two-way access roads which links to perimeter roads and/or to fire trail networks,
- contain provisions for adequate water supply for fire fighting purposes,
- minimise the perimeter of the area of land interfacing the hazard which may be developed,
- introduce controls on the placement of combustible materials in the Inner Protection Area.

Consideration must also be given to NSW RFS *Practice Note 2/12 Planning Instruments and Policies*. It is expected that the RFS, in its assessment of the proposal will consider the requirements of this Practice Note.

1.4.4 Planning for Bush Fire Protection 2006

Rezoning proposals require consultation with the NSW RFS as the lead agency for managing bushfire. As such the requirements of Planning for Bush Fire Protection (PBP) are to be addressed. This includes having regard to the following planning principles of PBP:

- Provision of a perimeter road with adequate two way access which delineates the extent of the intended development;
- Provision, at the urban bushland interface, for the establishment of adequate asset protection zones for future housing;
- Specifying minimum residential lot depths to accommodate asset protection zones for lots on perimeter roads;
- Minimising the perimeter of the area of land, interfacing the hazard, which may be developed;
- Introduction of controls which avoid placing inappropriate developments in hazardous areas; and
- Introduction of controls on the placement of combustible materials in asset protection zones.

2 Bushfire threat assessment

An assessment of the bushfire hazard is necessary to determine the application of bushfire protection measures such as asset protection zone location and dimension. This section provides a detailed account of the vegetation communities (bushfire fuels) and the topography (effective slope) that combine to create the bushfire hazard that may affect bushfire behaviour within the study area.

This assessment is based on the possible future vegetation coverage as determined by ELA with consideration given to Existing Native Vegetation and Biodiversity Certification for the area. Some of the current bushland areas will contribute to the future bushfire hazard, however this hazard may be added to in parts, particularly in the way of connectivity between remnants and along drainage lines to achieve biodiversity and riparian environmental objectives. The increase in hazard is not significant enough to preclude development or pose a future hazard that cannot be addressed by typical bushfire protection planning precautions as outlined within PBP. Alternatively the removal of existing vegetation will reduce the bushfire hazard and provide increased protection to future development.

The concept of bushfire risk as influenced by fire history and current and past bushfire issues has little bearing on the determination of bushfire protection strategies for rezoning and future development at the study area. This is due to a different future vegetation layer and the fact that PBP assesses bushfire protection based purely on vegetation and slope (i.e. hazard and not risk), making the assumption that a fire may occur in any patch of bushland at a worst-case scenario (based on a set design fire).

Notwithstanding this, the Hawkesbury Bush Fire Risk Management Plan (BFRMP) was reviewed to gain a greater understanding of the bushfire environment, hazard and risk issues that affect the study area. Part of the study area (along Commercial Road) is captured as a human settlement (residential) asset with a low risk rating identified and no specific treatments required. The BFRMP does not affect the bushfire protection measures required for future development within the study area, but may require updating following development.

2.1 Vegetation communities influencing bushfire

The 'predominant vegetation' influencing fire behaviour approaching future developable areas has been assessed strictly in accordance with the methodology specified within PBP.

The study area is dominated by a combination of cleared pastureland and scattered remnant vegetation that often occurs in discrete patches. In general, native vegetation is concentrated in two bands that are located approximately parallel to the boundary of the precinct, one of which is primarily remnant vegetation associated with Killarney Chain of Ponds Creek. A relatively large patch of remnant vegetation is located in the south western area of the precinct.

The northern and south-eastern areas of the site are dominated by Cumberland Plain Woodland (CPW), with some Shale Gravel Transition forest in the south-eastern areas as well. There is a large area of Alluvial Woodland (AW) running northwest-southeast through the centre of the site. A small area of Cooks River Castlereagh Ironbark Forest is located in the north eastern area of the precinct.

The remainder of the study area has been extensively cleared and modified for agricultural purposes, primarily poultry, market garden and cut flower production. A map displaying the current coverage of vegetation is provided in **Figure 2** showing the bushland throughout and adjoining the site.

According to the vegetation formation categories of PBP, Cumberland Plain Woodland (CPW) is considered as Woodland, whilst Alluvial Woodland (AW) is considered as Forested Wetlands. Using the vegetation conversion identified in Table A3.5.1 of PBP Addendum Appendix 3 'Forest Wetlands is converted to 'Forest' for AS3959 purposes.

It has been assumed that the majority of existing remnant vegetation along riparian corridors and within non-certified land will be retained, with the remaining areas identified for residential development.

Figure 4 shows the conservation significance of vegetation within the subject land. It is this layer that the bushfire assessment is based on with the emphasis placed on riparian corridors and existing native vegetation within non-certified land.

2.2 Slopes influencing bushfire

The 'effective slope' influencing fire behaviour approaching the developable area has been assessed strictly in accordance with the methodology specified within PBP. This is conducted by measuring the worst-case scenario slope where the vegetation occurs over a 100 m transect measured outwards from the development boundary. The slope classes are listed in **Table 1** below.

The area is relatively flat with some steeper areas alongside riparian corridors.

Table 1: Effective slope

Slope	PBP slope class
Upslope / Flat Land	Flat land and all upslope land leading away from the development
Downslope	>0-5 degrees downslope leading away from the development
	>5-10 degrees downslope leading away from the development
	>10-15 degrees downslope leading away from the development
	>15-18 degrees downslope leading away from the development

2.3 Threat assessment

A bushfire threat assessment has been undertaken based on the slope, vegetation and required APZs according to PBP.

Figure 4 provides an indication of the required APZs for residential development across the site. **Figure 2** and **Table 1** have been used in conjunction to estimate indicative APZ distances for different areas across the site (see **Section 4.1**).

The analysis has also considered the relative topographic position that bushfire prone vegetation may have to potential development. The threat assessment assumes that bushland is downslope from development as a worst case scenario. Where bushland is located upslope from development a fire impacting on the area will burn much slower and at a much lower intensity

Consideration has been given to potential future areas of vegetation. In order to achieve environmental objectives it is anticipated there will be regeneration works in areas reserved for vegetation conservation, and revegetation in the proposed riparian corridors.

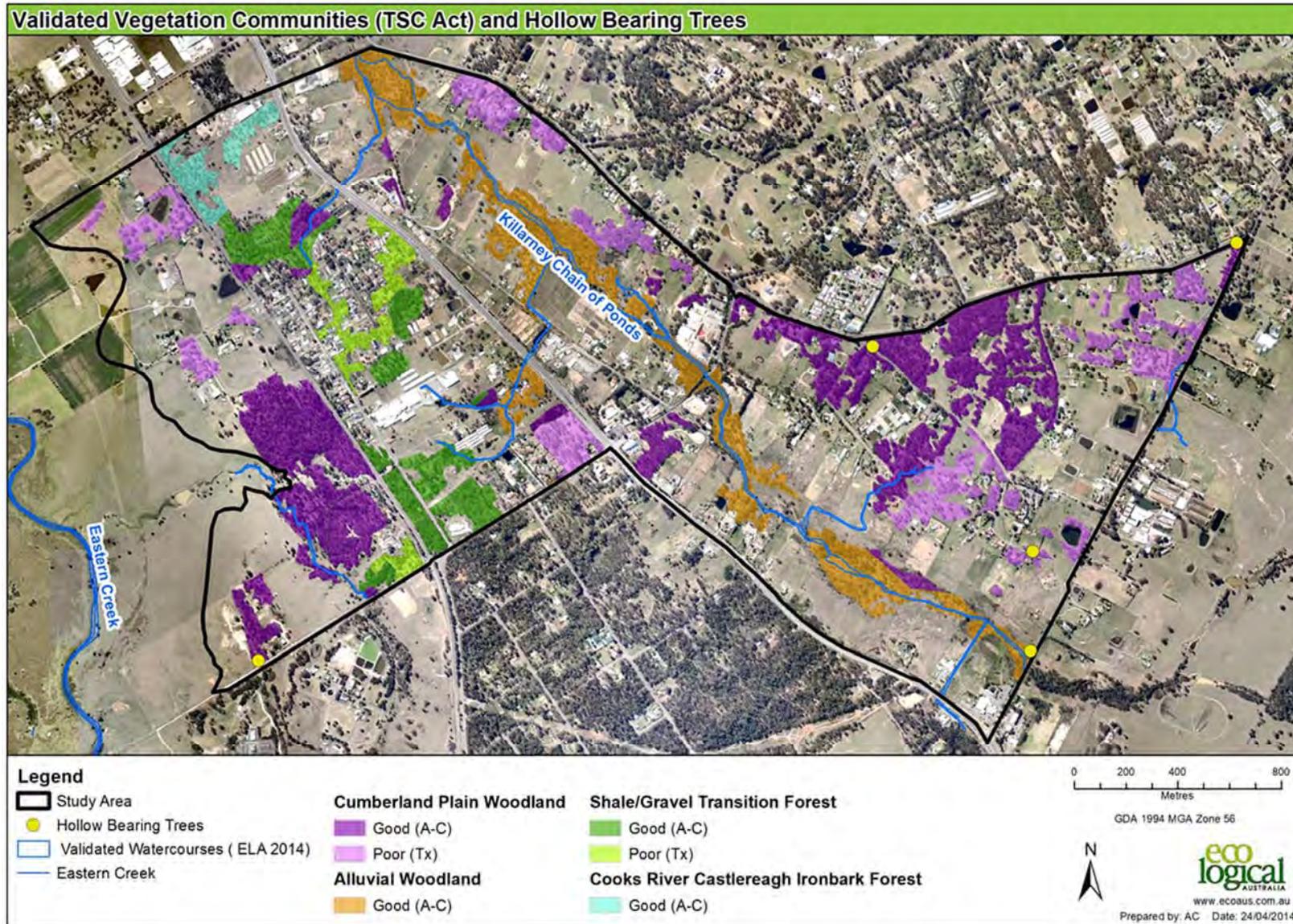


Figure 2: Vegetation communities

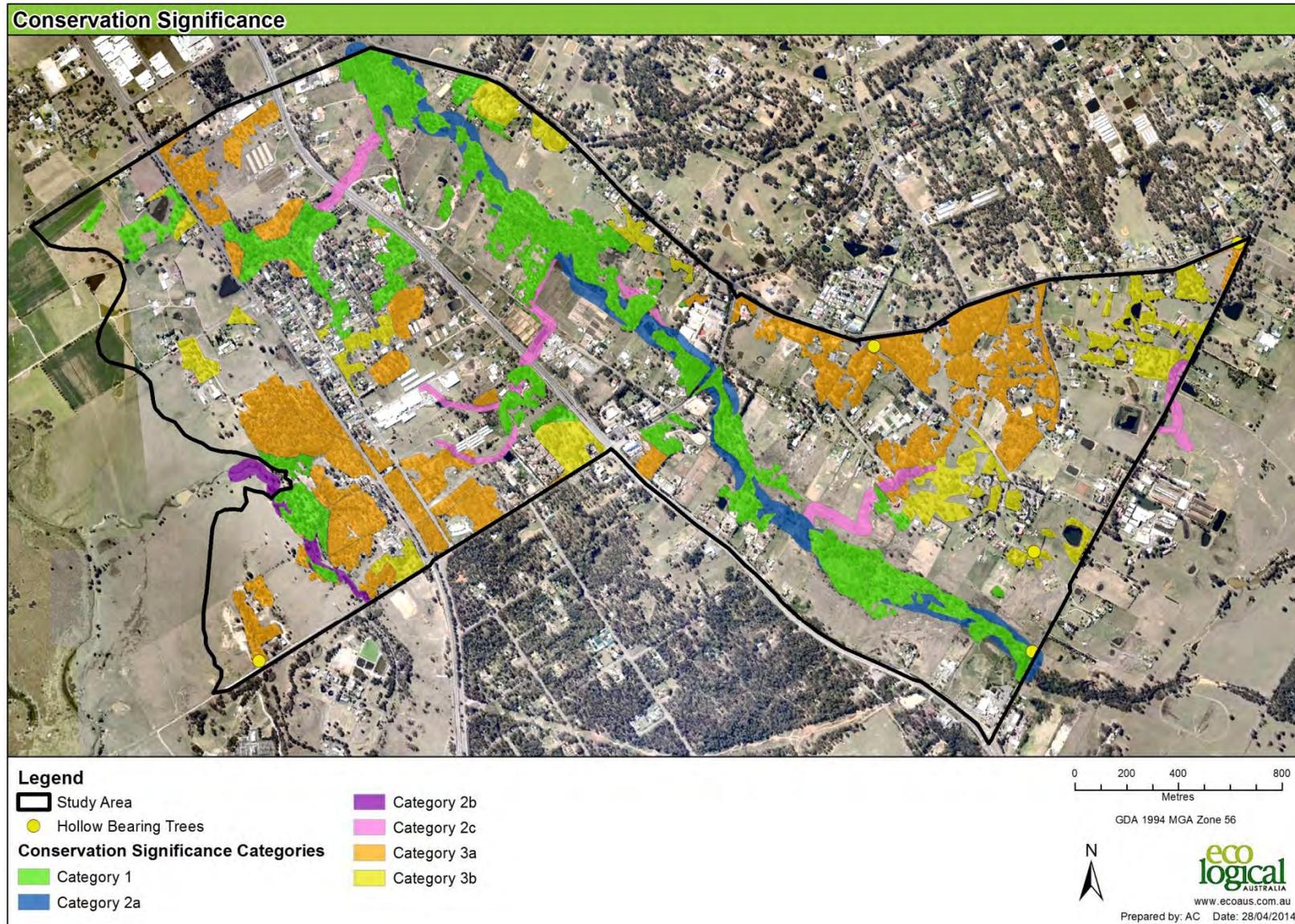


Figure 3: Conservation significance

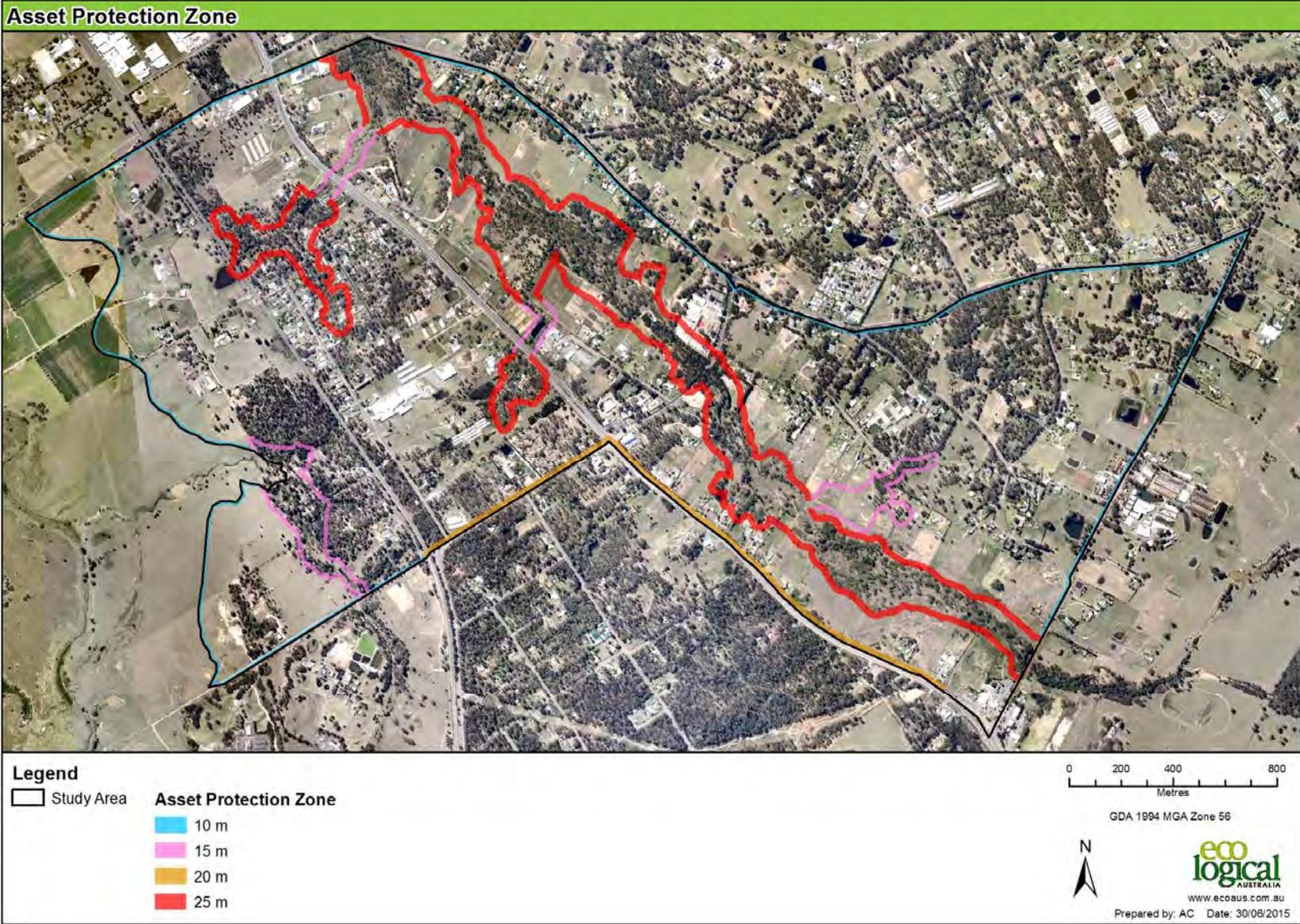


Figure 4: APZ

3 Assessment framework

The following section outlines the assessment framework required for the various types of development that are likely to be considered for the Precinct in the context of bushfire and *Planning for Bush Fire Protection 2006* (PBP).

3.1 Residential development

Residential development will be assessed under section 100B of the RF Act and a Bush Fire Safety Authority (BFSA) must be obtained from the NSW Rural Fire Service (RFS) at subdivision and/or DA stage'. Section 100B of the RF Act specifies conformance with the intent and performance criteria of the Bushfire Protection Measures outlined in PBP.

3.2 Special Fire Protection Purpose (SFPP) development

SFPP developments include developments where occupants may be more vulnerable to bushfire attack, and include:

- a school,
- a child care centre,
- a hospital (including a hospital for the mentally ill or mentally disordered),
- a hotel, motel or other tourist accommodation,
- a building wholly or principally used as a home or other establishment for mentally incapacitated persons,
- housing for older people or people with disabilities within the meaning of State Environmental Planning Policy No 5 - Housing for Older People or People with a Disability (now State Environmental Planning Policy (Seniors Living)),
- a group home within the meaning of State Environmental Planning Policy No 9 - Group Homes,
- a retirement village,
- any other purpose prescribed by the regulations. (Section 100B (6) of the RF Act).

Within the Precinct there are no existing schools, however, it is considered highly likely that areas will be set aside for schools to cater for the increased population. For these developments the specific objectives of SFPP developments within PBP should be followed in addition to the requirements for residential developments.

3.3 Industrial and commercial development

Any commercial, employment and/or industrial uses within the Precinct will be classified in accordance with PBP as 'Other Development'. As such these developments need to satisfy the aims and objectives of PBP and the proposal will need to incorporate these considerations along with an adequate combination of relevant bushfire protection measures (BPM). Generally, the bushfire protection measures listed in PBP for residential development can be used as a guide.

It is recommended that development associated with employment lands, such as commercial and industrial development, be treated as residential development for the purpose of the rezoning analysis. Non-habitable development of this kind has the opportunity to have an APZ less than that required for residential subdivision. This flexibility relies on the known use of the building, its design and construction standard, and can be determined at the subdivision application stage.

4 Bushfire protection measures

The bushfire protection measures described in PBP are an effective way to design developments to minimise the risks from bushfire and to ensure that the aims and objectives of PBP are met. The bushfire protection measures are required to be addressed in bushfire assessments;

- Asset Protection Zones (APZs)
- Emergency access/egress
- Water supply
- Construction standards
- Landscaping

4.1 Asset protection zones

Using the vegetation and slope data discussed in Section 3, APZs suitable for residential subdivision around environmentally constrained lands have been calculated (e.g. riparian corridors and existing native vegetation within non-certified land). These have been mapped and identified in Figure 4 and described in **Table 2**. Where land is to be managed for recreational purposes and a bushfire hazard will not exist, an APZ will not be required. If additional vegetation is retained within open space, parklands etc., then an APZ will be required for any vegetation considered to constitute a bushfire hazard. The required APZ will be dependent on any rehabilitation and revegetation of any Vegetation Management Plan (VMP) that is prepared for the area, and may increase/decrease depending on the final bushfire hazard expected.

A second APZ dimension for Special Fire Protection Purposes (SFPP) is also listed in **Table 2**

It is recommended that an APZ dimension that achieves a building construction standard under *AS 3959-2009 Construction of buildings in bushfire-prone areas* (Standards Australia 2009) of Bushfire Attack Level (BAL)-29 at the maximum is chosen. The current accepted minimum APZ dimension (determined by PBP) allows for a BAL-40 standard in some instances (under AS3959). The increase in APZ provides a higher level of bushfire protection and ensures that future home owners are not impacted by the additional costs associated with construction of a dwelling at BAL-40. **Table 2** lists the current minimum APZ required by PBP and the recommended APZ to achieve BAL-29 construction (refer to Section 5.4 for more information on AS 3959-2009).

It is important to note that the APZ calculations quoted in this assessment are indicative only and have been determined at a landscape scale. This level of detail is suitable for a rezoning assessment where the aim is to demonstrate whether a parcel of land can accommodate the bushfire hazard, the expected APZ and future development. The final APZ dimensions for any future subdivision or development depends on the accuracy of a slope assessment undertaken at a site-specific level. The APZ dimensions quoted in this assessment should not be relied on to approve a future subdivision; they may be used as a guide only.

Table 2: Asset protection zones

Direction	Vegetation	Slope	PBP required APZ	SFPP APZ	BAL-29 APZ	Comments
Main riparian	Forested wetlands	>0-5°	25 m	70 m	32 m	Vegetation classification may be downgraded

corridor	(Forest)	downslope				where rehabilitation/revegetation results in a low hazard
Smaller riparian corridors	Woodland	>0-5° downslope	15 m	50 m	21 m	
South	Forest	Upslope	20 m	60 m	25 m	APZ may be provided by adjoining managed land and roads
West, East and South east	Grassland	>0-5° downslope	10 m	10 m	10 m	APZ may be removed where adjoining grasslands are managed

4.1.1 Vegetation management within APZ

The management of vegetation within the APZ is to achieve the specifications of an Inner Protection Area (IPA), as described by PBP. As such, the future APZ should be managed as follows:

- No tree or tree canopy is to occur within 2 - 5 m of future dwelling rooflines;
- The presence of a few shrubs or trees in the APZ is acceptable provided that they are well spread out, do not form a continuous canopy, and are located far enough away from future buildings so that they will not ignite the buildings by direct flame contact or radiant heat emission;
- Any landscaping or plantings should preferably be low flammability species such as local rainforest species;
- In the IPA, the ground fuel is to be maintained to less than 4 tonnes per hectare of fine fuel (4 t/ha is equivalent to a 1 cm thick layer of leaf litter and fine fuel means any dead or living vegetation of less than 6 mm in diameter, e.g. twigs less than a pencil in thickness).

4.1.2 Staging of development for APZ

Staging of future development should give consideration to the provision of APZ to manage any potential bushfire hazard within adjoining future development areas to ensure that future dwellings are not impacted by unnecessary construction standards. This could be through the provision of temporary APZ for earlier stages which will be automatically extinguished once the land where the APZ operates is developed and the hazard is permanently removed.

4.1.3 Perimeter access within APZ

An APZ may include a perimeter road depending on the significance of the bushfire threat. The assessment of perimeter access is provided in **Section 4.2**.

4.2 Access

PBP requires an access design that enables safe evacuation away from an area whilst facilitating adequate emergency and operational response to the area requiring protection. It also relates to emergency management arrangements such as procedures and routines for evacuation and consideration of safe havens.

Specific management and evacuation plans may be required at a later stage especially where SFPP developments are proposed. Additionally, emergency management arrangements may need to be discussed with the RFS specifically in regard to the capacity of existing resources to service the Precinct.

4.2.1 Safe access and egress

All bushfire prone areas should have an alternate access or egress option. This is usually achieved by providing more than one public road into and out of an area. The need for an alternative road and its location depends on the bushfire risk, the density of the development, and the chances of the road being cut by fire. All precincts within the site should allow for an alternative public access road.

4.2.2 Perimeter roads

Depending on the bushfire risk, all bushland interface areas containing an APZ for a significant bushfire hazard should feature a perimeter public road within the APZ. It is acceptable for some areas not to have a perimeter road or have a perimeter trail instead. These include areas of lower bushfire risk (such as adjoining low hazard areas), rural residential areas with large lot sizes whereby perimeter access can be provided within each lot, or areas where it may not be feasible to provide a continuous road due to the shape of the interface or the terrain. These areas should have some other access strategy such as trails or regular access points including access to a hydrant network.

Public roads are to comply with the PBP acceptable solution design standards as listed in **Table 3**. Future residential subdivision within the site will be able to comply with these standards.

4.3 Utilities

4.3.1 Water supply and hydrants

The purpose of this measure is to provide adequate supply of water for the protection of buildings during and after the passage of a bushfire, and to locate gas and electricity services so as not to contribute to the risk of fire to a building.

Future lots will be serviced by reticulated water infrastructure suitable for fire fighting purposes in accordance with *Australian Standard 2419.1 – 2005 Fire Hydrant Installations - System Design, Installation and Commissioning* (Standards Australia 2005).

4.3.2 Electrical and gas supplies

In accordance with PBP, electricity should be underground wherever practicable. Where overhead electrical transmission lines are installed:

- No part of a tree should be closer to a powerline than the distance specified in *ISSC 3 Guideline for Managing Vegetation Near Power Lines* (Industry Safety Steering Committee, 2005)

Any gas services are to be installed and maintained in accordance with *AS/NZS 1596-2008 The storage and handling of LP gas* (Standards Australia 2008).

Table 3: Design and construction for public roads (RFS 2006; pg 21)

Performance Criteria	Acceptable Solutions
Firefighters are provided with safe all weather access to structures (thus allowing more efficient use of firefighting resources)	<ul style="list-style-type: none"> • Public roads are two-wheel drive, all weather roads
Public road widths and design that allows safe access for firefighters while residents are evacuating an area	<ul style="list-style-type: none"> • Urban perimeter roads are two-way, that is, at least two traffic lane widths (carriageway 8 metres minimum kerb to kerb), allowing traffic to pass in opposite directions. Non perimeter roads comply with PBP Table 4.1 – Road widths for Category 1 Tanker (Medium Rigid Vehicle) • The perimeter road is linked to the internal road system at an interval of no greater than 500 metres in urban areas • Traffic management devices are constructed to facilitate access by emergency services vehicles • Public roads are through roads. Dead end roads are not recommended, but if unavoidable, dead ends are not more than 200 metres in length, incorporate a minimum 12 metres outer radius turning circle, and are clearly sign posted as a dead end and direct traffic away from the hazard • Curves of roads (other than perimeter roads) are a minimum inner radius of six metres • Maximum grades for sealed roads do not exceed 15 degrees and an average grade of not more than 10 degrees or other gradient specified by road design standards, whichever is the lesser gradient • There is a minimum vertical clearance to a height of four metres above the road at all times
The capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles	<ul style="list-style-type: none"> • The capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles (approximately 15 tonnes for areas with reticulated water, 28 tonnes or 9 tonnes per axle for all other areas). Bridges clearly indicated load rating
Roads that are clearly sign posted (with easy distinguishable names) and buildings / properties that are clearly numbered	<ul style="list-style-type: none"> • Public roads greater than 6.5 metres wide to locate hydrants outside of parking reserves to ensure accessibility to reticulated water for fire suppression • Public roads between 6.5 metres and 8 metres wide are “No Parking” on one side with the services (hydrants) located on this side to ensure accessibility to reticulated water for fire suppression
There is clear access to reticulated water supply	<ul style="list-style-type: none"> • Public roads up to 6.5 metres wide provide parking within parking bays and located services outside of the parking bays to ensure accessibility to reticulated water for fire suppression • One way only public access roads are no less than 3.5 metres wide and provide parking within parking bays and located services outside of the parking bays to ensure accessibility to reticulated water for fire suppression
Parking does not obstruct the minimum paved width	<ul style="list-style-type: none"> • Parking bays are a minimum of 2.6 metres wide from kerb to kerb edge to road pavement. No services or hydrants are located within the parking bays • Public roads directly interfacing the bush fire hazard vegetation provide roll top kerbing to the hazard side of the road

4.4 Construction standards

The application of building construction standards for bushfire protection under *AS 3959-2009 Construction of buildings in bushfire-prone areas* (Standards Australia 2009) is to be considered at the development application stage for individual dwellings and buildings. An assessment under AS 3959-2009 is not required at the rezoning or subdivision stages. The following is a brief introduction on AS 3959-2009.

AS 3959-2009 contains six Bushfire Attack Levels (BALs), each with a prescribed suite of design and construction specifications aimed at preventing ignition during the passing of a bushfire front. The BALs are outlined below:

- BAL-Low: The threat does not warrant application of construction standards. Developments with BAL-Low are generally not within bushfire prone land (greater than 100 m from bushland);
- BAL-12.5: Addresses background radiant heat at lower levels and ember attack;
- BAL-19: Addresses mid-range radiant heat and ember attack;
- BAL-29: Addresses high range radiant heat and ember attack;
- BAL-40: Addresses extreme range of radiant heat and potential flame contact and ember attack; and
- BAL-FZ: Addresses construction within the flame zone. New subdivided lots are not permitted within the flame zone in NSW.

NSW has a minor variation to AS 3959-2009 which requires consideration in future development applications. The variation is contained within the document 'PBP Appendix 3 Addendum' (RFS 2010).

Buildings of Class 5-8 and 10 under the Building Code of Australia within the National Construction Code (NCC) do not have any specific bushfire specific performance requirements for construction. The general fire safety construction provisions within the NCC are considered as acceptable solutions. These classes of buildings include offices, factories, warehouses, public car parks and other commercial or industrial facilities. Buildings used for SFPP purposes as defined in section 100B of the RF Act are not captured by this and are required to comply with AS3959.

4.5 Landscaping and vegetation management

The best bushfire mitigation measures and design can be undone by poor landscaping and property maintenance. It is recommended that the measures described in Appendix 5 of PBP 2006 be adopted in all lots within 100m of bushland. These measures are equally important for residential, industrial and public zoned lots.

5 Management requirements

Vegetation occurring within the riparian corridor, and a number of proposed neighbourhood parks will be retained and in some cases revegetated. Vegetation that is retained or regenerated is to be managed for biodiversity protection, and as such APZs are not permitted within these areas. Fire is an important ecological process, and must be integrated with long term environmental management. It is recommended that a conservation and bushfire management plan be prepared for these areas prior to any construction.

It is important to ensure that fire regimes are varied spatially across the site, and temporally at any one point, the objectives being;

- Ensuring a variety of fire interval periods are present across the site
- Ensuring that the season, intensity and frequency of burns are varied at any one area

This is referred to as mosaic management and is aimed at ensuring a diversity of life cycles are present across the site and that a homogenous fire regime is avoided that may benefit certain species at the expense of others.

Fire frequency is usually presented as fire interval periods. The minimum fire interval period is the minimum amount of time between fires that will enable sufficient recruitment and recharge of seedbanks. Maximum fire interval period refers to the maximum amount of time between fires before senescence may begin. **Table 4** below provides the recommended maximum and minimum fire intervals for the vegetation communities within the study area. Successive fires at the minimum recommended fire interval may have a severe impact on species diversity, therefore, fire regimes erring towards the maximum interval are recommended.

Table 4: Recommended fire intervals

<i>Keith (2004) Classification</i>	<i>Minimum Fire Interval</i>	<i>Maximum Fire Interval</i>	<i>Source</i>
Grassy Woodland	5 years	40years	DEC 2004 "Guidelines for Ecologically Sustainable Fire Management". NSW NP&WS
Shrubby Dry Sclerophyll Forests	7 years	30 years	DEC 2004 "Guidelines for Ecologically Sustainable Fire Management". NSW NP&WS
Wet Sclerophyll Forests	25 years	60 years	DEC 2004 "Guidelines for Ecologically Sustainable Fire Management". NSW NP&WS

6 Recommendations and conclusion

Recommendations are included throughout this report to address the provision of asset protection zones, adequate access, water supply for fire fighting, the safe installation of utilities, and building construction standards for future dwellings.

This bushfire assessment demonstrates that the subject land is capable of accommodating future residential subdivision and associated land uses with the appropriate bushfire protection measures and bushfire planning requirements prescribed by s.117 (2) Direction 4.4 – ‘Planning for Bush Fire Protection’ (EP&A Act) and PBP.

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