



Mt Gilead Rezoning

Bushfire Assessment

Prepared for
Mt Gilead P/L and S & A Dzwonnik

3 September 2014





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Project Manager	Bruce Mullins Suite 4, 2-4 Merton St, Sutherland 02 8536 8611
Prepared by	Danielle Meggos
Reviewed by	David Peterson
Approved by	Bruce Mullins
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1 Introduction

1.1 Background

Eco Logical Australia Pty Ltd (ELA) was commissioned by Mt Gilead P/L and S & A Dzwonnik to prepare a bushfire report to support the rezoning of Lot 59 DP 752042, Lot 61 DP 752042, part Lot 1 DP 807555 and part Lot 2 DP 807555 for residential development through an amendment to the Campbelltown Local Environmental Plan.

1.2 Location and description of study area

The subject land is located within the suburb of Gilead within the Campbelltown Local Government Area. It lies 5 km south of Campbelltown city centre, immediately to the west of Appin Road as shown in **Figure 1**.

The property has predominantly been used for agricultural purposes, and contains several cleared paddocks with improved pastures.

1.3 Aims and objectives of bushfire assessment

The aim of this study is to investigate the capability and general suitability of the site for future residential subdivision and other land uses with the appropriate bushfire protection measures as guided by the relevant legislation and policy into bushfire planning and design of new development in NSW. The findings and recommendations are to inform a Planning Proposal to appropriately rezone the site.

The objectives of this study are therefore to:

- Provide statements as to the capability of the site to achieve the required minimum bushfire protection measures for future development, namely subdivision and the construction of dwellings;
- Satisfy the legislative requirements for assessment of rezoning bushfire prone land for residential purposes under the *Environmental Planning and Assessment Act 1979*;
- Investigate the application of asset protection zone (APZ) building setbacks to vegetation/bushland and report on the location and dimensions of any required APZ;
- Provide guidance on the access and egress requirements for residential development in bushfire prone land; and
- Provide guidance on other bushfire protection measures such as the provision of utilities.

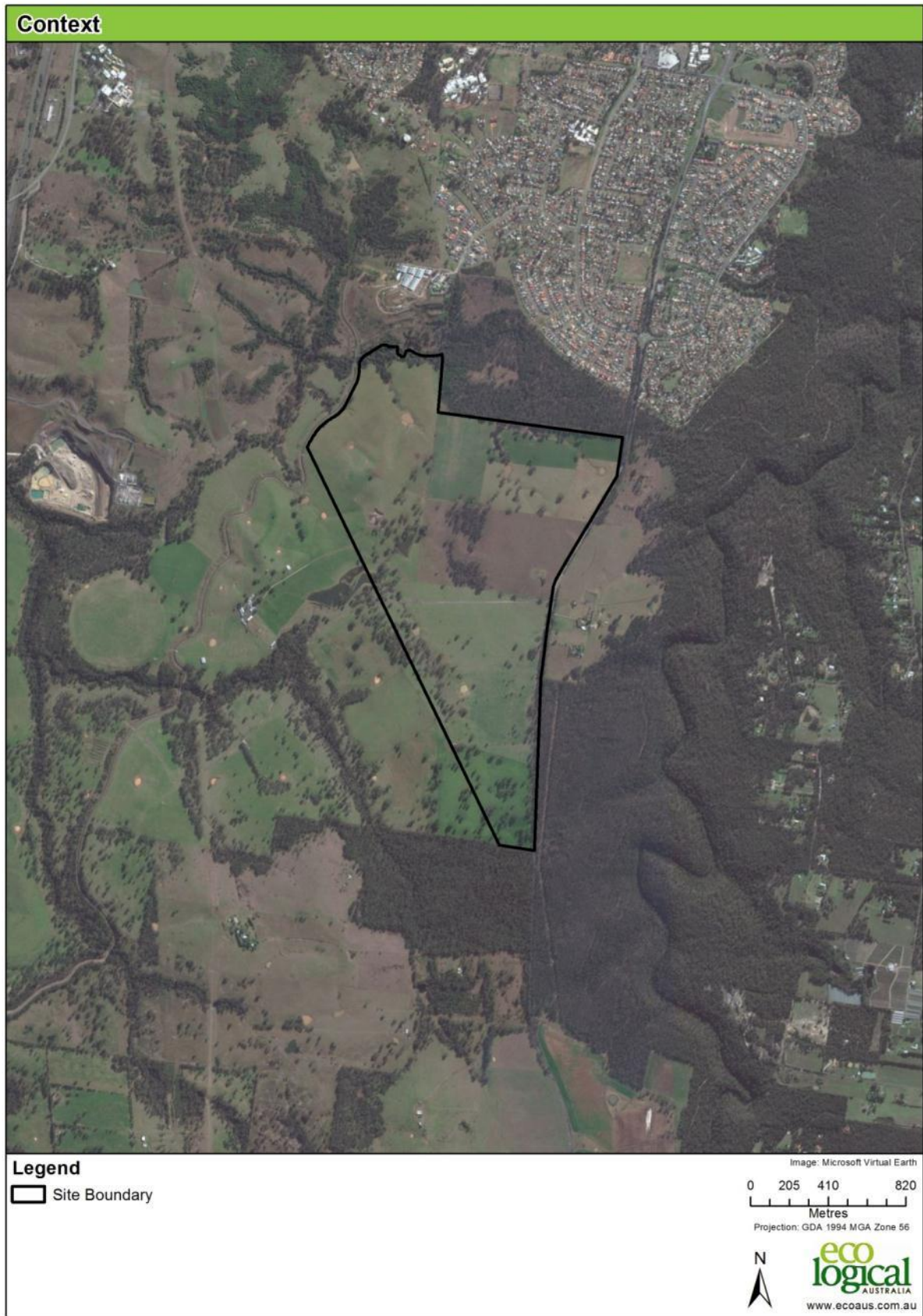


Figure 1: Study area

2 Assessment requirements

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

When investigating the capability of bushfire prone land to be rezoned for residential purposes, local councils must have regard to s.117 (2) Direction 4.4 – ‘Planning for Bush Fire Protection’ of the *Environmental Planning and Assessment Act 1979*. The objectives of Direction 4.4 are:

- To protect life, property and the environment from bushfire hazards, by discouraging the establishment of incompatible land uses in bushfire prone areas; and
- To encourage sound management of bushfire prone areas.

Direction 4.4 instructs councils on the bushfire matters which need to be addressed when drafting LEPs. This includes:

- Consultation with the Commissioner of the NSW Rural Fire Service (RFS) under s.62 of the EPA Act, and take into account any comments so made;
- Draft LEPs shall have regard to Planning for Bushfire Protection 2006 (PBP); and
- Compliance with numerous bushfire protection provisions where development is proposed.

After the rezoning stage, future subdivision of land and the construction of buildings also require an assessment against PBP. These assessments are based on a final development application for these uses.

3 Methods and approach

The bushfire assessment followed the methods and approach outlined in **Table 1** below

Table 1: Methods and approach

Method and Approach	Task	Considerations
Review	A literature review of relevant reports and studies occurred.	Campbelltown Bush Fire Prone Land Map; Macarthur Bush Fire Risk Management Plan
Desk top analysis	Review and analysis of all available mapping layers in GIS relevant to bushfire hazard.	GIS layers include: satellite imagery; vegetation mapping; topographical data (e.g. contours).
Site inspection	An inspection of the study area occurred in June 2013.	The inspection ground-truthed the results of the desk-top analysis, particularly in regards to vegetation classification and slopes that influence the overall bushfire hazard and APZ calculations. The inspection took place with the consulting ecologist (ELA) so that discussions could take place on the likely retention and enhancement of remnant bushland for the protection and maintenance of biodiversity (e.g. Koala habitat and movement) including riparian treatments and buffers.
Ecological consultation	Consultation with ecologist to enable integrated design	Discussions occurred with the consulting ecologist to refine the bushfire protection measures. The biodiversity constraints were first presented on which to base the required APZs (i.e. the vegetation to be retained due to conservation values forms the bushfire hazard to be assessed and the overall development footprint).
Assessment	Determine all relevant bushfire protection measures.	Assessment in accordance with PBP methodology, Direction 4.4 of EP&A Act and RFS requirements.
Reporting	Preparation of bushfire assessment.	Carry out all necessary reporting required for rezoning and Planning Proposals for development of bushfire prone land.

4 Bushfire hazard

An assessment of the bushfire hazard is necessary to determine the application of bushfire protection measures such as asset protection zone location and dimension. The following sub-sections provide 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 at the site.

This assessment is based on the possible future vegetation coverage as determined by ELA (2014) ecological assessment for the rezoning. The future vegetation is discussed in **Section 4.1** below. Some of the current bushland areas will contribute to the future bushfire hazard, however, this hazard will be added to, 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.

Following on from above, 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 this site. 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 *Macarthur Bush Fire Risk Management Plan* was reviewed to gain a greater understanding of the bushfire environment, hazard and risk issues that affect the study area. The only impact the plan has specifically on the study area is the identification of a strategic fire advantage zone along Appin Road to the east of the site. This complementary management offsite does not affect the bushfire protection measures required for future development within the study area.

4.1 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.

Comprehensive and site specific vegetation assessment and mapping occurred as part of the ecological assessment (Eco Logical Australia 2014). A map displaying the current coverage of vegetation is provided in **Figure 2** showing the bushland throughout and adjoining the site

Vegetation formations within the study area include units mapped as Sclerophyll (Dry) and Grassy Woodland.

The primary hazard is predominantly forest to the east and south of the study area with smaller pockets of forest and woodland contained within the subject land and grassland.

Figure 3 shows the recommended future coverage of vegetation based on environmental objectives and constraints. It is this layer that the bushfire assessment is based on.

The PBP predominant vegetation classification of all future vegetation for the study area has been determined as 'forest' or 'grassland'. However, there are areas of small remnants (less than 1 ha) and narrow corridors (less than 50 m in width) which may be classified as 'low hazard' due to the limited fire behaviour in small areas of vegetation, depending on the future revegetation and retention.

4.2 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 2** below.

The majority of the slopes within the study area are gently sloping with areas of steeper slopes within the northern western portion of the site.

Table 2: PBP slope classes

Upslope or Downslope	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

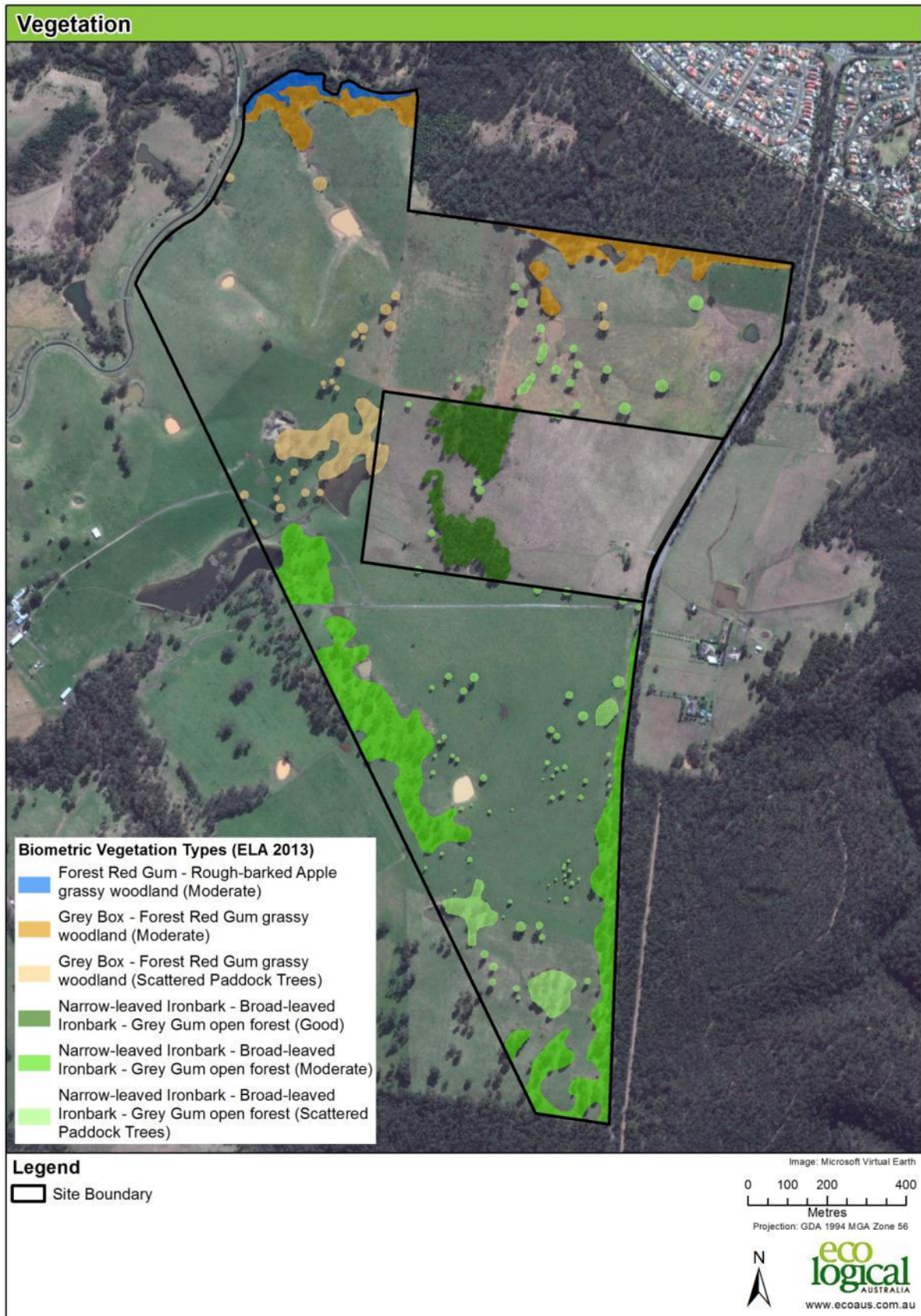


Figure 2: Vegetation communities on the site



Figure 3: Proposed land use

5 Bushfire protection measures

PBP requires the assessment of a suite of bushfire protection measures that in total afford an adequate level of protection. The measures required to be assessed for rezoning are listed in **Table 3** and are discussed in detail in this section. This section demonstrates that the study area can accommodate the required bushfire protection measures and achieve the Direction 4.4 objectives and RFS requirements.

Table 3: PBP bushfire protection measures

Bushfire Protection Measure	Considerations
Asset Protection Zones (APZ)	Location and dimension of APZ setbacks from vegetation including prescriptions of vegetation management within the APZ.
Access	Assessment to include access and egress in and out of a developable area such as alternate access, operational response and evacuation options. APZ perimeter access to be considered as is design standards of public roads and any fire trails.
Water supply and other utilities	List requirements for reticulated water supply and hydrant provisions, and any static water supplies for fire fighting.
Building construction standards	Provide a guide on the application of construction standards for future buildings.

5.1 Asset protection zones

5.1.1 APZ location and dimension

Using the vegetation and slope data discussed in **Section 4**, APZs suitable for residential subdivision around all environmentally constrained lands have been calculated. These have been mapped and identified in **Figure 4** and described in **Table 4**.

A second APZ dimension for Special Fire Protection Purposes (SFPP) is also listed in **Table 4**. These SFPP APZs are for schools, child care centres, tourist accommodation, retirement villages and other uses listed under s100B (6) *Rural Fires Act 1997*.

It is currently considered best practice to provide 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. The current accepted minimum APZ dimension (determined by PBP) allows for a BAL-40 standard (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 4** lists the current minimum APZ and best practice APZ related to BAL-29 (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.

There are smaller areas of retained vegetation that will be contained within open space areas along the eastern boundary. Given the separation from other vegetation and lineal nature, this has not been considered in this assessment.

5.1.2 Vegetation management within APZ

The management of vegetation within the APZ is to achieve the specifications of an Inner Protection Area (IPA) and Outer Protection Area (OPA) 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); and
- In the OPA, the ground fuel may have up to 8 tonnes per hectare of fine fuel.

5.1.3 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.

5.1.4 Perimeter access within APZ

An APZ may require a perimeter road depending on the significance of the bushfire threat. The assessment of perimeter access is provided in the following **Section 5.2**.

Table 4: Indicative asset protection zone (APZ) calculation

Predominant Vegetation	Effective Slope	PBP APZ width	Section No. (Figure 4)	PBP SFPP APZ width	AS3959 BAL-29 APZ	Comments
Forest	>0-5° downslope	25 m	1	70 m	32 m	Forest and woodland within offset area along northern boundary and adjoining land to the north will require an APZ.
Forest	>10-15° downslope	50 m	2	100 m	49 m	Forest and woodland within offset area along northern boundary and adjoining land to the north will require an APZ.
Forest	>0-5° downslope	25 m	3	70 m	32 m	Forest and woodland within offset area along northern boundary and adjoining land to the north will require an APZ.
Grassland	>0-5° downslope	10 m	4	10 m	10 m	The canal on the adjoining property is managed and provides a break between any potential grassland hazard on the property further to the north-west. There is the potential for grassland to eventuate on the retained lands to the west.
Forest	Upslope/flat	20 m	5	60 m	25 m	The offset area along western boundary of the site will require an APZ.
Grassland	Upslope/flat	10 m	6	10 m	10 m	There is the potential for grassland to eventuate on the adjoining lands to the west.

Predominant Vegetation	Effective Slope	PBP APZ width	Section No. (Figure 4)	PBP SFPP APZ width	AS3959 BAL-29 APZ	Comments
Forest	>0-5° downslope	25 m	7	70 m	32 m	The managed portion of Appin Road reserve could contribute to the APZ, that is, the APZ can be measured from the eastern edge of the road. The wooded section between the road and the boundary is only approx. 5m and not wide enough to require a full APZ on its own.
Forest	>0-5° downslope	25 m	8	70 m	32 m	The remnant size is too large to be classified as 'low hazard'.
Grassland	>0-5° downslope	10 m	9	10 m	10 m	The managed portion of Appin Road reserve could contribute to the APZ, that is, the APZ can be measured from the eastern edge of the road.
Forest	Upslope/flat	20 m	10	60 m	25 m	The remnant size is too large to be classified as 'low hazard'.
Forest	>0-5° downslope	25 m	11	70 m	32 m	The remnant size is too large to be classified as 'low hazard'.
Forest	Upslope/flat	20 m	12	60 m	25 m	The remnant size is too large to be classified as 'low hazard'.

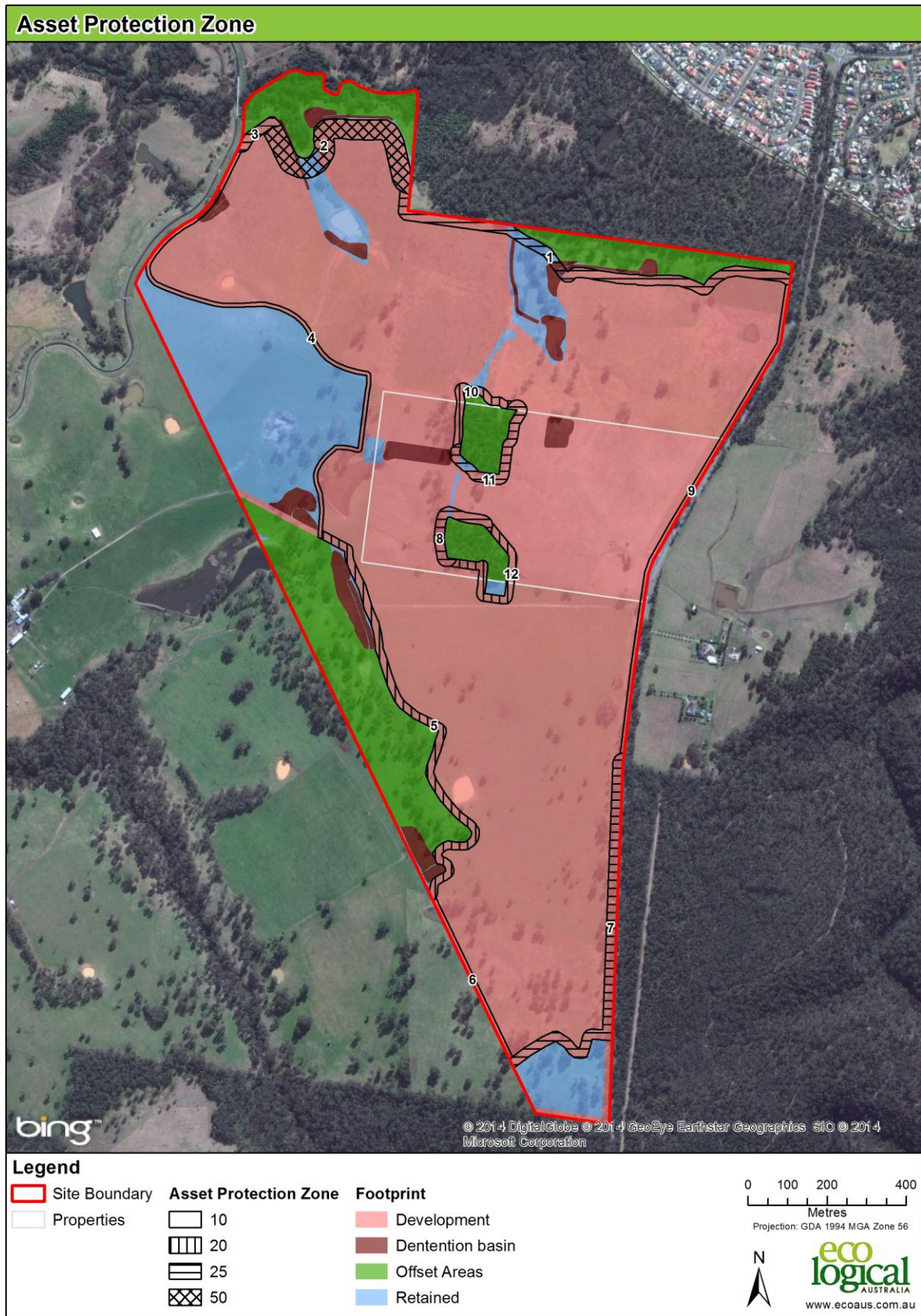


Figure 4: Asset protection zone (APZ)

5.2 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. The following sections present the bushfire planning requirements for access in bushfire prone land.

5.2.1 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 a precinct. 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.

5.2.2 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 grassland or low hazard remnants), 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.

The design details (PBP acceptable solutions) of public perimeter roads and fire trails are listed in **Section 5.2.3** below.

5.2.3 Road design and construction standards

Public roads and perimeter fire trails are to comply with the PBP acceptable solution design standards as listed in **Table 5** and **Table 6**, respectively. Future residential subdivision within the site will be able to comply with these standards.

Table 5: 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)	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	- 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	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	- 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	- 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	- 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

Table 6: Design and construction for fire trails (RFS 2006; pg 25)

Performance Criteria	Acceptable Solutions
The width and design of the fire trails enables safe and ready access for firefighting vehicles	- A minimum carriageway width of four metres with an additional one metre wide strip on each side of the trail (clear of bushes and long grass is provided) - The trail is a maximum grade of 15 degrees if sealed and not more than 10 degrees if unsealed - A minimum vertical clearance of four metres to any overhanging obstructions, including tree branches is provided - The crossfall of the trail is not more than 10 degrees - The trail has the capacity for passing by: - Reversing bays using the access to properties to reverse fire tankers, which are six metres wide and eight metres deep to any gates, with an inner minimum turning radius of six metres and outer minimum radius of 12 metres; and / or - A passing bay every 200 meters, 20 metres long by tree metres wide, making a minimum trafficable width of seven metres at the passing bay <i>Note: Some short construction 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>
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	- The fire service is accessible to firefighters 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 to the through road system at frequent intervals of 200 metres or less - Fire trails do not traverse a wetlands or other land potentially subject to periodic inundation (other than a flood or storm surge) - Gates for fire trails are provided and locked with a key / lock system authorized by the local RFS
Fire trails designed to prevent ween infestation, soil erosion and other land degradation	- Fire trail 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

5.3 Water supply and other utilities

5.3.1 Water supply and hydrants

Future lots are to be serviced by reticulated water infrastructure suitable for fire fighting purposes. With the exception of rural residential subdivision, the furthest point from any future dwellings to a hydrant is to be less than 90 m (with a tanker parked in-line) in accordance with *AS 2419.1 – 2005 Fire Hydrant Installations - System Design, Installation and Commissioning* (Standards Australia 2005). The reticulated water supply is to comply with the following acceptable solutions within Section 4.1.3 of PBP:

- Reticulated water supply to use a ring main system for areas with perimeter roads;
- Fire hydrant spacing, sizing and pressures comply with AS 2419.1 – 2005;
- Hydrants are not located within any road carriageway;
- All above ground water and gas service pipes external to the building are metal, including and up to any taps; and
- The PBP provisions of parking on public roads are met.

Future dwellings on rural residential lots will require a static water supply at time of development application as the dwellings will be beyond the hydrant distance quoted above.

5.3.2 Electrical and gas supplies

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

- Lines are to be installed with short pole spacing, unless crossing gullies, and
- No part of a tree should be closer to a powerline than the distance specified in *Vegetation Safety Clearances* issued by Energy Australia (NS179, April 2002).

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).

5.4 Building 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 (BAL) each with a prescribed suite of design and construction specifications aimed at preventing ignition during the passing of a bushfire front. The BALs are introduced 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).

6 Conclusion

6.1 Statement of capability

This bushfire assessment demonstrates that the study area is capable of accommodating future subdivision and land development with the appropriate bushfire protection measures.

6.2 Recommendations and conclusion

The recommendations of this bushfire assessment are located within **Section 5 Bushfire protection measures**. They include 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 use 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 *Planning for Bush Fire Protection* (RFS 2006).

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**HEAD OFFICE**

Suite 4, Level 1
2-4 Merton Street
Sutherland NSW 2232
T 02 8536 8600
F 02 9542 5622

CANBERRA

Level 2
11 London Circuit
Canberra ACT 2601
T 02 6103 0145
F 02 6103 0148

COFFS HARBOUR

35 Orlando Street
Coffs Harbour Jetty NSW 2450
T 02 6651 5484
F 02 6651 6890

PERTH

Suite 1 & 2
49 Ord Street
West Perth WA 6005
T 08 9227 1070
F 08 9322 1358

DARWIN

16/56 Marina Boulevard
Cullen Bay NT 0820
T 08 8989 5601

SYDNEY

Level 6
299 Sussex Street
Sydney NSW 2000
T 02 8536 8650
F 02 9264 0717

NEWCASTLE

Suites 28 & 29, Level 7
19 Bolton Street
Newcastle NSW 2300
T 02 4910 0125
F 02 4910 0126

ARMIDALE

92 Taylor Street
Armidale NSW 2350
T 02 8081 2681
F 02 6772 1279

WOLLONGONG

Suite 204, Level 2
62 Moore Street
Austinmer NSW 2515
T 02 4201 2200
F 02 4268 4361

BRISBANE

51 Amelia Street
Fortitude Valley QLD 4006
T 07 3503 7193

ST GEORGES BASIN

8/128 Island Point Road
St Georges Basin NSW 2540
T 02 4443 5555
F 02 4443 6655

NAROOMA

5/20 Cauty Street
Narooma NSW 2546
T 02 4476 1151
F 02 4476 1161

MUDGEES

Unit 1, Level 1
79 Market Street
Mudgee NSW 2850
T 02 4302 1230
F 02 6372 9230

GOSFORD

Suite 5, Baker One
1-5 Baker Street
Gosford NSW 2250
T 02 4302 1220
F 02 4322 2897

1300 646 131
www.ecoaus.com.au