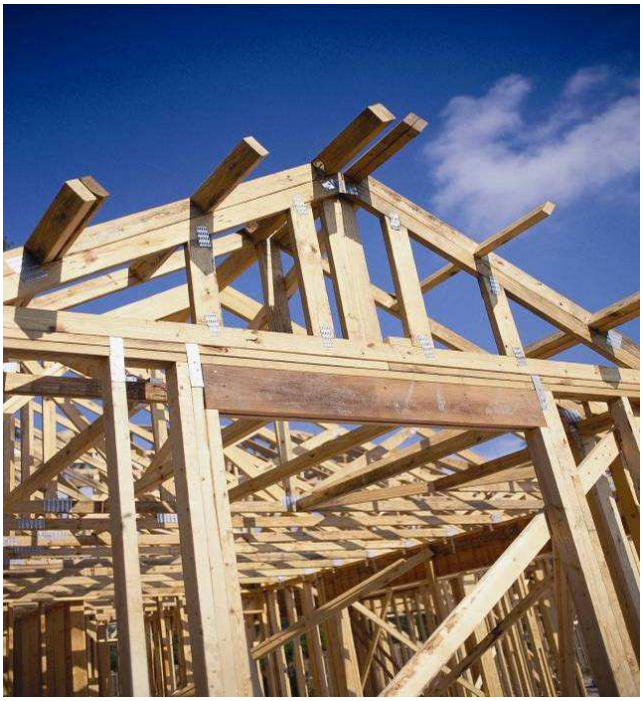
BUSHFIRE ASSESSMENT

Proposed Residential Subdivision, Jumping Creek Estate, Queanbeyan

Prepared for
CIC Australia

12 January 2012



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1 Introduction

1.1 PROPOSAL DESCRIPTION AND LOCATION

CIC Australia engaged Eco Logical Australia Pty Ltd (ELA) to prepare a Bushfire Assessment of a proposed residential subdivision at 30 Lonergan Drive, Greenleigh. The site is referred to as Jumping Creek Estate, and is located approximately 3 km south-east of Queanbeyan. Figure 1 locates the subject land and Table 1 below lists site details.

The proposal consists of a subdivision for low density residential development (single-detached dwellings in E4 Environmental Living zone) to consist of 262 residential lots. The subdivision also includes public roads and open space parkland that will consist primarily of restored riparian zones (within the RE2 Private Recreation zone).

The subdivision will be staged into three stages. The proposed layout identifying the staging is provided as Figure 2.

Table 1: Details of subject land

Street or property Name:	30 Lonergan Drive
Suburb, town or locality:	Greenleigh
Postcode:	2620
Lot/DP no:	Lot 1 DP 711905
Local Government Area:	Queanbeyan
Zoning:	Currently being rezoned (under exhibition) to E4 Environmental Living, E2 Environmental Conservation and RE2 Private Recreation
Type of development:	Residential subdivision

1.2 DESCRIPTION OF SUBJECT LAND AND SURROUNDING LANDS

The subject land is approximately 97 ha in size and has an extensive history of disturbances, including farming and mining, resulting in widespread clearing and establishment of exotic vegetation. The subject land contains a number of disturbed forest and woodland communities, but is dominated by exotic pasture.

The subject land is generally bounded to the:

- North-west by Greenleigh Estate - an existing rural residential development;
- North and east by bushland zoned Environmental Protection and Cuumbeun Nature Reserve;
- South by bushland known as Ngunnawal Land; and
- West by the Queanbeyan River.

1.3 AIMS AND OBJECTIVES OF BUSHFIRE ASSESSMENT

The aim of this Bushfire Assessment is to demonstrate that the proposed subdivision satisfies the relevant legislation and policy on bushfire planning and design of new development in bushfire prone land in NSW. The details of the requirements are discussed in Section 2.

The objectives of this Bushfire Assessment are therefore to:

1. Provide a conclusive statement that the subdivision proposal complies with the relevant requirements and specifications;
2. Demonstrate to the determining authorities (Queanbeyan City Council and NSW Rural Fire Service) that the subdivision proposal complies with the relevant requirements and specifications;
3. Provide recommendations for use by determining authorities to ensure compliance with the relevant requirements and specifications; and
4. Support an application to the NSW Rural Fire Service for a Bush Fire Safety Authority prior to the submission of a development application to Council.

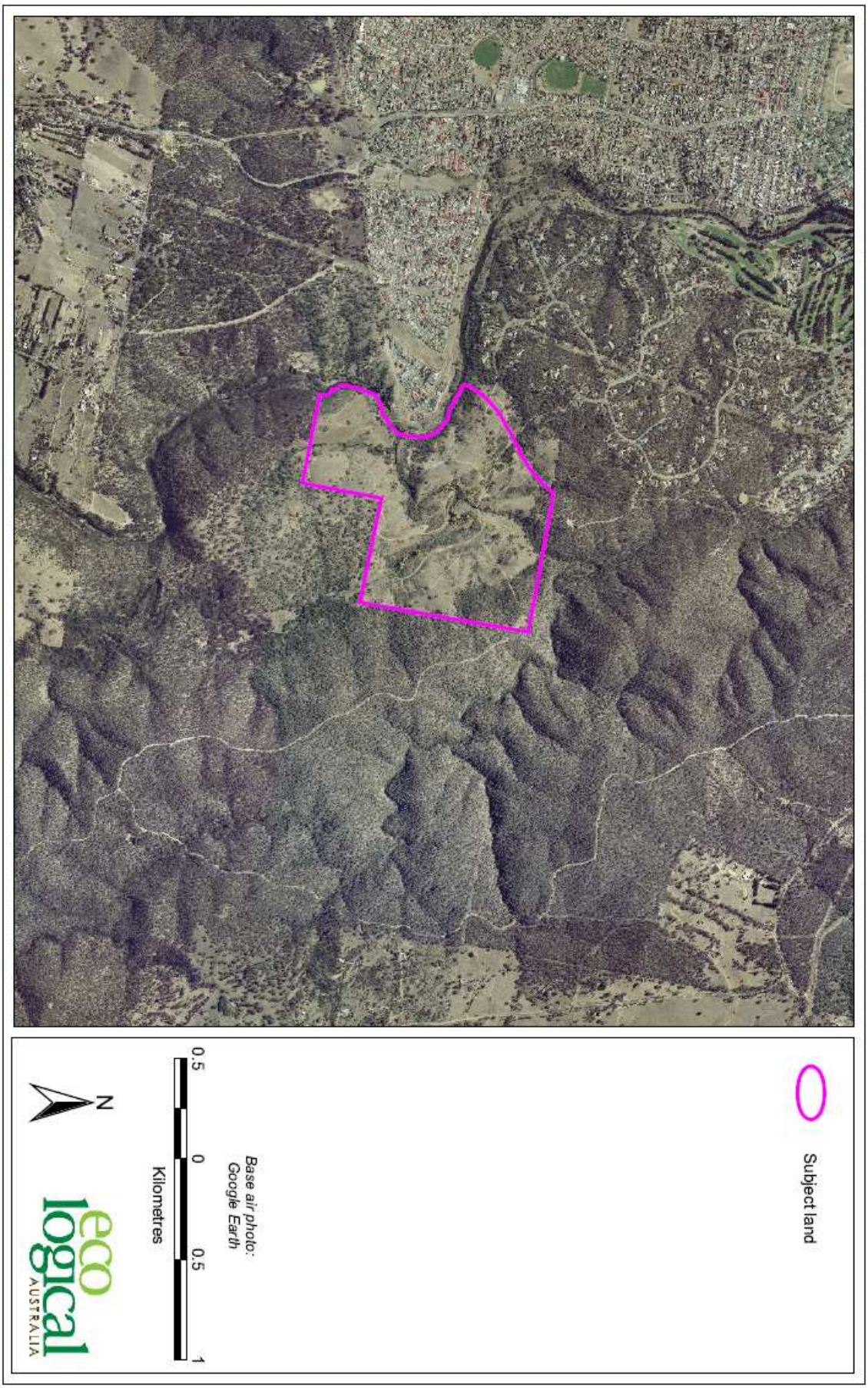

Figure 1: Location of subject land

Figure 2: Proposed subdivision layout and staging

2 Assessment Requirements

The subject land has been identified as containing bushfire prone land as mapped by Queanbeyan City Council (QCC) and the NSW Rural Fire Service (RFS) under a requirement of the *Rural Fires Act 1997* (see Figure 3). In NSW, bushfire prone lands are those identified that could support a bushfire or are potentially likely to be subject to bushfire attack and are generally lands that contain or are within 100 m of significant stands of bushland.

Section 91 of the *Environmental Planning and Assessment Act 1979* requires an assessment of subdivision proposals within bushfire prone land following Section 100B of the *Rural Fires Act 1997*. The assessment is to consider Clause 44 of the *Rural Fires Regulation 2008*, and *Planning for Bushfire Protection 2006* (RFS 2006) herein referred to as PBP.

This Bushfire Assessment strictly follows and adheres to the assessment process and methodologies required by the legislation noted above.

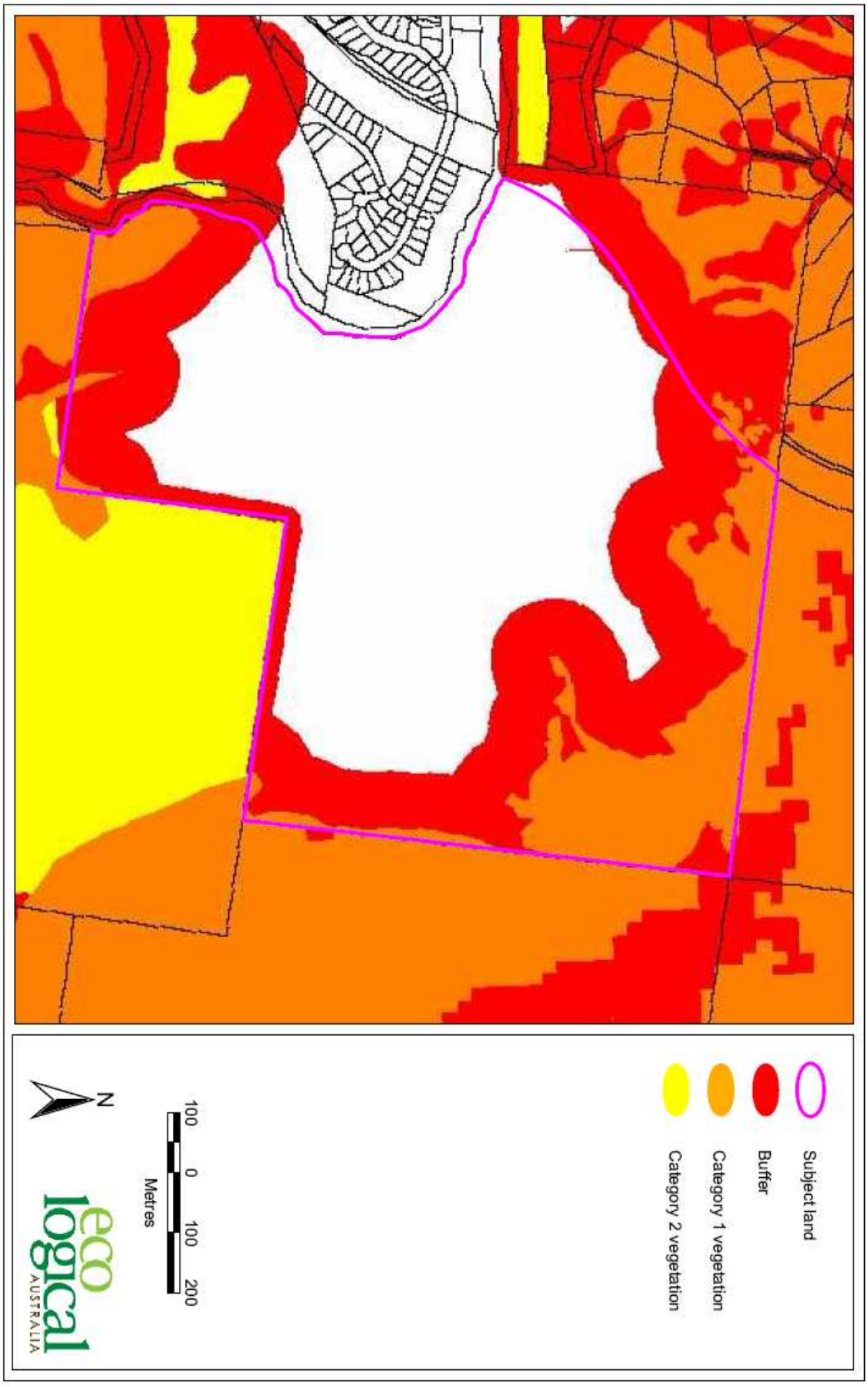

Figure 3: Bushfire prone land mapped for the subject land

3 Methods and Approach

This Bushfire Assessment followed the methods and approach outlined in Table 2 below. In summary, the development and design of bushfire protection measures required by PBP was detailed and complied with the methodologies stated within PBP.

Table 2: Methods and Approach

Method and Approach	Task	Considerations
Review	A literature review of relevant reports and studies occurred.	Bushfire Assessment, Proposed Rezoning, Jumping Creek Estate (Eco Logical Australia, 2010); Draft Flora and Fauna Assessment, Rezoning Investigations, Jumping Creek Estate, Queanbeyan (Eco Logical Australia, 2010); Queanbeyan Bush Fire Prone Land Map
Desk top analysis	Review and analysis of all available mapping layers in GIS relevant to bushfire hazard and risk assessment.	GIS layers include: Aerial and satellite imagery; Vegetation mapping including the locations of endangered ecological communities and proposed riparian zone enhancement; Topographical data (e.g. contours).
Site inspection	A site inspection occurred.	A site inspection was undertaken by ELA staff to ground-truth the results of the desk-top analysis, particularly in regards to vegetation classification and slopes.
Ecological constraints workshop	Review the Ecological Assessment and consult the ecologist to enable integrated design.	Discussions occurred with the ELA ecologist to refine the bushfire protection measures to ensure a non significant impact on EECs and proposed riparian corridors.
Input into final development layout	Consultation with town planner to develop a compliant design.	Information was provided on APZ locations, vegetation management and access.
Assessment	Assessment all relevant protection measures.	Assessment against PBP.
Reporting	Preparation of Bushfire Assessment.	Carry out all necessary reporting required for residential subdivision in 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 subject land.

4.1 VEGETATION COMMUNITIES INFLUENCING BUSHFIRE

The 'predominant vegetation' influencing fire behaviour approaching the proposed subdivision layout has been assessed strictly in accordance with the methodology specified within PBP.

Comprehensive and site specific vegetation assessment and mapping has occurred as part of the Draft Flora and Fauna Assessment (Eco Logical Australia 2010). A vegetation map of the subject land is provided in Figure 4. This mapping was based on extensive field survey and review of previous mapping for the area such as within the Planning Framework for Natural Ecosystems of the ACT and NSW Southern Tablelands (Fallding 2002) which was used for the Queanbeyan Biodiversity Study (BES 2008).

Much of the subject land is currently cleared and heavily disturbed with weed invasion, particularly along the many tributaries of Queanbeyan River that traverse the site. It is proposed to rehabilitate these tributaries with Box-gum Woodland. Figure 5 displays the future coverage of vegetation that this assessment is based on. A description of the vegetation communities is listed below.

4.1.1 Box-gum Woodland

Box-Gum Woodland occurs patchily in a band on the spur extending from Lonergan Drive across Jumping Creek and on the ridge in the southern part of the subject land as shown in Figure 4. The community is likely to have once been more extensive within the subject land and may have covered all the lower parts of the landscape. However historic disturbances have been so intensive that the community is now extinct across much of its former range within the study area.

The community is characterised by a sparse canopy dominated by a few mature and regrowth Yellow Box *Eucalyptus melliodora* trees with occasional individuals of Blakely's Red Gum *Eucalyptus blakelyi*, Apple Box *Eucalyptus bridgesiana*, Red Box *Eucalyptus polyanthemos,* Red Stringybark *Eucalyptus macrorhyncha,* Bundy *Eucalyptus goniocalyx* and Brittle Gum *Eucalyptus mannifera*.

The community is generally heavily modified with abundant weeds in the understorey and groundcover, however in a few areas a more diverse native groundcover, and to a lesser extent, understorey persists. The groundcover typically includes a mix of hardy natives and weeds.

The areas along the tributaries will be rehabilitated to create Box-gum Woodland.

Box-gum Woodland is classified by PBP as 'grassy woodland'.

4.1.2 Dry Forest

This vegetation community occurs predominately on the mid and upper-slopes on the northern margins of the study area but also on the steep slopes above the Queanbeyan River and Jumping Creek which are particularly rocky and exposed. The community is generally in relatively good condition however in places it has been reduced to secondary grassland or is characterised by a dense shrubland of Burgan (*Kunzea ericoides*) regrowth.

The canopy is dominated by Bundy, Red Stringybark, Red Box and Scribbly Gum *Eucalyptus rossii,* and on the steep slopes above the Queanbeyan River by Apple Box. A few individuals of Yellow Box occur in places. The understorey includes species such a range of native shrubs and the groundcover is generally dominated by natives.

Dry Forest is classified by PBP as 'forest'.

4.1.3 Burgan Shrubland

There are two large dense patches of Burgan *Kunzea ericoides* within the north-eastern and south-western extremities of the subject land. The community comprises a dense shrubland to approximately 2 m in height and is dominated by Burgan almost to the exclusion of all other vegetation, although there are patches of native and exotic groundcovers typical of the disturbed habitats within the study area.

Burgan Shrubland is classified by PBP as 'tall heath'.

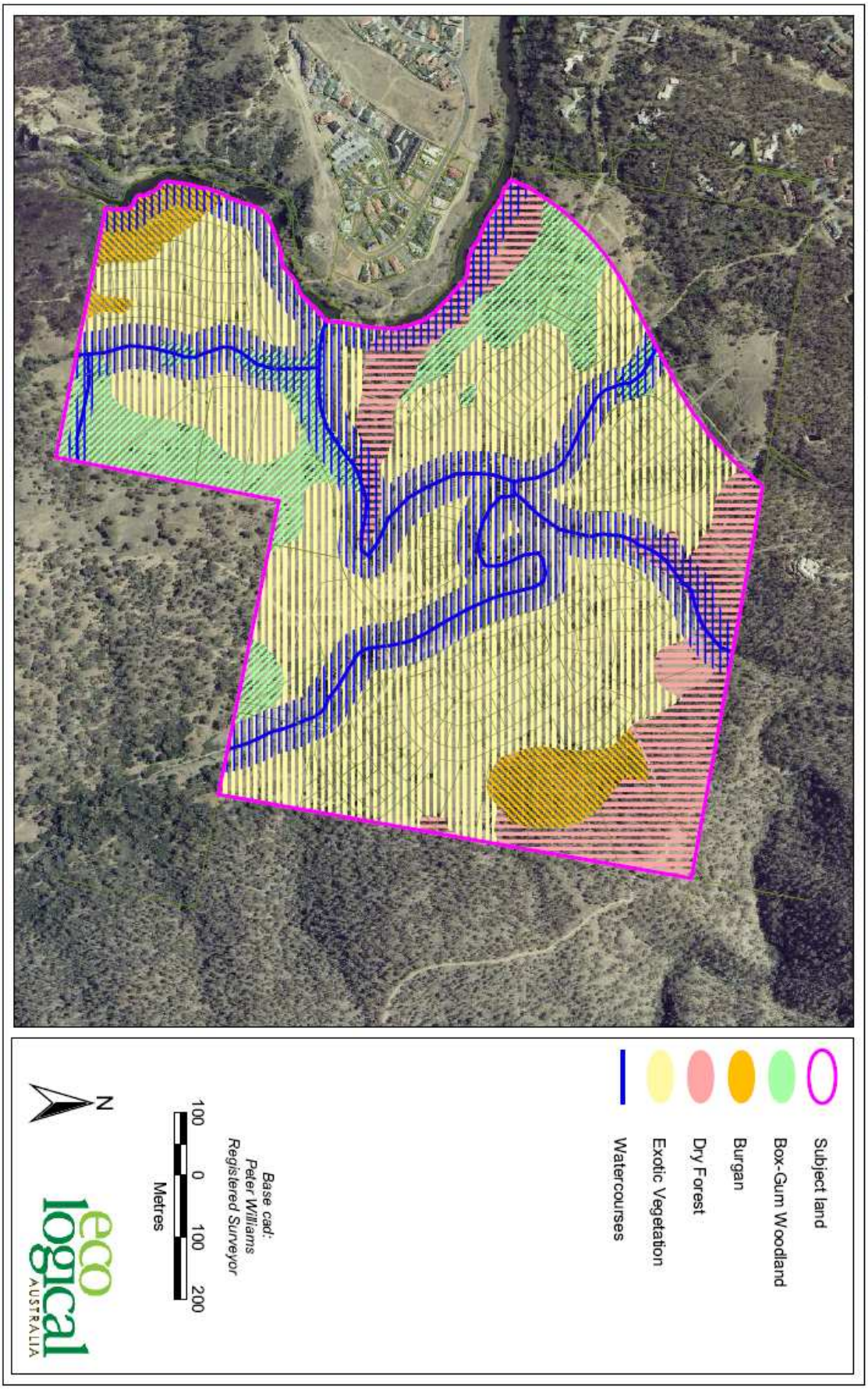

Figure 4: Current vegetation coverage (Eco Logical Australia, 2010)

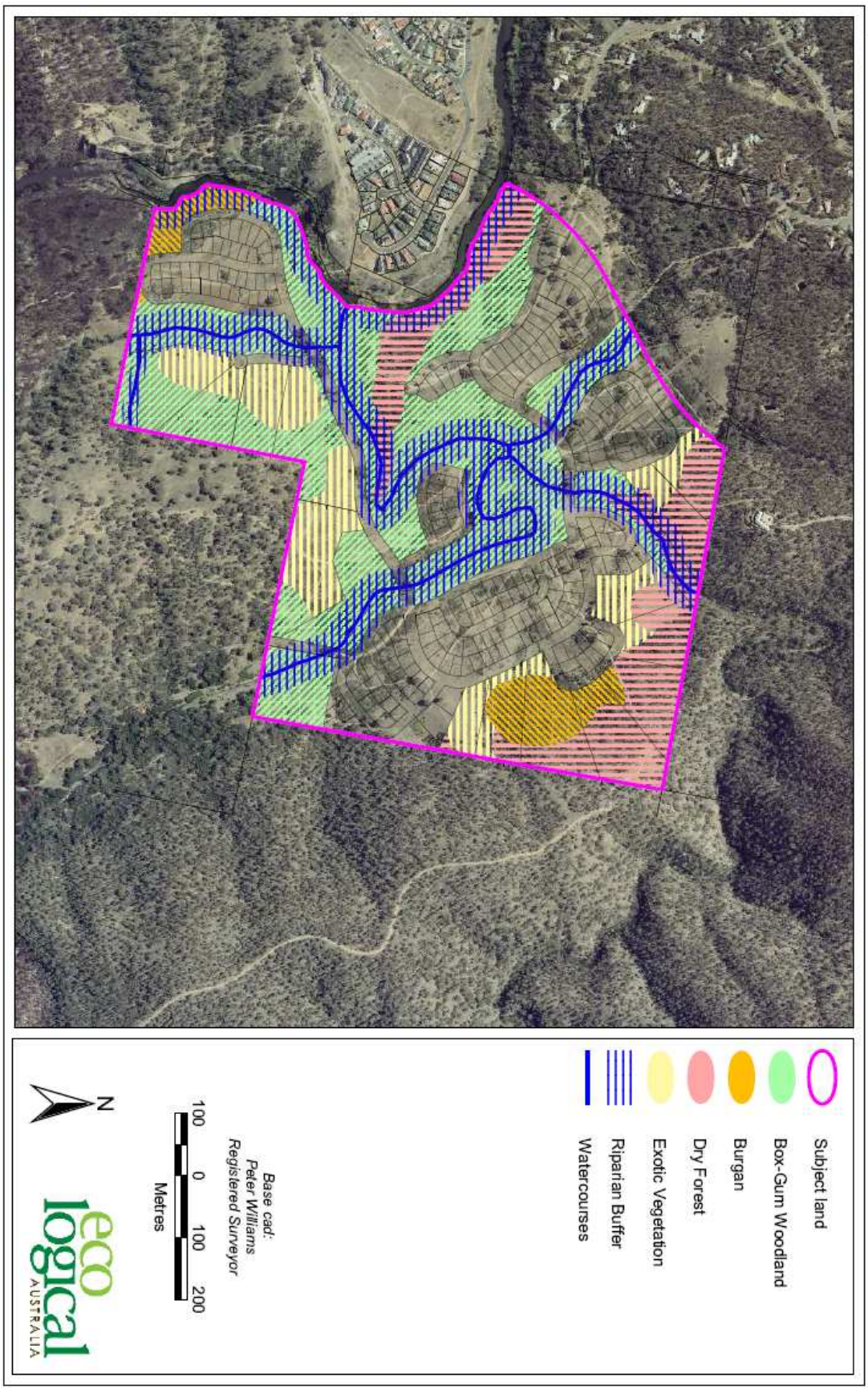

Figure 5: Future vegetation coverage after development & rehabilitation (Eco Logical Australia, 2010)

4.2 SLOPES INFLUENCING BUSHFIRE

The 'effective slope' influencing fire behaviour approaching the subdivision layout 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 lot boundaries. The slope classes are listed in Table 3 below. The assessment of the effective slope is detailed in Table 5 and displayed on Figure 6 in Section 5.

Table 3: 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

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 residential subdivision are listed in Table 4 below and are assessed in detail in the remainder of this section. This section demonstrates that the proposed subdivision complies with the required bushfire protection measures as set out in PBP.

Table 4: 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 the subdivision such as alternate access and operational response and evacuation options. APZ perimeter access to be considered as is design standards of public roads, private property access road and any fire trails.
Water supply and other utilities	List requirements for reticulated water supply and hydrant provisions for fire fighting, and the installation of electricity and gas.
Building construction standards	Provide a guide on the application of construction standards for future dwellings.

5.1 ASSET PROTECTION ZONES

5.1.1 APZ Location and Dimension

Using the vegetation and slope data discussed in Section 3, Asset Protection Zones (APZ) have been calculated at specific bushland interface locations around the proposed lots. These have been mapped and identified on Figure 6 and described in Table 5. Each APZ complies with the minimum APZ as specified by the acceptable solutions of PBP for residential subdivision.

As demonstrated in Figure 6, the proposed subdivision layout can accommodate the APZs required in compliance with PBP.

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 APZ should be managed as follows:

- No tree or tree canopy is to occur within 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 Perimeter Access within APZ

Perimeter access has been provided at all significant bushland interface locations. The assessment of perimeter access is provided in the following Section 5.2.

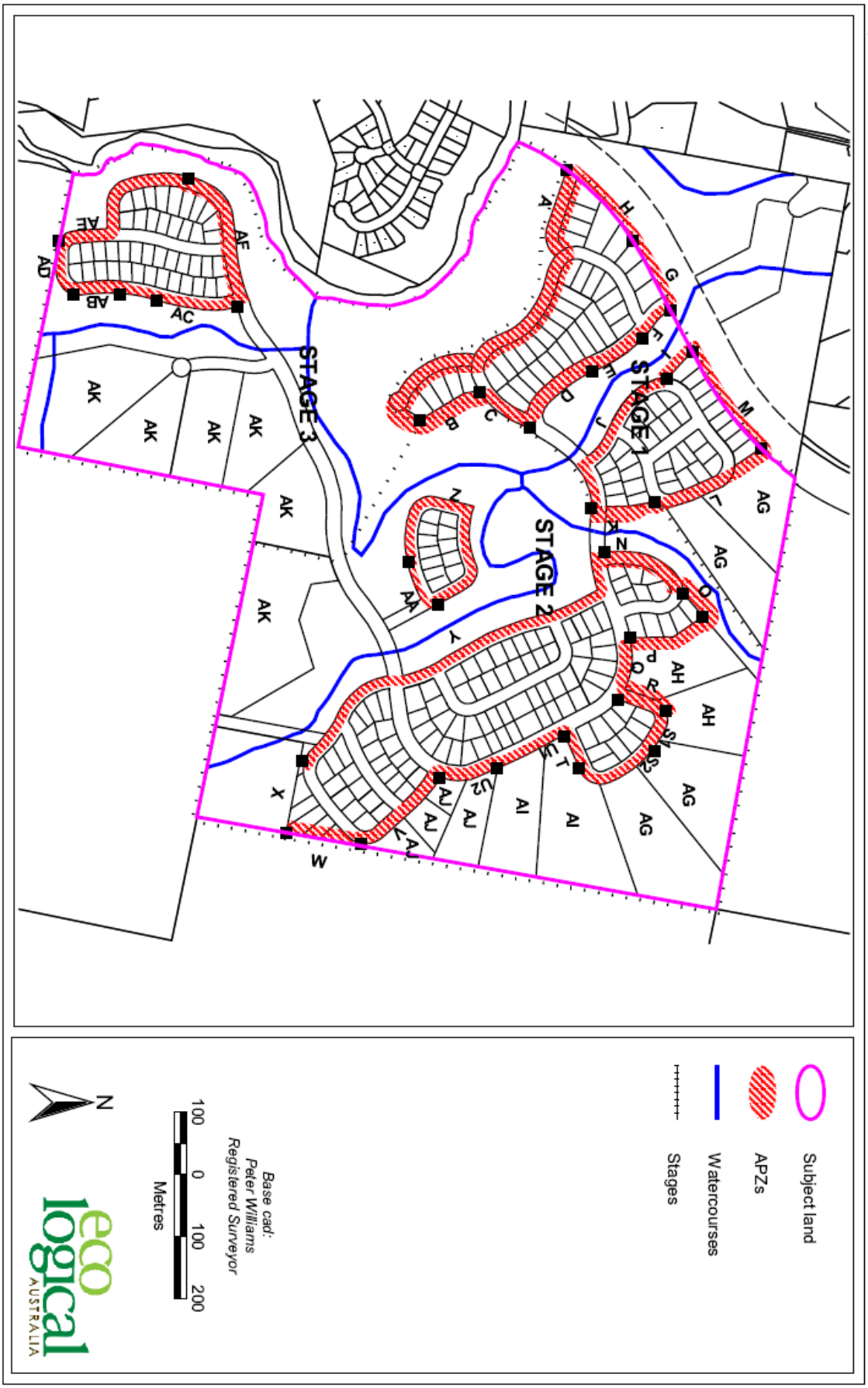

Figure 6: Proposed Asset Protection Zones (APZ)

Table 5: Asset Protection Zone (APZ) calculation, location and dimension

Interface (Figure 6)	Predominant Vegetation	Effective Slope	APZ	Comments
Stage 1				
A	Woodland	>15-18º down	30m	Woodland on higher slopes. Riparian forest below woodland. APZ will be created within road reserve and lots.
B	Woodland	>10-15º down	25m	Woodland to be created. APZ will be created in riparian zone.
C	Woodland	>5-10º down	20m	APZ will be created within road reserve.
D	Woodland	>10-15º down	25m	APZ will be created within road reserve and lots.
E	Woodland	>5-10º down	20m	APZ will be created within road reserve and lots.
F	Woodland	>0-5º down	15m	APZ will be created within road reserve.
G	Grassland	Upslope/Flat	15m	APZ will be created in Ellerton Drive road reservation.
H	Grassland	>5-10º down	15m	APZ will be created in Ellerton Drive road reservation.
I	Woodland	>0-5º down	15m	Woodland to be created. APZ will be created in riparian zone.
J	Woodland	>0-5º down	15m	Woodland to be created. APZ will be created within road reserve and lots.
K	Forest	>0-5º down	25m (10m OPA)	Woodland to be created although forest present upstream in gully. APZ will be created in riparian zone.
L	Forest	Upslope/Flat	20m (10m OPA)	Forest present in large lots adjacent. APZ will be created in road reserve.
M	Grassland	Upslope/Flat	15m	APZ will be created in Ellerton Drive road reservation.
AG	Forest	Upslope/Flat	20m (10m OPA)	To be placed between dwelling and hazard.

Interface (Figure 6)	Predominant Vegetation	Effective Slope	APZ	Comments
Stage 2				
N	Forest	>0-5º down	25m (10m OPA)	Woodland to be created although forest present upstream. APZ will be created within road reserve and lots.
O	Forest	>0-5º down	25m (10m OPA)	Woodland to be created although forest present upstream in gully. APZ will be created in riparian zone.
P	Forest	Upslope/Flat	20m (10m OPA)	Forest present in large lots adjacent. APZ will be created by way of easement on adjoining larger lot.
Q	Forest	Upslope/Flat	20m (10m OPA)	Forest present in large lot adjacent. APZ will be created within the road reserve.
R	Forest	>5-10º down	35m (15m OPA)	Forest present in large lot adjacent. APZ will be created within the road reserve and by way of easement in large lot.
S1	Forest	Upslope/Flat	20m (10m OPA)	Forest present in large lot adjacent. APZ will be created within the road reserve.
S2	Tall Heath	Upslope/Flat	15m	Burgan present in large lot adjacent. APZ will be created within the road reserve.
T	Tall Heath	Upslope/Flat	15m	Burgan present in large lot adjacent. APZ will be created within the road reserve.
U1	Tall Heath	Upslope/Flat	15m	Burgan present in large lot adjacent. APZ will be created within the road reserve.
U2	Forest	Upslope/Flat	20m (10m OPA)	Forest present in large lot adjacent. APZ will be created within the road reserve.
V	Forest	Upslope/Flat	20m (10m OPA)	Forest present in large lot adjacent. APZ will be created within the road reserve.
W	Forest	Upslope/Flat	20m (10m OPA)	Forest present in neighbouring land adjacent. APZ will be within the lots.

Interface (Figure 6)	Predominant Vegetation	Effective Slope	APZ	Comments
X	Managed land	>5-10º down	N/A	Adjacent lot is a heritage site that will be managed.
Y	Woodland	>0-5º down	15m	Woodland to be created. APZ will be created in road reserve.
Z	Woodland	>0-5º down	15m	Woodland to be created. APZ will be created in road reserve.
AA	Woodland	Upslope/Flat	10m	Woodland to be created. APZ will be created in road reserve.
AG	Forest	Upslope/Flat	20m (10m OPA)	To be placed between dwelling and hazard.
AH	Forest	>5-10º down	35m (15m OPA)	To be placed between dwelling and hazard.
AI	Tall Heath	Upslope/Flat	15m	To be placed between dwelling and hazard.
AJ	Forest	Upslope/Flat	20m (10m OPA)	To be placed between dwelling and hazard.
AK	Woodland	>10-15º down & Upslope/Flat	25m & 10m	To be placed between dwelling and hazard.
Stage 3				
AB	Woodland	>5-10º down	20m	Woodland to be created. APZ will be created in road reserve.
AC	Woodland	>0-5º down	15m	Woodland to be created. APZ will be created in road reserve.
AD	Tall Heath	Upslope/Flat	15m	Tall Heath in neighbouring land. APZ will be created in road reserve.
AE	Tall Heath	>15-18º down	20m	Tall Heath in riparian zone. APZ will be created in road reserve.
AF	Woodland	>10-15º down	25m	Woodland to be created. APZ will be created in road reserve and lots.
AK	Woodland	>10-15º down & Upslope/Flat	25m & 10m	To be placed between dwelling and hazard.

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 proposed subdivision road layout has been developed to achieve this. This subdivision layout can be viewed on Figure 2 and the details of the external access and egress can be viewed on Figure 7. The details of the access design are discussed in the following sections.

5.2.1 Alternate Access and Egress

All three stages will have alternate access and egress as they are developed. The following access strategies will be relied on for each stage:

Stage 1 will have its primary access point off Lonergan Drive to the west on the northern side of the Queanbeyan River (refer to Figure 7). The Ellerton Drive road reservation forms the northwest boundary of the subject land and Stage 1 and will provide the primary access in the future. However, it is anticipated that Stage 1 will be developed before the construction of Ellerton Drive. Therefore an interim alternate access is proposed to extend from Severne Street in the northwest down the hill into Stage 1 (see Figure 7), thus providing an alternate access point for Stage 1. The alternate access to Severne Street will be of a fire trail standard (refer to Table 7) approximately 1 km in length.

The creation of the two access points prior to Ellerton Drive construction will also benefit the properties (on Severne Street, Woodmand Place and Lonergan Drive) that back onto the bushland within and adjacent Jumping Creek Estate by providing general fire fighter access and perimeter control line protection.

It is expected that Ellerton Drive will be constructed before Stages 2 and 3. In addition to Ellerton Drive and the access provided for Stage 1, Stages 2 and 3 are likely to have alternate access via a link road to the southeast to neighbouring future development.

5.2.2 Perimeter Roads

All bushland interface areas containing an APZ for a significant bushfire hazard will have a perimeter road within the APZ. The only APZs without a perimeter road as shown in Figure 6 is at the following interface locations listed in Table 5:

- B – fire trail perimeter road provided;
- G, H and M – grassland interface adjacent 60 m wide Ellerton Drive road reservation;
- I, K, O, P and W – short sections of interface accessible from nearby roads; and
- Larger lots – will contain future dwellings with conserved bushland with access defined at DA stage.

The above strategies are acceptable by PBP.

The design details of the perimeter roads will comply with the PBP acceptable solutions for public roads and fire trails as 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 Tables 6 and 7 respectively. Future residential subdivision within the subject land will be able to comply with these standards.

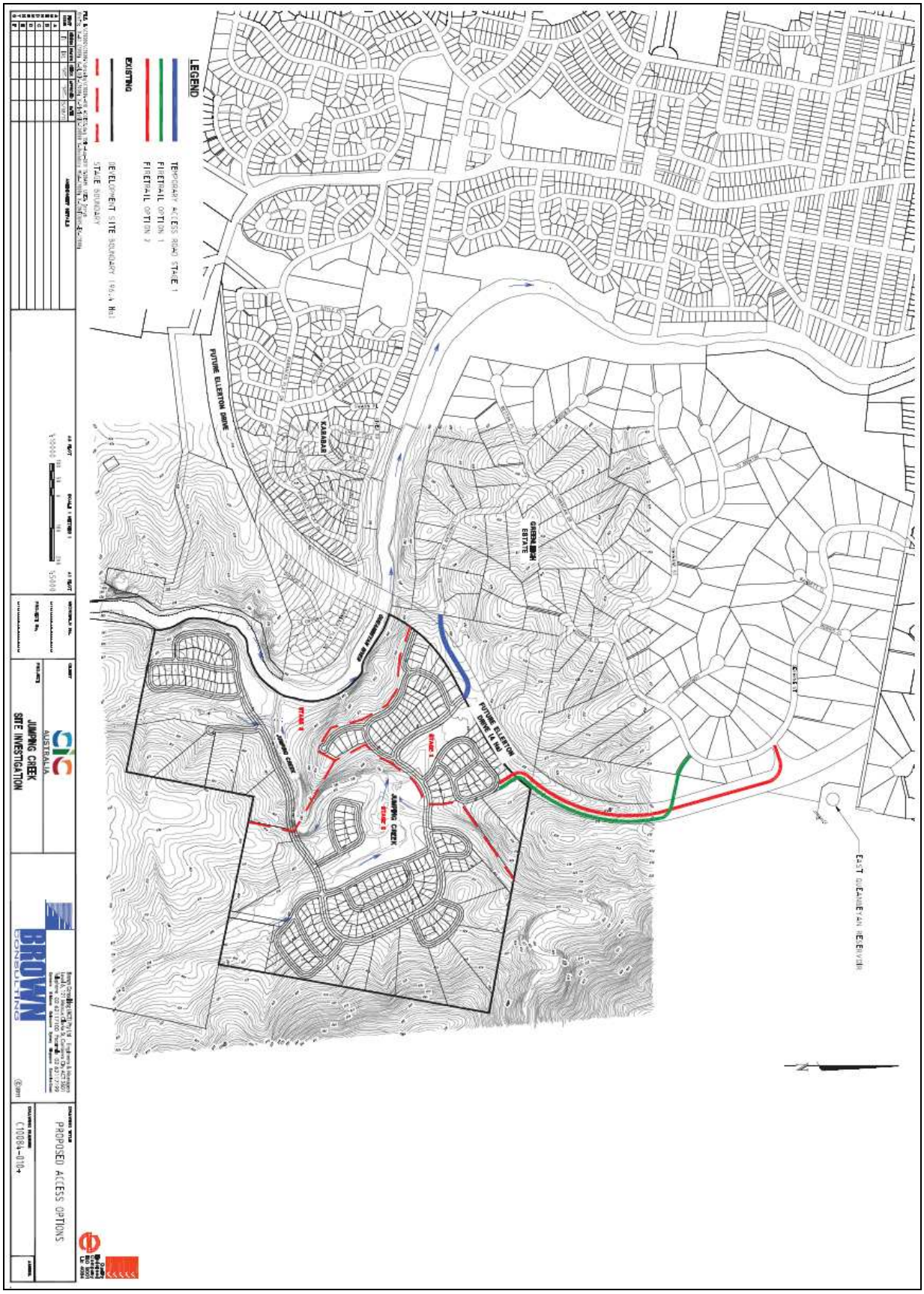

Figure 7: Location of alternate access and egress point

Table 6: 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*	• *Public roads up to 6.5 metres wide provide parking within parking*

Performance Criteria	Acceptable Solutions
reticulated water supply	*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 7: 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 by every 200 meters, 20 metres long by tree metres wide, making a minimum trafficable width of seven metres at the passing bay* *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*
• *Fire trails are trafficable under all weather conditions. Where the fire*	• *The fire service is accessible to firefighters and maintained in a serviceable condition by the owner of the land*

Performance Criteria	Acceptable Solutions
trail joins a public road, access shall be controlled to prevent use by non authorised persons	• *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

The subject land is to be serviced by reticulated water infrastructure suitable for fire fighting purposes. 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.

The subject land is capable of complying with the above requirements.

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).

The subject land is capable of complying with the above requirements.

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. AS 3959-2009 contains six Bushfire Attack Levels (BAL) each with a corresponding construction standard. An assessment under AS 3959-2009 is not required at the subdivision stage, however Figure 8 displays the relevant BALs expected across the subdivision.

The objective of the BALs are summarised 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 variation to AS 3959-2009 which requires consideration. The variation is contained within the document 'PBP Appendix 3 Addendum' (RFS 2010).

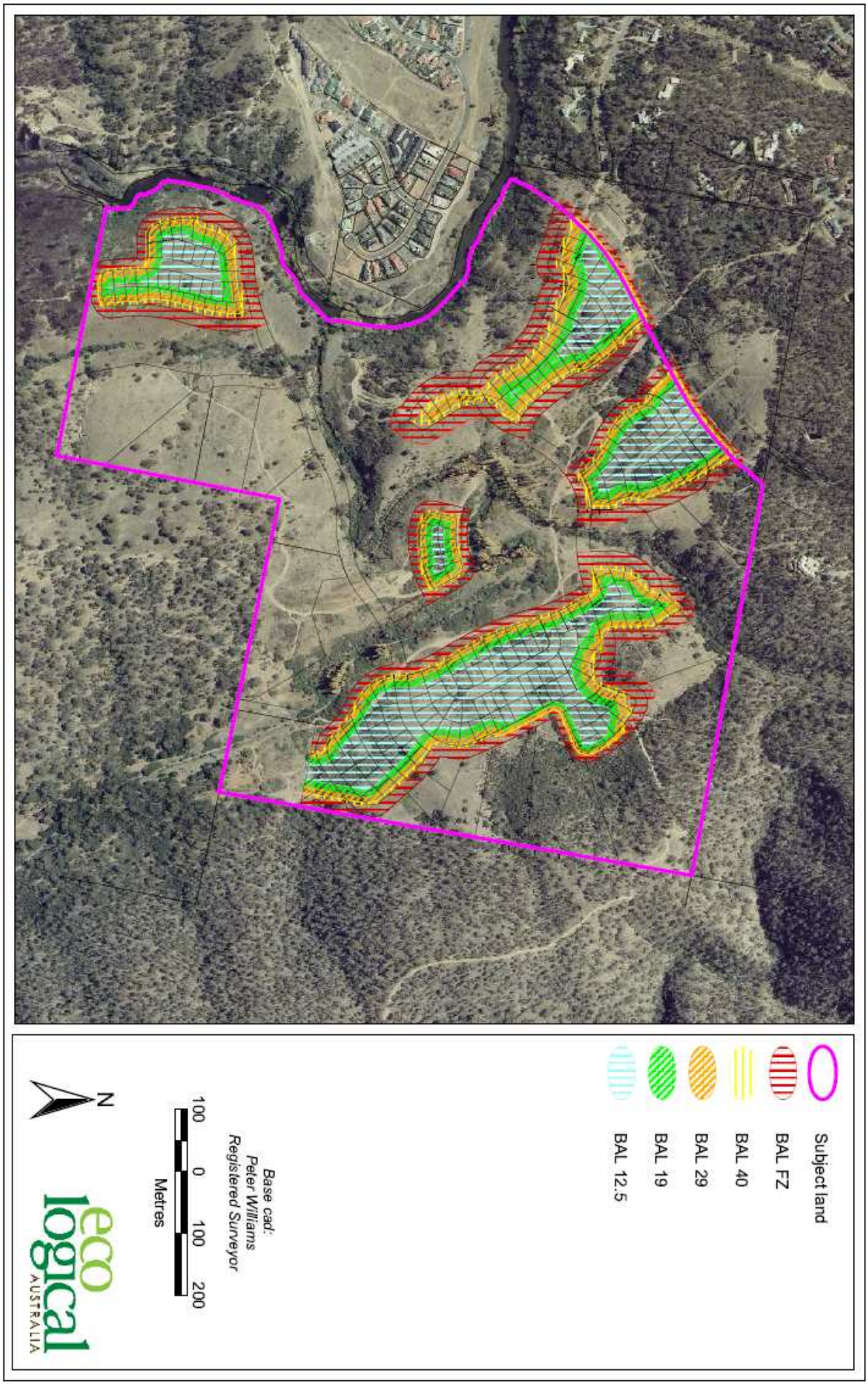

Figure 8: AS 3959-2009 Bushfire Attack Levels (BAL) for the subdivision

6 Conclusion

6.1 STATEMENT OF COMPLIANCE

This Bushfire Assessment demonstrates that the proposed staged subdivision complies with the bushfire planning requirements prescribed by *Planning for Bushfire Protection* (RFS 2006).

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, and the safe installation of electricity, gas and building construction standards for future dwellings.

In the author's professional opinion the bushfire protection requirements listed in this assessment provide an adequate standard of bushfire protection for the proposed development, a standard that is consistent with *Planning for Bushfire Protection* (RFS 2006) and appropriate for the issue of a Bush Fire Safety Authority.

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