Travers

bushfire & ecology

bushfire protection assessment

Planning Proposal
(Rezoning for residential subdivision)
Lot 71 DP 706546
71 St Andrews Rd, Varroville

Under Section 117(2) Direction No 4.4
of the *EP&A Act*

December 2018
(REF: 18GAT03B)

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Date:	20 December 2018
File:	18GAT03B

Disclaimer:

This report has been prepared to provide advice to the client on matters pertaining to the particular and specific development proposal as advised by the client and / or their authorised representatives. This report can be used by the client only for its intended purpose and for that purpose only. Should any other use of the advice be made by any person including the client then this firm advises that the advice should not be relied upon. The report and its attachments should be read as a whole and no individual part of the report or its attachments should be relied upon as meaning it reflects any advice by this firm. The report does not suggest or guarantee that a bush or grass fire will not occur and or impact the development. This report advises on matters published by the *NSW Rural Fire Service* in their guideline *Planning for Bush Fire Protection 2006* and other advice available from that organisation.

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

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EXECUTIVE SUMMARY

Travers bushfire & ecology prepared a bushfire protection assessment report for the proposed rezoning and future residential subdivision of Lot 71 DP 706546, 71 St Andrews Rd, Varroville of the site in February 2018.

The proposal seeks to rezone land to the west of the internal easement as R2 Low Density Residential and retain the current E3 zoning (with a single dwelling entitlement) to include the easement and extending to the water channel in the east. This revised assessment has been undertaken based on a proposed new dwelling location with the E3 zone and to address the potential amendment to the current access arrangements.

This report identifies matters for consideration for the planning proposal and highlights the required bushfire protection measures, including asset protection zones (APZs), for future development under the *Environmental Planning and Assessment Act 1979 (EP&A Act), Section 117 Direction 4.4* and in accordance *Planning for Bush Fire Protection 2006* (*PBP*) and *Community Resilience Practice Note 2/12 Planning Instruments and Policies*.

The key principle for the proposal is to ensure that future development is capable of complying with *PBP*. Planning principles for the proposal include the provision of adequate access including perimeter roads, establishment of adequate APZs for future housing, specifying minimum lot depths to accommodate APZs and the introduction of controls which avoid placing inappropriate developments in hazardous areas and placement of combustible material in APZs.

Our assessment found that bushfire can potentially affect the site from the woodland located beyond St Andrew Road to the south-west and the potential short heath associated with the electrical services easement adjoining the proposed R2 zoned land to the south-east resulting in possible ember attack, radiant heat and potentially flame attack.

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

The assessment has concluded that future development on site will provide compliance with the planning principles of *PBP* and *Community Resilience Practice Note 2/12 – Planning Instruments and Policies*.

GLOSSARY OF TERMS

AHIMS	Aboriginal Heritage Information System
APZ	Asset protection zone
AS1596	*Australian Standard – The storage and handling of LP Gas*
AS2419	*Australian Standard – Fire hydrant installations*
AS3745	*Australian Standard – Planning for emergencies in facilities*
AS3959	*Australian Standard – Construction of buildings in bushfire-prone areas 2009*
BAL	*Bushfire attack level*
BCA	*Building Code of Australia*
BSA	Bushfire safety authority
EEC	Endangered ecological community
FDI	Fire danger index
IPA	Inner protection area
LEP	*Local environmental plan*
OPA	Outer protection area
PBP	*Planning for bush fire protection 2006*
RFS	NSW Rural Fire Service

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Introduction 1

Travers bushfire & ecology has been requested by *GAT & Associates* to undertake a bushfire protection assessment for the proposed rezoning and future residential subdivision of Lot 71 DP 706546, 71 St Andrews Rd, Varroville.

The proposal is located on land mapped by *Campbelltown Council* as being bushfire prone. *Direction 4.4, Planning for Bush Fire Protection 2006 (PBP)* identifies matters for consideration for planning proposals that will affect, or are in proximity to land mapped as bushfire prone.

As such, the proposal is subject to the requirements of Section 117(2) of *the Environmental Planning and Assessment Act 1979 (EP&A Act)* which requires Council to consult with the Commissioner of the NSW Rural Fire Service (RFS) and to take into account any comments by the Commissioner.

1.1 Aims of the assessment

The aims of the bushfire protection assessment are to:

- Review the bushfire threat to the landscape
- Undertake a bushfire attack assessment in accordance with *PBP*
- Provide advice on planning principles, including the provision of perimeter roads, asset protection zones (APZs) and other specific fire management issues
- Review the potential to carry out hazard management over the landscape, taking into consideration the proposed retention of trees within the final development plans.

1.2 Project synopsis

The proposal seeks to rezone the western extent of Lot 71 DP 706546 from E3 Environmental Management to R2 Low Density Residential (minimum lot size 700sq/m) (refer Figure 1.1). The eastern portion extending from the existing internal services easement to the water channel will retain the current E3 zone.

The majority of the Cumberland Plain Woodland (CPW) vegetation, identified within the Flora and Fauna Assessment compiled by *Travers bushfire & ecology* (December, 2017) to the east of the easement will be retained as a biodiversity / riparian corridor with a single dwelling entitlement. An indicative dwelling footprint has been identified within Schedule 1 attached.

In accordance with the Concept Services Plan prepared by *Lean Lackenby & Hayward* (refer Figure 1.2), the current preferred access to the site will be provided via the recently constructed residential subdivision extending from Aqueduct Street in the west. An alternative access via a potential upgrade of St Andrews Road has also been explored.

This report has highlighted the bushfire constraints, minimum APZs as well as recommendations for future road design, building construction, water supply and utilities. Based

on the current design one lot will be constrained by the APZ (refer Figure 1.2 & Schedule 1 attached).

Figure 1.1 – Rezoning planning proposal
(Source: Nearmap)

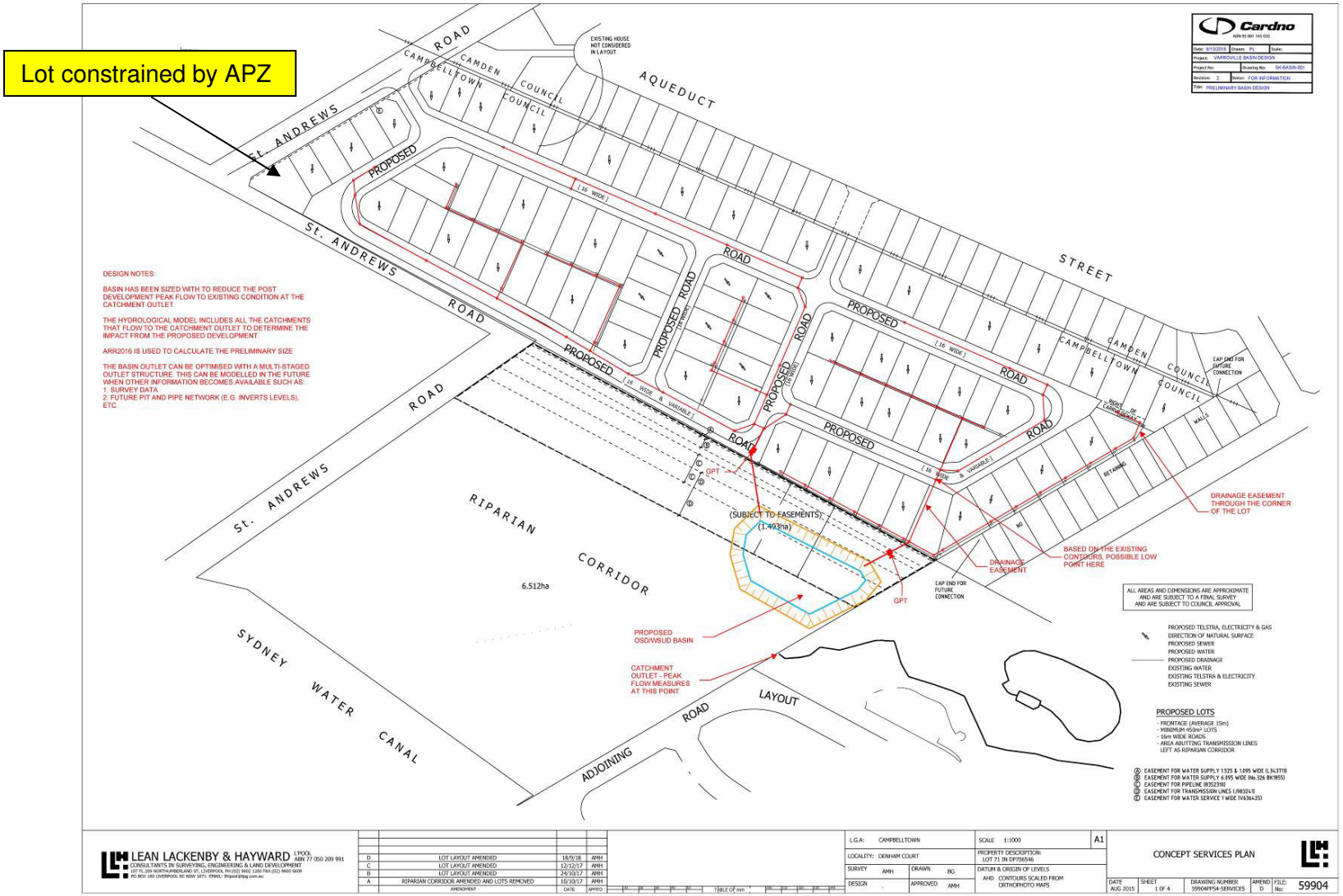


Figure 1.2 – Concept services plan

1.3 Information collation

To achieve the aims of this report, a review of the information relevant to the property was undertaken prior to the initiation of field surveys. Information sources reviewed include the following:

- Concept services plan prepared by *Lean Lackenby & Hayward* dated 18/9/2018
- Campbelltown Local Environmental Plan 2015
- Flora and Fauna Assessment, 2018 prepared by *Travers bushfire & ecology*
- *Nearmap* aerial photography
- Topographical maps *DLPI of NSW* 1:25,000
- *Australian Standard 3959 Construction of buildings in bushfire-prone areas*
- *Planning for Bush Fire Protection 2006 (PBP)*
- *Community Resilience Practice Notes 2/12 Planning Instruments and Policies.*

A site inspection was undertaken by Nicole van Dorst on 11th November 2017 to assess the topography, slopes, aspect, drainage, vegetation and adjoining land use. The identification of existing bushfire measures and a visual appraisal of bushfire hazard and risk were also undertaken.

1.4 Site description

The site is located at Lot 71 DP 706546, 71 St Andrews Rd, Varroville (refer Figure 1.3). It is situated to the north-east of the exiting St Andrews Road and to the west of Sydney Water Canal within the local government area (LGA) of Campbelltown.

The surrounding land to the north and west has been recently subdivided forming part of an urban release area.

Table 1.1 provides a summary of the planning, cadastral, topographical, and disturbance details of the subject site.

Table 1.1 – Site features

Location	71 St Andrews Road, Varroville
Local government area	Campbelltown
Grid reference	297400E 6237200N
Topography	Situated on a mostly flat landscape with a very gentle rise to the south-east of the site along Andrews Road.
Vegetation	Where present, native vegetation has an open woodland structure. Trees are around 15-25m tall in most areas, there is a limited mid-storey or nil, and a ground layer of grasses and forbs. The vegetation is modified throughout the study area due to previous clearing and continued grazing and cultivation processes.
Existing land use	Cattle grazing/managed
Clearing	The understorey has been previously cleared for indicated land uses.

Figure 1.3 – Aerial appraisal

1.5 Legislation and planning instruments

1.5.1 Environmental Planning and Assessment Act 1979 (EP&A Act) and bushfire prone land

The *EP&A Act* governs environmental and land use planning and assessment within New South Wales. It provides for the establishment of environmental planning instruments, development controls and the operation of construction controls through the *Building Code of Australia (BCA)*. The identification of bushfire prone land is required under Section 10.3 of the *EP&A Act*.

Bushfire prone land maps provide a trigger for the development assessment provisions. The proposed rezoning is located on land that is mapped by *Campbelltown Council* as being bushfire prone (refer Figure 1.4).

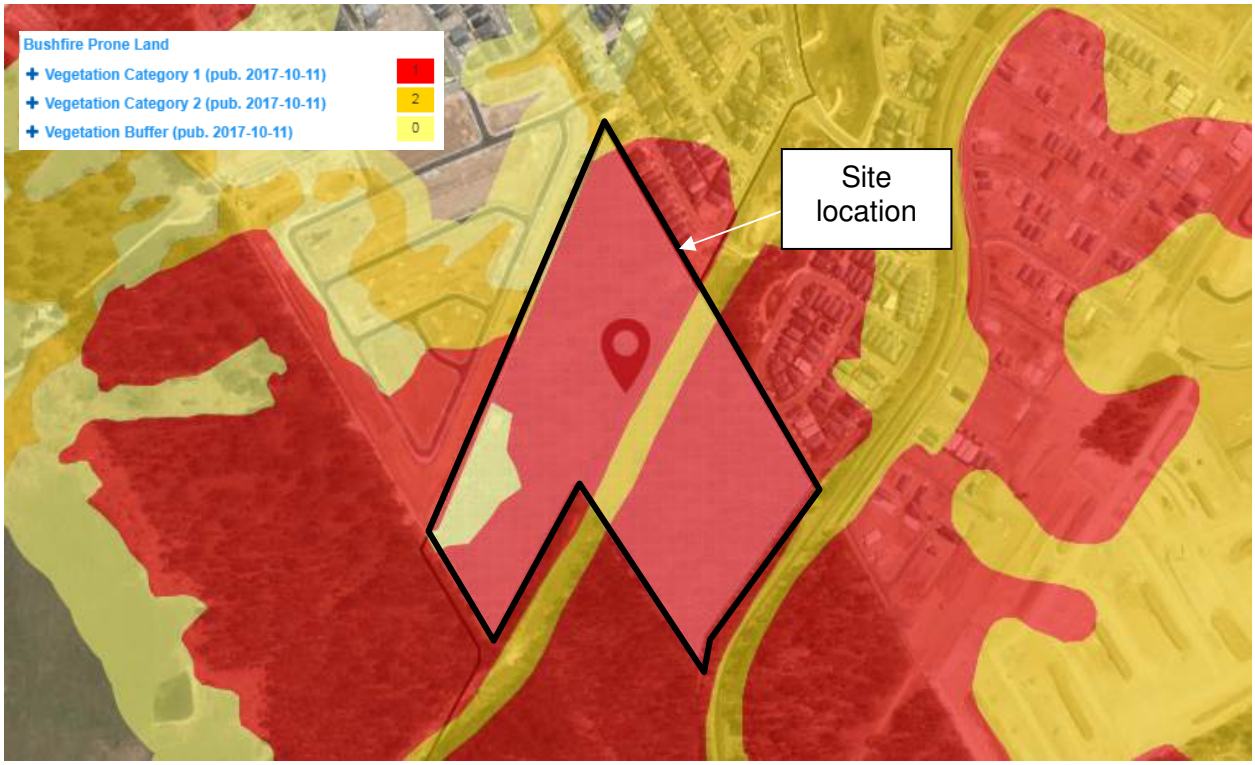


Figure 1.4 – Bushfire prone land map
(Source: Campbelltown Council)

PBP (pg 4) stipulates that if a proposed amendment to land use zoning or land use affects a designated bushfire prone area then the Section 117(2) Direction No 4.4 of the *EP&A Act* must be applied. This requires Council to consult with the Commissioner of the RFS and to take into account any comments by the Commissioner and to have regard to the planning principles of *PBP* (detailed within Section 1.5.3).

1.5.2 Local Environmental Plan (LEP)

A LEP provides for a range of zonings which list development that is permissible or not permissible, as well as the objectives for development within a zone.

The proposal is to proceed as an amendment to the current *Campbelltown LEP 2015* as outlined below.

Campbelltown Local Environmental Plan 2015

The site is zoned under the current Campbelltown LEP *2015* as E3 Environmental Management, R2 (refer Figure 1.5). The land surrounding the property to the north and east supports the proposed R2 Low Density Residential as part of the greater East Leppington Precinct Plan.

The proposal seeks to amend the LEP and rezone land to the west of the internal easement as R2 Low Density Residential and to retain the E3 zone within the easement to the water channel in the east.

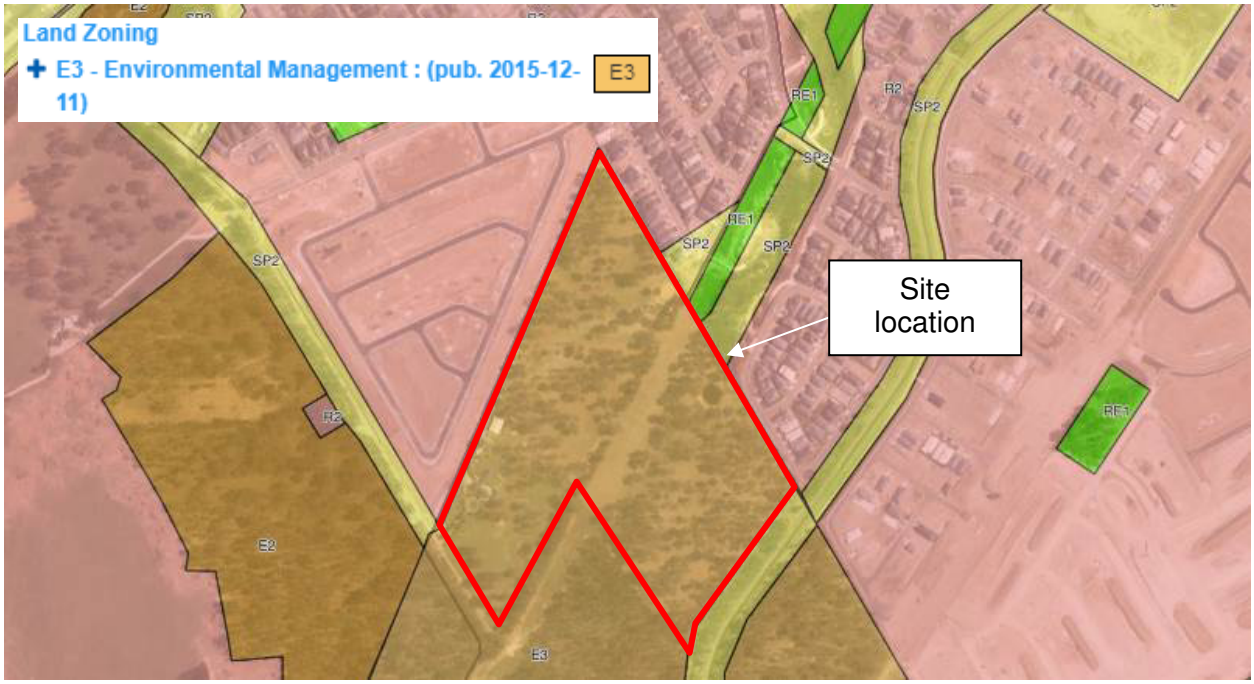


Figure 1.5 – Campbelltown LEP 2015
(Source: Planning Portal website)

The proposal, including the provision of APZs within the proposed R2 & E3 zone would seek to comply with the objectives of the rezoning.

1.5.3 Planning for Bush Fire Protection 2006 (PBP)

Bushfire protection planning requires the consideration of the RFS planning document entitled *PBP. PBP* provides planning principles for rezoning to residential land as well as guidance on effective bushfire protection measures.

The policy aims to provide for the protection of human life (including fire fighters) and to minimise impacts on property and the environment from the threat of bushfire, while having due regard to development potential, on site amenity and protection of the environment.

PBP outlines the following planning principles that must be achieved for all rezoning proposals:

1. Provision of a perimeter road with two way access which delineates the extent of the intended development.

2. Provision, at the urban interface, for the establishment of adequate APZs for future housing.

3. Specifying minimum residential lot depths to accommodate APZs for lots on perimeter roads.

4. Minimising the perimeter of the area of land interfacing the hazard, which may be developed.

5. Introduction of controls which avoid placing inappropriate developments in hazardous areas, and

6. Introduction of controls on the placement of combustible materials in APZs.

In addition to the above, *PBP* outlines the bushfire protection measures required to be assessed for new development in bushfire prone areas.

The proposed rezoning has been assessed in compliance with the following measures to ensure that future development is capable of complying with *PBP*:

- asset protection zones
- building construction and design
- access arrangements
- water supply and utilities
- landscaping
- emergency arrangements

1.5.4 Building Code of Australia (BCA) and the Australian Standard AS3959 Construction in bushfire-prone areas 2009 (AS3959)

The *BCA* is given effect through the *EP&A Act* and forms part of the regulatory environment of construction standards and building controls. The *BCA* outlines objectives, functional statements, performance requirements and deemed to satisfy provisions. For residential dwellings these include Classes 1, 2 and 3 buildings. The construction manual for the deemed to satisfy requirements is *AS3959.*

Although consideration of *AS3959* is not specifically required in a rezoning proposal, this report (Section 3.2) provides the indicative minimum setbacks for each dwelling construction level and can be used in future planning for master plans and / or subdivision proposals.

1.6 Environmental constraints

A flora & fauna report has also been prepared by *Travers bushfire & ecology* (December, 2018). The report outlines that the planning proposal is unlikely to result in a significant impact on any threatened species, populations or EECs or their habitats. The indicative dwelling footprint and associated APZ has been placed to minimise impact on the EEC vegetation.

Bushfire Threat Assessment

2

To assess the bushfire threat and to determine the required width of an APZ for a development, a review of the elements that comprise the overall threat needs to be completed.

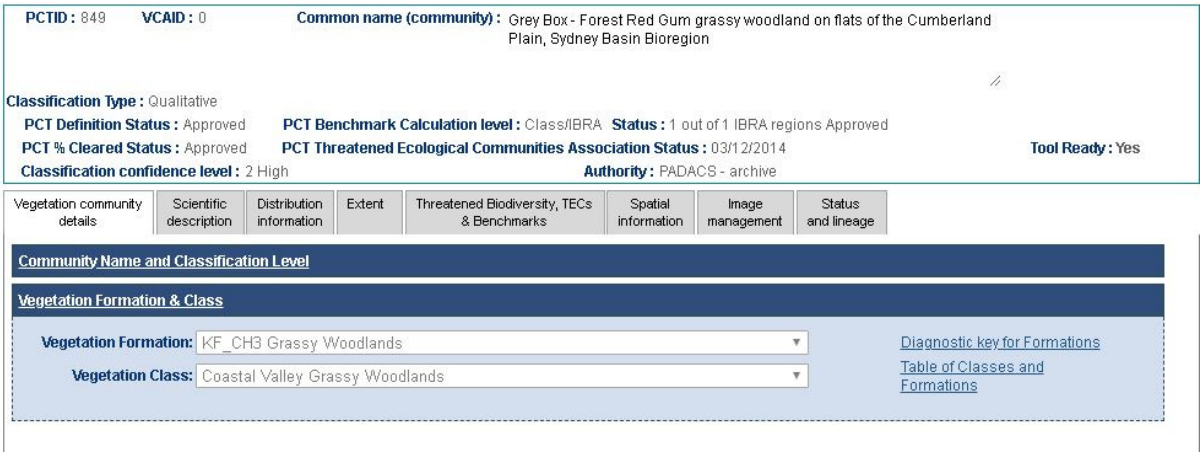
PBP provides a methodology to determine the size of any APZ that may be required to offset possible bushfire attack. These elements include the potential hazardous landscape that may affect the site and the effective slope within that hazardous vegetation.

2.1 Hazardous fuels

PBP guidelines require the identification of the predominant vegetation formation in accordance with David Keith (2004) to determine APZ distances for subdivision developments. The hazardous vegetation is calculated for a distance of at least 140m from a proposed building envelope.

The vegetation posing a bushfire threat to the proposed R2 zoned land includes:

- Woodland vegetation located 6m beyond the site boundary (beyond St Andrews Road) to the west. This community is identified as Plant Community Type (PCT) 849 as detailed below.



- An electrical easement runs parallel within and adjacent to the south-eastern boundary of the proposed R2 zoned land. A portion of this area (within the site currently consists of cleared / managed land (photo 2). For the purposes of this report a 'short heath' threat has been used based on the *TransGrid* - Easements and Access Track Maintenance Policy. The document specifies minimum standards for easement maintenance in order to maintain safe clearances from conductors to vegetation to eliminate the risk of lines causing a bushfire.

Although the vegetation within the easement is currently managed and/or grassland with remnant trees a worst case scenario has been adopted and a 'short heath' vegetation has been used).

Cumberland Plain Woodland (plant community type 849) has been identified within the Flora and Fauna Assessment compiled by *Travers bushfire & ecology* (December, 2018) as occurring beyond the existing electrical easement and within the retained E3 zone in the east. It is envisioned that this vegetation will be retained as part of a Biodiversity Riparian Corridor. This vegetation is not considered the 'predominant' hazardous vegetation to the R2 zoned land as it is located 50m from the proposed subdivision.

A single dwelling entitlement is proposed with the E3 zoned land. An indicative dwelling footprint has been identified within Schedule 1 attached. The bushfire threat posed to the dwelling includes the surrounding woodland vegetation.

The following photographs depict the hazardous vegetation surrounding the site.

Photo 1 – Woodland vegetation to the south-west (beyond St Andrews Road)

Photo 2 – Cleared internal service easement (eastern aspect)

Photo 3 – Electrical easement to the south-east of the property boundary (photo taken looking north from southern corner of R2 zoned land)

Photo 4 – Woodland vegetation within the E3 zone surrounding the proposed single dwelling.

2.2 Effective slope

The effective slope is determined by reviewing the slopes within 100m of the development boundary. Effective slope refers to that slope which provides the most effect upon likely fire behaviour. A mean average slope may not in all cases provide sufficient information such that an appropriate assessment can be determined.

The effective slope within the hazardous vegetation is:

- Level to upslope within the woodland to the south-west
- Level within the 'short heath' associated within the electrical easement in the south-west
- Level to 2 degree downslope surrounding the indicative dwelling footprint within the E3 zone.

2.3 Bushfire attack assessment

A fire danger index (FDI) of 100 has been used to calculate bushfire behaviour on the site using forest vegetation located within the Greater Sydney region.

Table 2.1 below provides a summary of the bushfire attack assessment and the minimum required APZs (equivalent to BAL 29 construction) in compliance with the Appendix 2 of PBP 2006, AS3959 (2009) and the Pre-release PBP 2018.

Table 2.1 – Bushfire attack assessment

Aspect	Vegetation formation within 140m of development	Effective slope of land	Minimum APZ (PBP 2006)	Minimum APZ (AS3959) (refer Note 1)	Minimum APZ Pre-release PBP 2018
Proposed R2 zoned land					
North & west	Managed land & land subject to future development	N/A	N/A	**N/A**	N/A
South-east (within electrical services easement)	Short heath	Level	10	**13**	10
South-west	Woodland	Level to upslope	10	**16 (includes St Andrews Road)**	12
Single dwelling entitlement (E3 zoned land)					
East and south	Woodland	Level to upslope	10	**16**	12
North-west	Woodland	2^0 downslope	15	**18 (refer Note 2)**	16

Note 1: The APZ depicted in Schedule 1 is based on the worst case scenario utilising Method 1 of AS3959 (2009). Using this APZ for future subdivision design will allow for dwelling construction to occur under a complying development application.

Please note that future subdivision design should consider the legislation at the time of the application.

A review has been conducted of Planning for Bush Fire Protection 2006. It is anticipated that PBP 2018 will become legislated by mid – 2019, to coincide with the enactment of the National Construction Code 2019. Until then, PBP 2018 is in a 'pre-release' stage, also known as the transitionary period. Until PBP 2018 becomes legislated, PBP 2006 will remain the legally referenced document. As a result any application for subdivision development which occurs after the Pre-release PBP becomes legislated may require minimum APZ's as outlined in Column 6 above.

Note 2: A performance based assessment using Appendix B of *AS3959* was undertaken to determine the required APZ (equivalent to BAL 29 construction) based on woodland vegetation on a downslope of 2^o. The results of the assessment, provided below, was prepared using the bushfire attack assessor (BFAA) developed by *Newcastle Bushfire Consulting.*

NBC Bushfire Attack Assessment Report V2.1

AS3959 (2009) Appendix B - Detailed Method 2

Printed: 21/12/2017 **Assessment Date:** 20/12/2017

Site Street Address:	71 St Andrews Road, Varroville		
Assessor:	Mr Admin; admin		
Local Government Area:	Campbelltown	**Alpine Area:**	No

Equations Used

Transmissivity: Fuss and Hammins, 2002
Flame Length: RFS PBP, 2001
Rate of Fire Spread: Noble et al., 1980
Radiant Heat: Drysdale, 1985; Sullivan et al., 2003; Tan et al., 2005
Peak Elevation of Receiver: Tan et al., 2005
Peak Flame Angle: Tan et al., 2005

Run Description: North

Vegetation Information

Vegetation Type:	Woodland	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	2 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	15	**Overall Fuel Load(t/ha):**	25

Site Information

Site Slope	2 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	18

Fire Inputs

Veg./Flame Width(m):	100	**Flame Temp(K)**	1090

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100

Program Outputs

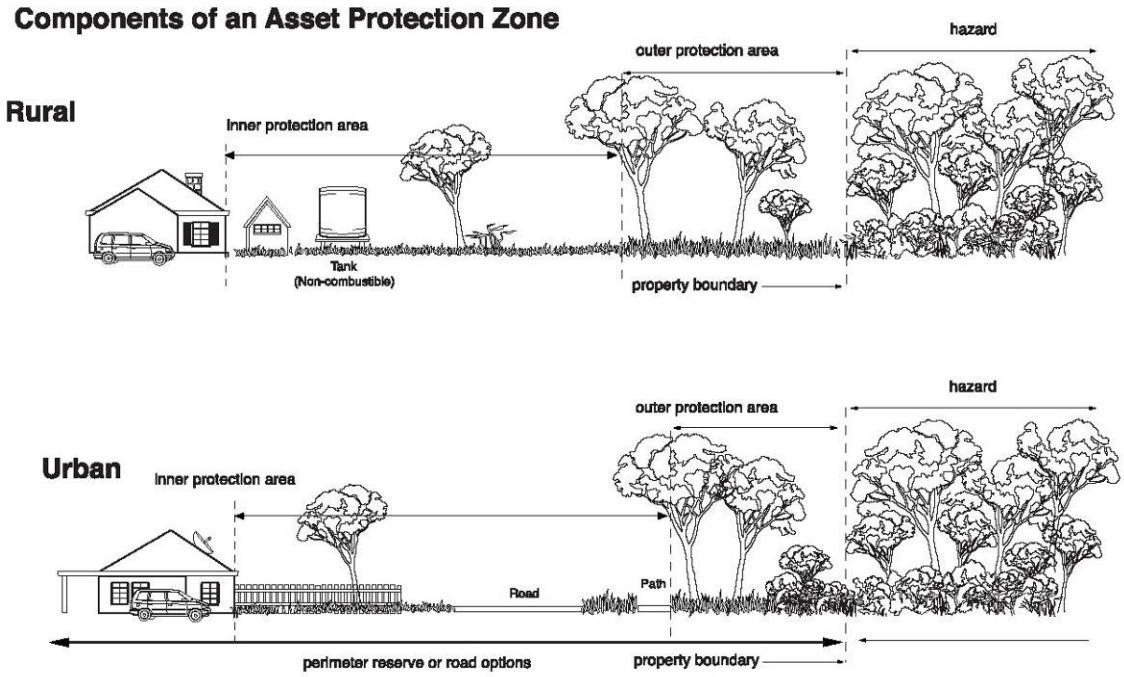
Category of Attack:	HIGH	**Peak Elevation of Receiver(m):**	6.76
Level of Construction:	BAL 29	**Fire Intensity(kW/m):**	26690
Radiant Heat(kW/m2):	28.75	**Flame Angle (degrees):**	64
Flame Length(m):	16.43	**Maximum View Factor:**	0.446
Rate Of Spread (km/h):	2.07	**Inner Protection Area(m):**	18
Transmissivity:	0.849	**Outer Protection Area(m):**	0

Specific Protection Issues

3

3.1 Asset protection zones (APZs)

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



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

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

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

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

Performance criteria	Acceptable solutions	Complies
Radiant heat levels at any point on a proposed building will not exceed 29kW/m^2.	APZs are provided in accordance with Appendix 2. APZs are wholly within the boundary of the development site.	Yes - refer Table 2.1.
APZs are managed and maintained to prevent the spread of fire towards the building.	In accordance with the requirements of *Standards for Asset Protection Zones* (*NSW RFS* 2005).	Yes - to be made a condition of consent.
APZ maintenance is practical , soil stability is not compromised and the potential for crown fires is negated.	The APZ is located on lands with a slope of less than 18^o.	Yes - Slopes are less than 18^o.

3.2 Building protection

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

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

Table 3.2 provides an indication of the BALs that are likely to apply for future building construction. These BAL levels are based on Method 1 AS3959 (2009) and can be used to for dwelling construction under complying development (for the proposed R2 portion of the property only). Future dwelling construction within the E3 zone is subject to section 4.14 of the EP&A Act and will need a full bushfire protection assessment report.

As outlined in Section 2.3 Pre-release PBP (2018) has been released. As a result any application for subdivision development which occurs after the adoption of the PBP 2018 (expected mid next year) may require minimum APZ's as outlined in Table 2.1 (Column 6). The APZ and BAL level applicable under the Pre-release PBP are less than those depicted in Schedule 1 attached and Table 3.1 below. As a result BAL levels will be assessed / confirmed prior to building construction stage.

Table 3.2 – Determination of bushfire attack level (BAL)

Aspect	Vegetation formation within 140m of development	Effective slope of land	Minimum APZ (AS3959)	Construction standards
Proposed R2 zoned land				
North & west	Managed land & land subject to future development	N/A	N/A	N/A
South-east (within electrical services easement)	Short heath	Level	13	BAL 29 (13–<19m) BAL 19 (19-<27m) BAL 12.5 (27-<100m)

South-west	Woodland	Level to upslope	16	BAL 29 (16–<24m) BAL 19 (24-<33m) BAL 12.5 (33-<100m)
Single dwelling entitlement (E3 zoned land)				
North South, west and east	Woodland	Level to upslope	16	BAL 29
North	Woodland	2^0 downslope	18	

3.3 Hazard management

Should the development be approved, the owner or occupier of each lot will be required to manage the APZ in accordance with RFS guidelines *Standards for Asset Protection Zones* (RFS, 2005), with landscaping to comply with Appendix 5 of *PBP*.

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

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

3.4 Access for fire fighting operations

The preferred access to the proposed R2 portion of land will be provided via the recently constructed Aqueduct Street in the west. This design does not provide for perimeter roads and follows a similar subdivision design as the adjoining recently approved subdivision to the west. Firefighting access to the adjoining vegetation (under this design) can be provided via the existing St Andrew Road in the south-west and via the existing access tracks under TransGRID maintenance.

Alternatively the main access to the site could potentially be provided via St Andrews Road to the south. This unformed road provides access to Camden Valley Way further north. If this access design is adopted St Andrews Road (for the full length between Camden Valley Way and the subdivision) will need to be upgraded to perimeter road standards (i.e. 8m carriageway which excludes parking).

Table 3.3 outlines the performance criteria and acceptable solutions for future public roads within future subdivision design.

Future access to the proposed single dwelling entitlement within the E3 zoned land will be gained via the Stockland development in the north.

Table 3.3 – Performance criteria for public roads (*PBP* guidelines pg. 20)

Performance criteria	Acceptable solutions
Fire fighters are provided with safe all weather access to structures (thus allowing more efficient use of fire fighting resources).	Public roads are two-wheel drive, all weather roads.
Public road widths and design that allow safe access for fire fighters while residents are evacuating an area.	Urban perimeter roads are two way, that is, at least two traffic lane widths (carriageway 8m minimum kerb to kerb) allowing traffic to pass in opposite directions. Non perimeter roads comply with Table 3.4 below. Perimeter road is linked with the internal road system at an interval of no greater than 500m in urban areas. Traffic management devices are constructed to facilitate access by emergency services. Public roads have a cross fall not exceeding 3^{o}. All roads are through roads. If unavoidable, dead end roads are not more than 200m in length, incorporate a minimum 12m outer radius turning circle, sign posted dead end and direct traffic away from the hazard. Curves of roads (other than perimeter) have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress. The minimum distance between inner and outer curves is 6m. Maximum grades for sealed roads do not exceed 15^{o} and an average grade of not more than 10^{o}. Minimum vertical clearance of 4m above the road at all times.
The capacity of road surfaces and bridges is sufficient to carry fully loaded fire fighting vehicles.	The capacity of road surfaces and bridges is sufficient to carry fully loaded fire fighting vehicles (15 tonnes for reticulated water and 28 tonnes for all other areas). Bridges clearly indicate load rating.
Roads that are clearly sign posted (with easily distinguishable names) and buildings / properties that are clearly numbered.	Public roads >6.5m wide to locate hydrants outside of parking reserves to ensure accessibility to reticulated water. Public roads 6.5-8m wide are No Parking on one side with the hydrant located on this side to ensure accessibility to reticulated water. Public roads <6.5m wide provide parking within parking bays and locate services outside of parking bays to ensure accessibility to reticulated water. One way only public access are no less than 3.5m wide and provide parking within parking bays and locate services outside of parking bays to ensure accessibility to reticulated water.
There is clear access to reticulated water supply. Parking does not obstruct the minimum paved width	Parking bays are a minimum of 2.6m wide from kerb edge to road pavement. No services or hydrants are located within parking bays. Public roads directly interfacing the bushfire hazard are to provide roll top kerbing to the hazard side of the road.

Table 3.4 – Minimum widths for public roads that are not perimeter roads

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

3.5 Water supplies

Town reticulated water supply is available to the property in the form of an underground reticulated water system.

Table 3.5 outlines the performance criteria and acceptable solutions for reticulated water supply.

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

Performance criteria	Acceptable solutions
Water supplies are easily accessible and located at regular intervals.	Reticulated water supply to urban subdivision uses a ring main system for areas with perimeter roads. Fire hydrant spacing, sizing and pressures comply with AS2419.1 - 2005. Where this cannot be met, the RFS will require a test report of the water pressures anticipated by the relevant water supply authority. In such cases, the location, number and sizing of hydrants shall be determined using fire engineering principles. Hydrants are not placed within any road carriageway. All above ground water and gas pipes external to the building are metal, including and up to taps. The provisions of parking on public roads are met.

3.6 Gas

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

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

Performance criteria	Acceptable solutions
Location of gas services will not lead to the ignition of surrounding bushland land or the fabric of buildings	Reticulated or bottled gas bottles are to be installed and maintained in accordance with AS1596 (2002) and the requirements of relevant authorities. Metal piping is to be used. All fixed gas cylinders are to be kept clear of flammable materials to a distance of 10m and shielded on the hazard side of the installation. If gas cylinders are to be kept close to the building the release valves must be directed away from the building and at least 2m away from any combustible material, so that they do not act as a catalyst to combustion. Connections to and from gas cylinders are metal. Polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not to be used

3.7 Electricity

Table 3.7 outlines the required performance criteria for electricity supply.

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

Performance criteria	Acceptable solutions
Location of electricity services limit the possibility of ignition of surrounding bushland or the fabric of buildings Regular inspection of lines in undertaken to ensure they are not fouled by branches.	Where practicable, electrical transmission lines are underground Where overhead electrical transmission lines are proposed: • Lines are installed with short pole spacing (30m), unless crossing gullies, gorges or riparian areas: and • No part of a tree is closer to a power line than the distance set out in accordance with the specification in *Vegetation Safety Clearances* issued by *Energy Australia* (NS179, April 2002).

Conclusion & Recommendations

4

4.1 Conclusion

A bushfire protection assessment has been undertaken for the proposed rezoning and future residential subdivision of Lot 71 DP 706546, 71 St Andrews Rd, Varroville. This updated report takes into consideration the proposed change of location for the dwelling within the E3 zone and proposed alternative egress point via St Andrews Road.

Our assessment found that bushfire can potentially affect the site from the woodland vegetation located beyond St Andrew Road to the south-west and the potential short heath associated with the electrical services easement adjoining the proposed R2 zoned land to the south-east resulting in possible ember attack, radiant heat and potentially flame attack.

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

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

Table 4.1 – Planning principles

Planning principles	Recommendations
Provision of a perimeter road with two way access which delineates the extent of the intended development.	In this circumstance the preferred access design (via Aqueduct Street) does not allow for a perimeter road. This concept follows a similar subdivision design as the recently approved land to the west where St Andrews Road provides firefighting access to adjoining woodland vegetation. Alternatively if St Andrews Road is adopted as the main access point this road will need to be upgraded to an 8m carriageway and will form a perimeter road for the proposed subdivision and adjoining land to the west.
Provision, at the urban interface, for the establishment of adequate APZs for future housing.	APZs have been recommended in compliance with BAL 29 (AS3959, 2009).
Specifying minimum residential lot depths to accommodate APZs for lots on perimeter roads.	Future subdivision design is to allow for the minimum APZs as recommended within Table 2.1 and as depicted within Schedule 1 attached.
Minimising the perimeter of the area of land interfacing the hazard, which may be developed.	Compliant.
Introduction of controls which avoid placing inappropriate developments in hazardous areas.	Future development consists of residential dwellings and is appropriate for the level of bushfire risk.
Introduction of controls on the placement of combustible materials in APZs.	Compliant – can be made a condition of consent.

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

4.2 Recommendations

Recommendation 1 - APZs are to be provided to the future residential development. APZs are to be measured from the exposed wall of any dwelling toward the hazardous vegetation. The minimum APZ must be achievable within all lots fronting the bushfire hazard as nominated in Table 2.1 and also as generally depicted in Schedule 1.

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

Recommendation 3 – Public access roads are to comply with the acceptable solutions provided within Section 4.1.3 (1) of *PBP* (refer Section 3.4 of this report) for internal roads.

Recommendation 4 – Water, electricity and gas supply is to comply with the acceptable solutions as provided within Section 4.1.3 of *PBP* (refer Sections 3.5, 3.6 and 3.7 of this report).

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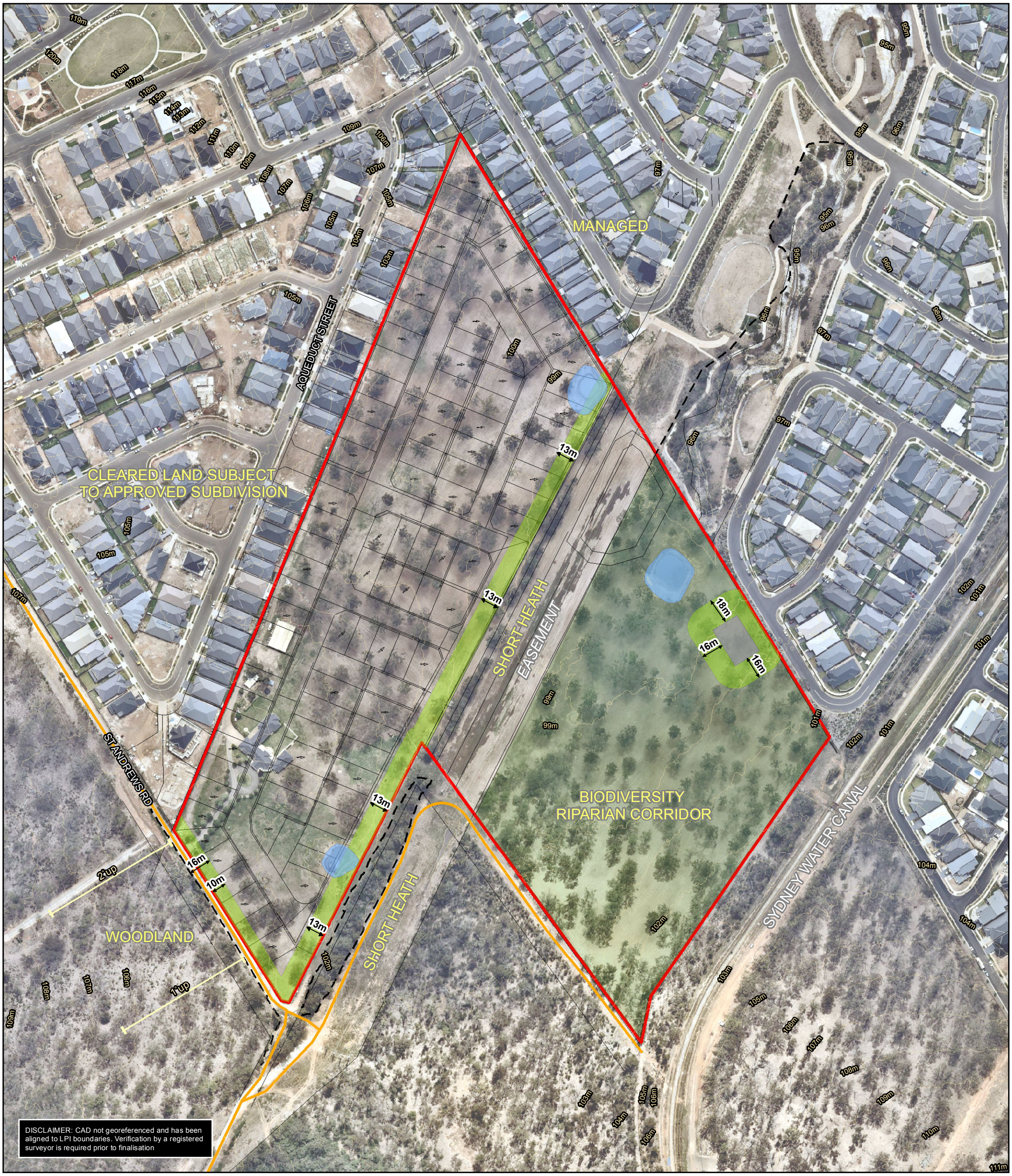
Plan of Bushfire Protection Measures

S1



Legend

- Lot boundary (source: LPI)
- Contours 1m (source: LiDAR)
- Biodiversity corridor
- Easement
- Edge of vegetation
- Exisiting external access
- Indicative dwelling footprint (20x30m)
- Asset Protection Zone (APZ)

Aerial source: Nearmap

Travers bushfire & ecology
www.traversecology.com.au

PROJECT & MXD REFERENCE	DATE & ISSUE NUMBER	SCALE & COORDINATE SYSTEM
71 St Andrews Road, Varroville 18GAT03_BF001	20/12/2018 Issue 1	1:2,500 @ A3 GDA 1994 MGA Zone 56

0 50 100 m

TITLE

Schedule 1 - Bushfire Protection Measures

Document Path: N:\GIS STORAGE\N Drive\A17179_StAndrewsRd_Varroville\MXDs\18GAT03_BF001.mxd

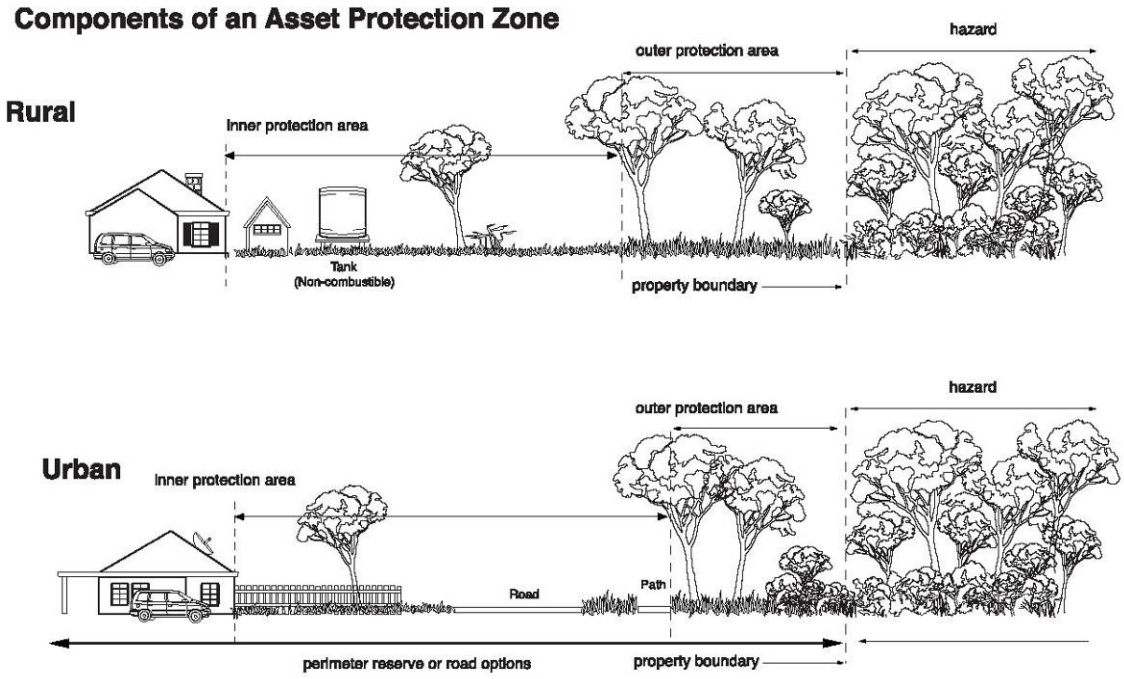
Disclaimer: The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered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

Management of Asset Protection Zones

A1

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

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



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

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

The following provides maintenance advice for vegetation within the IPA.

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

Trees are to be maintained to ensure;

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

- Tree canopies (at maturity) should be well spread out and not form a continuous canopy
- Lower limbs should be removed up to a height of 2m above ground
- Preference should be given to smooth barked and evergreen trees

Shrubs are to be maintained to ensure;

- Large discontinuities or gaps in vegetation
- Shrubs should not be located under trees
- Shrubs should be in clumps no greater than $5m^2$
- Shrubs should not form more than 10% of ground cover
- Clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation.

Grass is to be maintained to ensure:

- A height of 10cm or less
- Leaves and debris is removed.

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

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