Bushfire Assessment and Recommendations

Proposed Development
Medium Density Residential Development
Lot 1115 DP 2475
185 Fifth Avenue
Austral NSW 2179

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Introduction

The following report has been commissioned by GM Architects, here in '*the proponent*', to provide a Bushfire Assessment and Recommendations for bushfire safety and design compliance for the proposed medium density residential development of **Lot 1115 DP 2475** – 185 Fifth Avenue, Austral NSW 2179 (Liverpool City Council Local Government Area), herein '*the subject property'* or *'subject development*'.

The development application involves the construction of a residential flat building within a single existing rural residential allotment. The site is proposed to contain 222 individual residential flats within 2 separate buildings. Each of these 2 residential flat buildings will contain 2 individual towers, connected by a common basement carpark. The appearance from street level will be that of 4 separate buildings over ≤5 levels above ground, with a basement carpark (over 2 levels underground).

This assessment considers the subject development site on the basis of;

- A site-specific inspection undertaken on the 10/5/2017,
- An analysis of the DA Plans as prepared by GM Architects, Homebush West (Project No, 16826, Drawing Nos. a101 – a106 / a200 – a208 / a300 – a301 / a400, Issue B, Dated 26/07/2017); &
- A desktop assessment using licensed or on-line spatial data resources available at the time of this report.

The subject property has been identified as being within, or bounded by, bush fire prone land. In this regard, the NSW legislative requirements for building, or land subdivision development on bush fire prone lands is applicable.

Considering the subject development as being 'integrated development', it has been assessed against the requirements and principals (aim and objectives) as outlined in the NSW document *'Planning for Bushfire Protection (PBP), 2006'.*

PBP states;

'*The aim of PBP is to use the NSW development assessment system to provide for the protection of human life (including firefighters) and to minimise impacts on property from the threat of bush fire, while having due regard to development potential, on-site amenity and protection of the environment.*

More specifically, the objectives are to:

(i) afford occupants of any building adequate protection from exposure to a bush fire;

(ii) provide for a defendable space to be located around buildings;

(iii) provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent direct flame contact and material ignition;

(iv) ensure that safe operational access and egress for emergency service personnel and residents is available;

(v) provide for ongoing management and maintenance of bush fire protection measures, including fuel loads in the asset protection zone (APZ); and

(vi) ensure that utility services are adequate to meet the needs of firefighters (and others assisting in bush fire fighting).'

This assessment includes an analysis of the potential (persisting) bushfire hazard extent and threat to the subject development and recommends standards and bush fire mitigation measures that should be introduced to address the objectives of PBP 2006.

Bushfire safety compliance, as purported by this report, for the subject development site comprises a package of *measures in combination* including asset protection zones, vehicle access and egress, construction standards & fire fighting water supplies as applicable.

The above measures have been derived from provisions and recommendations as outlined within the document *'Planning for Bushfire Protection 2006'*.

The following bushfire assessment has been prepared in accordance with the *NSW Rural Fires Regulation 2002, Clause 44 - Application for a Bushfire Safety Authority.*

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1.0 Description of the property

1.1 Lot and deposited plan (DP) number of the subject property

Lot: **1115** DP: **2475**

1.2 Street address and locality map

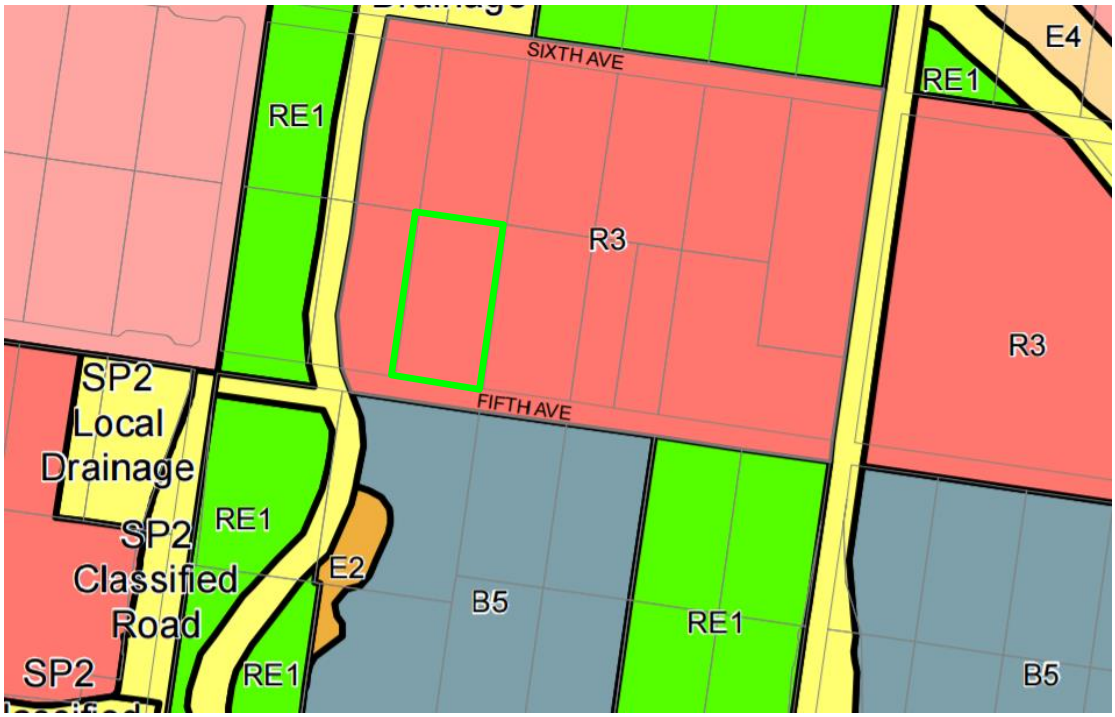
185 Fifth Avenue, Austral NSW 2475. Locality map is as denoted in attached map 1.

1.3 Zoning of the subject land and any adjoining lands

The subject property is zoned 'R3 – Medium Density Residential' (SEPP – SRGC 2006). Adjoining allotments to the North, East & West are zoned similarly, to support ongoing medium density residential growth. Adjacent allotments to the South are zoned B5 – Business Development. All zoning is in line with the area being a major regional growth centre.

To allow for local infrastructure a drainage line is located West of the subject site, zoned 'SP2 Infrastructure (Drainage)' and beyond this is an area zoned 'RE1 – Public Recreation'.

The site also adjoins the Fifth Avenue road reserve to the South.



Extract SEPP (SRGC 2006)

1.4 Staging issues, if relevant, and description of the whole proposal

Description of the whole proposal

The site currently contains single level residential dwelling and a number of ancillary structures (sheds, carports etc.) and associated infrastructure.

The site has direct access to the public road system. It is not initially proposed to alter this access arrangement as part of this development. All new residential flat buildings will also be accessed directly from the public road system, by way of sealed all weather driveways.

The site forms part of the approved regional growth center as noted within *'SEPP (Sydney Regional Growth Centre's) 2006' – South West Growth Centre*.

The development application involves the construction of a series of residential flat buildings within a single existing rural residential allotment. The site is proposed to contain 222 individual residential flats within 2 separate buildings.

Each of these 2 residential flat buildings will contain 2 individual towers, connected by a common basement carpark. The appearance from street level will be that of 4 separate buildings over ≤5 levels above ground, with a basement carpark (over 2 levels underground). Public access to the residential flats will be from both Fifth Avenue, and along the new road located within the Eastern boundary.

As such, a public road will also be partially constructed (i.e. half road width 6.6m pavement) within the subject site, along the Eastern boundary (as per the DCP provisions), along with the upgrade to Fifth Avenue, along the Southern boundary (half road width and associated drainage etc.).

In relation to the public road design, the current development plan provides an integrated approach, to facilitate the seamless transition to residential development amongst all adjoining lots, as per the *'Liverpool City Council Growth Centre Precincts DCP 2016 – Schedule 1 Austral & Leppington North Precincts'*.

Extract - Indicative Layout Plan – Austral & Leppington North Precinct

The construction of the 2 separate residential unit buildings (within 4 towers) is proposed as part of this Development Application. This requires a separate assessment, under *s79BA* of the *EP&A Act 1979,* to determine relevant bushfire construction requirements – Bushfire Attack Levels. This assessment also forms part of this Bushfire Assessment.

Staging Issues (temporary and reciprocal asset protection zone easements / agreements)

For the purposes of bushfire safety compliance, the subject development will not rely on any temporary / reciprocal asset protection zone (APZ) easement / agreement on some adjoining lands.

1.5 Aerial or ground photographs of the subject land, existing and proposed cadastre

An ortho-photo and boundary overlay of the subject property is as shown attached Map 1. Ground / site photos (captured 10/5/2017) of the subject property, neighbouring lands and existing public access roadway are appended to this report (Appendix 1).

Contours as shown / considered by this report are derived from the Department of Lands SIX Viewer Digital Elevation Model (DEM) data (10m Contour Interval).

The proposed cadastral boundaries are as denoted in attached map 2.

2.0 Classification of vegetation out to 140m from the development

2.1 Structural description consistent with the identification key in Keith D (2004) and PBP

Vegetation extent (bushfire hazard) within the study area is derived from aerial photo interpretation (API), a desktop review of local vegetation classification mapping and an inspection of the subject property.

The subject property has been mapped as bush fire prone land within the Liverpool City Council Bush Fire Prone Land Map. The property is currently constrained by bush fire vegetation, within the study area, classified as 'Vegetation Category 1'.

The local bushfire map only shows the current extent of vegetation within the study area, and does not account for the planned regeneration/repatriation of the drainage line that will generally run parallel to the Western boundary of the subject site (within the Western section of the adjacent site – 195 Fifth Avenue), then joining the existing mapped vegetation, further to the South, within 184 Fifth Avenue. The regeneration of this drainage line, with riparian vegetation, will see the extent of the vegetation' extend as a thin strip, to the North of its current location.

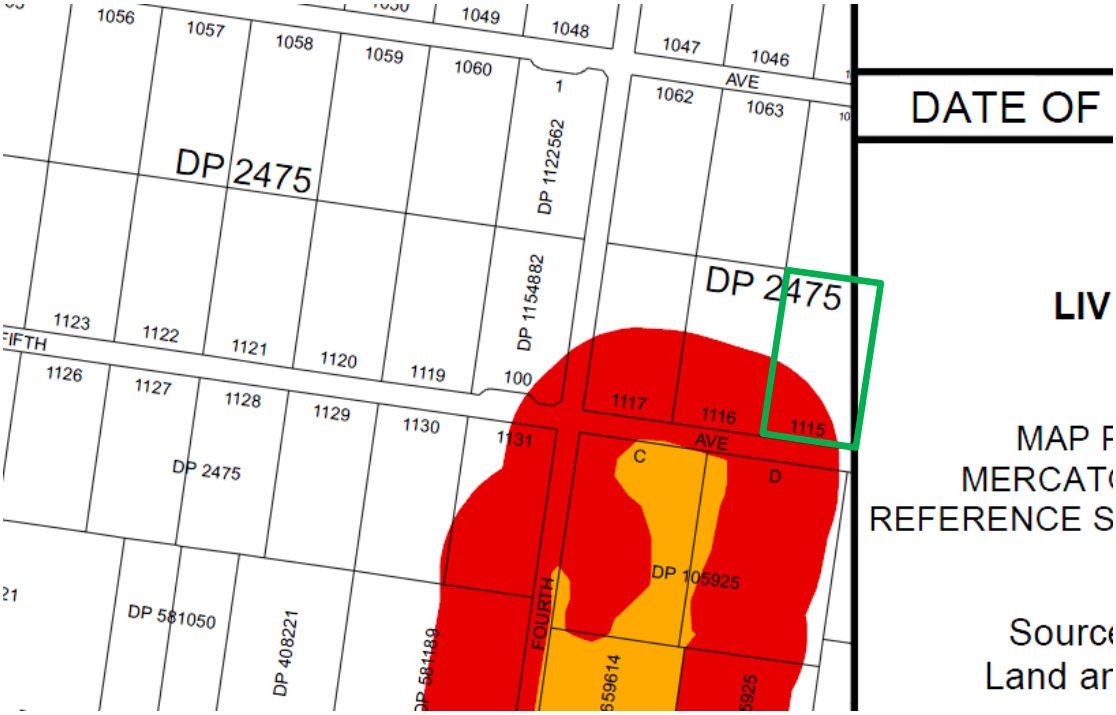
This drainage line continues beyond Fifth Avenue, to the South, where it becomes 'Category 1 Vegetation'.

Apart from this regenerating drainage line, the subject site, and all adjacent sites, are currently clear of persistent bushfire vegetation, and could be considered as 'cleared & managed lands'.

The vegetation within the drainage line, to the South West of the subject site, has been assessed in local planning studies as 'Sydney Coastal Riverflat Forest - Alluvial Woodlands'.

Areas within, and directly adjacent to this drainage line are considered to be 'Riparian Zones'.

Some individual trees associated with 'Shale Plains Woodlands' are located within the subject site and study area, but most trees within the site will be removed as they are within the building envelope.



Extract Liverpool BFPLM

PBP 2006 states, '*For the purposes of assessment, the following are not considered a hazard or as a predominant vegetation class/ formation and can be included within an asset protection zone:*

> *(a) non-vegetated areas including roads, footpaths, cycle ways, waterways, buildings, rocky outcrops and the like; and*
>
> *(b) reduced vegetation including maintained lawns, golf course fairways, playgrounds or sports fields, vineyards, orchards, cultivated ornamental gardens and commercial nurseries.*

Considering the above, this report notes that adjoining rural residential properties are generally considered 'managed lands'.

The subject development also adjoins a managed road reserve (Fifth Avenue).

Based on a determination of vegetation formation using the Keith 2004 Identification Key, the vegetation which constrains the subject development to the South West within the regenerating drainage line, based on available information and a site visit, is most representative of a remnant of 'Sydney Coastal Riverflat Forest – Alluvial Woodland'.

This vegetation will be assessed as equivalent to 'Rainforest' as per Appendix 2 - A 2.3 a) PBP2006.

It should also be noted that *'Liverpool City Council Growth Centre Precincts DCP 2016 – Schedule 1 Austral & Leppington North Precincts',* contains recommendations for APZ requirements associated with these repatriated riparian zones (Figure 2.7 Page 11 – See Map 4 to rear). The APZ recommendation in this case, being a 10m APZ either side of the drainage line, supports this vegetation assessment.

2.2 Past disturbance factors and any future intended land uses that could alter the vegetation classification in the future

Considering the location of the development site, within a major growth corridor, and the new zoning of adjacent lands, it would be reasonable to suggest that the potential extent of bushfire vegetation that may persist or accumulate adjacent to the subject development site will not increase any further in the future.

Major medium density residential development, and business development, under the local planning legislation (i.e. SEPP SRGC 2006) will continue to see significant development throughout the area, and further reduction in bushfire risk levels in this major growth corridor.

3.0 Assessment of the effective slope to a distance of 100m

Slope analysis (used by this assessment) is derived from 10m grid digital elevation model (DEM) and a general inspection of the subject development site. This includes deriving contours for each 10m change in elevation and the approximate areas of slope / gradient based on PBP slope classes. The effective slope surrounding or affecting the subject development site, primarily influencing bushfire behaviour has been assessed as;

- **Maximum >0 – 5 Degrees Downslope – Falling South to North along drainage line**

4.0 Identification of any significant environmental features

The proponent has not advised of any constraint, restriction or burden over the subject property for the purposes of land development and associated asset protection zone maintenance.

Based on a brief desktop assessment of the subject property, the following table outlines any significant environmental features potentially affected by the subject development.

Table 1.0

	Present within Subject Property	***Present within Study Area***	***Comment***
Native Forest / Vegetation	Yes	Yes	Some native forest vegetation is located adjacent to, and within, the subject development.
Riparian Corridor	No	Yes	Riparian Corridors are located within the study area, but not within the subject site.
SEPP 14 – Wetland	No	No	
SEPP 26 – Littoral Rainforest	No	No	
SEPP 44 – Koala Habitat	No	No	
Areas of Geological Interest	Undetermined	Undetermined	
Environmental Protection Zones	Yes	Yes	The drainage lines are noted within the local Development Control Map
Steep Lands (>18°)	No	No	
Land Slip Area	No	No	
Flood Prone Area	Yes	Yes	The drainage lines are noted within the local Development Control Map
National Park / State Forest	No	No	

5.0 Details of threatened species, populations, endangered ecological communities and critical habitat known to the applicant

Some vegetation within the study area is mapped as 'Alluvial Woodlands' and 'Shale Plains Woodlands'.

These are listed as threatened ecological communities under the *NSW Threatened Species Conservation Act 1995.* The drainage lines are listed within the local *'Native Vegetation Retention Area Map'*.

No other known threatened species, populations or ecological communities identified under the *NSW Threatened Species Conservation Act 1995* have been noted, recorded or advised of as part of this assessment.

For the purposes of this assessment, the proponent has not provided, nor indicated there to be any other threatened species issues or occurrence potentially affecting the subject land / development.

6.0 Details of Aboriginal heritage known to the applicant

No known Aboriginal relics (being a relic within the meaning of the *NSW National Parks and Wildlife Act 1974*) or Aboriginal place (within the meaning of that Act) have been noted, recorded or advised of as part of this assessment.

For the purposes of this assessment, the proponent has not provided nor indicated there to be any items or issues of Aboriginal heritage potentially affecting the subject property / development.

Likewise, this assessment has not considered any past studies, surveys for the area or any documentation supplied to council in relation to any items or issues of Aboriginal heritage potentially affecting the subject property / development.

7.0 Bushfire assessment (including methodology)

Methodology for this site assessment for bushfire attack and recommended mitigation measures (setback distances and construction standards) are based on Appendix 2 of PBP 2006. Minimum required asset protection zones and other recommended setback measures for bushfire protection are derived from distances outlined by PBP for a residential subdivision development within an **FDI 100** Fire Area (PBP Appendix 2 – A2.4).

The Liverpool City Council LGA is designated as potentially having an **FDI** of **100** as a 1:50 year event (PBP Appendices 2 – Table A2.3).

8.0 Asset protection zones (including any management arrangements or easements including those contained on adjoining lands)

The minimum specified APZ / setback required for the above parameters of slope and vegetation as determined from PBP 2006 (for a 'Residential Subdivision Development' Table A2.4) for the building siting from any persisting and available bushfire vegetation (hazard) within the study area are as follows.

Table A2.4 Appendix 2 PBP 2006

Direction	Vegetation	Minimum APZ Distance	Slope	k/Wm^2
West	Riparian (Remnant)	10m (Actual 66m)	>0 – 5 Degrees Downslope	29
South West	Riparian (Remnant)	10m (Actual 53m)	>0 – 5 Degrees Downslope	29

PBP 2006 acceptable solutions for APZ compliance require that;

- *an APZ is provided in accordance with the relevant tables / figures [within PBP 2006],*
- *the APZ is wholly within the boundaries of the development site, &*
- *the APZ is located on lands with a slope less than 18 degrees*.

Considering the above, the subject development site can reasonably facilitate the specified minimum APZ / setback from potentially unmanaged and persisting bushfire vegetation, located to the West – South West of the subject development site.

Where the minimum specified APZ distance extends beyond the boundary of the subject development site, the adjoining land is a managed lands and a road reserve.

9.0 Siting & adequacy of water (in relation to reticulation rates or where dedicated water storage will be required)

The subject development site is currently connected to a reticulated town water supply which services the residential building development along Fifth Avenue. Apart from the above, the proponent has not provided any specific advice (at the time of this assessment) regarding proposed reticulated water infrastructure and mains size, supply pressure or guarantee of delivery.

This report notes a number of hydrant connection points within Fifth Avenue and reticulated mains, which will serve to supply water to the proposed development sites.

All future residential buildings within the proposed allotments will be required to be <**90 m** from the nearest and reasonably available fire hydrant connection, in terms of PBP 2006 Section 4.1.3. PBP acceptable solutions for a reticulated water supply area (relevant to the subject development) states that:

- *fire hydrant spacing, sizing and pressures comply with AS 2419.1 – 2005. Where this cannot be met, the RFS will require a test report of the water pressures anticipated by the relevant water supply authority, once development has been completed. In such cases, the location, number and sizing of hydrants shall be determined using fire engineering principles.*
- *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.*

Based on AS2419 requirements, hydrant connection points;

- fed by mains supply only, should be located so as to be **no greater than 90m** from the furthest most point of buildings or areas that may require protection or water supply during a fire event

It is recommendation of this assessment that all future services (including water supply) to the proposed residential subdivision are to achieve full compliance with *Section 4.1.3 'Standards for Bushfire Protection Measures for Residential and Rural Residential Subdivisions (PBP 2006)'.*

In addition, the development will be required to achieve compliance with the general fire safety provisions of the BCA for these building types, including firefighting provisions (e.g. internal hydrant systems, brigade booster systems etc. as required).

10.0 Capacity of public roads (especially perimeter roads and traffic management treatments)

The proposed Southern building (known as buildings A & B) will be accessed directly off Fifth Avenue, by a sealed all weather driveway, which complies with AS 2890 Parts 1, 2 & 6 and the local DCP.

The proposed Northern building (known as buildings C & D) will be accessed directly off a new public road, running along the Eastern boundary, by a sealed all weather driveway, which complies with AS 2890 Parts 1, 2 & 6 and the local DCP.

Both underground car parking facilities provide for onsite access for a 'Large Rigid Vehicle' – as per AS 2890.

An additional road will be constructed in the future beyond the Northern & Western boundaries, allowing for an integrated approach, to facilitate the seamless transition to residential development amongst all adjoining lots, in due course, as per the *'Liverpool City Council Growth Centre Precincts DCP 2016 – Schedule 1 Austral & Leppington North Precincts Plan'.*

Fifth Avenue, to the South, will be constructed to a width of approximately 11m (verge – verge, with formed carriageway), two-way access with constructed roadside drainage and verge areas either side. The maximum speed limit along Fifth Avenue is 60 kph.

The proposed new road (along the Eastern boundary), will only be partially constructed at this stage (i.e. half road width 6.6m pavement), and will be required, by Council, to provide temporary turning circles at the termination points, until adjacent properties are developed and the remainder of the road width is constructed.

However, given the location of the main bushfire risk (to the South West of the buildings), and the internal BCA general fire safety provisions associated with this type of development (e.g. specifically internal fire hydrant and hose reel system), firefighting appliances would operate only from Fifth Avenue.

As a considered opinion, all existing and proposed public roadways servicing the subject development site should have the capacity to handle an increase in traffic associated with the subject development and a potential bushfire emergency.

11.0 Public roads link to fire trails and have two-way access

The subject development site does not propose nor necessarily require any fire trail access to service the subject development site.

12.0 Adequacy of access and egress for emergency response

The subject development is to be accessed directly off the existing, and proposed, public road system. There will be no new internal roads, just short sealed driveways, accessing the underground basement car parks, which will provide egress for evacuating residents.

PBP acceptable solutions for property roads (for this specific development location) states that;

'*No specific access requirements apply in an urban area where a 70m unobstructed path can be demonstrated between the most distant external part of the proposed dwelling and the nearest part of the public access road (where the road speed limit is not greater than 70kph) that supports the operational use of emergency firefighting vehicles (i.e. a hydrant or water supply)'.*

13.0 Adequacy of maintenance plans and emergency procedures

No additional advice or information regarding bushfire maintenance plans & fire emergency procedures has been provided by the proponent. Should a bushfire emergency impact upon this area, the implementation of the existing *'Liverpool Local Emergency Management Plan'* should be adequate for bushfire suppression, hazard management and maintenance.

The implementation, and on-going future maintenance, of building construction standards described and recommended section *14.0 (Construction standards to be used)* and APZ areas as described section *8.0 (APZ)* should reasonably facilitate bushfire maintenance for the subject development.

14.0 Construction standards to be used

Based on the above assessment and APZ recommendations stated by this report, the subject development site **will** provide sufficient separation for the proposed residential dwellings to comply with BCA DTS provisions or otherwise the application of AS3959-2009.

The site methodology used for this assessment is based on Addendum: Appendix 3 of PBP 2010. This addendum requires a conversion of vegetation classification from David Keith to the AUSLIG Pictorial Analysis in AS3959-2009. This addendum requires a conversion of vegetation classification from David Keith to the AUSLIG Pictorial Analysis in AS3959-2009. Based on this conversion **'Riparian Vegetation'** converts to **'Rainforest'**.

In terms of establishing the construction levels relevant to the proposal, each building has been considered for this assessment as single free standing building. The following table illustrates the relevant construction levels required for the proposal.

Table 2.0

Building A

Building Elevation	Vegetation	Slope	Direction	Separation	Construction Level
All Elevations	Remnant/ Riparian (Rainforest)	>0 – 5 Degrees Downslope	West	Min. 106m	**BAL 12.5**
			South West	Min. 90m	

Building B

Building Elevation	Vegetation	Slope	Direction	Separation	Construction Level
All Elevations	Remnant/ Riparian (Rainforest)	>0 – 5 Degrees Downslope	West	Min. 66m	**BAL 12.5**
			South West	Min. 53m	

Building C

Building Elevation	Vegetation	Slope	Direction	Separation	Construction Level
All Elevations	Remnant/ Riparian (Rainforest)	>0 – 5 Degrees Downslope	West	Min. 66m	**BAL 12.5**
			South West	Min. 111m	

Building D

Building Elevation	Vegetation	Slope	Direction	Separation	Construction Level
All Elevations	Remnant/ Riparian (Rainforest)	>0 – 5 Degrees Downslope	West	Min. 106m	**BAL LOW**
			South West	Min. 136m	

PBP states: *'Where more than one façade is exposed to a hazard, then the façade with the highest construction requirement is used to determine the appropriate level of construction. All other facades may be reduced by one level of construction unless that façade is also subject to the same bush fire attack level'.*

Construction standard recommendations are as listed section 17.0 (Bushfire Safety & Compliance Recommendations).

15.0 Adequacy of sprinkler systems & other fire protection systems

Bushfire sprinkler systems are neither recommended nor necessarily required for the subject development site (based on the recommended building safety designs and siting as considered by this report).

Likewise, no other bushfire related alternate fire protection measures are recommended by this report (over and above AS3959-2009 DTS & PBP requirements).

16.0 An assessment of how the development complies with the acceptable solutions, performance requirements and relevant specific objectives within Chapter 4 of PBP

16.1 Performance criteria / acceptable solution compliance

The following table outlines how the subject development complies with PBP provisions for a residential or rural residential subdivision. Compliance is stated as;

- ***YES*** – the subject development can facilitate the acceptable solution for bushfire safety,
- ***REASONABLY ASSUMED*** – the subject development can reasonably facilitate the acceptable solution for bushfire safety, predicated on assumptions of future design and activities likely to occur,

- ***NOT CONSIDERED*** – the acceptable solution for bushfire safety is considered unnecessary or otherwise overly exceeds the relative risk associated with a bushfire event affecting the subject development. Bushfire safety compliance is based on performance criteria,

- ***NOT APPLICABLE (N/A)*** – the acceptable solution is not applicable to the design or construction of the subject development,

- ***NO*** – the subject development will not facilitate the acceptable solution for bushfire safety compliance. Bushfire safety compliance is based on performance criteria.

Table 3.0 Derived from PBP Chapter 4; 4.1.3 – Standards for Bush Fire Protection Measures for Residential and Rural Residential Subdivision

Performance Criteria	Acceptable Solution	Compliance	Assessment / Comment
Radiant heat levels at any point on a proposed building will not exceed 29 kW/m²	*an APZ is provided in accordance with the relevant tables and figures in PBP*	***Yes***	Compliance as per Rec. No. 1 of this report. Where the minimum specified APZ areas extend beyond the boundary of the proposed allotment, the adjoining land will be road reserves, or managed rural residential allotments.
	the APZ is wholly within the boundaries of the development site	***No***	
Applicants demonstrate that issues relating to slope are addressed: maintenance is practical, soil stability is not compromised and the potential for crown fires is negated	*the APZ is not located on lands with a slope exceeding 18 degrees*	***Yes***	No part of the proposed APZ is located on slopes exceeding 18 degrees.
APZs are managed and maintained to prevent the spread of a fire towards the building	*in accordance with the requirements of 'Standards for Asset Protection Zones (RFS 2005)*	***Yes***	Compliance as per Rec. No. 1 of this report, and a reasonable assumption that future property maintenance and landscaping would ensure APZ areas remained managed / fuel reduced for the life of the proposed development.
Fire fighters 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*	***Yes***	The existing, and proposed new public roads, and the surrounding road infrastructure are two-wheel drive, all weather sealed 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 8 metres minimum kerb to kerb), allowing traffic to pass in opposite directions*	***Yes***	The subject development will incorporate a series of new roadways. The new roadway system will be able to comply with public road requirements.

Performance Criteria	Acceptable Solution	Compliance	Assessment / Comment
	non perimeter roads comply with Table 4.1 – Road widths for Category 1 Tanker (Medium Rigid Vehicle)	***Yes***	The existing public roadway system can reasonably support any increased traffic flow due to operational firefighting or emergency evacuations.
	the perimeter road is linked to the internal road system at an interval of no greater than 500 metres in urban areas	***Yes***	
	roads are through roads. Dead end roads are not more than 200 m in length from a through road, incorporate a minimum 12 m outer radius turning circle, and are clearly sign posted as a dead end	***Yes***	
	traffic management devices are constructed to facilitate access by emergency services vehicles	***Reasonably Assumed***	
	there is a minimum vertical clearance to a height of 4m above the road at all times	***Reasonably Assumed***	
	curves have a minimum inner radius of six metres and are minimal in number to allow for rapid access and egress	***Yes***	
	the minimum distance between inner and outer curves is six metres	***Yes***	
	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.	***Yes***	
	public roads have a cross fall not exceeding 3 degrees	***Yes***	
	the internal road surfaces and bridges have a capacity to carry fully-loaded firefighting vehicles (15 tonnes)	***Reasonably Assumed***	
The capacity of public road surfaces and bridges is sufficient to carry fully loaded fire fighting vehicles ***Roads that are clearly***	*the capacity of road surfaces and bridges is sufficient to carry fully loaded fire fighting vehicles (approximately 15 tonnes for areas with reticulated water, 28 tonnes*	***Reasonably Assumed***	The new public roadway system will be able to comply with public road requirements.

Performance Criteria	Acceptable Solution	Compliance	Assessment / Comment
sign- posted (with easily distinguishable names) and buildings/properties that are clearly numbered	*or 9 tonnes per axle for all other areas). Bridges clearly indicate load rating*		The existing public roadway system can reasonably support any increased traffic flow due to operational firefighting or emergency evacuations.
There is clear access to reticulated water supply	*public roads greater than 6.5 metres wide to locate hydrants outside of parking reserves to ensure accessibility to reticulated water for fire suppression*	***Yes***	Reticulated supply within development area. Hydrants are located on footpath areas and outside of parking reserves.
	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	***N/A***	
	public roads up to 6.5 m wide provide parking within parking bays and locate services outside of the parking bays to ensure accessibility to reticulated water for fire suppression	***N/A***	
	one way only public access roads are no less than 3.5 metres wide and provide parking within parking bays and locate services outside of the parking bays to ensure accessibility to reticulated water for fire suppression	***N/A***	
Parking does not obstruct the minimum paved width	*parking bays are a minimum of 2.6 metres wide from kerb edge to road pavement. No services or hydrants are located within the parking bays*	***Reasonably Assumed***	New public roadway system will be able to comply with public road requirements.
	public roads directly interfacing the bush fire hazard vegetation provide roll top kerbing to the hazard side of the road	***N/A***	
Access to properties is provided in recognition of the risk to fire fighters and/ or evacuating occupants	*at least one alternative property access road is provided for individual dwellings (or groups of dwellings) that are located more than 200 metres from a public through road*	***N/A***	

Performance Criteria	Acceptable Solution	Compliance	Assessment / Comment
The capacity of property access road surfaces and bridges is sufficient to carry fully loaded fire fighting vehicles ***All weather access is provided***	*bridges clearly indicate load rating and pavements and bridges are capable of carrying a load of 15 tonnes*	***N/A***	The current and proposed driveways will be all-weather access, do not require bridges or traverse wetlands etc.
	roads do not traverse a wetland or other land potentially subject to periodic inundation (other than a flood or storm surge)	***Yes***	
Property road widths and design enable safe access for vehicles ***Property road widths and design enable safe access for vehicles***	*Note: No specific access requirements apply in an urban area where a 70m unobstructed path can be demonstrated between the most distant external part of the proposed dwelling and the nearest part of the public access road (where the road speed limit is not greater than 70 kph) that supports the operational use of emergency firefighting vehicles (i.e. a hydrant or water supply.*	***N/A***	Internal driveways can comply with the planning provisions of PBP 2006 S 4.1.3. The road speed limit within the local area is not greater than 70 kph. All public access roads, within the study area, support the operational use of emergency firefighting vehicles (i.e. a hydrant or water supply.
	in forest, woodland and heath situations, rural property access roads have passing bays every 200 metres that are 20 metres long by two metres wide, making a minimum trafficable width of six metres at the passing bay	***N/A***	
	a minimum vertical clearance of four metres to any overhanging obstructions, including tree branches	***N/A***	
	internal roads for rural properties provide a loop road around any dwelling or incorporate a turning circle - minimum 12 m outer radius	**N/A**	
	curves have a minimum inner radius of six metres and are minimal in number to allow for rapid access and egress	***N/A***	
	the minimum distance between inner and outer curves is six metres	***N/A***	
	the cross-fall is not more than 10 degrees	***N/A***	

Performance Criteria	Acceptable Solution	Compliance	Assessment / Comment
	Maximum grades for sealed roads do not exceed 15 degrees and not more than 10 degrees for unsealed roads.	***N/A***	
	access to a development comprising more than three dwellings have formalised access by dedication of a road and not by right of way	***N/A***	
The width and design of the fire trails enables safe and ready access for fire fighting 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*	***N/A***	The subject development does not incorporate nor require any new or redesigned fire trail access.
	the trail is a maximum grade of 15 degrees if sealed and not more than 10 degrees if unsealed	***N/A***	
	a minimum vertical clearance of four metres to any overhanging obstructions, including tree branches is provided	***N/A***	
	the cross-fall of the trail is not more than 10 degrees	***N/A***	
	the trail has the capacity for passing by: *- reversing bays; and/or* *- a passing bay every 200 metres, 20 metres long by three metres wide.*	***N/A***	
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 trail is accessible to fire fighters and maintained in a serviceable condition by the owner of the land*	***N/A***	The subject development does not incorporate nor require any new or redesigned fire trail access.
	appropriate drainage and erosion controls are provided	***N/A***	
	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	***N/A***	
	fire trails do not traverse a wetlands or other land potentially subject to periodic inundation (other than a flood	***N/A***	

Performance Criteria	Acceptable Solution	Compliance	Assessment / Comment
	or storm surge)		
	gates for fire trails are provided and locked with a key/lock system authorised by the local RFS	***N/A***	
Fire trails designed to prevent weed infestation, soil erosion and other land degradation	*fire trail design does not adversely impact on natural hydrological flows*	***N/A***	The subject development does not incorporate nor require any new or redesigned fire trail access.
	fire trail design acts as an effective barrier to the spread of weeds and nutrients	***N/A***	
	fire trail construction does not expose acid-sulphate soils	***N/A***	
(Reticulated water supplies)	*reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads*	***Yes***	Reticulated water supply is located along Fifth Avenue. The development must achieve compliance for reticulated water supplies, as per PBP 2006 4.1.3. All services will also then reasonably achieve the acceptable solutions under s79BA. Hydrants located are to be located within the pathway areas and will be supported by an internal hydrant system.
Water supplies are easily accessible and located at regular intervals	*fire hydrant spacing, sizing and pressures comply with AS 2419.1 – 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*	***Reasonably Assumed***	
	hydrants are not located within any road carriageway	***Yes***	
	all above ground water and gas service pipes external to the building are metal, including and up to any taps	***Reasonably Assumed***	
	the provisions of parking on public roads are met	***Yes***	
(Electricity Services) ***Location of electricity services limits the possibility of ignition of surrounding bushland or the fabric of buildings*** ***Regular inspection of lines is undertaken to ensure they are not fouled by branches.***	*where practicable, electrical transmission lines are underground*	***Reasonably Assumed***	As is the existing practice, any new electrical supplies would be located underground (i.e. to service the development. All services can also achieve the acceptable solutions under s79BA
	where overhead electrical transmission lines are proposed: *- lines are installed with short pole spacing (30 metres), unless crossing gullies, gorges or riparian areas; and*	***Reasonably Assumed***	

Performance Criteria	Acceptable Solution	Compliance	Assessment / Comment
	- no part of a tree is closer to a power line than the distance set out in accordance with the specifications in 'Vegetation Safety Clearances' issued by Energy Australia (NS179, April 2002)		
(Gas Services) ***Location of gas services will not lead to ignition of surrounding bushland or the fabric of buildings***	*reticulated or bottled gas is installed and maintained in accordance with AS 1596 and the requirements of relevant authorities. Metal piping is to be used*	***Reasonably Assumed***	No domestic reticulated gas supply currently services the existing development. Any future gas supply will be installed and maintained in accordance with relevant bushfire planning provisions.
	all fixed gas cylinders are kept clear of all flammable materials to a distance of 10 metres and shielded on the hazard side of the installation	***N/A***	
	if gas cylinders need to be kept close to the building, the release valves are directed away from the building and at least 2 metres away from any combustible material, *so that they do not act as a catalyst to combustion. Connections to and from gas cylinders are metal*	***N/A***	
	polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not used	***N/A***	

Table 4.0 - PBP 2006 specific objective assessment

PBP 2006 Specific Objective	Assessment / Comment
(i) afford occupants of any building adequate protection from exposure to a bush fire	Where all recommendations stated by this report are reasonably and adequately incorporated, occupants remaining within the subject development site during a significant bushfire event would be afforded the benefit of bushfire protection '*measures in combination*'. In this respect, occupants remaining within a dwelling or else defending the dwelling during a potential fire storm should be reasonably protected (shielded) or separated from the effects of a bush fire event.
(ii) provide for a defendable space to be located around buildings	Where all recommendations relating to APZ areas stated by this report are reasonably and adequately incorporated and maintained, the proposed residential building would be afforded a defendable space.

PBP 2006 Specific Objective	Assessment / Comment
	Fire fighters or occupants undertaking property protection activities in and around any future proposed residential buildings should reasonably be afforded protection and separation from radiant heat and an opportunity to quell small ignitions that may occur on or directly adjacent to the residential buildings.
(iii) provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent direct flame contact and material ignition	Where all recommendations relating to AS3959-2009 Construction standards and APZ areas as stated by this report are reasonably and adequately incorporated, the existing and any future proposed residential building should be afforded appropriate separation to prevent direct flame contact and material ignition.
(iv) ensure that safe operational access and egress for emergency service personnel and residents is available	Where all recommendations relating to property roadway access as stated by this report are reasonably and adequately incorporated, emergency services personnel and residents should be afforded safe operational access / egress for the subject development site. The existing public roadway system should safely facilitate access and egress (early evacuation) from the subject development site for emergency services personnel and residents during a bushfire event.
(v) provide for ongoing management and maintenance of bush fire protection measures, including fuel loads in the asset protection zone (APZ)	Where all recommendations relating to AS3959-2009 Construction standards & APZ areas stated by this report are reasonably and adequately incorporated, it would be reasonable to assume regular residential property maintenance would ensure ongoing management and maintenance of bush fire protection measures. Should the standard or upkeep of APZ areas, buildings or vehicle access (required for bushfire safety compliance) become compromised during the life of the subject development site, it would also be reasonable to assume such issues (bushfire hazard) would be addressed by Council or the Fire Authorities through their standard policies and notice procedures.
(vi) ensure that utility services are adequate to meet the needs of firefighters (and others assisting in bush fire fighting)	Where all recommendations relating to fire fighting water supplies as stated by this report are reasonably and adequately incorporated, both emergency services personnel and others assisting in bush fire fighting should safely be able to draw on a water supply for property protection purposes. Similarly, where the installation or connection to electrical services incorporates the associated recommendations as stated by this report, both emergency services personnel and others assisting in bush fire fighting should safely be able to manage any electrical hazards associated during a bushfire event.

17.0 Bushfire Safety & Compliance Recommendations

The following recommendations (Table 5.0) are made for the bushfire safety & protection measures for the proposed residential flat development within 185 Fifth Avenue, Austral NSW 2179. These recommendations are based upon the relevant provisions (acceptable solutions or performance criteria) for future residential building in bushfire prone areas and the NSW Rural Fire Service guideline entitled *Planning for Bushfire Protection 2006.*

Table 5.0 – Bushfire Safety / Compliance Recommendations

No.	PBP Standard	Recommendation
1	**Asset Protection Zone**	*The area indicated (within Appendix 1 - Map 2) is to be maintained as an Asset Protection Zone (**Inner Protection Area**) for the life of the development.*
2	**Building Construction Standard** **(BCA DTS)**	***Buildings A, B & C*** *Based on the assessment given within 14.0 of this report the following construction standards in accordance with AS3959-2009 are recommended:* • *For **All Elevations** of the proposed residential flat buildings: the construction standards outlined within **AS3959-2009 Section 5 (BAL 12.5)** are to be applied.* • *In addition, AS3959 Section 3 'Construction General" is to be applied where relevant, including: 3.2.1 'Attached Structures'.* ***Note**: In line with the NSW variation to AS3959-2009 the additional construction requirements for BAL 12.5 outlined within PBP Addendum: Appendix 3 (A3.7) are to be applied. This section is relevant for any proposed:* • *Sarking*

No.	PBP Standard	Recommendation
		Building D *Based on the assessment given within 14.0 of this report, all new residences within the development site (based on stated building envelopes) must comply with the construction standards outlined within* ***AS3959-2009 Section 4 (BAL – LOW).*** ***Note****: This standard does not provide construction requirements for buildings assessed in bushfire prone areas in accordance with Section 2 as being BAL – LOW.* *The Bushfire Attack Level BAL – LOW is based on insufficient risk to warrant specific bushfire construction requirements.*
3	**Water Supply**	• *Fire hydrant spacing, sizing and pressures should comply with AS 2419.1 – 2005.* • *Within the subject development site, all above ground water pipes external to the buildings should be metal including and up to any taps.*
4	**Electrical Services**	*Electrical supply connections to service any proposed residential building should be designed & located in accordance with PBP, including;* • *New or re-positioned electrical transmission lines are located underground (from supply point).*
5	**Gas Services**	*Any future gas service connection/installation should comply with the acceptable solutions of PBP, including:* • *Reticulated gas is installed and maintained in accordance with AS1596 and the requirements of the relevant authorities* • *Metal piping is to be used and polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not used.*

No.	PBP Standard	Recommendation
6	**Access & Egress**	*New Roadways, within subject allotment, to be constructed/maintained in compliance with provisions of PBP 4.1.3 Access (1) Public roads; as denoted above in section 16.1 of this report.*

18.0 Conclusion

Provided that the proposed residential building development, APZ areas, access and water supply facilities within the subject development site are constructed / designed / maintained in accordance with the recommendations as described by this report, it is a considered opinion that the subject development can satisfy the aims, objectives and performance requirements of *Planning for Bushfire Protection 2006* that are considered relevant to the development under *Section 100B* of the *NSW Rural Fires Act* and *Section 79BA* of the *EP&A Act.*

Bushfire safety compliance and mitigation (as recommended and/or purported by this report) for the subject development site comprises a package of '*measures in combination*' primarily including asset protection zoning, construction standards, property roadway access & adequate water supply for firefighting purposes.

The above measures have been derived from provisions and recommendations as outlined within the document '*Planning for Bushfire Protection Guidelines, 2006*', engineered judgment, considered opinion, and previous advice from the NSW Rural Fire Service Development Control Unit.

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Diploma of Building Surveying
Diploma of Public Safety (Fire Fighting Management) (Dip PSFM)
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19.0 References

Australian Standard 3959-2009, Construction of buildings in bushfire prone areas – Standards Australia.

Building Code of Australia (2016) – Australian Building Codes Board, Canprint.

Environmental Planning and Assessment Act (1979) – NSW Government Printer.

- Section 79BA Consultation and Development Consent Certain Bushfire Prone Land
- Section 146 Bushfire Prone Land

Rural Fires Act (1997) – NSW Government Printer

Landscape and building design for bushfire areas (2003) – Ramsay G C & Rudolf L, CSIRO Publishing, Collingwood Victoria.

Ocean shores to desert dunes: the native vegetation of NSW and the ACT (2004) – Keith D, NSW Dept of Environment and Conservation, Hurstville NSW.

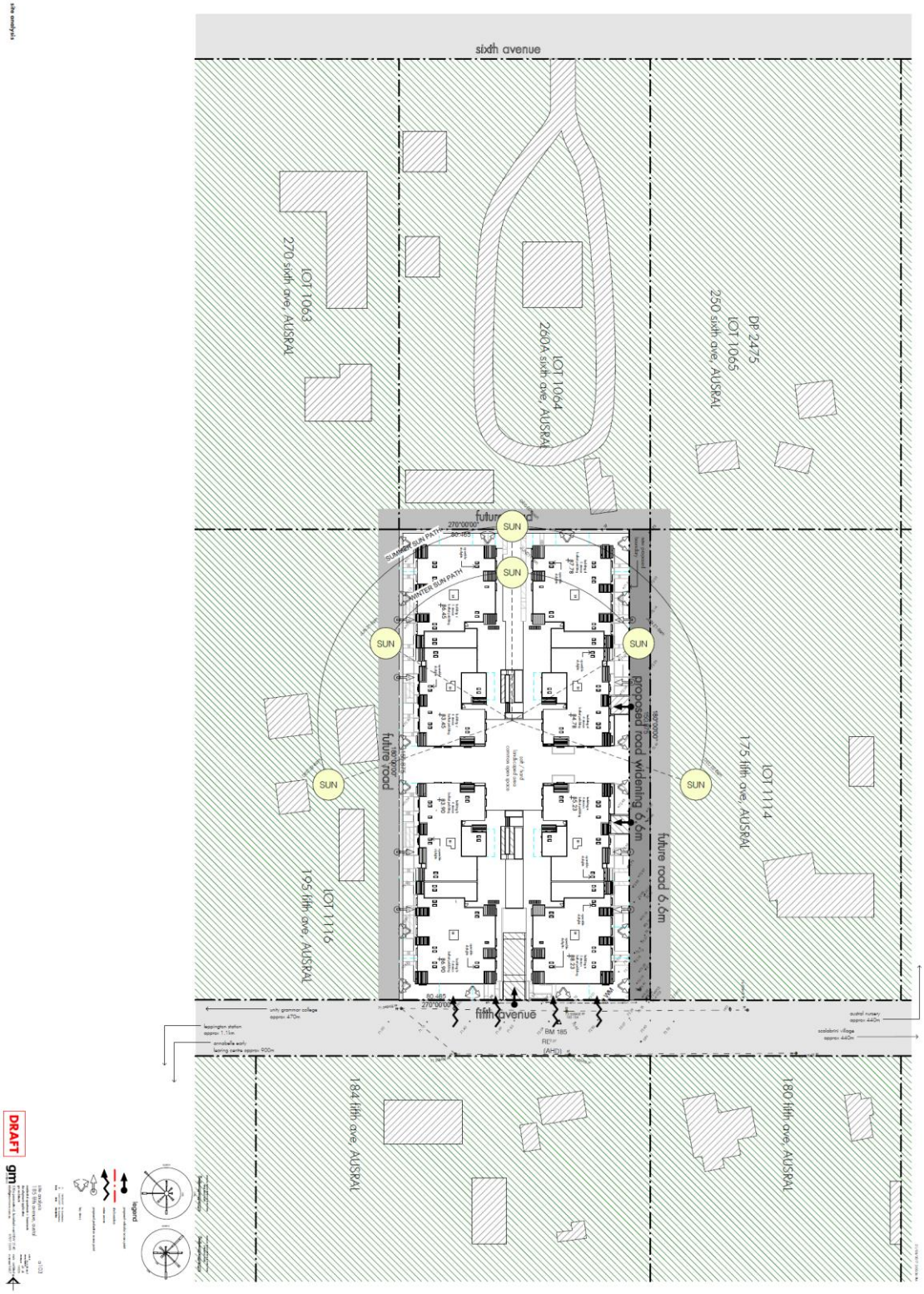
Planning for Bushfire Protection. A guide for councils, planners, fire authorities and developers (2006) – NSW Rural Fire Service.

Addendum: Appendix 3 - Planning for Bushfire Protection. A guide for councils, planners, fire authorities and developers (2010) – NSW Rural Fire Service.

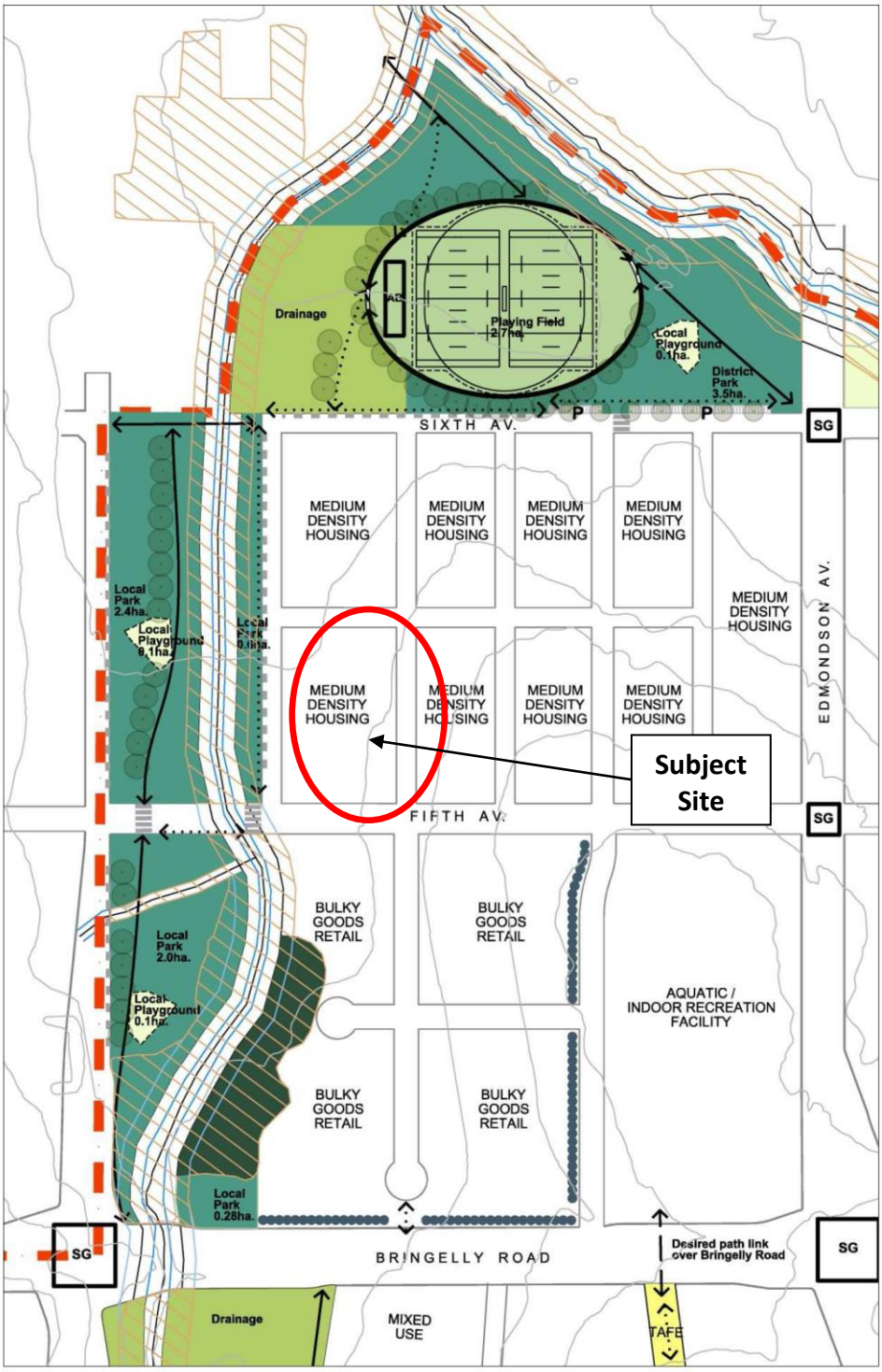
Standards for Asset Protection Zones – NSW Rural Fire Service

Map 1 – Overview & Access

Map 2 – Site Plan



Map 3 – Future Uses / Extract Liverpool Growth Centres Precincts DCP



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Map 4 – APZ Requirements / Extract Liverpool Growth Centres Precincts DCP

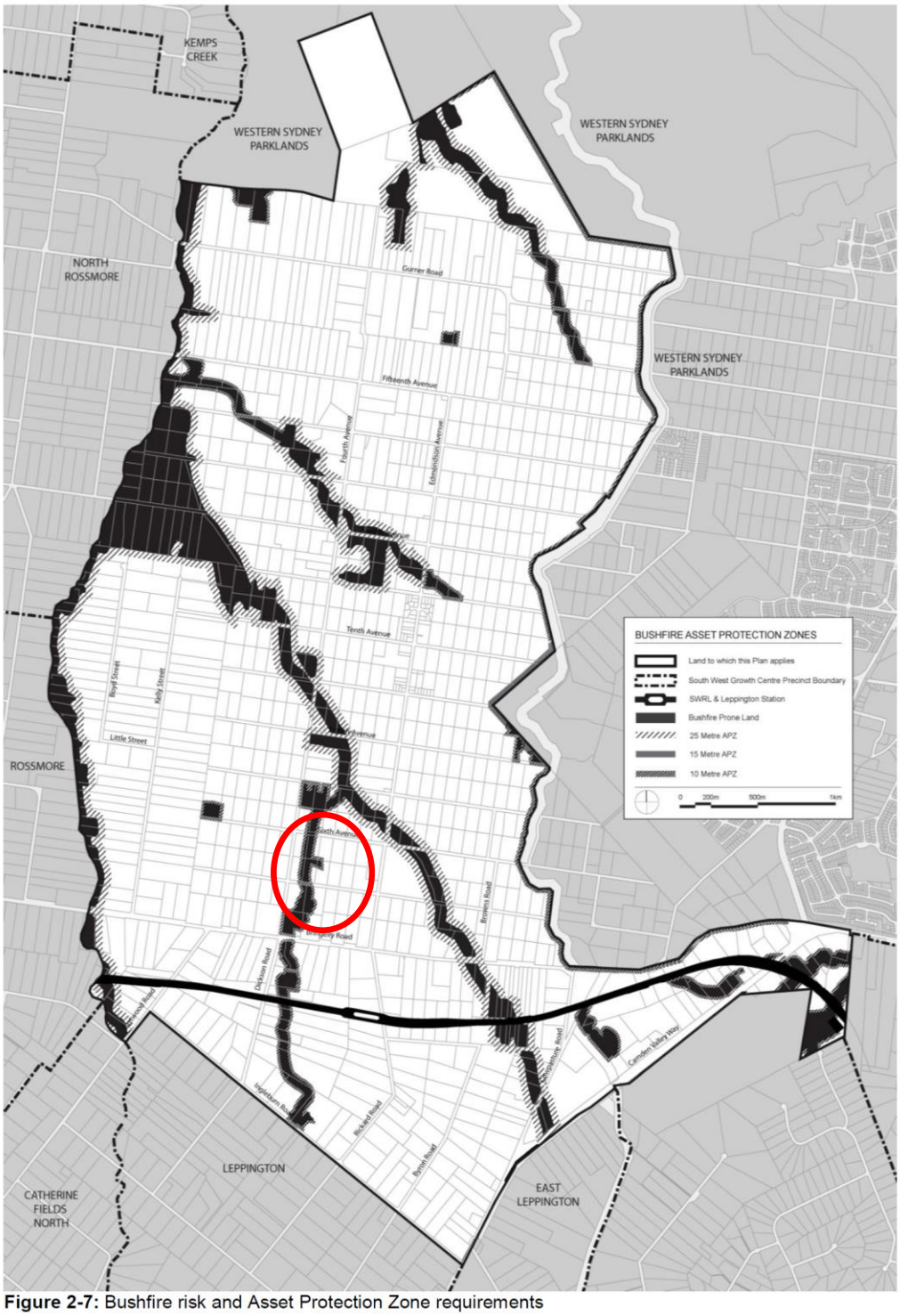
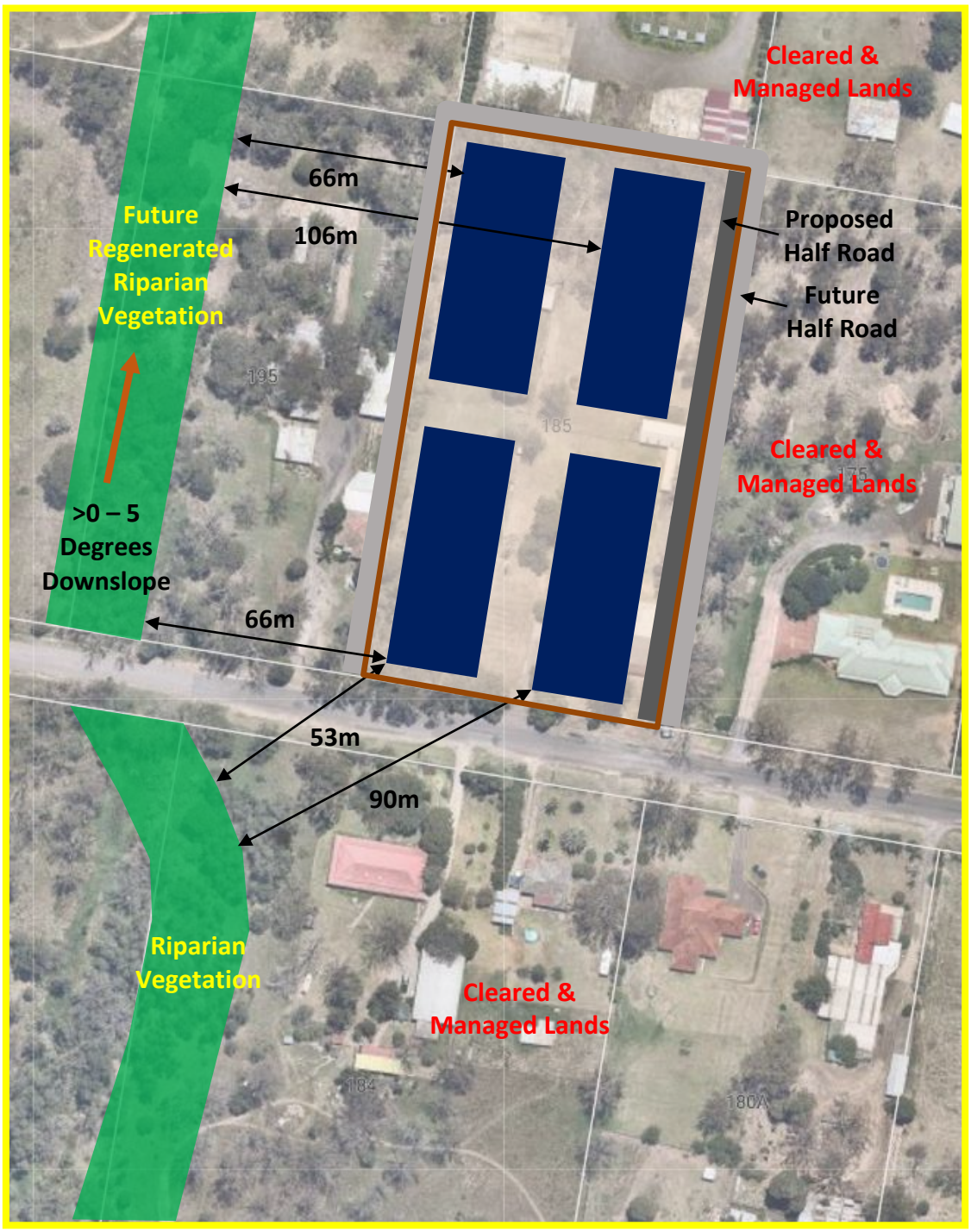


Figure 2-7: Bushfire risk and Asset Protection Zone requirements

Appendix 1 - Bushfire Constraints



Appendix 2 – Site Photos (10/5/2017)

Eastern side of subject site, looking N

Fifth Avenue, looking W

Fifth Avenue, looking E

Existing electrical supply

Reticulated water supply

Western side of subject site, looking N

Future Riparian Zone, looking N from Fifth Avenue

Current Riparian Zone, looking S from Fifth Avenue

Cleared lands, beyond future riparian zone, looking NW from Fifth Avenue

Managed residential site, South West of subject site

Managed residential site, South of subject site

Managed residential site, West of subject site