Bushfire Assessment and Recommendations

Proposed Residential Development
Residential Subdivision
Lots 1 & 2 DP 210459, Lots 21 & 22 DP 776219
Lots 33, 34, 35 & 36 DP 28459
21 – 49 Heath Road & 26 – 52 Park Road
Leppington NSW 2179

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Introduction

The following report has been commissioned by Crownland Developments (Heath Road 43 Pty Ltd atf Crown Trust 42), here in '*the proponent*', to provide a Bushfire Assessment and Recommendations for bushfire safety and design compliance for the proposed residential subdivision/development of **Lots 1 & 2 DP 210459, Lots 21 & 22 DP 776219 & Lots 33, 34, 35 & 36 DP 28459:** 21 – 49 Heath Road and 26 – 52 Park Road, Leppington NSW 2179 (Camden Council Local Government Area), herein '*the subject property'* or *'subject development*'.

The development application involves the subdivision of 8 individual adjoining rural residential allotments, into smaller residential allotments, over 4 stages.

The subject site is currently proposed to contain 290 individual residential allotments and all associated infrastructure (i.e. new public roads and utilities).

The subject site and all surrounding rural residential lands have been rezoned for General Residential development under the *'SEPP (Sydney Regional Growth Centres) 2006 – South West'*.

As such, most adjacent rural residential allotments are currently in varying stages of development approval for similar subdivision works.

The current subdivision plan provides an integrated approach, to facilitate the seamless transition to residential development amongst all adjoining lots. This is in relation to road design and the alignment of proposed residential allotments, under the *'Camden Growth Centre Precincts DCP November 2016'* and specially *'Schedule 5 Leppington Precinct'*.

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

- A site-specific inspection undertaken on the 15/9/2020 & 3/4/2021;
- An analysis of the Master Stage Plan, prepared by Mepstead & Associates, Thornleigh (Reference No. 5801, Drawing No. 5801-MASTER C, Sheet No. 1, Revision C, Dated 10/12/21);
- An analysis of the Stage 1 Subdivision Plan, prepared by Mepstead & Associates, Thornleigh (Reference No. 5801, Drawing No. 5801-ST1_A, Sheet No. 1, Revision A, Dated 27/10/21);
- An analysis of the Stage 2A Subdivision Plan, prepared by Mepstead & Associates, Thornleigh (Reference No. 5801, Drawing No. 5801-ST2A_A, Sheet No. 1, Revision A, Dated 27/10/21);
- An analysis of the Stage 2B Subdivision Plan, prepared by Mepstead & Associates, Thornleigh (Reference No. 5801, Drawing No. 5801-ST2B_A, Sheet No. 1, Revision A, Dated 27/10/21);

- An analysis of the Stage 3A Subdivision Plan, prepared by Mepstead & Associates, Thornleigh (Reference No. 5801, Drawing No. 5801-ST3A_A, Sheet No. 1, Revision A, Dated 28/10/21);
- An analysis of the Stage 3B Subdivision Plan, prepared by Mepstead & Associates, Thornleigh (Reference No. 5801, Drawing No. 5801-ST3B_A, Sheet No. 1, Revision A, Dated 28/10/21);
- An analysis of the Stage 4A Subdivision Plan, prepared by Mepstead & Associates, Thornleigh (Reference No. 5801, Drawing No. 5801-ST4A_B, Sheet No. 1, Revision B, Dated 10/12/21);
- An analysis of the Stage 4B Subdivision Plan, prepared by Mepstead & Associates, Thornleigh (Reference No. 5801, Drawing No. 5801-ST4B_A, Sheet No. 1, Revision A, Dated 28/10/21); &
- 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 addition, due to the potential future bushfire risks arising from the proposed revegetation of some local drainage reserves, the development has been assessed against the requirements and principals (aim and objectives) as outlined in the NSW document *'Planning for Bush Fire Protection 2019'* (PBP 2019).

PBP 2019 states;

'The aim of PBP is to provide for the protection of human life and minimize the impacts on property from the threat of bush fire, while having due regard to development potential, site characteristics and protection of the environment.

The objectives are to:

- *Afford buildings and their occupant protection from exposure to a bushfire;*
- *Provide for a defendable space to be located around buildings;*
- *Provide adequate separation between a hazard and buildings which, in combination with other measures, prevent the likely spread to buildings;*
- *Ensure that the appropriate operational access and egress for emergency services personnel and occupants is available;*
- *Provide for ongoing management and maintenance of Bushfire Protection Measures (BPMs): and*
- *Ensure that utility services are adequate to meet the needs of firefighters.*

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 2019.

Bushfire safety compliance, as purported by this report, for the subject development site, comprises a package of *measures in combination* including asset protection zones, building construction & design, landscaping, emergency management arrangements, water supply & utilities and access as applicable.

The above measures have been derived from provisions and recommendations as outlined within the document *'Planning for Bush Fire Protection 2019'*.

The following bushfire assessment has been prepared in accordance with the *NSW Rural Fires Regulation 2013 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

Lots: **1 & 2** DP: **210459**
Lots: **21 & 22** DP: **776219**
Lots: **33, 34, 35 & 36** DP: **28459**

1.2 Street address and locality map

21 – 49 Heath Road and 26 – 52 Park Road, Leppington NSW 2179.

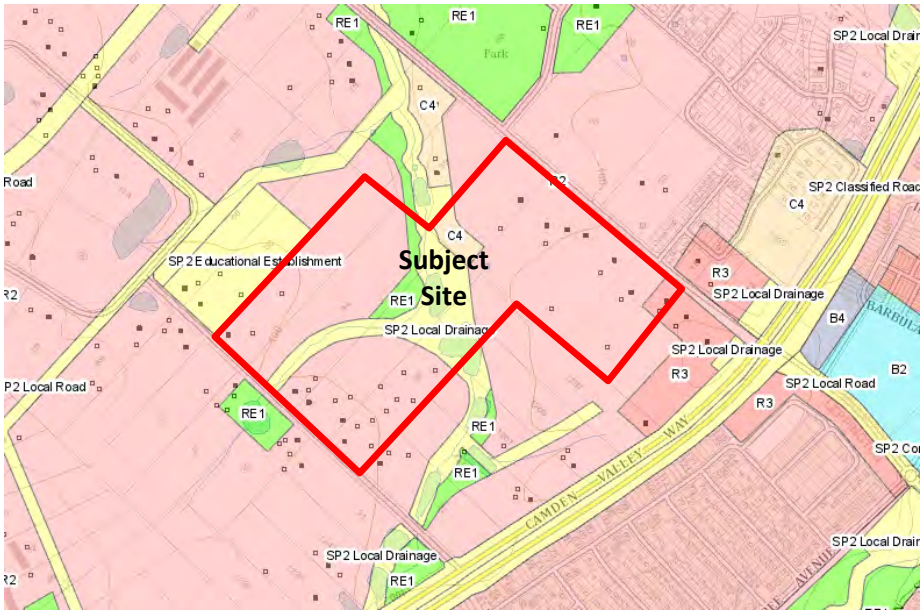
Locality map is as denoted in attached Map 1.

1.3 Zoning of the subject land and any adjoining lands

The subject site is generally zoned 'R2 – Low Density Residential', 'R3 – Medium Density Residential' & 'C4 – Environmental Living' under the *'Camden Growth Centre Precincts DCP November 2016'* and specially *'Schedule 5 Leppington Precinct'*. Certain sections are also zoned as 'RE1' & 'SP2' to support the establishment of all associated infrastructure.

All adjoining allotments are zoned similarly under the SEPP, to support ongoing residential growth. All zoning is in line with the area being a major regional growth centre.

The site also adjoins Heath Road to the North East and Park Road to the South West.



Extract SEPP (SRGC 2006)

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

Description of the whole proposal

The subject site consists of 8 adjoining rural residential allotments, all with rural residential dwellings and associated infrastructure e.g. sheds, fences and driveways, which also contain some limited vegetation (i.e. some limited vegetation around the central drainage line and some scattered canopy trees with managed understories).

The site currently has direct access to the public road system (Heath Road & Park Road).

All new residential allotments will also be accessed directly from the existing, or the proposed new, 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 Centres) 2006' – South West Growth Centre*.

The development application involves the subdivision of 8 individual adjoining rural residential allotments, into smaller residential allotments, over 4 stages (and sub stages).

The subject site is currently proposed to contain 290 individual residential allotments and all associated infrastructure (i.e. new public roads and utilities).

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 *'Camden Growth Centre Precincts DCP November 2016'*, but with the inclusion of some temporary access arrangements due to the staging of development within adjacent sites.

Extract – Indicative Layout Plan
'Camden Growth Centre's Precincts DCP November 2016'

The construction of any future residential buildings (which is not proposed at present) would be subject to further assessment under *Section 4.14 EP&A Act 1979* (to determine relevant bushfire construction requirements – Bushfire Attack Levels) in due course.

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

For the purposes of bushfire safety compliance, the subject development may look an option to establish a temporary / reciprocal asset protection zone (APZ) easement / agreement on adjoining lands to the North West (future school site).

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 19/5/2021) of the subject property, neighbouring lands and existing public access roadway are appended to this report (Map 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 Maps 2 – 4.

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 2019

The extent of bushfire vegetation (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 identified as being within, or bounded by, bush fire prone land. The extent of this bushfire risk will also increase in the future, due to the risks arising from the proposed revegetation of the central drainage reserves. As such the development has been assessed against the requirements and principals (aim and objectives) as outlined in the NSW document *'Planning for Bush Fire Protection 2019'.*

Future development will see most vegetation removed from within the subject site, apart from the repatriation and regeneration of the central drainage reserve, in line with the DCP provisions.

The primary future bushfire risk will then be contained only within this new drainage reserve, within and adjacent to the subject site, generally running from the South East through to the North West of the residential development.

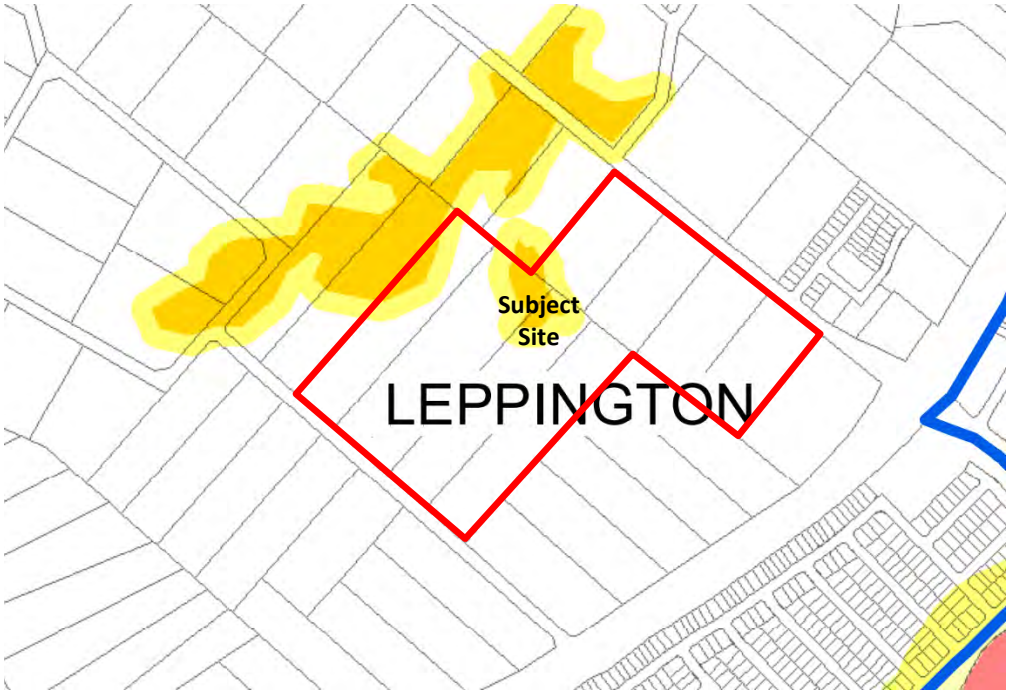
The repatriated vegetation will be based on the existing vegetation assessment completed in support of the rezoning processes, with the central drainage line being regenerated as an 'Sydney Coastal River-flat Forest - Alluvial Woodland'.

Based on a determination of vegetation formation using the Keith 2004 Identification Key, the repatriated bushfire vegetation, which in the future will have the potential to affect the subject development will be most representative of **'Forested Wetlands'**.

Additionally, an area of residual vegetation is located within an adjoining rural residential allotment (60 Park Road Lot 32 DP 28459) to the North West of 52 Park Road, extending from the South West to North East into adjacent rural residential allotments. This is initially contained with sites identified as a future school site.

This adjoining residual area of vegetation is mapped within local studies as 'Coastal Valley Grassy Woodlands'.

Based on a determination of vegetation formation using the Keith 2004 Identification Key, the residual bushfire vegetation, which currently will have the potential to affect the subject development will be most representative of **'Woodlands'**.



Extract Camden Council BFPLM

PBP 2019 (*Appendix 1 Section A1.10*) states, *'The following exclusions of AS3959 apply, and are not required to be considered for the purposes of PBP, as detailed below:*

- *Single areas of vegetation less than 1 hectare in area and greater than 100metres separation from other areas of Category 1 and 2 vegetation.*
- *Multiple areas of vegetation less than 0.25 hectares in area and not within 20m of the site, or each other or of other areas of vegetation being classified vegetation.*

- *Strips of vegetation less than 20m in width (measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20m of the site or other areas of vegetation being Category 1, 2 or 3 vegetation.*
- *Vegetation regarded as low threat due to factors such as flammability, moisture content or fuel load, including grassland managed in a minimal fuel condition, mangroves and other saline wetlands, maintained lawns, golf courses such as playing areas and fairways, maintained public reserves and parklands, sporting fields, vineyards, orchards, banana plantations, market gardens and other non-curing crops, cultivated gardens, arboretums, commercial nurseries, nature strips and windbreaks.*
- *Existing areas of managed gardens and lawns within curtilage of buildings.*
- *Non-vegetated areas including waterways, roads, footpaths, buildings and rocky outcrops.*

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

The subject development also adjoins a managed road reserves along the North Eastern boundary (Heath Road) and along the South Western boundary (Park Road).

It should also be noted that *'Camden Growth Centre Precincts DCP November 2016'* and specially *'Schedule 5 Leppington Precinct',* contains recommendations for future APZ requirements associated with this growth corridor (Figure 2.7 Page 11 – See Map 7 to rear of this report).

This bushfire assessment and associated recommendations contained within this report generally reflect and support these DCP requirements, although the vegetation assessment has been amended in line with the provisions of PBP 2019 – i.e. 'Forested Wetlands', along with the prescribed minimal setbacks (i.e. APZs) for this classification.

The subject development site **will** provide sufficient separation for any future proposed residential dwellings to comply with NCC – BCA DtS provisions or otherwise the application of PBP 2019 and AS 3959:2018.

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 zoning of the 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 (other than discussed above) 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:

Direction	Maximum Effective Slope (over up to 100m)
Into Central Drainage Corridor	>0 – 5 Degrees Downslope (maximum)
North West to residual Woodland	2 Degrees Downslope (actual maximum)

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

Environmental Feature	Present within Subject Property	Present within Study Area	Comment
Native Forest / Vegetation	Yes	Yes	Some native forest vegetation is located within, and adjacent to, the subject development.
Riparian Corridor	Yes	Yes	A riparian corridor will run through the subject site.
SEPP 14 – Wetland	No	No	
SEPP 26 – Littoral Rainforest	No	No	

Environmental Feature	Present within Subject Property	Present within Study Area	Comment
SEPP 44 – Koala Habitat	No	No	
Areas of Geological Interest	Undetermined	Undetermined	
Environmental Protection Zones	Yes	Yes	Part of the site is subject to an environmental overlay.
Steep Lands (>18˚)	No	No	
Land Slip Area	No	No	
Flood Prone Area	Yes	Yes	The site contains some flood prone areas.
National Park / State Forest	No	No	

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

No known threatened species, populations or ecological communities 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 1 PBP 2019.

Minimum required asset protection zones and other recommended setback measures for bushfire protection are derived from distances outlined by Appendix 1 PBP 2019, for a residential subdivision development within an **FDI 100** Fire Area (Table A1.12.2 Appendix 1 PBP 2019). The Camden Council LGA is designated as potentially having an **FDI** of **100** as a 1:50 year event (Source: NSW RFS).

Table 2.0

Table A1.12.2 Appendix 1 PBP 2019 (& Method 2 AS 3959:2018)				
Direction	**Vegetation**	**Minimum APZ Distance**	**Slope**	**k/Wm^2**
North East	Forested Wetlands	Minimum 12m	>0 – 5 Degrees Downslope	29
South West	Forested Wetlands	Minimum 12m	>0 – 5 Degrees Downslope	29
North West	Woodlands	Minimum 12.5m (Method 2)	2 Degrees Downslope	29

Considering the above, the subject development site can reasonably facilitate the specified minimum APZ / setback from potentially unmanaged and persisting bushfire vegetation, located within the study area. Where the minimum specified APZ distance extends beyond the boundary of the subject development site, the adjoining land is managed lands and road reserves.

8.0 Bushfire Protection Measures

The Bushfire Protection Measures (BPMs) for residential and rural residential subdivisions include measures relating to APZs, access to structures and water supply, fire trail access, and provision of water. Electricity and gas services should be provided so they don't add to the bush fire risk to buildings.

All requirements for BPMs that relate to the development must be provided, unless where specific circumstances apply to render a BPM irrelevant (e.g. no landscaping required).

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

Intent of measures: to provide sufficient space and maintain reduced fuel loads to ensure radiant heat levels at the building are below critical limits and prevent flame contact (Chapter 5.3.1 PBP 2019).

Performance Criteria	Acceptable Solution	Compliance	Assessment / Comment
The intent may be achieved where:			
Asset Protection Zones			
Potential building footprints must not be exposed to radiant heat levels exceeding 29 kW/m² on each proposed lot.	APZs are provided in accordance with Tables A1.12.2 and A1.12.3 based on the FFDI.	**Yes**	Compliance as per Recommendation 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 lands. The development will retain an option to formally locate a temporary APZ within an adjoining site to the North West (future School site).
APZs are managed and maintained to prevent the spread of fire towards the building	APZs are managed in accordance with the requirements of Appendix 4.	**Yes**	
The APZ is provided into perpetuity.	APZs are wholly within the boundaries of the development site.	**Yes / No**	
APZ maintenance is practical, soil stability is not compromised and the potential of a crown fire is minimised.	APZs are located on lands with a slope less than 18 degrees.	**Yes**	
Landscaping			
Landscaping is designed and managed to minimise flame contact and radiant heat to buildings, and the potential for wind-driven embers to cause ignitions.	Landscaping is in accordance with Appendix 4.	**Reasonably assumed**	As per Recommendation No. 1 Any landscaping and fencing to be constructed as part of the subdivision works will be able to comply.
	Fencing is constructed in accordance with section 7.6	**Reasonably assumed**	

The minimum specified APZ / setback required for the subject development have been determined within Section 7.0 (above).

Considering the above, the subject development site can reasonably facilitate the specified minimum APZ / setback from potentially unmanaged and persisting bushfire vegetation, located within the study area. Where the minimum specified APZ distance extends beyond the boundary of the subject development site, the adjoining land is managed lands (rear setbacks) and road reserves. The development will retain an option to formally locate a temporary APZ within the adjacent site to the North West (future School site) subject to concurrence and approval.

APZ recommendations are as listed Section 12.0 (Bushfire Safety & Compliance Recommendations).

8.2 Access

Intent of measures: to provide safe operational access to structures and water supply for emergency services, while residents are seeking to evacuate from an area (Chapter 5.3.2 PBP 2019).

Performance Criteria	Acceptable Solution	Compliance	Assessment / Comment
The intent may be achieved where:			
Access (General Requirements)			
Firefighting vehicles are provided with safe all-weather access to structures.	Property access roads are two-wheel drive, all-weather roads.	**N/A**	As per Recommendation No. 2 A perimeter road is provided around most of the interface to the central riparian corridor. All roads have been designed in line with the ILP/DCP requirements. Some temporary constraints relate to road construction, due to the staging between adjacent developments. As such some temporary turning circles, and half width roads will be provided initially. Once all stages, and adjacent development is completed, all roads will be through roads, with no cul-de-sacs or dead ends. A compliant reticulated water supply will be provided.
	Perimeter roads are provided for residential subdivisions of three or more allotments.	**Yes**	
	Subdivisions of three or more allotments have more than one access in and out of the development.	**Yes**	
	Traffic management devices are constructed to not prohibit access by emergency vehicles.	**Reasonably assumed**	
	Maximum grades for sealed roads do not exceed15 degrees and an average of not more than 10 degrees or other gradient specified by road design standards, whichever is the lesser.	**Reasonably assumed**	
	All roads are through roads.	**No**	
	Dead ends are not recommended, but if unavoidable, are not more than 200m in length, incorporate a minimum 12 meters' outer radius turning circle, and are clearly signposted as a dead end.	**Yes**	
	Where kerb and guttering is provided on perimeter roads, roll top kerbing should be used to the hazard side of the road.	**Reasonably assumed**	

Performance Criteria	Acceptable Solution	Compliance	Assessment / Comment
The intent may be achieved where:			
	Where access/egress can only be achieved through forest, woodland and heath vegetation, secondary access shall be provided to an alternate point on the existing public road system.	**Yes**	
	One-way public access roads are no less than 3.5m wide and have designated parking bays with hydrants located outside of these areas to ensure accessibility to reticulated water for fire suppression.	**N/A**	
The capacity of access roads is adequate for firefighting vehicles.	The capacity of perimeter and non-perimeter road surfaces and any bridges / causeways as sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes); bridges / causeways are to clearly indicate load rating.	**Reasonably assumed**	
There is appropriate access to water.	Hydrants are located outside of parking reserves and road carriageways to ensure accessibility to reticulated water for fire suppression.	**Reasonably assumed**	
	Hydrants are provided in accordance with the relevant clauses of AS 2419.1:2005 – *Fire hydrant installations System design, installation and commissioning.*	**Reasonably assumed**	
	There is suitable access for a Category 1 fire appliance to within 4m of the static water supply where no reticulated supply is available.	**N/A**	
Perimeter Roads			
Access roads are designed to allow safe access and egress for firefighting vehicles while residents are evacuating as well as providing a safe	Are two-way sealed roads	**Yes**	As per Recommendation No. 2
	Minimum 8m carriageway width kerb to kerb.	**Yes**	
	Parking is provided outside the carriageway width.	**Yes**	
	Hydrants are located clear of parking areas.	**Reasonably assumed**	

Performance Criteria	Acceptable Solution	Compliance	Assessment / Comment
The intent may be achieved where:			
operational environment for emergency service personnel during firefighting and emergency management on the interface.	Roads are through roads, and these are linked to the internal road system at an interval of no greater than 500m.	**Yes**	A perimeter road is provided around most of the central riparian corridor, however, the predetermined /approved ILP road plan has a small number of environmental lots directly adjoining the drainage reserve (Lots 2273 – 276 in Stage 2). Some temporary constraints relate to road construction, due to staging between adjacent developments. A compliant reticulated water supply will be provided.
	Curves of roads have a min. inner radius of 6m.	**Reasonably assumed**	
	The maximum road grade is 15 degrees and average grade of not more than 10 degrees.	**Reasonably assumed**	
	The road cross fall does not exceed 3 degrees.	**Reasonably assumed**	
	A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.	**Reasonably assumed**	
Non-Perimeter Roads			
Access roads are designed to allow safe access and egress for firefighting vehicles while residents are evacuating.	Minimum 5.5m carriageway width kerb to kerb.	**Yes**	As per Recommendation No. 2 Some temporary constraints relate to road construction, due to staging between adjacent developments. A compliant reticulated water supply will be provided.
	Parking is provided outside of the carriageway width.	**Yes**	
	Hydrants are located clear of parking areas.	**Reasonably assumed**	
	Roads are through roads, and these are linked to the internal road system at an interval of no greater than 500m.	**Yes**	
	Curves of roads have a minimum inner radius of 6m.	**Reasonably assumed**	
	The road cross fall does not exceed 3 degrees.	**Reasonably assumed**	
	A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.	**Reasonably assumed**	
Property Access			
Firefighting vehicles can access the dwelling and exit the property safely.	There are no specific access requirements in an urban area where an unobstructed path (no greater than 70m) is provided between the most distant external part of the proposed dwelling and the nearest part of the public access road (where the	**Yes**	All proposed residential allotments have direct access to the existing/proposed public road system. Any future dwellings would be reasonably located within 70m of the existing/proposed public road system.

Performance Criteria	Acceptable Solution	Compliance	Assessment / Comment
The intent may be achieved where:			
	road speed limit is not greater than 70kph) that supports the operational use of emergency firefighting vehicles.		
	In circumstances where this cannot occur, the following requirements apply.		
	Minimum 4m carriageway width.	**N/A**	
	In forest, woodland and heath situations, rural property access roads have passing bays every 200m that are 20m long by 2m wide, making a minimum trafficable width of 6m, at the passing bay.	**N/A**	
	A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches.	**N/A**	
	Property access must provide a suitable turning area in accordance with Appendix 3.	**N/A**	
	Curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress.	**N/A**	
	The minimum distance between inner and outer curves is 6m.	**N/A**	
	The cross fall is not more than 10 degrees.	**N/A**	
	Maximum grades for sealed roads do not exceed 15 degrees and not more than 10 degrees for unsealed roads.	**N/A**	
	A development comprising of more than 3 dwellings has formalised access by dedication of a road and not by right of way.	**N/A**	
	Note: Some short constrictions in the access may be accepted where they are not less than 3.5m wide, extend for no more than 30m and where the obstruction cannot be reasonably avoided or removed. The gradients applicable to public roads also apply to community style development property access roads in addition to the above.		

The subject development site is currently accessed directly from Heath Road and Park Road. The proposed development will continue to be accessed from the local road system, via a new interconnecting road system (designed as per the Camden *Growth Centre Precincts DCP November 2016'*).

A new internal public road system is proposed (inclusive of a perimeter road), allowing all new lots to directly access the public road system. Future adjacent residential development will also continue to provide additional access / egress roads as the area is redeveloped into an urban residential area.

The proposed new public road system will be located within roads reserves that are 13.5m – 16m in width, and will allow for an 8m wide formed carriageway, two-way access with constructed roadside drainage and verge areas either side. It will also include some temporary access road arrangements, due to staging.

Depending on the staging of adjacent residential development and infrastructure, some of the proposed new public roads within the subject site may initially terminate in temporary dead ends. These dead ends will require either a temporary turning circle (minimum radius 12m), or an engineered 'hammer head' type turning head, designed to support the use of heavy vehicles (i.e. complying swept paths etc.), as per Appendix 3 PBP 2019.

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.

All proposed residential allotments will be accessed directly off the public road system (new and existing, see above). PBP 2019 acceptable solutions for property roads (relevant to these allotments) states that:

'There are no specific access requirements in an urban area where an unobstructed path (no greater than 70m) is provided 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)'.

Access recommendations are as listed Section 12.0 (Bushfire Safety & Compliance Recommendations).

8.3 Services – Water, electricity and gas

Intent of measures: to provide services for water for the protection of buildings during and after the passage of a bush fire, and to locate gas and electricity so as not to contribute to the risk of fire to a building (Chapter 5.3.3 PBP 2019).

Performance Criteria	Acceptable Solution	Compliance	Assessment / Comment
The intent may be achieved where:			
Water Supplies			
Adequate water supplies are provided for firefighting purposes.	Reticulated water is provided to the development where available.	**Yes**	As per Recommendation No. 3 A compliant reticulated water supply will be provided.
	A static water and hydrant supply is provided for non-reticulated developments or where reticulated water supply cannot be guaranteed.	**N/A**	
	Static water supplies shall comply with table 5.3d.	**N/A**	
Water supplies are located at regular intervals, and the water is accessible and reliable for firefighting operations.	Fire hydrant, spacing, design and sizing complies with the relevant clauses of AS 2419.1:2005.	**Yes**	
	Hydrants are not located within any road carriageway.	**Reasonably assumed**	
	Reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads.	**Reasonably assumed**	
Flows and pressures are appropriate.	Fire hydrant flows and pressures comply with the relevant clauses of AS 2419.1:2005.	**Reasonably assumed**	
The integrity of the water supply is maintained.	All above ground water service pipes are metal, up to and including any taps.	**Reasonably assumed**	
	Above ground water storage tanks shall be concrete or metal.	**N/A**	
Electricity Services			
Location of electricity services limits the possibility of ignition of surround bush land or the fabric of the buildings.	Where practicable, electrical transmission lines are underground.	**Yes**	As per Recommendation No. 3 The future electrical transmission lines within the subject development will be located underground.
	Where overhead, electrical transmission lines are proposed as follows: - Lines are installed with short pole spacing of 30m,	**Yes**	

Performance Criteria	Acceptable Solution	Compliance	Assessment / Comment
The intent may be achieved where:			
	unless crossing gullies, gorges or riparian areas. - No part of a tree is closer to a power line than the distance set out in *ISSC3 Guideline for Managing Vegetation Near Power Lines*.		
Gas Services			
Location of gas services will not lead to ignition of surrounding bush land or the fabric of the buildings.	Reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:*2014 – The storage and handling of LP Gas*, and metal piping is used.	**Reasonably assumed**	As per Recommendation No. 3 Any future gas supply will be installed and maintained as per the provisions of PBP 2019.
	All fixed gas cylinders are kept clear of all flammable materials to a distance of 10m and shielded on the hazard side.	**N/A**	
	Connections to and from gas cylinders are metal.	**N/A**	
	Polymer-sheathed flexible gas supply lines are not used.	**Reasonably assumed**	
	Above ground gas service pipes are metal, including and up to any outlets.	**Reasonably assumed**	

The subject development site is currently connected to a reticulated town water supply, which services the residential building development along Heath Road and Park Road. 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 the local road system and reticulated mains, which will be extended to supply water to the proposed development site. All future residential buildings within the proposed residential allotments will be required to comply with AS 2419.1:2005.

Services recommendations are as listed Section 12.0 (Bushfire Safety & Compliance Recommendations).

9.0 Construction standards to be used

No residential construction is currently proposed as part of this development application. This application relates only to boundary adjustments and civil works.

However, based on the above assessment, recommendations and current separation distances stated by this report, the subject development sites **will** provide sufficient separation for any future proposed residential dwellings to comply with BCA DtS provisions or otherwise the application of PBP 2019 and AS 3959:2018.
Likewise, when the current bushfire mapping is updated, any future proposed residential dwelling, constructed within the proposed new residential allotments will be subject to a further assessment under Section 4.14 EP&A Act 1979 (in due course).

Construction standard recommendations are as listed Section 12.0 (Bushfire Safety & Compliance Recommendations).

10.0 An assessment of how the development complies with the specific objectives within Chapter 5 of PBP 2019

Table 3.0

Specific Objectives	Assessment / Comment
Minimise perimeters of the subdivision exposed to the bush fire hazard (hourglass shapes, which maximize perimeters and create bottlenecks should be avoided).	Where all recommendations stated by this report are reasonably and adequately incorporated into the design of the subdivision, exposure to bushfire hazards will be minimised. In this respect, occupants remaining within a dwelling or else defending the dwelling during a potential bushfire should be reasonably separated from the effects of a bushfire event.
Minimise vegetated corridors that permit the passage of bush fire towards buildings.	Where all recommendations stated by this report are reasonably and adequately incorporated into the design of the subdivision, vegetated corridors and the passage of bushfire towards the buildings are minimised.
Provide for the siting of future dwellings away from ridge-tops and steep slopes, within saddles and narrow ridge crests.	Where all recommendations relating to APZ areas as stated by this report are reasonably and adequately incorporated, future dwellings will be afforded appropriate separation from bushfire hazards and detrimental features to prevent direct flame contact and material ignition.
Ensure that APZs between a bushfire hazard and future dwellings are effectively designed to address the relevant bush fire attack mechanisms.	Where all recommendations relating to APZ areas stated by this report are reasonably and adequately incorporated, it would be reasonable to assume that future dwellings are afforded sufficient separation distances to address all relevant bushfire attack mechanisms.

Specific Objectives	Assessment / Comment
Ensure the ongoing maintenance of APZs.	Where all recommendations relating to 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 become compromised during the life of the subject development site, it would also be reasonable to assume Council or the Fire Authorities, through their standard policies, would address such issues (bushfire hazard) and notice procedures.
Provide adequate access from all properties to the wider road network for residents and emergency services.	Where all recommendations relating to property access as stated by this report are reasonably and adequately incorporated, emergency services personnel and residents should be afforded safe operational access / egress to the subject development site. The proposed 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.
Provide access to hazard vegetation to facilitate bush fire mitigation works and fire suppression.	Where all recommendations relating to access as stated by this report are reasonably and adequately incorporated, emergency services personnel should be afforded safe operational access / egress to the subject development site.
Ensure the provision of an adequate supply of water and other services to facilitate effective firefighting.	Where all recommendations relating to firefighting water supplies as stated by this report are reasonably and adequately incorporated, both emergency services personnel and others assisting in bush firefighting should safely be able to draw on a water supply for property protection purposes. Similarly, where the installation or connection to electrical services and gas services incorporates the associated recommendations as stated by this report, both emergency services personnel and others assisting in bush firefighting should safely be able to manage any electrical or gas hazards associated during a bushfire event.

11.0 An assessment of how the development complies with the aims and objectives of PBP 2019

Table 4.0

Aim and objectives	Assessment / Comment
Afford buildings and their occupant protection from exposure to a bushfire.	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 bushfire should be reasonably protected or separated from the effects of a bushfire event.

Aim and objectives	Assessment / Comment
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. Firefighters 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.
Provide adequate separation between a hazard and buildings, which, in combination with other measures, prevent the likely spread to buildings.	Where all recommendations relating to APZ areas as stated by this report are reasonably and adequately incorporated, any future proposed residential buildings will be afforded appropriate separation to prevent direct flame contact and material ignition.
Ensure that the appropriate operational access and egress for emergency services personnel and occupants is available.	Where all recommendations relating to access roads 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 proposed 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.
Provide for ongoing management and maintenance of BPMs.	Where all recommendations relating to BPMs 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 BPMs become compromised during the life of the subject development site, it would also be reasonable to assume Council or the Fire Authorities, through their standard policies, would address such issues (bushfire hazard) and notice procedures.
Ensure that utility services are adequate to meet the needs of firefighters.	Where all recommendations relating to firefighting water supplies as stated by this report are reasonably and adequately incorporated, both emergency services personnel and others assisting in bush firefighting should safely be able to draw on a water supply for property protection purposes. Similarly, where the installation or connection to electrical services and gas services incorporates the associated recommendations as stated by this report, both emergency services personnel and others assisting in bush firefighting should safely be able to manage any electrical or gas hazards associated during a bushfire event.

12.0 Bushfire Safety & Compliance Recommendations

The following recommendations are made for the bushfire safety & protection measures for the proposed residential subdivision development within 15 – 51 Heath Road and 26 – 52 Park Road, Leppington NSW 2179.

These recommendations are based upon the relevant provisions (acceptable solutions or performance criteria) within the NSW Rural Fire Service guideline entitled *Planning for Bush Fire Protection 2019,* for residential & rural residential subdivision developments in bushfire prone areas.

Recommendation No. 1

Asset Protection Zones

1.1 At the issue of the subdivision certificate, and in perpetuity, the entirety of all residential lots shall be managed as an 'Inner Protection Area' as outlined within 'Appendix 4 – Planning for Bush Fire Protection 2019' and the document 'Standards for asset protection zones' (NSW Rural Fire Service, 2005).

1.2 At the issue of the subdivision certificate, and in perpetuity, a:

- 12m asset protection zone (APZ) is to be provided between any repatriated/retained bushfire vegetation within the central drainage line and future residential building envelopes. This may include some road reserve areas and a rear building setback within proposed Lots 273 – 277.
- 12.5m asset protection zone (APZ) is to be provided between the residual bushfire vegetation within the adjoining site to the North West (Lot 32 DP 28459) and any future building envelopes within Stage 4 (see engineering attached – Appendix 3).

Option 1.

This may be established within the subject site as a temporary onsite APZ, or temporary restriction / building line (i.e. within Lots 456, 479 & 488).

Option 2

This may be established on the adjoining site to the North West, as a temporary offsite APZ. This must be a formal arrangement (i.e. 88B) with concurrence from the adjoining landowner for ongoing vegetation management for a minimum distance of 12.5m.

Option 3

Any combination of the previous two options.

These APZs shall be managed as an 'Inner Protection Area' as outlined within 'Appendix 4 – Planning for Bush Fire Protection 2019' and the document 'Standards for asset protection zones' (NSW Rural Fire Service, 2005).

Landscaping

1.3 Landscaping is to be in accordance with 'Appendix 4 – Planning for Bush Fire Protection 2019'.

1.4 Fencing is to be constructed in accordance with 'Section 7.6 – Planning for Bush Fire Protection 2019'.

Recommendation No. 2

Access (General Requirements)

2.1 All access roads shall comply with the following requirements of 'Chapter 5.3.2 – Planning for Bush Fire Protection 2019'.

- Property access roads are two-wheel drive, all-weather roads.
- Perimeter roads are provided for residential subdivisions of three or more allotments.
- Subdivisions of three or more allotments have more than one access in and out of the development (temporary constraint noted).
- Traffic management devices are constructed to not prohibit access by emergency vehicles.
- Maximum grades for sealed roads do not exceed15 degrees and an average of not more than 10 degrees or other gradient specified by road design standards, whichever is the lesser gradient.
- Dead ends are not recommended, but if unavoidable, are not more than 200m in length, incorporate a minimum 12 meters' outer radius turning circle, and are clearly signposted as a dead end.
- Where kerb and guttering is provided on perimeter roads, roll top kerbing should be used to the hazard side of the road.
- Where access/egress can only be achieved through forest, woodland and heath vegetation, secondary access shall be provided to an alternate point on the existing public road system.

Access – Perimeter Roads

2.2 Perimeter roads shall comply with the following requirements of 'Chapter 5.3.2 – Planning for Bush Fire Protection 2019'.

- Are two-way sealed roads
- Minimum 8m carriageway width kerb to kerb.
- Parking is provided outside the carriageway width.
- Hydrants are located clear of parking areas.
- Roads are through roads, and these are linked to the internal road system at an interval of no greater than 500m.
- Curves of roads have a minimum inner radius of 6m.
- The maximum road grade is 15 degrees and average grade of not more than 10 degrees.
- The road cross fall does not exceed 3 degrees.
- A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.

Access – Non-Perimeter Roads

2.3 Non-Perimeter roads shall comply with the following requirements of 'Chapter 5.3.2 – Planning for Bush Fire Protection 2019'.

- Minimum 5.5m carriageway width kerb to kerb.
- Parking is provided outside of the carriageway width.
- Hydrants are located clear of parking areas.
- Roads are through roads, and these are linked to the internal road system at an interval of no greater than 500m.
- Curves of roads have a minimum inner radius of 6m.
- The road cross fall does not exceed 3 degrees.
- A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.

Access – Property Access Roads

2.4 Property Access roads shall comply with the following requirements of 'Chapter 5.3.2 – Planning for Bush Fire Protection 2019'.

- There are no specific access requirements in an urban area where an unobstructed path (no greater than 70m) is provided 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.

Recommendation No. 3

Services – Water, electricity and gas

3.1 Water Supplies shall comply with the following requirements of 'Chapter 5.3.3 – Planning for Bush Fire Protection 2019'.

- Reticulated water is provided to the development where available.
- Fire hydrant, spacing, design and sizing complies with the relevant clauses of AS 2419.1:2005.
- Hydrants are not located within any road carriageway.
- Reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads.
- Fire hydrant flows and pressures comply with the relevant clauses of AS 2419.1:2005.
- All above ground water service pipes are metal, up to and including any taps.

3.2 Electrical Services shall comply with the following requirements of 'Chapter 5.3.3 – Planning for Bush Fire Protection 2019'.

- Where practicable, electrical transmission lines are underground.

3.3 Gas Services shall comply with the following requirements of 'Chapter 5.3.3 – Planning for Bush Fire Protection 2019'.

- Reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:2014 – *The storage and handling of LP Gas*, and metal piping is used.
- Polymer-sheathed flexible gas supply lines are not used.
- Above ground gas service pipes are metal, including and up to any outlets.

Recommendation No. 4

Construction

No residential construction is proposed as part of this development application.

Any further development application for Class 1,2 & 3 buildings as identified by the 'National Construction Code' must be subject to separate application under Section 4.14 EP&A Act 1979 and address the requirements of *'Planning for Bush Fire Protection 2019'.*

13.0 Conclusion

Provided that the proposed residential building development, APZ areas, access provisions and services within the subject development site are designed, constructed and maintained in accordance with the recommendations as described by this report, it is a considered opinion that the subject development can satisfy the aims and objectives of *Planning for Bush Fire Protection 2019* that are considered relevant to the development under *Section 100B NSW Rural Fires Act 1997* and *Section 4.14 EP&A Act 1979.*

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, access roads and adequate services for firefighting purposes.

The above measures have been derived from provisions and recommendations as outlined within the document '*Planning for Bush Fire Protection 2019'*, engineered judgment, considered opinion, and previous advice received from the NSW Rural Fire Service.

Scott Jarvis
Sydney Bushfire Consultants

Graduate Diploma Design for Bushfire Prone Areas
Diploma of Building Surveying
Diploma of Public Safety (Fire Fighting Management) (Dip PSFM)
Cert. IV Residential Building Studies
Member No. 18593 Fire Protection Association Australia
BPAD-Level 3 Certified Practitioner BPD-PA-18593
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Email: scott@sydneybushfireconsultants.com.au

14.0 References

Australian Standard 3959:2018 Construction of buildings in bushfire prone areas – Standards Australia.

Building Best Practice Guide – Upgrading of Existing Buildings (Development Assessment & Planning, NSW Rural Fire Service, Reference 0914).

National Construction Code (2021) – Australian Building Codes Board, Canprint.

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

- Section 4.14 Consultation and Development Consent Certain Bushfire Prone Land
- Section 10.3 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.

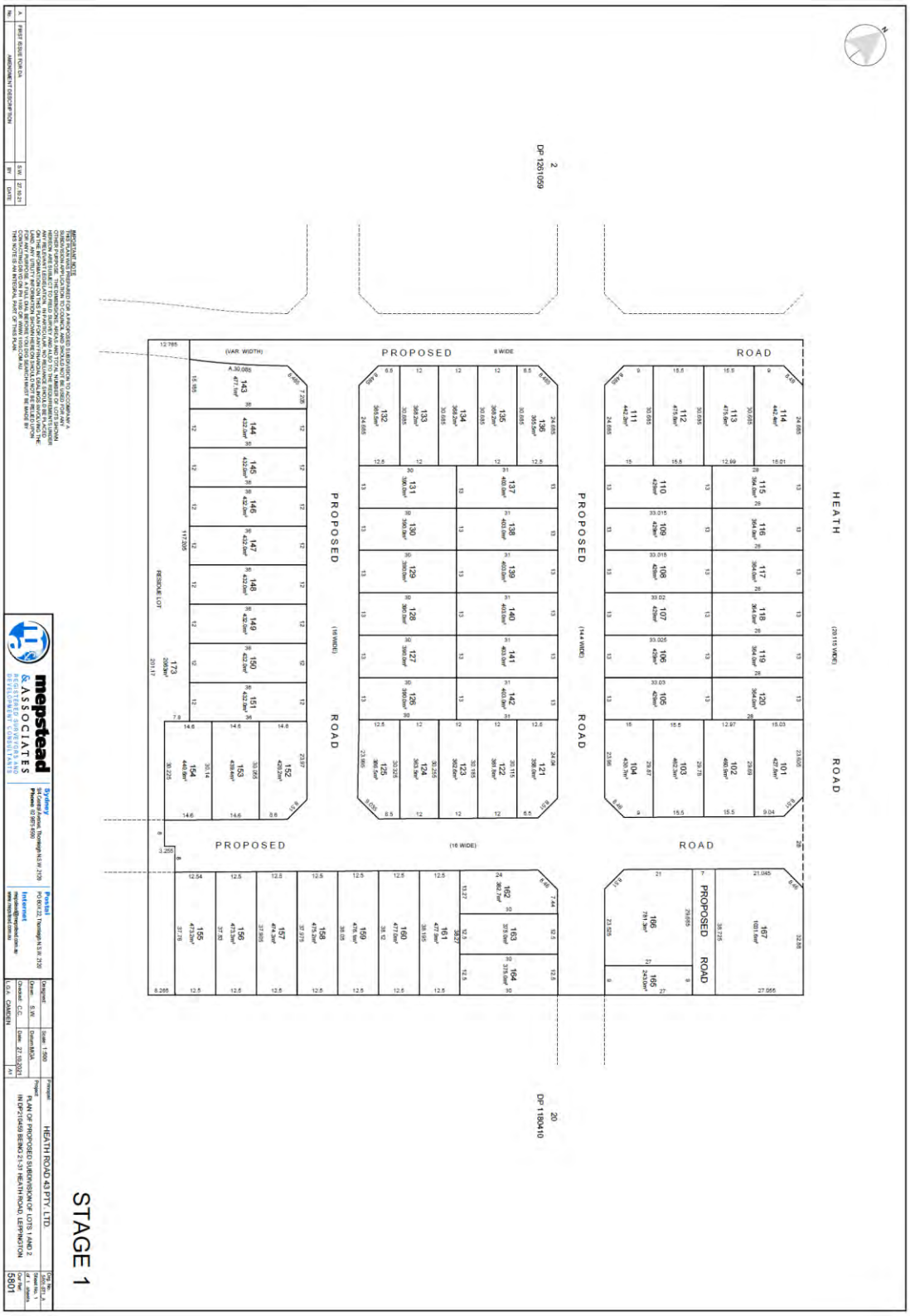
Ocean shores to desert dunes: the native vegetation of NSW and the ACT (2004) – Keith D, NSW Dept of Environment and Conservation, Hurstville NSW.

Planning for Bush Fire Protection. A guide for councils, planners, fire authorities and developers (2019) – NSW Rural Fire Service.

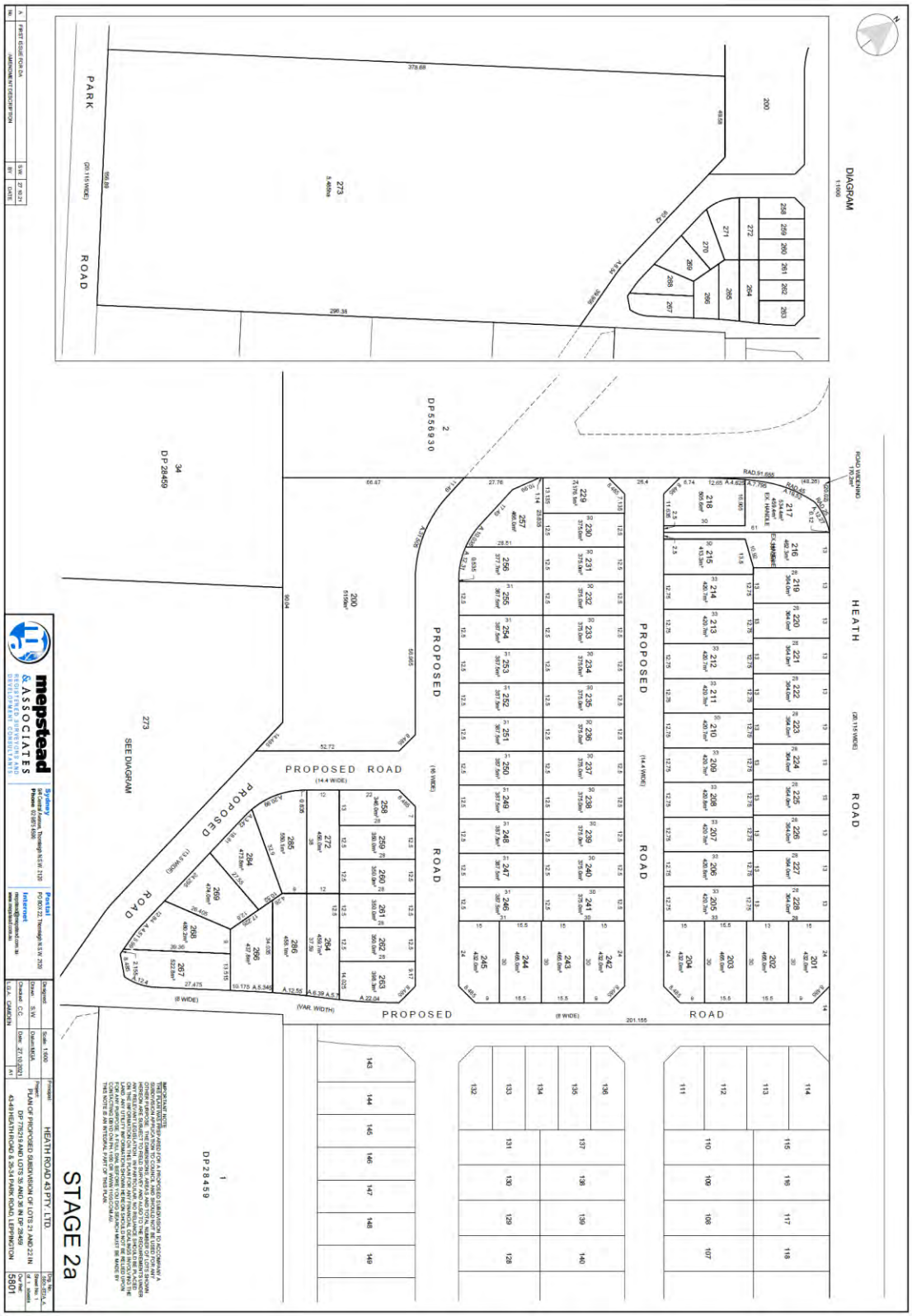
Standards for Asset Protection Zones – NSW Rural Fire Service

Map 1 – Overview & Access

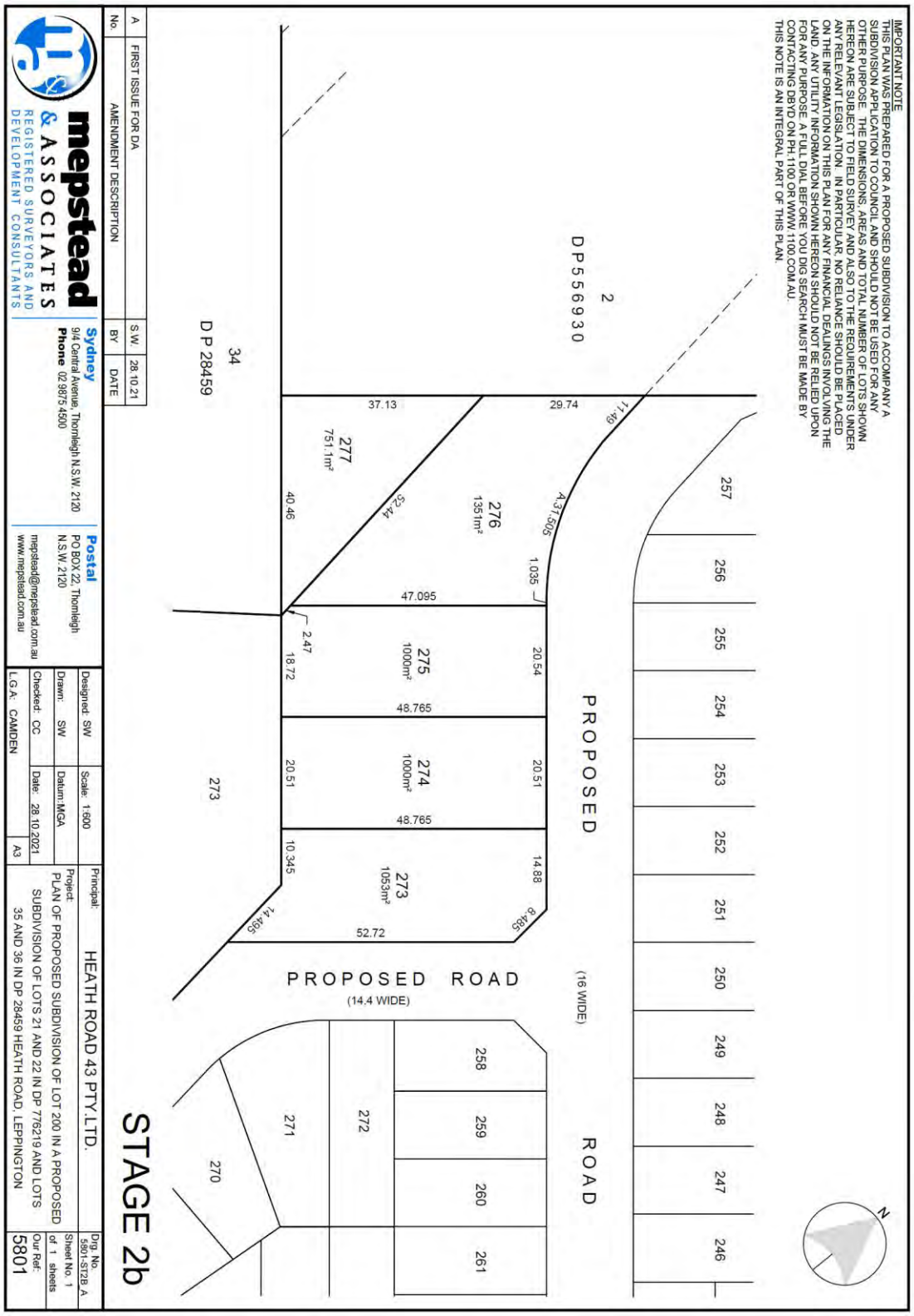
Map 2 – Stage 1 Subdivision Plan



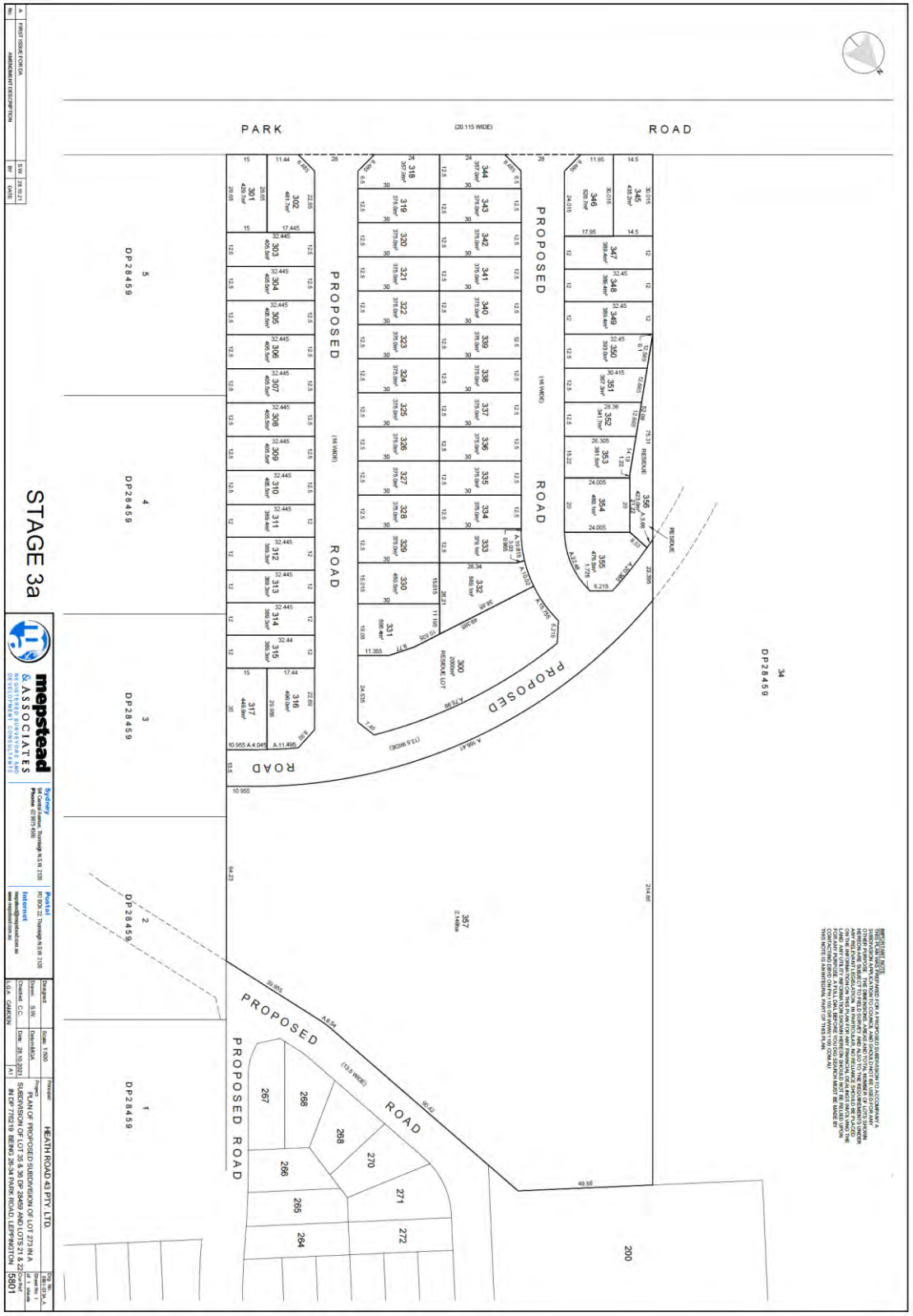
Map 3 – Stage 2A Subdivision Plan



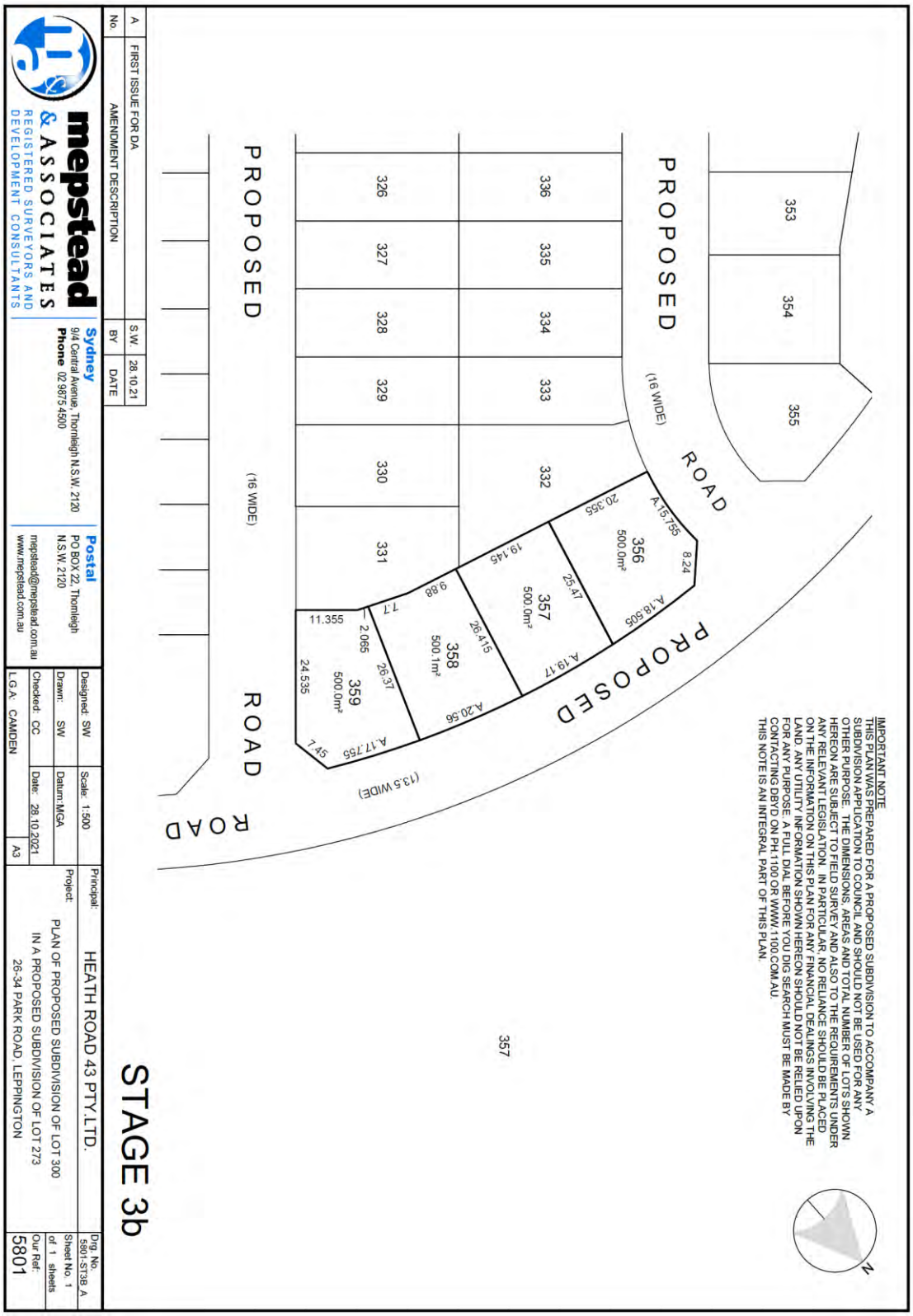
Map 4 – Stage 2B Subdivision Plan



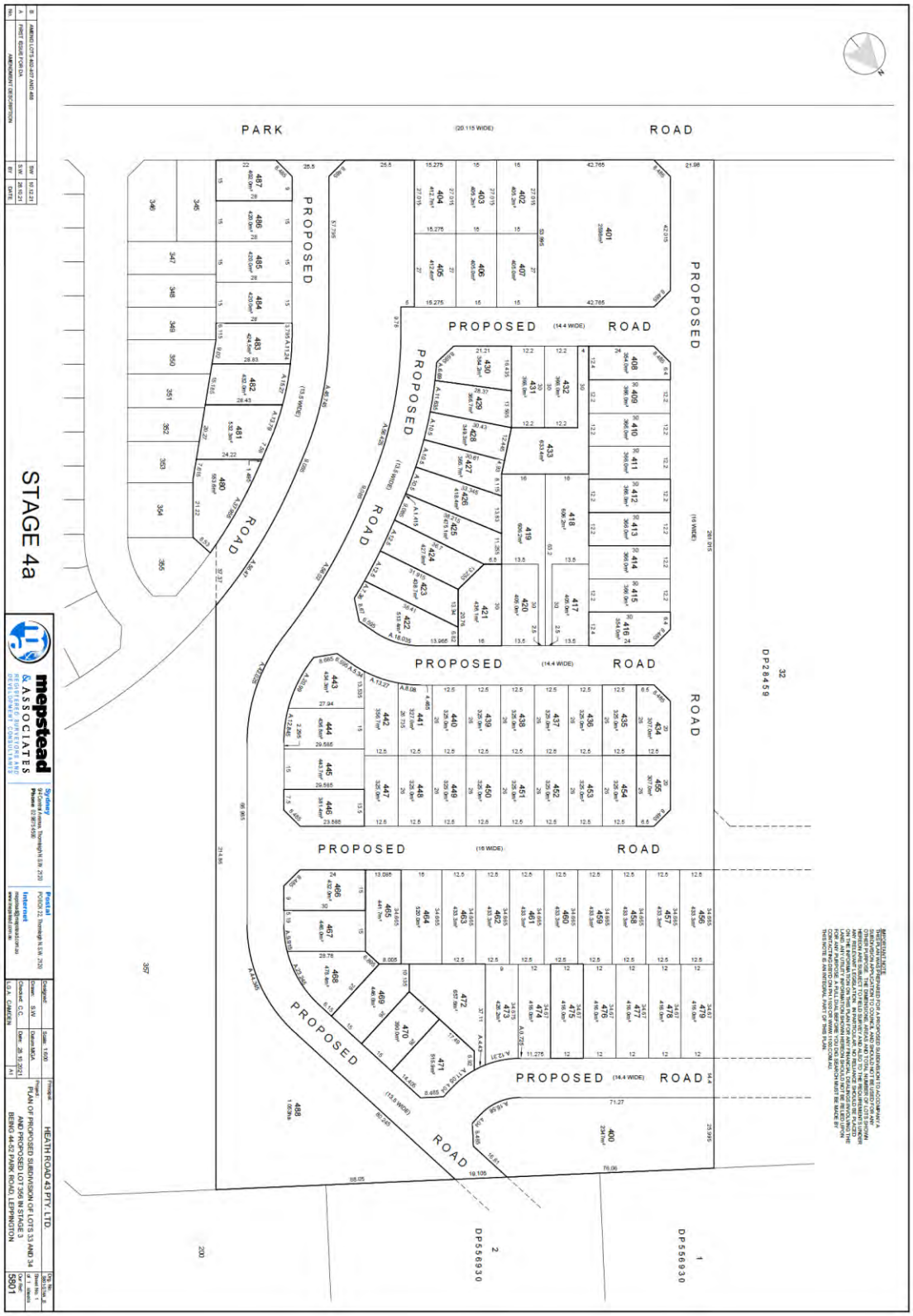
Map 5 – Stage 3A Subdivision Plan



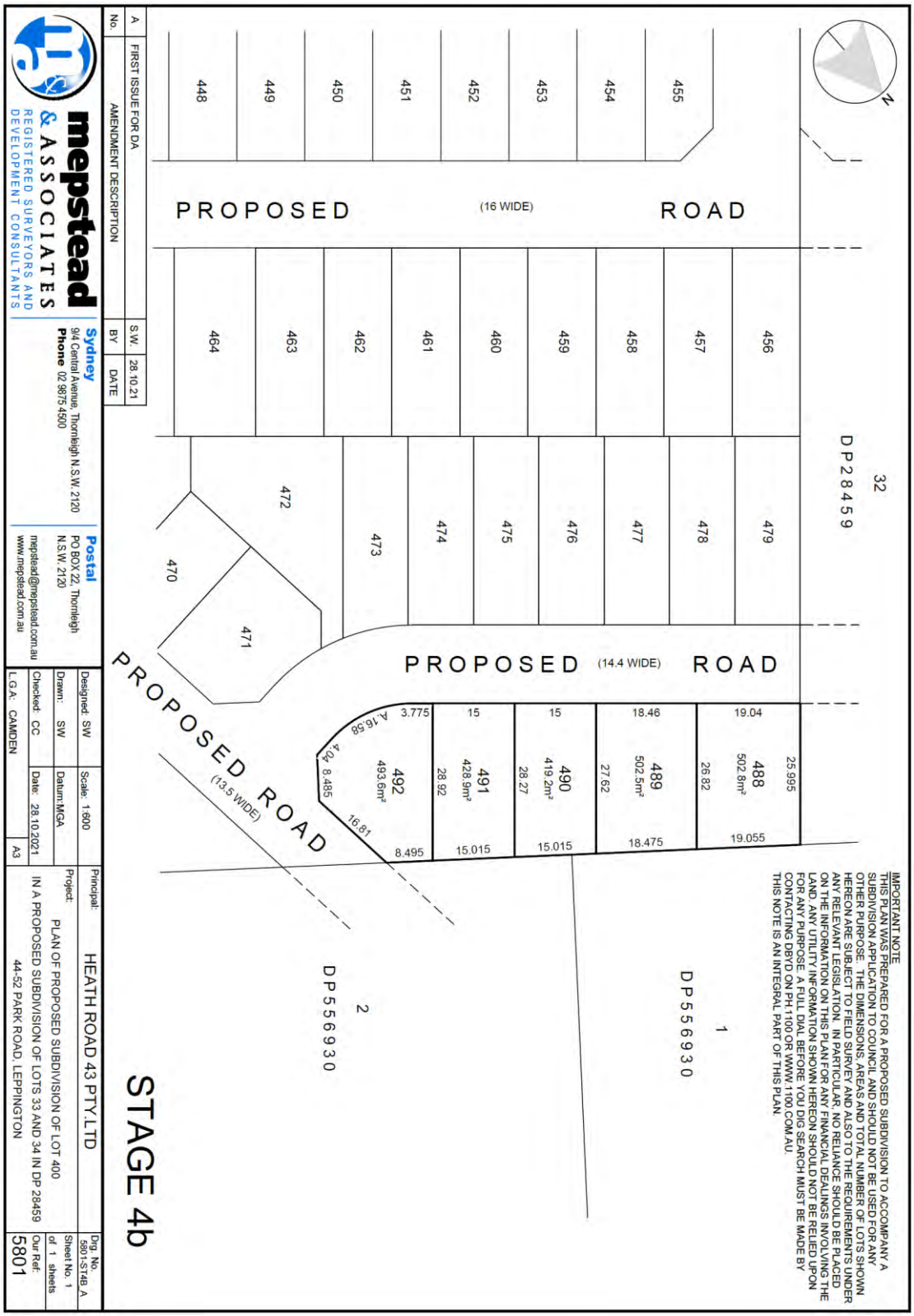
Map 6 – Stage 3B Subdivision Plan



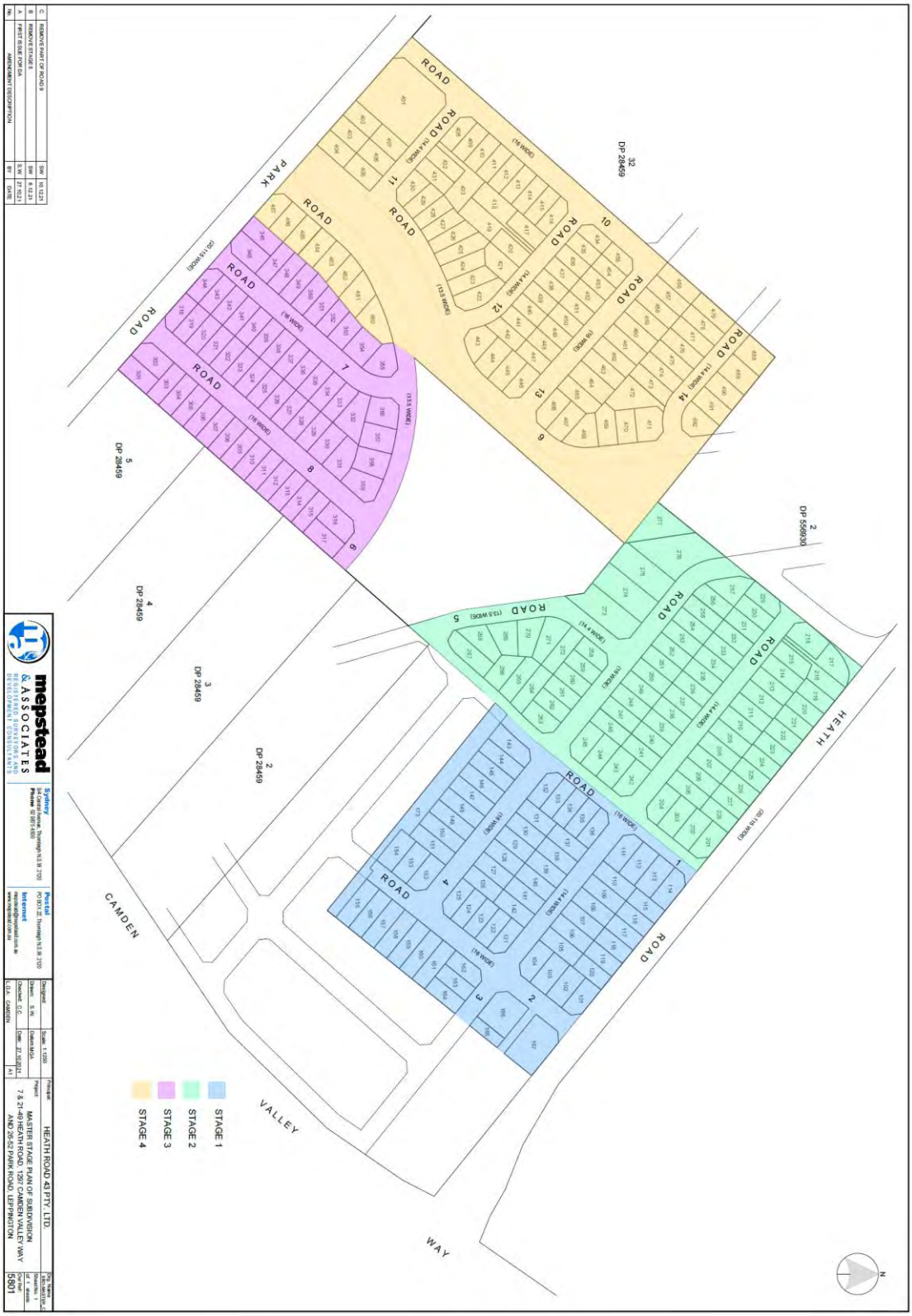
Map 7 – Stage 4A Subdivision Plan



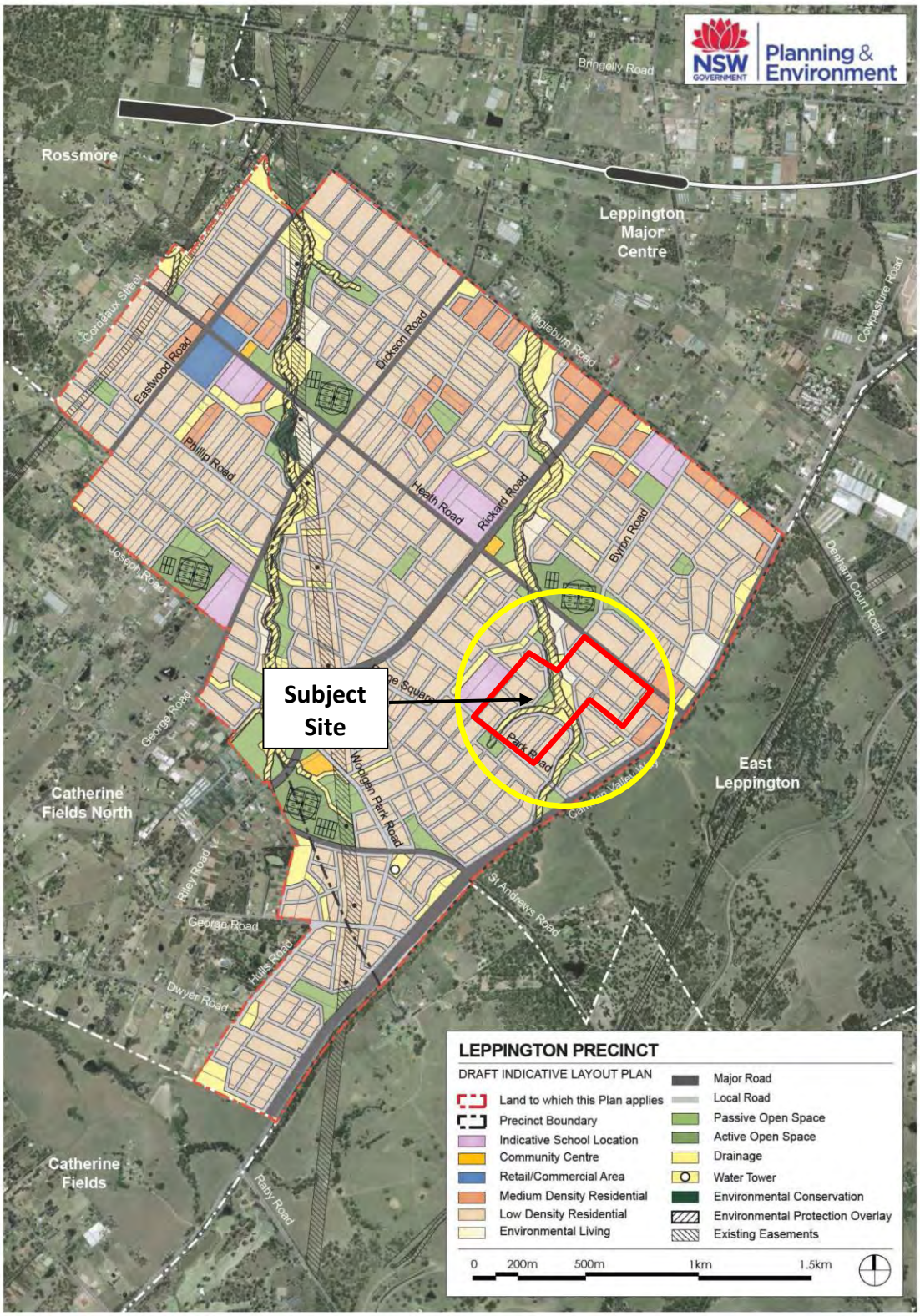
Map 8 – Stage 4B Subdivision Plan



Map 9 – Staging Plan



Map 10 – Indicative Layout Plan (Camden Growth Centre Precincts DCP 2016)



Map 11 – APZ Requirements / Camden Growth Centre Precincts DCP 2016

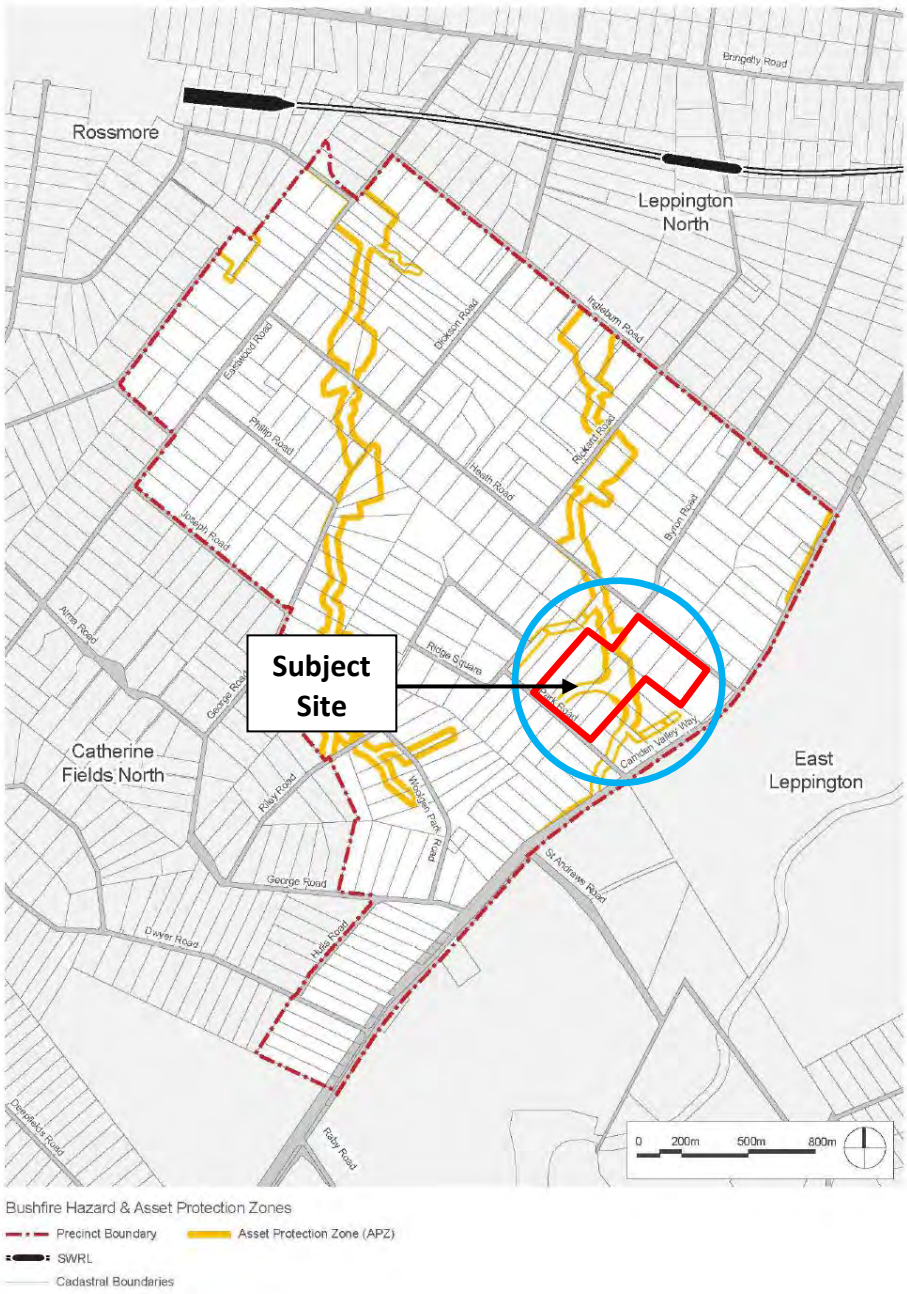
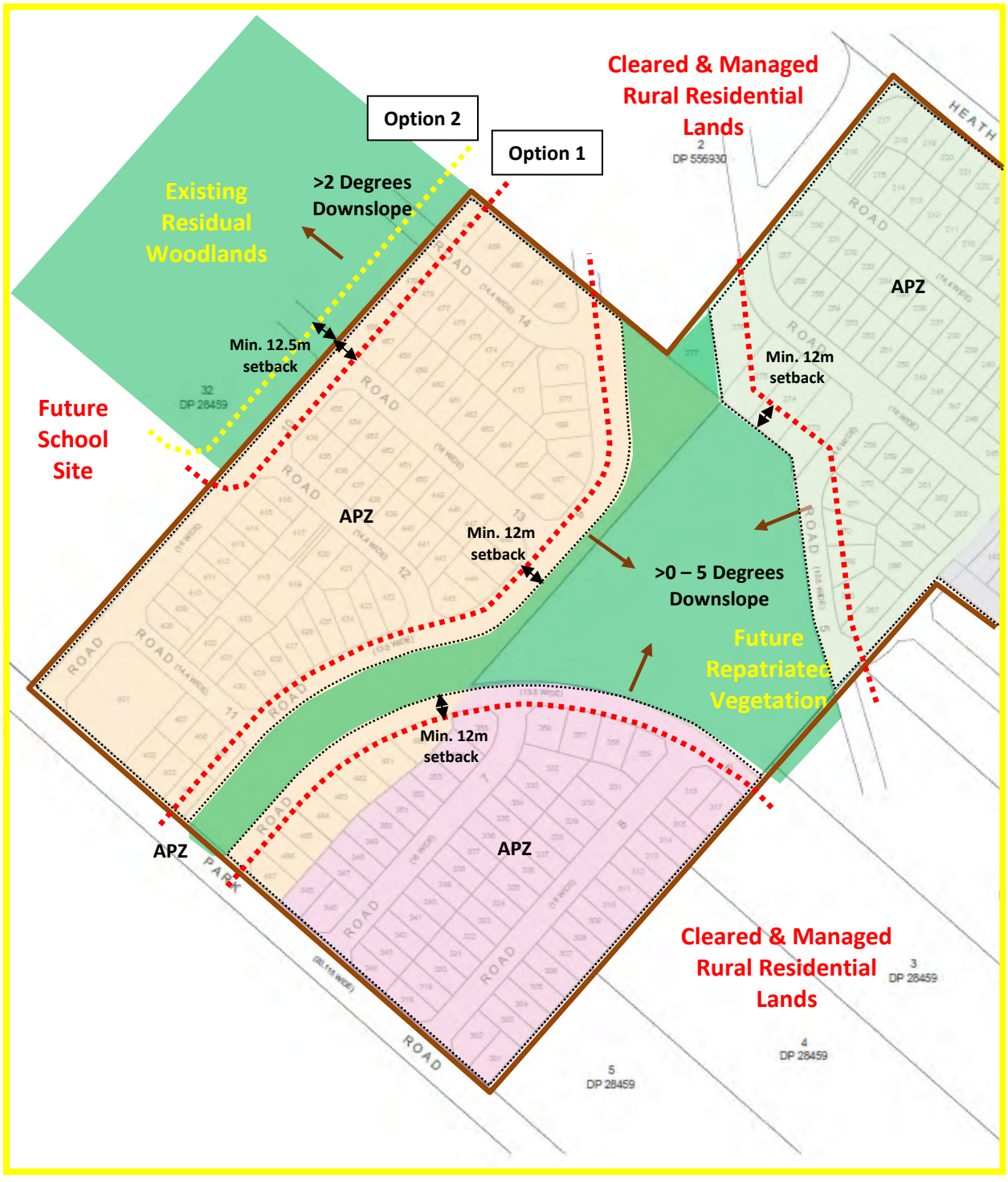


Figure 2-7: Bushfire risk and Asset Protection Zone requirements

Appendix 1 - Bushfire Constraints



Recommended Inner Protection Area (IPA)

Appendix 2 – Site Photos (15/9/2020 & 3/4/2021)

Lot 36, looking North East

Lot 35, looking North East

Lot 34, looking North East

Lot 33, looking North East

Aboveground electrical supply, Park Road

Reticulated water supply Park Road

Lot 2, looking South West

Lot 1, looking South West

Lot 22, looking South West

Lot 21, looking South West

Park Road, looking South East

Heath Road, looking South East

Appendix 3 – Radiant Heat Calculations

NBC Bushfire Attack Assessment Report V4.1

AS3959 (2018) Appendix B - Detailed Method 2

Print Date: 18/07/2021 **Assessment Date:** 5/07/2021

Site Street Address:	Park Road, Leppington		
Assessor:	Please Enter Your Name; Please Enter Company Name		
Local Government Area:	Camden	**Alpine Area:**	No

Equations Used

Transmissivity: Fuss and Hammins, 2002
Flame Length: RFS PBP, 2001/Vesta/Catchpole
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 West

Vegetation Information

Vegetation Type:	Coastal Valley Grassy Woodland		
Vegetation Group:	Woodlands		
Vegetation Slope:	2 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	10	**Overall Fuel Load(t/ha):**	18.07
Vegetation Height(m):	0.9	Only Applicable to Shrub/Scrub and Vesta	

Site Information

Site Slope:	0 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m):	6	**APZ/Separation(m):**	12.5

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

Level of Construction:	BAL 29	**Peak Elevation of Receiver(m):**	4.96
Radiant Heat(kW/m2):	28.83	**Flame Angle (degrees):**	66
Flame Length(m):	11.12	**Maximum View Factor:**	0.439
Rate Of Spread (km/h):	1.38	**Inner Protection Area(m):**	12
Transmissivity:	0.863	**Outer Protection Area(m):**	0
Fire Intensity(kW/m):	12861		