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Bushfire Risk Assessment

Subdivision Masterplan

Proposed Development: Masterplan – Staged Subdivision

Location: Part of Lot 13 DP 1264394 Henry Lawson Drive and Lot 3 DP622318 Mahers Lane, Terranora NSW 2486

Client: Mahers Lane Development Pty Ltd

Our Ref: 2203ZON1795b

Date of Issue: 9 December 2024

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EXPIRY

The bushfire risk assessment and resulting BAL rating contained in this report should not be relied upon for a period extending 6 months from date of issue. If this report was issued more than 6 months ago, it is recommended that the validity of the determination be confirmed with the Accredited Practitioner and where required an updated report should be issued.

COPYRIGHT STATEMENT

DISCLAIMER

This report was prepared on information provided by the client and is for exclusive use by the client for the stated purpose for which it is provided. Should any parts of this report or development application be incorrect or amended, revision shall be required.

Despite best efforts, there is no guarantee that desirable outcomes are achievable during extreme bushfire weather episodes, which may occasion unpredictable bushfire behaviour and detrimental consequences to life, property and the environment. Any representation, statement, opinion or advice expressed or implied in this report is made in good faith on the basis that Bushfire Risk or its employees are not liable (whether by reason of negligence, lack of care or otherwise) to any person for damage or loss whatsoever that may occur in relation to that person taking or not taking (as the case may be) action in respect of any representation, statement or advice referred to below.

LIMITATIONS OF 'PLANNING FOR BUSHFIRE PROTECTION'

It is to be acknowledged as per s.1.3 of PBP 2019, the following limitations of PBP' include but are not limited to uncertainties in the following areas:

- Fire Danger Index;
- Fuel loads;
- Existing developments;
- Human behaviour; and
- Maintenance'.

The solutions and recommendations contained herein aim to mitigate the impact from the effects of bushfire including risk to future buildings during the passage of a fire front. However there is no guarantee loss of life, injury and/or property damage will not occur during a bushfire event. The solutions rely on owners and/or occupiers of the site to carry out the recommendations made in this report and conditions of consent in perpetuity.

EXECUTIVE SUMMARY

This Bushfire Risk Assessment relates to a proposed development located at:	Part of Lot 13 DP 1264394 Henry Lawson Drive and Lot 3 DP622318 Mahers Lane, Terranora NSW 2486.
Client/s:	Mahers Lane Development Pty Ltd
Site inspection date:	5 September 2024
Proposed development:	Masterplan – Staged Subdivision comprising 216 residential lots, future development lot and other lots for open space, drainage and infrastructure (Ref. Appendix A).
Site Plans by:	Civil 360; Rev. L; 27.11.24 (Ref. Appendix A). A full set of plans shall be provided by the applicant to accompany the DA. All design and site plans must ensure compliance with the minimum building setbacks in relation to this development as proposed and the recommendations contained herein.
Is there a suitable building location envelope within each proposed lot below critical radiant heat flux limits of ≤29kW/m²?	YES – all proposed new lot/s incorporate an indicative building location envelope/s (BLE) and/or are positioned in a location with suitable setbacks from the hazard, which remain below critical radiant heat flux limit of 29kW/m².
Does this development satisfy the Aims and Objectives of PBP?	YES – with performance solutions to calculate the APZ and associated BAL rating.
Are performance solutions presented herein?	YES – assessing downslope hazard with slopes in excess of 20 degrees. The performance solution presented in s.5 – Performance Based Design Brief herein, demonstrates radiant heat exposure(RH) limits to proposed building envelopes specifically Lots 401 to 410 (in Stage 4), do not exceed 29kW/m². Complex calculations were carried out using the methodology described in Appendix B of AS3959-2018 to determine the RH flux ensuring BAL-29 or lower construction level can be achieved commensurate with the minimum calculated setbacks.
Does this development require referral to the NSW Rural Fire Service as per s.100B Rural Fires Act 1997?	YES – requiring a Bush Fire Safety Authority (BFSA) for integrated development.
This assessment has been prepared and certified by Melanie Jackson BPAD-Level 3 Certified Practitioner; FPAA Cert. No: 21977	

The following table provides a summary of the recommendations against the BPMs set out in s.5 *Residential and Rural Residential Sub-division* (PBP 2019) and method of assessment used to achieve compliance.

BPM	Recommendation	Method of Assessment
APZ	APZs shall be managed and maintained as per Appendix 4 of PBP (2019). Lots 401 to 410 – APZ provided where radiant heat flux is below 29kW/m^2.	Acceptable Solution all lots except Lots 401 to 410 by Performance Solution.
Landscaping	Landscaping is to comply with Appendix 4 of PBP (2019); & Fencing is constructed in accordance with section 7.6.	Acceptable Solution
Access	Comply with Table 5.3b PBP (2019).	Acceptable Solution
Water	Reticulated water supplies & hydrants: Comply with Table 5.3c PBP (2019).	Acceptable Solution
Electricity	Comply with Table 5.3c PBP (2019).	Acceptable Solution
Gas	Comply with Table 5.3c PBP (2019).	Acceptable Solution

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ABBREVIATIONS

Abbreviation	Description
APZ	Asset protection zone
AS3959	Australian Standard – Construction of Buildings in Bushfire Prone Areas
BAL	Bush fire attack level
BCA	Building Code of Australia
BFPL	Bush fire prone land
BFPL Map	Bush fire prone land map
BFSA	Bush fire safety authority
BE	Building envelope (Building footprint)
BPM	Bush fire protection measure
DA	Development application
DCP	Development control plan
EP&A Act	*Environmental Planning & Assessment Act 1979*
FFDI	Forest fire danger index
GFDI	Grass fire danger index
IPA	Inner protection area
kW/m^2	Kilowatts per metre squared
LEP	Local environmental protection plan
NSW RFS	NSW Rural Fire Service
OPA	Outer protection area
PBDB	Performance Based Design Brief
PoM	Plan of Management
PBP	Planning for Bushfire Protection
RF Act	*Rural Fires Act 1997*
RF Reg	*Rural Fire Regulation 2013*
SEPP	*State Environmental Planning Policy*
SFPP	Special fire protection purpose
SFR	Short fire run

1 INTRODUCTION

Bushfire Risk Pty Ltd was engaged by the client/s to conduct a Bushfire Risk Assessment to assist with the Masterplan relating to the staged sub-division of a large parcel of land at Terranora in accordance with current legislative requirements.

The purpose of the assessment is to determine category of bushfire attack and critical radiant heat flux limits in relation to the proposed development described herein and make recommendations commensurate with Planning for Bushfire Protection (PBP, 2019). The development shall be carried out on the lot/s referred to as the 'Subject Site' (Figure 1) and where applicable, existing or future dwellings shall be sited within a Building Footprint. A Building Envelope is identified for each lot, which shall be referred to as a 'BE' throughout this document.

1.1 Subject Site

Address: Part of Lot 13 DP 1264394 Henry Lawson Drive and Lot 3 DP622318 Mahers Lane, of Terranora NSW 2486 (Ref. Figure 1).

The subject site is located in the Tweed Shire, approx. 12 km from Tweed City Centre. The subject site is 61.87 ha with the development footprint occupying approximately 23.58 hectares and shall constitute an extension to the existing housing estates to east and south of the subject site. The site contains significant vegetation to the north including mangrove wetlands and highly disturbed rainforest. With north facing slopes which extend between the east and west precincts. An existing residential estate abuts the southern boundary. Farmland (grassland) abuts portions of the eastern, northeast and western boundary and a high school is situated on Mahers Lane to the east. Significant native vegetation shall be retained.

Proposed works shall be carried out within predominantly cleared areas of the site. Under the Tweed Local Environmental Plan 2014 (Tweed LEP) the subject site is zoned as follows (Figure 2):

- RU2 – Rural Landscape;
- RU5 – Village;
- R1 – General Residential;
- RE1 – Public Recreation; and
- DM – Deferred Matter (1a – Rural; and 7(a) – Environmental Protection (Wetlands and Littoral Rainforest, under Tweed LEP).

1.2 Proposed Development

Masterplan – Staged Subdivision comprising 216 residential lots, future development lot and other lots for open space, drainage and infrastructure (Appendix A; Table 1).

Building Envelopes (BE) within each lot have been identified where radiant heat flux to each BE remains below critical limits (29kW/m^2) and direct flame contact is negated.

Table 1: Proposed number of lots

Stage	Precinct	No. Residential Lots
Stage 1	Western	56 lots and drainage reserve and open space
Stage 2	Western	46 lots and drainage reserve and open space
Stage 3	Eastern	62 lots and drainage reserve and open space
Stage 4	Eastern	52 lots and open space
Total	**-**	**216**

Figure 1: The subject site and surrounds (Source: Google 2024; Nearmap 2024)

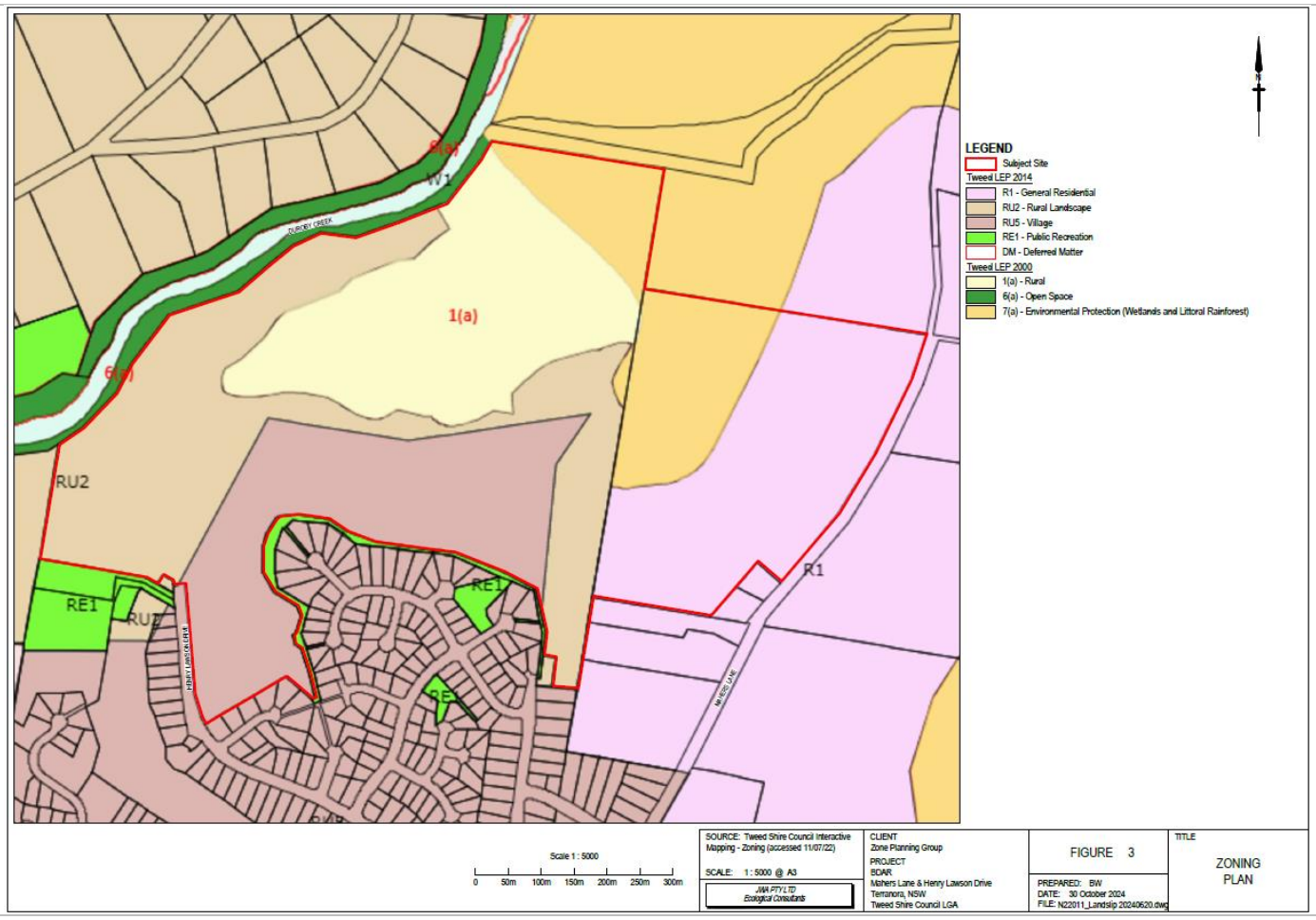


Figure 2: Zoning Plan (Source: JWA Pty Ltd; 30 October 2024)

1.3 Legislation

1.3.1 Strategic Planning Principles

PBP provides the foundation for the application of bush fire protection. Appropriate consideration of bush fire hazards at the strategic planning phase is required by the EP&A Act s.9.1(2) and PBP should be considered in applying the Section 9.1 Direction.

Strategic planning principles commensurate with s.4 of PBP shall be considered during the planning process which include broad principles and exclusion of inappropriate development in bushfire prone areas. A strategic bushfire study to ascertain any implications of future development for bushfire mitigation and management shall be assessed herein.

1.3.2 Development requiring a Bushfire Safety Authority (BFSA)

Proposed sub-divisions and special fire protection purpose (SFPP) developments as defined in PBP require approval from the NSW RFS in the form of a bushfire safety authority (BFSA) under s.100B *Rural Fires Act 1997*. Such developments are considered 'Integrated development' under s.4.46 of the *EP&A Act 1979*.

1.3.3 Bushfire Prone Land

The subject site is mapped as 'Bush Fire Prone Land' (BFPL) under s.10.3 Environmental Planning and Assessment Act 1979 (EPA Act), triggering the legislative requirements for building on bushfire prone land as applicable (Ref. Figure 3).

1.3.4 Building on Bushfire Prone Land

The National Construction Code (NCC) contains Performance Requirements and Deemed-to-Satisfy provisions relating building on Bushfire Prone Land (BFPL). Construction on BFPL must comply with AS3959-2018 – Construction of buildings in bushfire prone areas (AS3959) or the National Association of Steel Framed Housing (2021) Steel Framed Construction in Bush Fire Areas (NASH Standard) as varied in NSW. These requirements are considered Deemed-to-Satisfy solutions, however, do not extend to BAL-FZ or where modified by specific conditions of the relevant development consent.

1.3.5 Environmental, Ecological and Aboriginal Features

The scope of this bushfire report does not include an environmental, ecological or aboriginal assessment. As a result this report should be read in conjunction with the Statement of Environmental Effects (SEE) and any supporting assessments and reports submitted in support of the DA, which shall address the environmental, ecological or Aboriginal features known to the applicant/client for consideration during the Development Application (DA) process.

It is the responsibility of the applicant/client to disclose the details of any threatened species, population or ecological community identified under the Biodiversity Conservation Act 2016 that is known to the applicant to exist on the property and details and location of any Aboriginal object (within the meaning of the National Parks and Wildlife Act 1974) or Aboriginal place (within the meaning of that Act) that is known to the applicant to be situated on the property.

Identification of any significant environmental features may include the following:

- Riparian corridors
- Environmental protection zone or steep lands (>18°)
- Land slip or flood prone areas
- National parks estate or various other reserves
- Details of threatened species, populations, endangered ecological communities and critical habitat known to the applicant may include the following:
- Details of some threatened species can be found online (www.environment.nsw.gov.au)
- Past studies or surveys for the area (e.g. local environment studies) documentation supplied to council in relation to flora and fauna,
- Details of Aboriginal heritage known to the applicant
- Past surveys and information held by the DEC (application fees may apply).
- SEPP (Resilience and Hazards) 2021
- SEPP (Resilience and Hazards) 2021
- SEPP (Biodiversity & Conservation) 2021
- Areas of geological interest

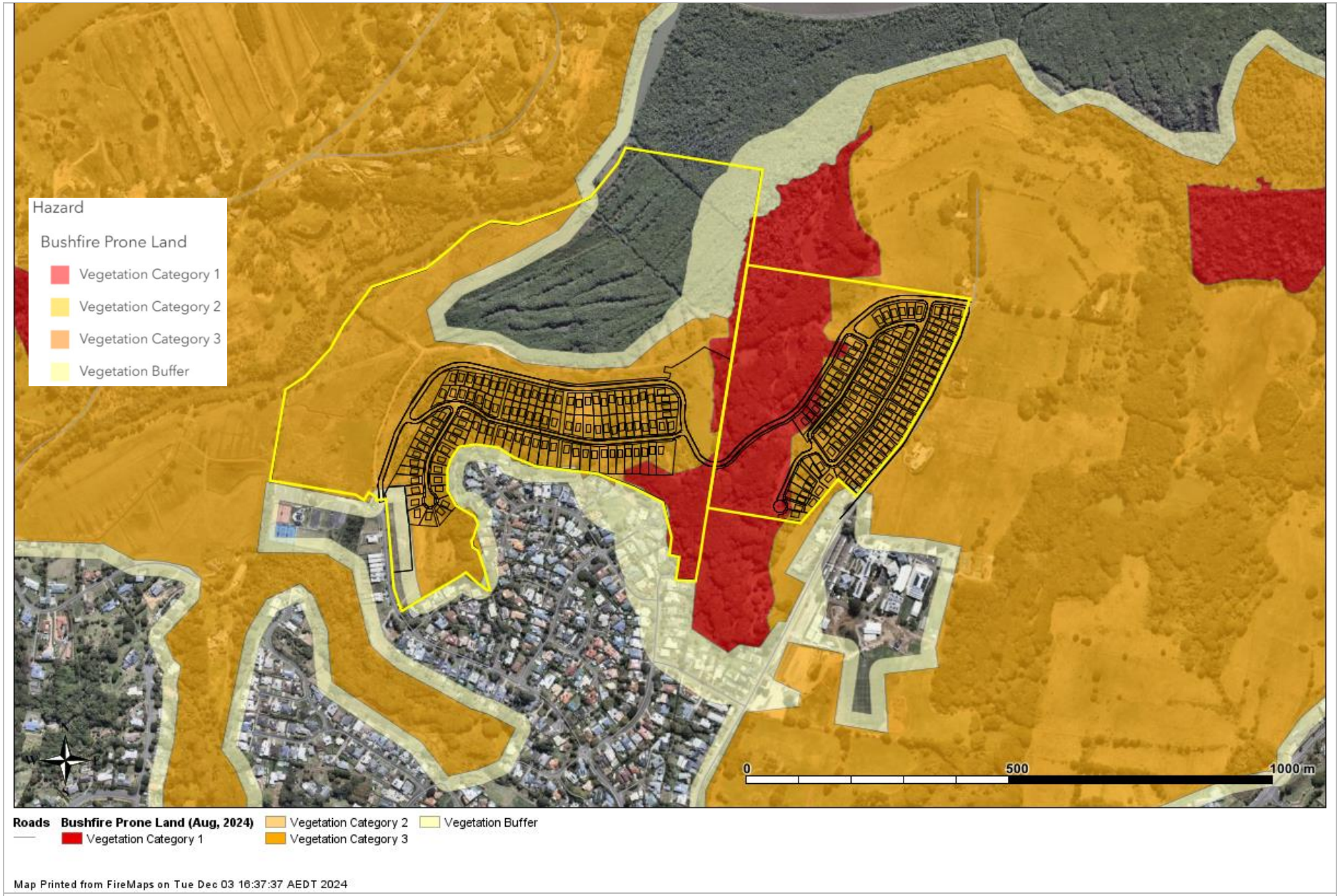


Figure 3: BFPL Map (Source: FireMap 2024)

1.4 Aim & Objectives

1.4.1 Aim and Objectives of PBP 2019

All development on BFPL must satisfy the aim and objectives of Planning for Bush Fire Protection (PBP 2019). This report demonstrates how the requirements can be met by ensuring suitable Bushfire Protection Measures (BPM) are put in place commensurate with the level of risk and characteristics of the occupants.

The aim of PBP is to provide for the protection of human life and minimise 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 occupants protection from exposure to a bush fire.
- Provide for a defendable space to be located around buildings.
- Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings.
- Ensure that appropriate operational access and egress for emergency service personnel and occupants is available.
- Provide for ongoing management and maintenance of BPMs; and
- Ensure that utility services are adequate to meet the needs of firefighters.

1.4.2 Specific Objectives – Subdivisions (s.5 PBP)

- Minimise perimeters of the subdivision exposed to the bushfire hazard (hourglass shapes, which maximise perimeters and create bottlenecks should be avoided).
- Minimise vegetation corridors that permit the passage of bushfire towards buildings.
- Provide for the siting of future dwellings away from ridge-tops and steep slopes, within saddles and narrow ridge crests.
- Ensure that APZs between a bushfire hazard and future dwellings are effectively designed to address the relevant bushfire attack mechanisms.
- Ensure the ongoing maintenance of APZs.
- Provide adequate access from all properties to the wider road network for residents and emergency services.
- Provide access to hazard vegetation to facilitate bushfire mitigation works and fire suppression.
- Ensure the provision of an adequate supply of water and other services to facilitate effective fire fighting.

2 BUSHFIRE STRATEGIC STUDY

A bushfire strategic study, subject to the Planning Principles and Table 4.2.1 of PBP (2019) was carried out to identify suitability of the proposed development and any future development implications for bushfire mitigation and management (Ref. Table 2).

Table 2: Bushfire Strategic Study

ISSUE	DETAIL	ASSESSMENT CONSIDERATIONS

Bushfire landscape assessment	A bushfire landscape assessment considers the likelihood of a bushfire, its potential severity and intensity and the potential impact on life and property in the context of the broader surrounding landscape.	• The bushfire hazard in the surrounding area, including:
		  • Vegetation
		  • Topography
		  • Weather
		• The potential fire behaviour that might be generated based on the above;
		• Any history of bushfire in the area;
		• Potential fire runs into the site and the intensity of such fire run; and
		• The difficulty in accessing and supressing a fire, the continuity of bushfire hazards or the fragmentation of landscape fuels and the complexity of the associated terrain.

Response:

The subject site is situated in Terranora Village, an outer suburb to Tweed City. Tweed City Centre being approx. 12 Kms from the subject site. The proposed development consists of two distinct locations, the 'Eastern Precinct' (stage 1 and 2) and 'Western Precinct' (stages 3 & 4).

The subject site will provide a continuation of the existing housing estate from Henry Lawson Drive from Stages 1 & 2 (western precinct) and provide direct access to Mahers Lane to the north-east being Stages 3 & 4 (eastern precinct).

The hazard is predominantly north of stages 3 & 4; significant tracts of farmland to the north, and east, classified as grassland. Existing residential development occurs to the west and south of stages 1 & 2. These stages are in an area of lower bushfire threat.

An existing school is situated east of the eastern precinct. It is assumed families and occupants of all ages will accommodate large family homes.

There are no recorded bushfire incidents on or in the vicinity of the subject site as a result of a search on the NSW Government Seed Mapping Program (NSW Government 2024).

Proposed stages 1 and 2 traverse the western portion of the subject site. Vegetated land traverses the northern aspect of the subject site consisting of Mangrove wetlands, deemed low threat vegetation as described in s.A1.10 PBP (2019) while grassland (farmland) traverses flat land to the northwest.

A narrow strip of vegetation traverses the southern boundaries, along the perimeter of the development footprint i.e. road reserve; narrow strips of planted rainforest etc. which can be described as low threat vegetation; despite this, separation shall be provided by nominated Asset Protection Zones (APZ), perimeter roads and/or land managed in a low fuel state etc.

The proposed perimeter road provides a fire break from any residual risk. Research did not find a history of fires in the area. Bushfires are assumed to be limited being flanked by low-threat

vegetation and the design incorporating a perimeter road and/or APZs which separate the lots from remaining hazards.

Existing residential development south of stages 1 & 2, will benefit from the proposed development, as the residual risk from the undeveloped steeply sloping land (the subject site) that consists of bushfire prone regrowth vegetation i.e. grassland and exotic regrowth vegetation shall be removed.

Stages 3 & 4 (eastern precinct) traverse the northeast area of the subject site. This part of the site traverses steeply sloping land with a north facing aspect with highly disturbed rainforest to the north, farmland (grazed pasture) to the northeast and east. A large school is situated on Mahers Lane and the proposed development will provide a road connection between Henry Lawson Drive and Mahers Lane.

Mahers Lane will be upgraded in accordance with Council requirements providing a 13.4m wide carriageway allowing for appropriate traffic movement with parking on both sides. The proposal will create a 'better bushfire outcome' providing superior vehicular access, movement and traffic flow, accommodating safe movement for evacuating occupants, while fire fighting vehicles and emergency service personnel carry out operational activities.

The proposal will connect the currently fragmented landscape, it will increase property access and supports suitable perimeter access to the hazard to carry out operational activities which currently does not exist.

The Northern Rivers climate, consists of a humid sub-tropical climate, dominated by summer/autumn rainfall (January to March), approx. 1,000 to 1,500 mm (annually; BOM 2023). Winter and spring are generally dry; however the main bushfire season occurs generally during late winter to spring (August to September) with strong winds tending from the southwest to northwest (NSW BFCC 2019). Climatic data indicates longer bushfire danger periods due to an increase in hot dry days with less rainfall predicted.

Grassfires move very quickly throughout the landscape; therefore appropriate asset protection zones have been assessed and provided. Rainforest is considered a moderate threat, and again appropriate setbacks have been accommodated between the hazard and plotted building envelopes (BE). Setbacks may include non-vegetated areas i.e. roads, waterways etc.

It is prudent to ensure adequate bushfire design enhances public safety and facilitates emergency access and egress. Fire management provisions shall be carefully considered, including road placement, APZ and landscaping provisions to prevent ignition and fire spread.

ISSUE	DETAIL	ASSESSMENT CONSIDERATIONS
Land use assessment	The land use assessment will identify the most appropriate locations within the masterplan area or site layout for the proposed land uses.	• The risk profile of different areas of the development layout based on the above landscape study; • The proposed land use zones and permitted uses; • The most appropriate siting of different land uses based on risk profiles within the site (i.e. not locating development on ridge tops, SFPP development to be located in lower risk areas of the site); and • The impact of the siting of these uses on APZ provision.

Response:

Land use has been determined by following detailed analysis of the site's attributes and the intent of the zoning.

The area identified for development shall be situated on cleared areas of the subject site. It is acknowledged stages 1 & 2 are in a lower threat locality. While the Eastern Precinct is sited in a moderate risk locality (rainforest on north facing slopes), improved road connections will be provided by connecting Henry Lawson Drive and Mahers Lane via a main connector 'Perimeter' road. Defendable space shall be provided to all sides of the development providing public access to and from the area commensurate with the requirements set out in PBP 2019.

The planning proposal attached has considered the implications and is prepared to carry out appropriate landscaping measures pursuant to the requirements set out in Appendix 4 PBP.

ISSUE	DETAIL	ASSESSMENT CONSIDERATIONS
Access and egress	A study of the existing and proposed road networks both within and external to the masterplan area or site layout.	• The capacity for the proposed road network to deal with evacuation of residents and responding emergency services, based on the existing and proposed community profile. • The location of key access routes and direction of travel; and • The potential for development to be isolated in the event of a bushfire.

Response:

As discussed above, the subject site will provide connectivity to the existing road network which are currently dead-end roads. The development will provide a new connecter road between Henry Lawson Drive and Mahers Lane. Mahers Lane adjacent to the subject will undergo a major upgrade by the developer supported by Council as part of the development.

Roads shall comply with the acceptable solutions of PBP (2019) whereby perimeter roads are commensurate with the requirements set out in section 5 (PBP 2019).

Traffic/Access: During the staged development process, access shall be addressed by providing temporary (compliant) access for firefighting vehicles and appropriate turning heads during various stages of the development.

Turning Areas: All turning bays will be suitable for large rigid vehicles and as such will be suitable for both RFS and NSW Fire & Rescue vehicles accommodating road requirements set out by Tweed Shire Council in addition to the requirements set out in PBP (2019).

Provision for additional emergency access and egress points to and from the subject site are satisfactory. The proposed development is not isolated, access is provided to ensure occupants and emergency services can traverse safely from the subject site to surrounding villages and towns i.e. Terranora Village, Tweed City Centre and other low threat neighbourhoods in the area.

The subject site is currently on the interface of Terranora Village (residential areas), near schools and shopping centres whereby there are numerous options to traverse into the surrounding built environment and additional options for emergency respondents to carry out operational activities from their vehicles.

ISSUE	DETAIL	ASSESSMENT CONSIDERATIONS
Emergency services	An assessment of the future impact of new development on emergency services.	• Consideration of the increase in demand for emergency services responding to a bushfire emergency including the need for new stations/brigades; and • Impact on the ability of emergency services to carry out fire suppression in a bushfire emergency.
Response: As discussed above, the proposed development has considered response and demand for emergency services, as per the proposed layout.		

ISSUE	DETAIL	ASSESSMENT CONSIDERATIONS
Infrastructure	An assessment of the issues associated with infrastructure and utilities.	• The ability of the reticulated water system to deal with a major bushfire event in terms of pressures, flows, and spacing of hydrants; and • Life safety issues associated with fire and proximity to high voltage power lines, natural gas supply lines etc.
Response: The subject site shall be serviced by reticulated water supplies complying with the acceptable solutions of PBP as a minimum. Hydrants shall be installed at regular intervals. Professional hydraulic advice (i.e. by a services engineer) during the planning stages shall be provided and presented to Council to ensure compliance can be achieved pursuant to the requirements of PBP and Council's long-term goals. Infrastructure solutions are proposed as part of the Engineering report accompanying the DA.		

ISSUE	DETAIL	ASSESSMENT CONSIDERATIONS
Adjoining land	The impact of new development on adjoining landowners and their ability to undertake bushfire management.	• Consideration of the implications of a change in land use on adjoining land including increased pressure on BPMs through the implementation of Bushfire Management Plans.
Response: There shall be no effect on adjacent lands, the proposed development provides perimeter roads that will enhance bushfire protection by providing access appropriate for operational activities.		

3 BUSHFIRE RISK ASSESSMENT

This Bushfire Risk Assessment includes an analysis of the hazard, threat and subsequent risk to the development as proposed and provides recommendations that the proposal satisfies the aim and objectives of PBP 2019 by complying with the acceptable solutions or performance criteria by applying an appropriate suite of bushfire protection measures (BPM) for the development as proposed, commensurate with the level of risk and characteristics of the occupants.

The bushfire risk assessment shall incorporate provisions to ensure appropriate separation distance between building/s and the hazard can be afforded relevant to the BAL rating. The specific objectives for the proposed development shall be met by demonstrating compliance against the acceptable solutions set out in PBP. Alternatively, deviations from the acceptable solutions will be addressed by providing performance solutions to demonstrate compliance.

3.1 Methodology

3.1.1 Residential and Rural Residential Sub-Division

The bushfire risk assessment was undertaken pursuant to the requirements set out in s.5 – *Residential and Rural Residential Subdivisions* (PBP 2019).

3.1.2 Site Analysis

A desktop and onsite assessment were carried out pursuant to the methodology described in PBP 2019 commensurate with the proposed development type and level of risk.

The following methodology was used to determine the effective slope consistent with the acceptable solutions.

- The minimum distance for APZs was determined pursuant to Table A1.12.3 Appendix 1 PBP.
- The methodology described in Appendix 1 – Site Assessment Methodology using table A1.12.6 – Determination of BAL, FFDI 80 – residential development (PBP 2019) was used to determine the BAL rating and appropriate APZ/setbacks for the proposed development.

3.1.3 Determine the Effective Slope – Performance Solution

PBP is a performance-based document, which allows performance solutions to be used to demonstrate compliance against the performance criteria. Where the effective slope of the hazard traverses a downslope exceeding 20 degrees, the APZ and BAL rating shall be determined using the following methodology:

- Method 2 – Complex Procedure as per the methodology described in 'Appendix B – Detailed Method for Determining the Bushfire Attack Level (BAL) Method 2' (AS3959) was used to determine the radiant heat flux to the receiver (proposed building/s) and associated BAL rating for construction.
- The complex calculations were carried out using the Newcastle Bushfire Consultants (NBC) Bushfire Attack Assessor Calculator (BFAA) (Couch, P. 2021), the detailed results of which are presented in Appendix B herein.

3.1.4 Vegetation & Significant Environmental Features

The assessment and classification of the predominant vegetation types on and surrounding the subject site (out to a minimum distance of 140m from the boundaries of the property) was undertaken, using Keith (2006) vegetation classification system as described in PBP (2019).

3.1.5 Slope & Aspect

An assessment of the aspect and effective slope, being the land under the classified vegetation most likely to have the greatest effect on bushfire behaviour within 100m of the site was undertaken.

Slope analysis was undertaken using assessment methodology:

- A desktop assessment of 2m contours available via the Fire Protection Association (FPAA) *FireMaps NSW* platform (FPAA 2024)
- On-site ground truthing was undertaken on-site, the slope was determined using a Leopold Laser Range Finder and a comparison made to determine the effective slope of the hazard. The results presented in the assessment tables herein.

3.1.6 Bushfire Protection Measures (BPM)

Detailed site analysis and the application of different BPMs in combination (Figure 4) identified in sections 5, 6, 7 & 8 of PBP (2019) achieve the acceptable outcomes, based on suitability and importance for the following particular development types:

- Residential and rural-residential development;
- SFPP development;
- Infill development; or
- Other developments.

The BPMs addressed herein achieve the acceptable outcomes for Residential and Rural Residential Subdivisions.

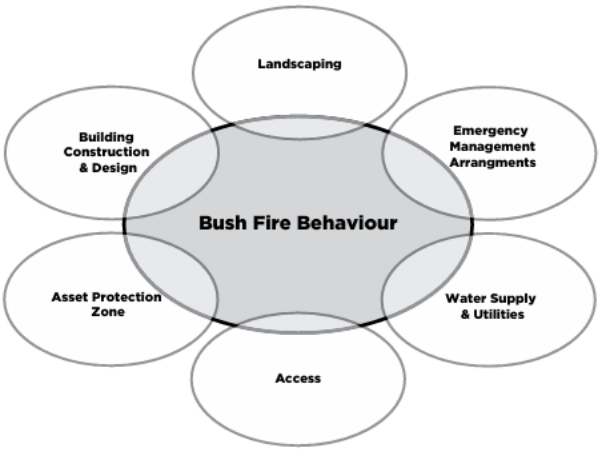


Figure 4: BPMs in combination

4 ANALYSIS & RESULTS

The following sections describe in detail the vegetation type, slope, access, availability of water supplies and environmental considerations for the subject site and surrounds.

4.1 Site Inspection Details

An assessment of the subject site was undertaken by Melanie Jackson (BPAD-Level 3 Accredited Practitioner No. 21977) on 5 September 2024. The vegetated areas described in Table 3 relate to the plot identifiers depicted in Figure 5; Photos presented in Table 4.

Table 3: Vegetation Assessment

Plot ID.	Hazard/Vegetation Formation and Brief Description
1	**GRASSLAND FORMATION**
1a	Grassland occasionally inundated with water. Partially grazed pasture.
1b	Grassland (future development area)
1c	Grassland – small patch
1d	Grassland – grazed pasture
1e	Grassland – grazed pasture
2	**FOREST FORMATION**
2a	Forested wetland
2b	Forested wetland
3	**LOW THREAT VEGETATION – EXCLUSIONS**
3a	Low threat vegetation (under development)
3b	20m wide offsite APZ (proposed) to be managed by the developer until the adjacent site is developed under a s.88b instrument.
3c	Bioretention Basin – low threat/excluded vegetation.
3d	Managed land – low threat/excluded narrow roadside vegetation.
3e	Low threat/excluded vegetation – Saltmarsh Community and Mangrove Wetlands Environmental Management Reserve.
3f	Low threat vegetation – Managed Drainage Reserve, Open Space / Local Park.
3g	Managed land around farm and/or residential dwellings on various lots.
4	**RAINFOREST FORMATION**
4a	Rainforest – Native and exotic mix. i.e. Camphor laurel.
4b	Rainforest – Planted 8m wide rainforest/low threat vegetation (classified as rainforest).
4c	Rainforest reserve – Casual Open Space / Environmental Management.
4d	Rainforest – Casual Open Space / Environmental Management.

Plot ID.	Hazard/Vegetation Formation and Brief Description
	Hazard slope in excess of 20°; Method 2 analysis used to demonstrate compliance to determine the APZ and BAL.
4e	Offsite – Camphor laurel dominated Rainforest regrowth vegetation.

Table 4: Photo Report

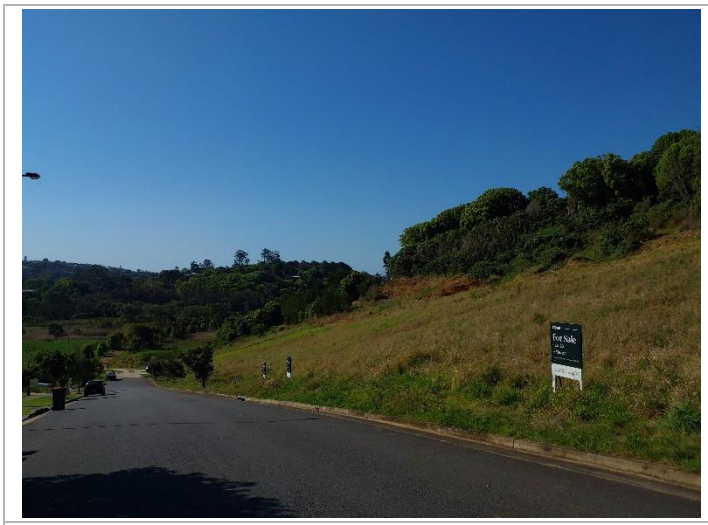


Photo 1: Henry Lawson Drive existing estate facing Stage 1.

Photo 2: Plot 1a – Grassland

Photo 3: Stage 1 & 2 – to be cleared (below Plot 4b)

Photo 4: Stage 1 & 2 - existing perimeter fire trail access

Photo 5: Plot 3e - mangrove forest/wetlands

Photo 6: Stage 3 & 4 – left Mahers Lane; right subject site

Photo 7: Site overview facing north (Plot 3e - flat land)

Photo 8: Site overview facing northeast

Photo 9: Site overview facing west

Photo 10: Site entrance northeast corner of site

Photo 11: Plot 1e – grassland off Mahers Lane; High school (right)

Photo 12: Mahers Lane; Significant road upgrade proposed

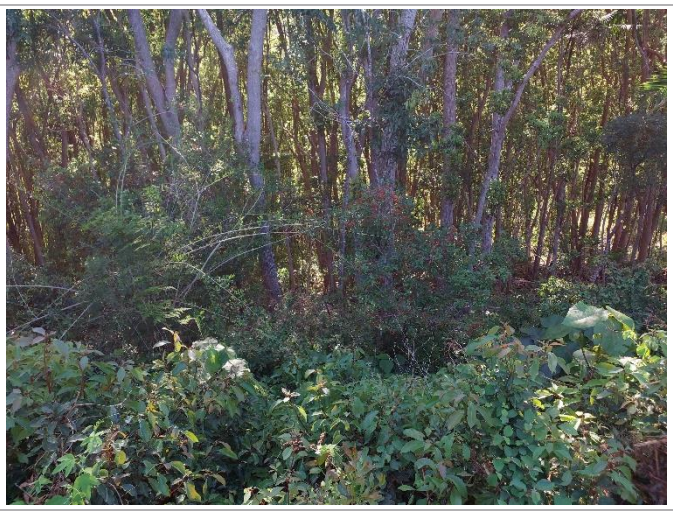


Photo 13: Plot 4d – Rainforest; slope >20 degrees.

Photo 14: Location of proposed lots 401 to 410 (left)

Photo 15: Plot 4c – facing north

Photo 16: Plot 4c (left); Plot 1d (right)

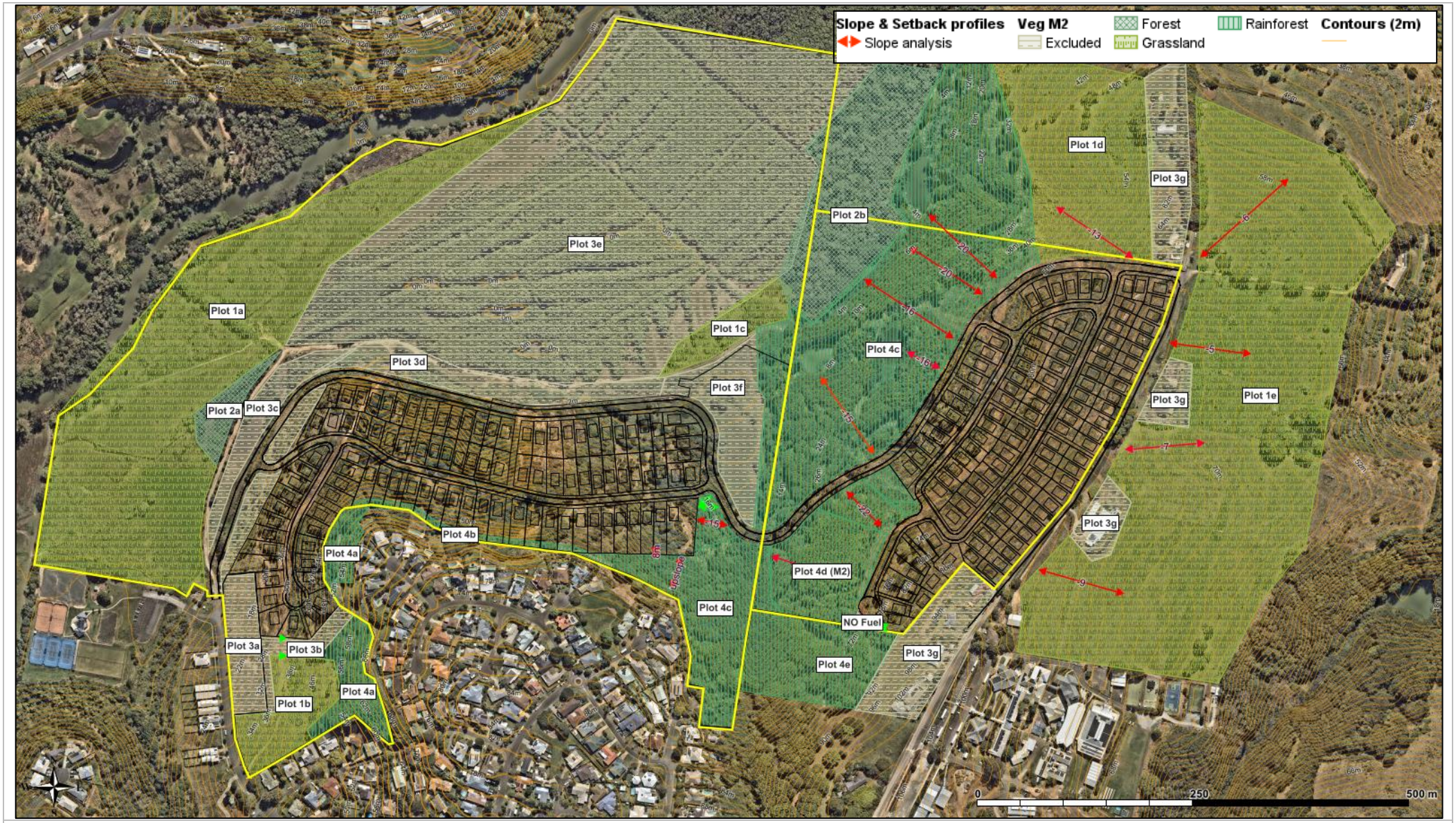


Figure 5: Subject Site, Vegetation Assessment (Source: FireMaps 2024; Nearmap 2024)

4.2 Bushfire Protection Measures (BPM)

The BPMs, namely APZ, access, construction, siting and design, landscaping, services and emergency and evacuation planning, are the relevant set of specifications and requirements to be satisfied to improve life safety, property protection and community resilience to bushfire attack.

4.2.1 Asset Protection Zone

Minimum APZ distances achieve the acceptable solutions for the majority of lots, complying with table A1.12.3 – *Minimum distances for APZs – Residential development FFDI 80 areas (<29kW/m², 1090K)*. In relation to Lots 401 to 410, complex calculations (performance solution) were used to demonstrate compliance against the performance criteria whereby demonstrating radiant heat flux limits shall remain below critical limits (29kW/m²).

The performance solution is presented in s.5 – Performance Based Design Brief (PBDB) which demonstrates how compliance has been met.

BAL-29 or lower construction level shall be achieved provided dwellings are constructed within the building envelopes (BE) depicted within each lot (Ref. Appendix C).

The following was considered during the site analysis.

- APZs should be managed within the bounds of the subject site in perpetuity pursuant to Appendix 4 – Asset Protection Zone Requirements (PBP 2019).
- Offsite APZs considered acceptable may include areas managed in a low fuel state, non-vegetated areas i.e. managed reserves, sports fields, roads, footpaths etc.
- Landscaping shall comply with the acceptable solutions i.e. Appendix 4 (PBP) & NSW RFS document '*Standards for Asset Protection Zones*'.
- In general, all BAL rated lots shall be managed as an Inner Protection Area (IPA) commensurate with Appendix 4 of PBP.

4.2.2 BAL Rating – Future Construction

The recommended BAL rating/s for the proposed development has been determined by the provision of Building Envelopes (BE) positioned with appropriate setbacks from the hazard where radiant heat flux limits remain below critical limits (29kW/m²). The proposed sub-division has been designed to accommodate construction level of BAL-29 or lower.

Future development, however, is required to achieve the Deemed to Satisfy provisions of the NCC and further development on each lot, i.e. construction of a 'Class 1a' dwelling, is subject to a *Development Application* as per s.4.14 EP&A Act or *Complying Development Application* as per the *State Environment Planning Code (SEPP) – Exempt and Complying Development* (where applicable).

4.2.3 APZ & BAL Rating

As per the BAL Plans and Tables presented in Appendix C herein, a BE has been sited within each lot. The BE ensures a minimum setback from the hazard commensurate with the level of risk. The BAL rating for each BE in each lot.

4.2.4 APZ – Staged Development

The proposed development shall be constructed over four (4) stages. Each stage of the development shall be provided with an appropriate APZ to ensure ongoing protection of occupants and firefighters is provided between stages (Ref. Figure A 1).

Furthermore, proposed Stage 1 requires a 20m offsite APZ over the land to be retained by the developer for future use. The 20m APZ is to be located adjacent to the southern boundary of Lots 112 – 115.

The legally binding agreement shall ensure an APZ is maintained by the developer until each stage is developed. Easements may be extinguished upon completion of each stage.

- An easement or covenant shall be established for the purpose of an APZ which shall be managed by the developer i.e. via a legally binding agreement e.g. s.88b instrument under the Conveyancing Act (1919).
- The easement or covenant may be extinguished when a bushfire hazard has been permanently removed i.e. when each stage has been developed.

4.2.5 Access

The proposed road network has been designed in accordance with the acceptable solutions described in Table 5.3b PBP (2019) as per the engineering plans provided in support of the application.

All bulk earthworks across all stages will occur at one time. As part of those bulk earthworks, the road formations, including Road 1 (the main road) will be constructed to a trafficable condition so that firefighting vehicles have alternative access if required.

The main road (Road 1) would be constructed to a final asphaltic surface standard on a staged basis according to the staging plan.

Road 1 – Low Volume Neighbourhood Connector Road

The proposed development has been designed with a Perimeter Road (Road 1 – Connector Road), traversing between Henry Lawson Drive (west) to Mahers Lane (east). Within the 18m wide road reserve, a 10.5m wide carriageway shall be constructed (Ref. Figure 6). Parking shall be made available on the 'lot' side of the road. Line markings and/or signage shall be provided to ensure an 8m carriageway is made available at all times.

Safe operational access for firefighting vehicles while residents are evacuating shall be provided and a safe operational environment for emergency service personnel during firefighting and emergency management activities on the interface shall be provided.

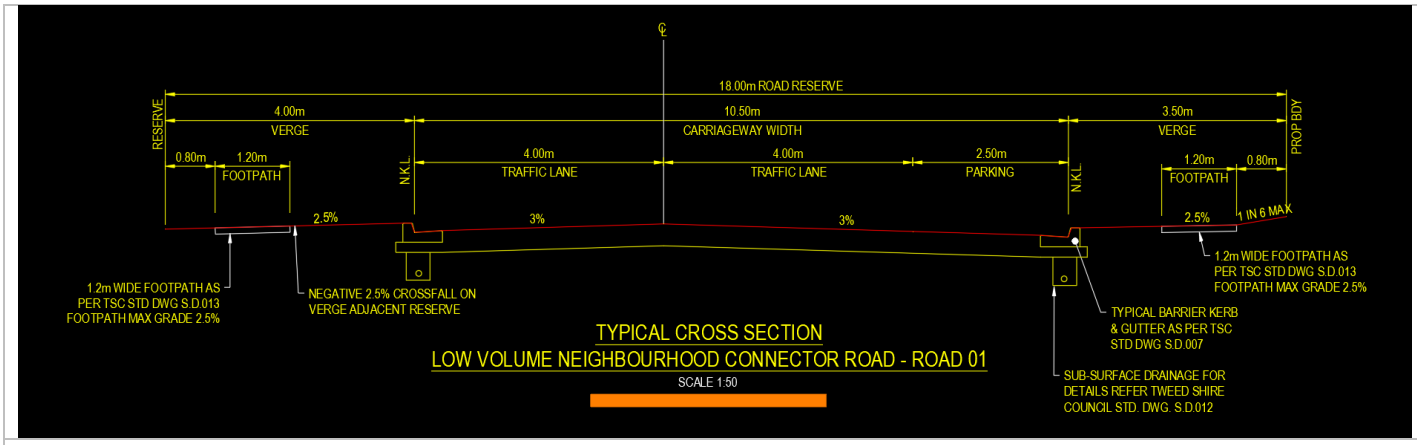


Figure 6: Typical cross section, low volume neighbourhood connector road

Mahers Lane – Council Road Upgrade

The proposed development provides for an upgrade of Mahers Lane, which traverses an existing road reserve adjacent to the subject site, to include a 13.4-metre-wide carriageway with parking on both sides of the road (Ref. Figure 7).

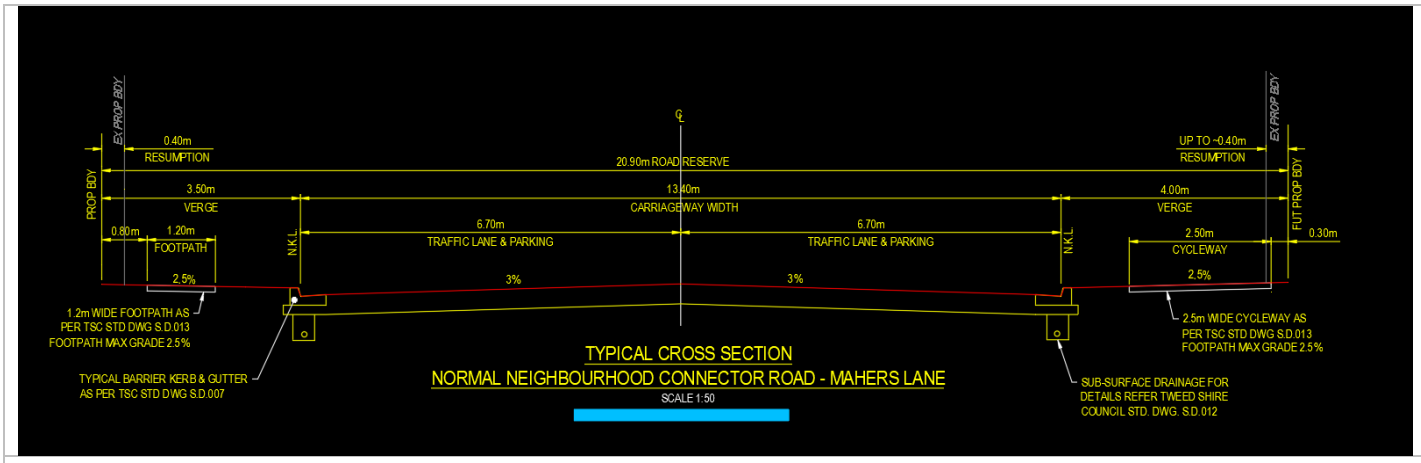


Figure 7: Typical cross section, normal neighbourhood connector road – Mahers Lane

Road 2, 3 & 4 – Access Streets

Non-interface roads consist of a 14.5m wide reserve with a carriageway width of 7.5m min. An unobstructed carriageway no less than 5.5m wide shall be available at all times.

Road 5 – Access Street

Road 5 provides access via a 100m long road, with a large turning circle at the end. An 8m wide carriageway shall be constructed within a 15m wide road reserve, providing 2 travelling lanes and 1 parking lane. Parking will be on one side of the road only.

No parking signage and/or line markings shall be positioned to the north (hazard) side of the road preserving minimum carriageway widths at all times.

4.2.6 Likely Environmental Impacts

The scope of this report does not include an environmental assessment of any significant vegetation which may require removal for bushfire management purposes. This report should be read in conjunction with the Statement of Environmental Effects (SEE) and supporting ecological reports submitted in support of this subdivision application.

4.2.7 Water Supplies for Fire Fighting Purposes

Reticulated water supplies shall be constructed/provided pursuant to the acceptable solutions presented in Table 5.3c (PBP), including hydrant location, spacing, flows and pressure, complying with AS 2419.1:2005.

4.2.8 Electricity & Gas Services

Underground electricity supplies shall be provided as per the acceptable solutions of s.5.3.3 (PBP). Reticulated gas is not proposed.

5 PERFORMANCE BASED DESIGN BRIEF – APZ

5.1 Performance Solution

The following Performance Based Design Brief (PBDB) summarises the process of the analysis undertaken to formulate the performance solution which determines appropriate hazard setbacks or APZ and associated BAL rating for construction commensurate with the level of risk.

5.1.1 Scope of the Project

The Method 2 – Complex Procedure to determine the APZ (setback from the hazard) and associated BAL rating, departs from the acceptable solutions of PBP 2019. Therefore justification is required to demonstrate compliance against the performance Criteria in s.5, Table 5.3a of PBP (2019).

5.1.2 Acceptable Solutions & Performance Criteria

The following BPMs tabulated below require a performance solution because the acceptable solutions cannot be met. Compliance is discussed in the last column, as to how the performance criteria has been achieved (Table 5).

Table 5: BPMs - requiring performance solution/s

BPM	Performance Criteria	Acceptable Solutions
The intent may be achieved where:		
APZ	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 Table A1.12.2 or A1.12.3 based on the FFDI.

Compliance Summary

Setbacks shall be provided to all lots however the slope under the downslope hazard north of Lots 401 to 410 exceeds 20 degrees. Complex calculations were carried out using Method 2 analysis which is described in s.3.1.3 herein, which was used to determine the setback distance and associated radiant heat flux to the receiver commensurate with BAL-29 construction level (or lower).

The actual flame length was also assessed to cross check the length of flame against the assessed setback distances. A summary of the results is presented below and as the actual flame length was longer than the APZ, the flame length was adopted rather than the minimum setbacks to ensure actual flame contact is negated in addition to ensuring radiant heat flux remain below 29kW/m².

Test	Slope (degrees)	Radiant Heat Flux (kW/m²)	Assessed Setback (m)	Flame Length (m)	Min. Setback Proposed (m)
1	26 downslope	26.47	36	39	39
2	22 downslope	28	29	30	30

The proposed BE within each lot shall be setback from the hazard ensuring critical radiant heat flux limits (29kW/m²) and direct flame contact with the associated building is negated. Construction levels triggered shall not exceed BAL-29 (Ref. Figure 8).

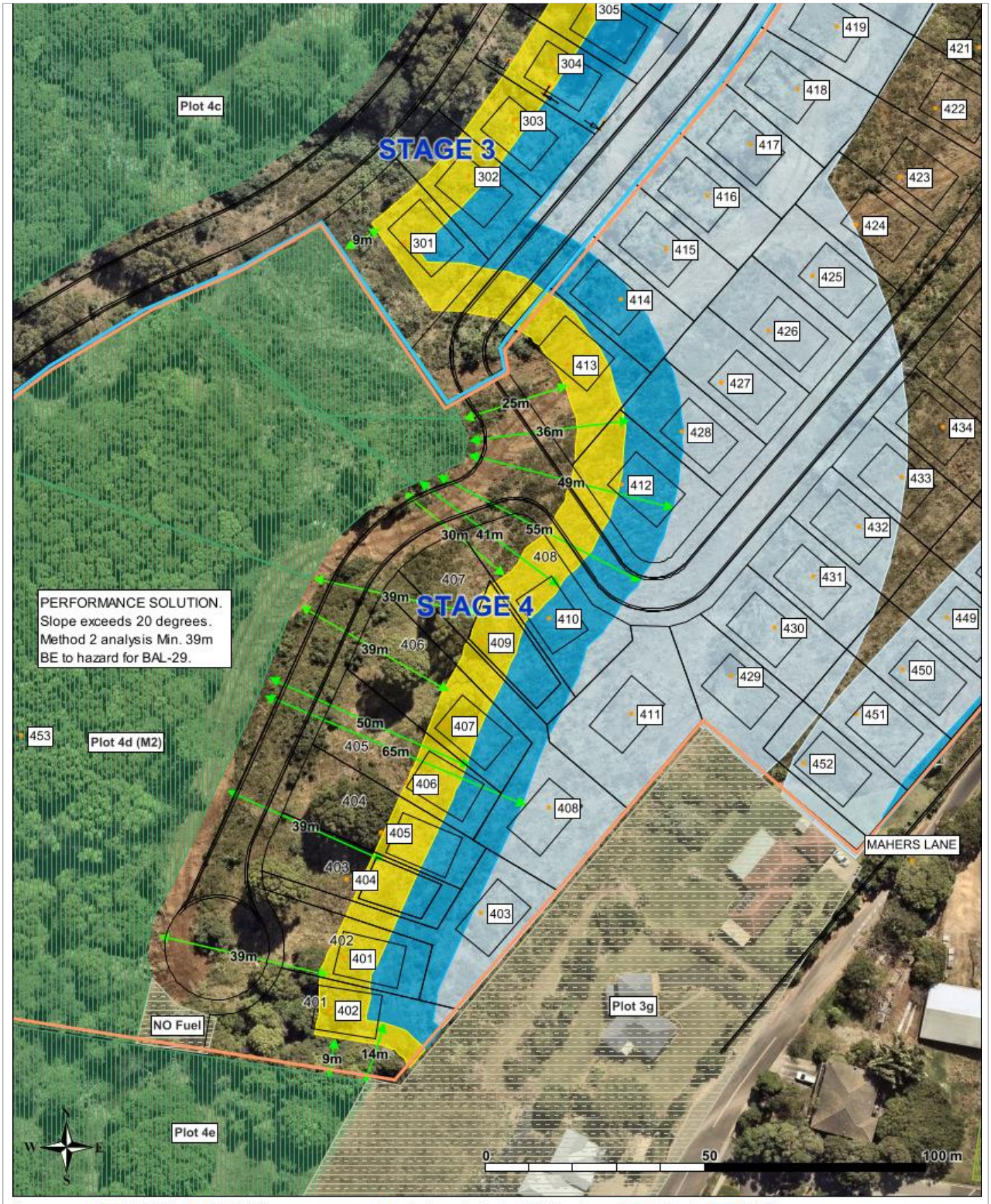


Figure 8: Lots 401 to 410 & 412 BAL Plan (Source: FireMap2024)

5.2 Discussion

A series of design fires were undertaken and analysed in order to determine the actual bushfire risk to the BE in relation to the downslope under the hazard to the north of Lots 401 to 410 which exceeded the acceptable limits of 20 degrees. Therefore tests for a 26 degree and 22 degree slope were required to be tested and analysed.

Design 'test' fires were carried out using BFAA (Couch 2021), using actual slope parameters of the hazard and site with an FFDI-80, to determine minimum setbacks and the BAL rating/s commensurate with the associated radiant heat flux and actual flame length, which is presented in the test results (Ref. Appendix B). The results indicate the 'worst case scenario' for the hazard slope, vegetation type and site slope. The flame length was also analysed to ensure direct flame contact with a building is negated and radiant heat flux to the receiver (building) remain below critical limits. BAL-29 or lower construction level must be achievable in each lot, with appropriate management of APZs and other BPMs associated with the development.

There is no scope to extend the APZ over steeply sloping land on or offsite. Therefore BEs have been placed in areas adjacent to managed land i.e. managed road reserves and managed areas within the lot to achieve appropriate setbacks.

5.3 Conclusion

In conclusion, direct flame contact with the BE shall be negated and radiant heat flux limits remain below 29kW/m^2. Dwelling shall be sited behind minimum setback distances from the hazard where max. BAL-29 construction level can be achieved within each lot.

Minimum recommended APZs shall be applied and managed in perpetuity and all additional BPMs as per the recommendations herein, must be applied. The method 2 results therefore are deemed to satisfy the performance criteria for APZ and associated construction level commensurate with the level of risk.

6 RECOMMENDATIONS & COMPLIANCE

The following table/s indicate the extent to which the proposed development conforms with or deviates from the standards, specific objectives, performance criteria and acceptable solutions set out in *s.5 – Residential and Rural Residential Subdivisions* (PBP).

The results and recommendations herein are commensurate with the level of bushfire risk and characteristics of the occupants for the proposed development, by applying the suite of BPMs in combination, being the site-specific requirements that must be satisfied in order to comply. The table below specifies the method used to demonstrate compliance i.e. acceptable solution or performance-based solution, against the BPMs and provides recommendations to ensure the intent of each BPM shall be met (Ref. Table 6).

Table 6: Compliance Tables; Re: s.5 – Residential and Rural Residential Subdivisions (PBP)

Compliance Tables; Re: *s.5 – Residential and Rural Residential Subdivisions* (PBP)			
BPM	**Performance Criteria**	**Acceptable Solutions**	**Compliance & Recommendations**
The intent may be achieved where:			
s.5.3.1 APZ – Intent of measures: To provide sufficient space and maintain reduced fuel loads to ensure radiant heat levels at the buildings are below critical limits and prevent direct flame contact.			
APZ	• Potential building footprints must not be exposed to radiant heat levels exceeding 29kW/m^2 on each proposed lot.	• APZs are provided in accordance with Tables A1.12.2 or A1.12.3 based on the FFDI.	Complies with the performance criteria as per the acceptable solutions (Ref. s.4 herein) and the PBDB (Ref. s.5 herein). • The APZ meets the recommended distances pursuant to table A1.12.3 (PBP) commensurate with BAL-29 construction level. • APZs were assessed using Table A1.12.3 based on FFDI-80 (acceptable solution); and • Part of Stage 4 complies with the performance criteria whereby a BE is positioned where radiant heat levels shall not exceed 29kW/m^2 on each lot.
APZ	• APZs are managed and maintained to prevent the spread of a fire towards a building.	• APZs are managed in accordance with the requirements of Appendix 4 (PBP).	Comply with the acceptable solutions.
APZ	• The APZ is provided in perpetuity.	• APZs are wholly within the boundaries of the development site.	All APZs shall be managed within each lot complying with the acceptable solution. With the following exception, which complies with the performance criteria. During staged development and for Stage 1, a 20m APZ via a legally binding agreement (i.e. s.88b instrument) is required for

Compliance Tables; Re: *s.5 – Residential and Rural Residential Subdivisions* (PBP)			
BPM	**Performance Criteria**	**Acceptable Solutions**	**Compliance & Recommendations**
			the ongoing management of an APZ on land retained by the developer adjacent to Lots 112 to 115. The following recommendations for offsite APZs is required: • Management of the APZ adjacent to design/release of subsequent stages shall be undertaken by the developer until such time as per the requirements of Appendix 4 PBP as depicted in (Appendix A) • A formal s.88b-easement for offsite APZs is required for ongoing management of areas adjacent to the proposed development including areas subject to staged development/future subdivision i.e. adjacent residual lots and areas subject to permanent APZ management.
APZ	• APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is minimised.	• APZ are located on lands with a slope less than 18 degrees.	Complies with the Acceptable Solutions. • Steeply sloping sites shall be terraced at the development stage.
Landscaping	• Landscaping is designed and managed to minimise flame contact and radiant heat to buildings, and the potential for wind-driven	• Landscaping is in accordance with Appendix 4 (PBP); & • Fencing is constructed in accordance with section 7.6.	Comply with the acceptable solutions and the following: • Landscaping is to be managed in accordance with Appendix 4 of PBP (Ref. Appendix D herein) and where required fences shall be constructed as follows: • All fences in bush fire prone areas should be made of either hardwood or non-combustible material.

Compliance Tables; Re: *s.5 – Residential and Rural Residential Subdivisions* (PBP)			
BPM	**Performance Criteria**	**Acceptable Solutions**	**Compliance & Recommendations**
	embers to cause ignitions.		• In circumstances where the fence is within 6m of a building or in areas of BAL-29 or greater, they should be made of non-combustible material only.

Compliance Tables; Re: *s.5 – Residential and Rural Residential Subdivisions* (PBP)			
BPM	**Performance Criteria**	**Acceptable Solutions**	**Compliance & Recommendations**
s.5.3.2 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.			
Access (General Requirements)	• Firefighting vehicles are provided with safe, all-weather access to structures.	• 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. • Traffic management devices are constructed to not prohibit access by emergency services vehicles. • 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. • All roads are through roads. • Dead end roads are not recommended, but if unavoidable, are not more than 200 metres in length,	Complies with the acceptable solutions and shall include the following: • Public dead-end roads which terminate at future subdivision stages and/or vacant land, i.e. residual lots etc. shall be provided with appropriate turning heads. • During staged development, all dead-end roads shall be provided with a multi-head turning area/s. • All multi-head turning areas and surfaces is sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes) and shall be constructed in accordance with Appendix 3 of PBP (Ref. Appendix D herein). • Temporary roads and turning areas, may be extinguished upon commencement of future stages.

Compliance Tables; Re: *s.5 – Residential and Rural Residential Subdivisions* (PBP)			
BPM	**Performance Criteria**	**Acceptable Solutions**	**Compliance & Recommendations**
		incorporate a minimum 12 metres outer radius turning circle, and are clearly sign posted as a dead end. • 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; and • One way only public access roads are no less than 3.5metres wide and have designated parking bays with hydrants located outside of these areas to ensure accessibility to reticulated water for fire suppression.	• Comply with the requirements for ongoing management whereby a s.88b instrument shall be issued ensuring ongoing management is undertaken in perpetuity; and/or • All bulk earthworks across all stages will occur at one time. • As part of those bulk earthworks, the road formations, including Road 1 (the main road) will be constructed to a trafficable condition. • The main road (Road 1) shall be constructed to a final asphaltic surface standard on a staged basis according to the staging plan.
Access (General Requirements)	• The capacity of access roads is adequate for firefighting vehicles.	• The capacity of perimeter and non-perimeter road surfaces and any bridges/causeways is sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes); bridges and causeways are to clearly indicate load rating.	Comply with the acceptable solutions.
Access (General Requirements)	• There is appropriate access to water supply.	• Hydrants are located outside of parking reserves and road carriageways to ensure accessibility to reticulated water for fire suppression. • Hydrants are provided in accordance with the relevant clauses of AS 2419.1:2005 – *Fire hydrant installations System design, installation and commissioning*; and • There is suitable access for a Category 1 fire appliance to within 4m of the static water supply where no reticulated supply is available.	Comply with the acceptable solutions. • Hydrants shall be provided pursuant to standard engineering guidelines and relevant Australian Standards including AS2419.1:2021.

Compliance Tables; Re: *s.5 – Residential and Rural Residential Subdivisions* (PBP)			
BPM	**Performance Criteria**	**Acceptable Solutions**	**Compliance & Recommendations**
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 operational environment for emergency service personnel during fire fighting and emergency management on the interface.	• Are two way sealed roads. • Minimum 8m kerb to kerb. • Parking is provided outside of the carriageway width. • Hydrants are located clear of parking areas. • 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 grade road is 15 degrees and average grade of not more than 10 degrees. • The road crossfall does not exceed 3 degrees. & • A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.	Complies with the acceptable solutions.
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. • 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 crossfall does not exceed 3 degrees. & • A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.	Complies with the acceptable solution as presented in the site plans provided herein (Ref. Appendix A).

Compliance Tables; Re: *s.5 – Residential and Rural Residential Subdivisions* (PBP)			
BPM	**Performance Criteria**	**Acceptable Solutions**	**Compliance & Recommendations**
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 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. • In forest, woodland and heath situations, rural property roads have passing bays every 200m that are 20m long by 2m wide, making a minimum trafficable width of 6m, at the passing bay. • A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches. • Provide a suitable turning area in accordance with Appendix 3. • Curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress. • The minimum distance between inner and outer curves is 6m. • The crossfall is not more than 10 degrees. • Maximum grades for sealed roads do not exceed 15 degrees and not more than 10 degrees for unsealed roads; and	Complies with the acceptable solution. The subject site is situated in a NSW Fire and Rescue service area where reticulated water and hydrants shall be provided. Comply with the acceptable solutions with regards to the following: • No specific property access roads are required to lots where dwellings are sited within 70m from the most distant external part of proposed BE. NB: it is recognised in NSW Fire and Rescue locations 90m is deemed acceptable.

Compliance Tables; Re: *s.5 – Residential and Rural Residential Subdivisions* (PBP)			
BPM	**Performance Criteria**	**Acceptable Solutions**	**Compliance & Recommendations**
		• A development comprising more than three dwellings has formalised access by dedication of a road and not by right of way. 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.	

Compliance Tables; Re: *s.5 – Residential and Rural Residential Subdivisions* (PBP)			
s.5.3.3 Services – Water, Electricity and Gas – Intent of Measures: To provide adequate services of 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.			
Water Supplies	• Adequate water supplies are provided for firefighting purposes.	• Reticulated water is to be provided to the development where available. • A static water and hydrant supply are provided for non-reticulated developments or where reticulated water supply cannot be guaranteed. & • Static water supplies shall comply with Table 5.3d.	Comply with the acceptable solutions. • Reticulated water supplies shall be provided to service the development.
Water Supplies	• Water supplies are located at regular intervals; and	• Fire hydrant, spacing, design and sizing complies with the relevant clauses of Australian Standard AS 2419.1:2005.	Comply with the acceptable solutions. • Fire hydrants shall be installed in accordance withAS2419:2021.

Compliance Tables; Re: *s.5 – Residential and Rural Residential Subdivisions* (PBP)			
	• The water supply is accessible and reliable for firefighting operations.	• Hydrants are not located within any road carriageway; and • Reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads.	
Water Supplies	• Flows and pressure are appropriate.	• Fire hydrant flows and pressures comply with the relevant clauses of AS 2419.1:2005.	Comply with the acceptable solutions. • Fire hydrants flow and pressure shall be installed in accordance withAS2419:2021.
Water Supplies	• The integrity of the water supply is maintained.	• All above-ground water service pipes are metal, including and up to any taps. & • Above-ground water storage tanks shall be of concrete or metal.	Comply with the acceptable solutions.

Electricity Services	Location of electricity services limits the possibility of ignition of surrounding bush land or the fabric of buildings.	• Where practicable, electrical transmission lines are underground; and
		• Where overhead, electrical transmission lines are proposed as follows:
		  • Lines are installed with short pole spacing of 30m, unless crossing gullies, gorges or riparian areas; and
		  • No part of a tree is closer to a power line than the distance set out in ISSC3 *Guideline for Managing Vegetation Near Power Lines*.
			Comply with the acceptable solution.
			• The electricity supply services, and installation shall be carried out in accordance with the acceptable solutions.

Gas Services	Location and design of gas services will not lead to ignition of	• Reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:2014 - *The storage and handling of LP Gas*,	Comply with the acceptable solutions where installed.

Compliance Tables; Re: *s.5 – Residential and Rural Residential Subdivisions* (PBP)			
	surrounding bushland or the fabric of buildings.	the requirements of relevant authorities, and metal piping is used. • All fixed gas cylinders are kept clear of all flammable materials to a distance of 10m and shielded on the hazard side. • Connections to and from gas cylinders are metal. • Polymer-sheathed flexible gas supply lines are not used; and • Above-ground gas service pipes are metal, including and up to any outlets.	

7 CONCLUSION

The combination of BPMs and recommendations contained within this document, aim to reduce the impacts of a bushfire attack to the occupants, firefighters, building/s and environment. With the aim to reduce consequences of ember attack and direct flame contact with building/s able to be constructed within the proposed BE. Acceptable and performance solutions in relation the bushfire protection measures in combination were used to demonstrate compliance against the performance criteria of PBP.

This report makes the determination through a detailed Bushfire Risk Assessment that the proposed development does not appear to negatively affect the indicative BE on each lot. All BE have been sited where radiant heat shall not exceed critical limits (29kW/m^2). The results of which are based on the proviso the recommended APZ distances and ongoing maintenance for both temporary and permanent offsite APZs is provided in perpetuity.

As a qualified consultant in Bushfire Risk Assessment as recognised by the NSW Rural Fire Service, this report has considered all elements of bushfire attack and BPMs in combination. Provided the development proposal is carried out in accordance with the recommendations contained herein, the development, in my professional opinion, shall satisfy the objectives and performance criteria of PBP (2019).

The proposed development requires a BFSA from the NSW RFS under s.100B of the RF Act. This report concludes the proposed development complies with the requirements of PBP (2019) for integrated development with performance solutions as presented in s.5 – PBDB herein.

BIBLIOGRAPHY

Australian Building Codes Board, 2022, *NCC–National Construction Code Series, Building Code of Australia Class 1 and Class 10 Buildings*, Vol 2. Canberra, Act.

Couch, P., 2021, *NBC Bushfire Attack Assessor*, Newcastle Bushfire Consultants, Warners Bay NSW 2282.

Fire Protection Association Australia (FPAA), 2024, *FireMaps NSW,* <www.firemaps.com.au>, Blackburn, North VIC 3128.

The National Association of Steel Framed Housing, 2021, '*Steel Framed Construction in Bush Fire Areas*' (NASH standard).

Nearmap, 2024, *Nearmap*, <http://maps.au.nearmap.com/>.

NSW Government, 2024, SEED – The Central Resource for Sharing and Enabling Environmental Data in NSW, <https://www.seed.nsw.gov.au/>.

NSW Rural Fire Service, 2005, *Standards for Asset Protection Zones, NSW Rural Fire Service,* Sydney NSW.

NSW Rural Fire Service, 2019, *Bushfire Survival Plan*, 2019, <http://www.rfs.nsw.gov.au>.

NSW Rural Fire Service, 2019, *Development Assessment & Planning – Upgrading of Existing Buildings* 0914, <http://www.rfs.nsw.gov.au>.

NSW Rural Fire Service, 2019, *Planning for Bush Fire Protection, A Guide for Councils, Planners, Fire Authorities and Developers*, NSW Rural Fire Service, Sydney NSW.

NSW Rural Fire Service, 2022, *Planning for Bush Fire Protection, A Guide for Councils, Planners, Fire Authorities and Developers Addendum November 2022*, NSW Rural Fire Service, Sydney NSW.

Standards Australia / New Zealand Standards, 2014, *AS/NZS 1596–2014 The Storage and Handling of LP Gas*, Sydney, Standards Australia International Ltd.

Standards Australia, 2018, AS 3959–2018 *Construction of Buildings in Bushfire Prone Areas*, Sydney, Standards Australia International Ltd.

APPENDIX A – MASTERPLAN STAGED DEVELOPMENT PLANS

Plans by: Civil 360; Rev. L; 27.11.24.

A full set of plans shall be provided by the applicant to accompany the DA. All design and site plans must ensure compliance with the minimum building setbacks in relation to this development as proposed and the recommendations contained herein.

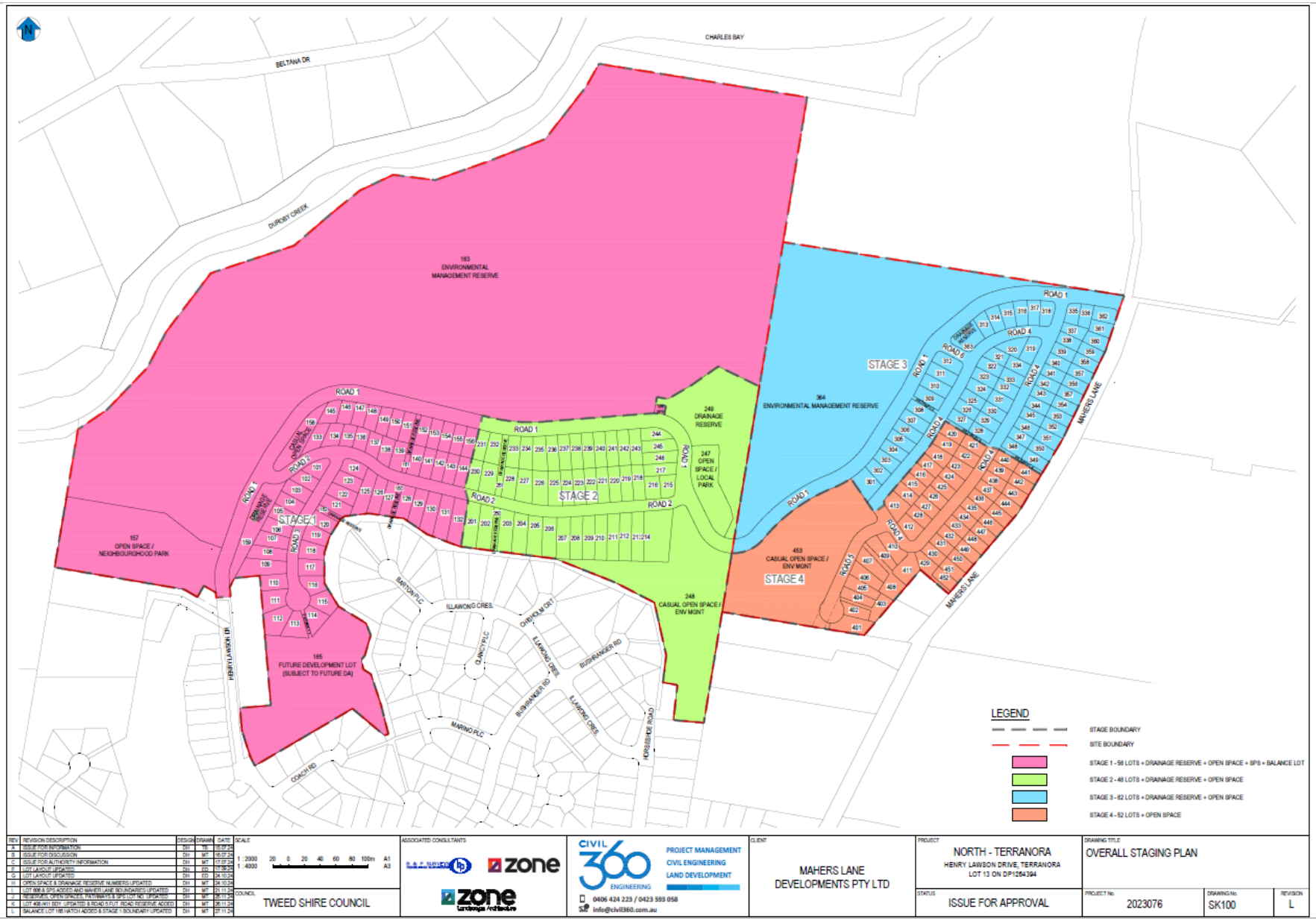


Figure A 1: Proposed Masterplan / Staging Plan (Source: Civil 360 Engineering; Revision L)

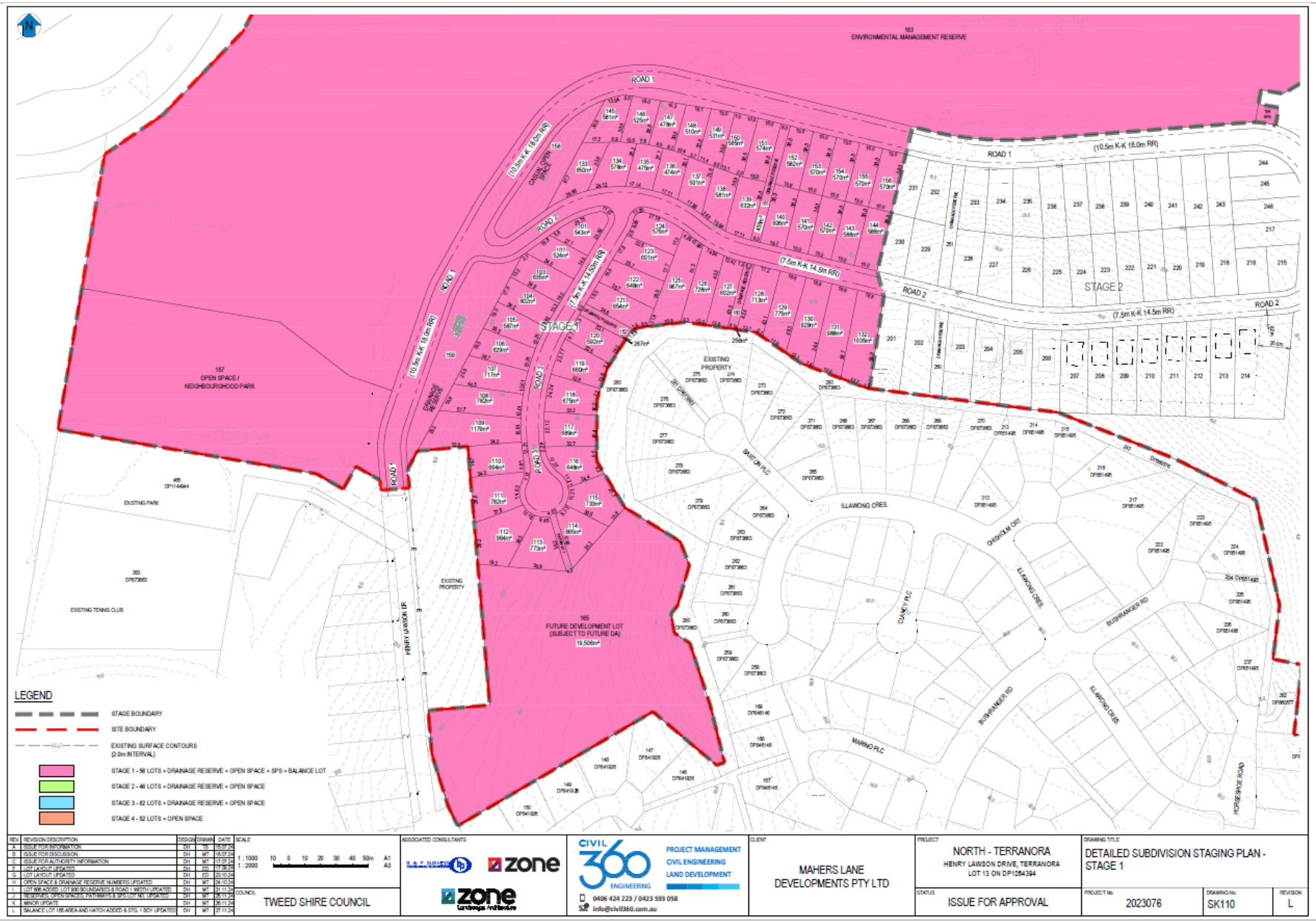


Figure A 2: Stage 1 – Proposed development layout (Source: Civil 360 Engineering; Revision L)

Figure A 3: Stage 2 – Proposed development layout (Source: Civil 360 Engineering; Revision L)

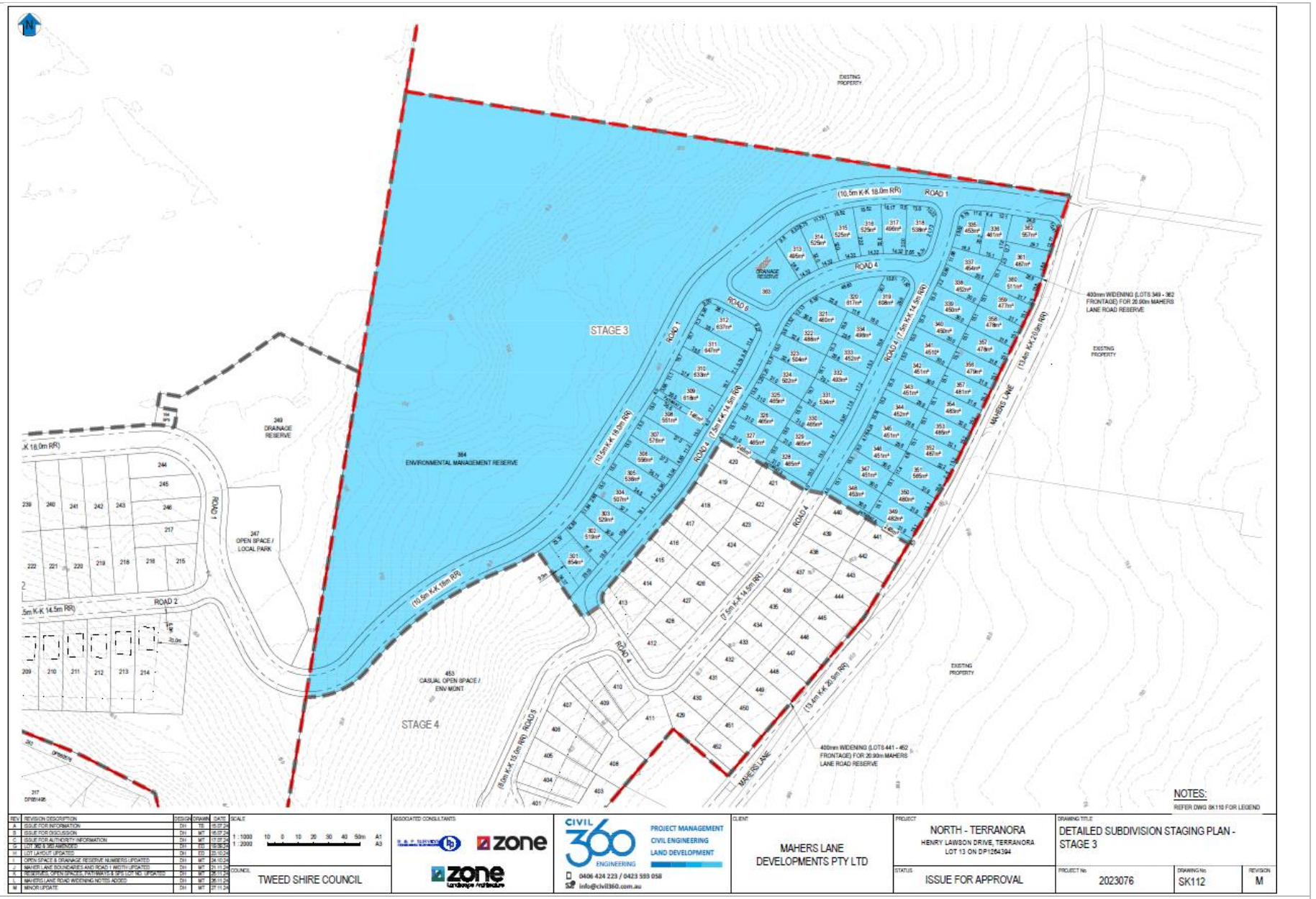


Figure A 4: Stage 3 – Proposed development layout (Source: Civil 360 Engineering; Revision L)

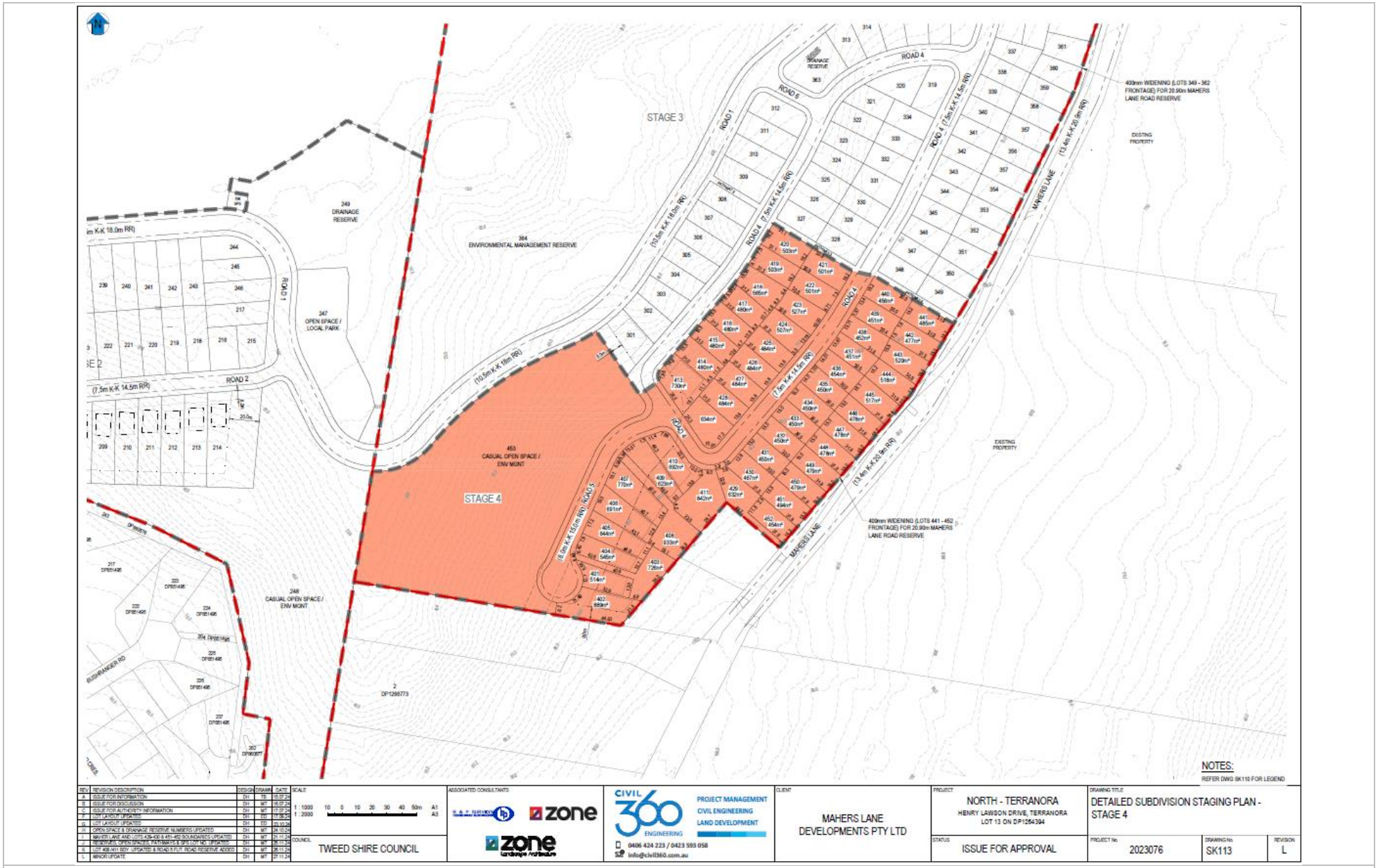


Figure A 5: Stage 4 – Proposed development layout (Source: Civil 360 Engineering; Revision L)

APPENDIX B – BFAA RESULTS

AS3959 (2018) Appendix B - Detailed Method 2

Print Date: 18/11/2024 **Assessment Date:** 8/09/2024

Site Street Address:	Mahers Lane SW corner, Terranora
Assessor:	Melanie Jackson; Bushfire Risk Pty Ltd
Local Government Area:	Tweed
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:	Test 1 (26 downslope)		
Vegetation Information			
Vegetation Type:	Rainforest		
Vegetation Group:	Forest and Woodland		
Vegetation Slope:	26 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	10	**Overall Fuel Load(t/ha):**	13.2
Vegetation Height(m):	2	Only Applicable to Shrub/Scrub and Vesta	
Site Information			
Site Slope:	10 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m):	Default	**APZ/Separation(m):**	39
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:**	80
Program Outputs			
Level of Construction:	BAL 29	**Peak Elevation of Receiver(m):**	10.85
Radiant Heat(kW/m2):	26.47	**Flame Angle (degrees):**	65
Flame Length(m):	39.11	**Maximum View Factor:**	0.433
Rate Of Spread (km/h):	5.77	**Inner Protection Area(m):**	39
Transmissivity:	0.803	**Outer Protection Area(m):**	0
Fire Intensity(kW/m):	39371		

BAL Thresholds

	BAL-40:	BAL-29:	BAL-19:	BAL-12.5:	10 kw/m2:	Elevation of Receiver:
Asset Protection Zone(m):	28	36	50	65	93	6

Run Description:	Test 2		
Vegetation Information			
Vegetation Type:	Rainforest		
Vegetation Group:	Forest and Woodland		
Vegetation Slope:	22 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	10	**Overall Fuel Load(t/ha):**	13.2
Vegetation Height(m):	2	Only Applicable to Shrub/Scrub and Vesta	
Site Information			
Site Slope:	10 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m):	Default	**APZ/Separation(m):**	30
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:**	80
Program Outputs			
Level of Construction:	BAL 29	**Peak Elevation of Receiver(m):**	8.54
Radiant Heat(kW/m2):	28	**Flame Angle (degrees):**	67
Flame Length(m):	30.06	**Maximum View Factor:**	0.449
Rate Of Spread (km/h):	4.38	**Inner Protection Area(m):**	30
Transmissivity:	0.819	**Outer Protection Area(m):**	0
Fire Intensity(kW/m):	29875		

BAL Thresholds

	BAL-40:	BAL-29:	BAL-19:	BAL-12.5:	10 kw/m2:	Elevation of Receiver:
Asset Protection Zone(m):	22	29	41	55	80	6

APPENDIX C – BUSHFIRE ATTACK LEVEL

Table A 1: Stage 1 BAL – Lots 101 to 165

STAGE 1										
LOT #	BAL-LOW	BAL-12.5	BAL-19	BAL-29	LOT #	BAL-LOW	BAL-12.5	BAL-19	BAL-29	
101		✓			134		✓			
102		✓			135		✓			
103		✓			136		✓			
104		✓			137		✓			
105		✓			138		✓			
106		✓			139		✓			
107		✓			140		✓			
108		✓			141		✓			
109		✓			142		✓			
110		✓			143		✓			
111		✓			144		✓			
112		✓			145		✓			
113		✓			146		✓			
114			✓		147		✓			
115				✓	148		✓			
116				✓	149		✓			
117				✓	150		✓			
118				✓	151		✓			
119				✓	152		✓			
120				✓	153		✓			
121				✓	154		✓			
122				✓	155		✓			
123		✓			156		✓			
124		✓			157	OPEN SPACE / NEIGHBOURHOOD PARK				
125				✓	158	CASUAL OPEN SPACE				
126				✓	159	DRAINAGE RESERVE				
127				✓	160	DRAINAGE RESERVE				
128				✓	161	DRAINAGE RESERVE				
129				✓	162	DRAINAGE RESERVE				
130				✓	163	ENVIRONMENTAL MANAGEMENT RESERVE				
131				✓	164	SPS				
132				✓	165	FUTURE DEVELOPMENT LOT				
133		✓								

Table A 2: Stage 2 BAL – Lots 201 to 251

STAGE 2									
LOT #	BAL-LOW	BAL-12.5	BAL-19	BAL-29	LOT #	BAL-LOW	BAL-12.5	BAL-19	BAL-29
201				✓	227		✓		
202				✓	228		✓		
203				✓	229		✓		
204				✓	230		✓		
205				✓	231	✓			
206				✓	232	✓			
207				✓	233	✓			
208				✓	234	✓			
209				✓	235	✓			
210				✓	236	✓			
211				✓	237	✓			
212				✓	238	✓			
213				✓	239	✓			
214				✓	240		✓		
215			✓		241		✓		
216			✓		242		✓		
217		✓			243		✓		
218		✓			244		✓		
219		✓			245		✓		
220		✓			246		✓		
221		✓			247	OPEN SPACE / LOCAL PARK			
222		✓			248	CASUAL OPEN SPACE / ENV MGNT			
223		✓			249	DRAINAGE RESERVE			
224		✓			250	DRAINAGE RESERVE			
225		✓			251	DRAINAGE RESERVE			

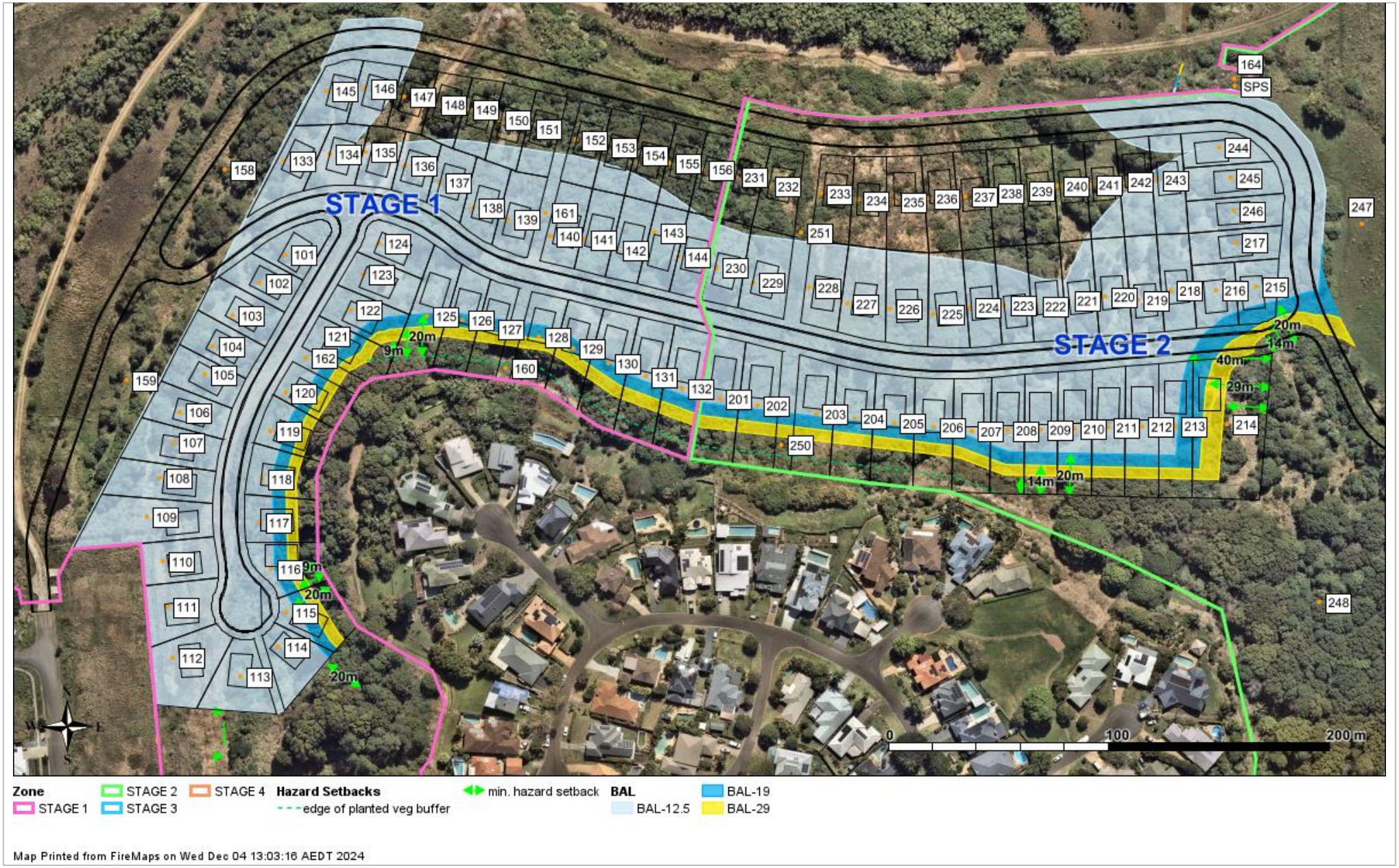


Figure A 6: Western Precinct BAL-Plan

Table A 3: Stage 3 BAL – Lots 310 to 364

STAGE 3										
LOT #	BAL-LOW	BAL-12.5	BAL-19	BAL-29	LOT #	BAL-LOW	BAL-12.5	BAL-19	BAL-29	
301				✓	333		✓			
302				✓	334		✓			
303				✓	335				✓	
304				✓	336				✓	
305				✓	337		✓			
306				✓	338		✓			
307				✓	339	✓				
308				✓	340	✓				
309				✓	341	✓				
310				✓	342	✓				
311				✓	343	✓				
312				✓	344	✓				
313				✓	345	✓				
314				✓	346	✓				
315				✓	347	✓				
316				✓	348	✓				
317				✓	349			✓		
318				✓	350			✓		
319		✓			351			✓		
320		✓			352			✓		
321		✓			353			✓		
322		✓			354		✓			
323		✓			355		✓			
324		✓			356		✓			
325		✓			357		✓			
326		✓			358			✓		
327		✓			359			✓		
328	✓				360			✓		
329	✓				361			✓		
330	✓				362				✓	
331	✓				363				✓	
332		✓			364	ENVIRONMENTAL MANAGEMENT RESERVE				

Table A 4: Stage 4 BAL – Lots 401 to 453

STAGE 4									
LOT #	BAL-LOW	BAL-12.5	BAL-19	BAL-29	LOT #	BAL-LOW	BAL-12.5	BAL-19	BAL-29
401				✓	428			✓	
402				✓	429		✓		
403			✓		430		✓		
404				✓	431		✓		
405				✓	432		✓		
406				✓	433		✓		
407				✓	434		✓		
408			✓		435	✓			
409				✓	436	✓			
410				✓	437	✓			
411		✓			438	✓			
412				✓	439	✓			
413				✓	440	✓			
414			✓		441			✓	
415		✓			442		✓		
416		✓			443		✓		
417		✓			444		✓		
418		✓			445		✓		
419		✓			446		✓		
420		✓			447		✓		
421	✓				448		✓		
422	✓				449		✓		
423	✓				450		✓		
424		✓			451		✓		
425		✓			452		✓		
426		✓			453	CASUAL OPEN SPACE / ENV MGNT			
427		✓							

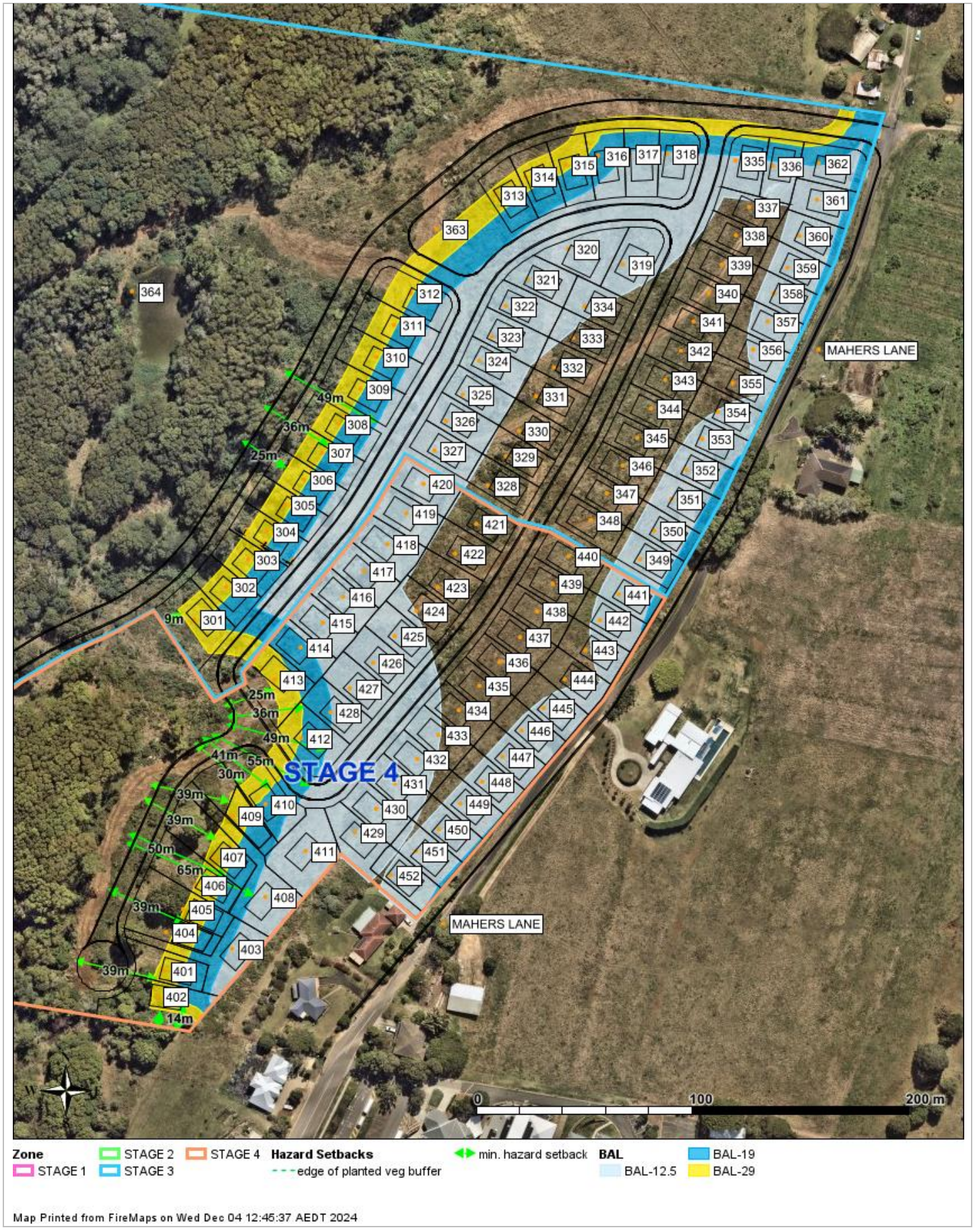


Figure A 7: Eastern Precinct BAL Plan

APPENDIX D – RFS GUIDELINES & FAST FACTS

APPENDIX 4

ASSET PROTECTION ZONE REQUIREMENTS

In combination with other BPMs, a bush fire hazard can be reduced by implementing simple steps to reduce vegetation levels. This can be done by designing and managing landscaping to implement an APZ around the property.

Careful attention should be paid to species selection, their location relative to their flammability, minimising continuity of vegetation (horizontally and vertically), and ongoing maintenance to remove flammable fuels (leaf litter, twigs and debris).

This Appendix sets the standards which need to be met within an APZ.

A4.1 Asset Protection Zones

An APZ is a fuel-reduced area surrounding a building or structure. It is located between the building or structure and the bush fire hazard.

For a complete guide to APZs and landscaping, download the NSW RFS document *Standards for Asset Protection Zones* at the NSW RFS Website www.rfs.nsw.gov.au.

An APZ provides:

- a buffer zone between a bush fire hazard and an asset;
- an area of reduced bush fire fuel that allows for suppression of fire;
- an area from which backburning or hazard reduction can be conducted; and
- an area which allows emergency services access and provides a relatively safe area for firefighters and home owners to defend their property.

Bush fire fuels should be minimised within an APZ. This is so that the vegetation within the zone does not provide a path for the spread of fire to the building, either from the ground level or through the tree canopy.

An APZ, if designed correctly and maintained regularly, will reduce the risk of:

- direct flame contact on the building;
- damage to the building asset from intense radiant heat; and
- ember attack.

The methodology for calculating the required APZ distance is contained within Appendix 1. The width of the APZ required will depend upon the development type and bush fire threat. APZs for new development are set out within Chapters 5, 6 and 7 of this document.

In forest vegetation, the APZ can be made up of an Inner Protection Area (IPA) and an Outer Protection Area (OPA).

A4.1.1 Inner Protection Areas (IPAs)

The IPA is the area closest to the building and creates a fuel-managed area which can minimise the impact of direct flame contact and radiant heat on the development and act as a defendable space. Vegetation within the IPA should be kept to a minimum level. Litter fuels within the IPA should be kept below 1cm in height and be discontinuous.

In practical terms the IPA is typically the curtilage around the building, consisting of a mown lawn and well maintained gardens.

When establishing and maintaining an IPA the following requirements apply:

Trees

- tree canopy cover should be less than 15% at maturity;
- trees at maturity should not touch or overhang the building;
- lower limbs should be removed up to a height of 2m above the ground;
- tree canopies should be separated by 2 to 5m; and
- preference should be given to smooth barked and evergreen trees.

Shrubs

- create large discontinuities or gaps in the vegetation to slow down or break the progress of fire towards buildings should be provided;
- shrubs should not be located under trees;
- shrubs should not form more than 10% ground cover; and
- clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation.

Grass

- grass should be kept mown (as a guide grass should be kept to no more than 100mm in height); and
- leaves and vegetation debris should be removed.

A4.1.2 Outer Protection Areas (OPAs)

An OPA is located between the IPA and the unmanaged vegetation. It is an area where there is maintenance of the understorey and some separation in the canopy. The reduction of fuel in this area aims to decrease the intensity of an approaching fire and restricts the potential for fire spread from crowns; reducing the level of direct flame, radiant heat and ember attack on the IPA.

Because of the nature of an OPA, they are only applicable in forest vegetation.

When establishing and maintaining an OPA the following requirements apply:

Trees

- tree canopy cover should be less than 30%; and
- canopies should be separated by 2 to 5m.

Shrubs

- shrubs should not form a continuous canopy; and
- shrubs should form no more than 20% of ground cover.

Grass

- grass should be kept mown to a height of less than 100mm; and
- leaf and other debris should be removed.

An APZ should be maintained in perpetuity to ensure ongoing protection from the impact of bush fires. Maintenance of the IPA and OPA as described above should be undertaken regularly, particularly in advance of the bush fire season.

APPENDIX 3

ACCESS

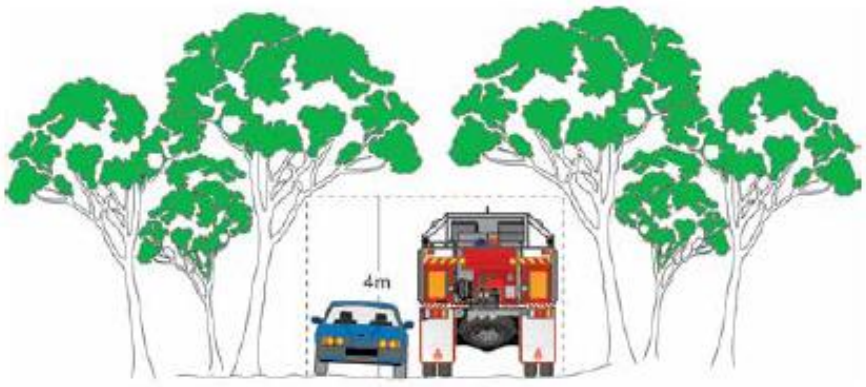
This appendix provides design principles for emergency service vehicle access.

A3.1 Vertical clearance

An unobstructed clearance height of 4 metres should be maintained above all access ways including clearance from building construction, archways, gateways and overhanging structures (e.g. ducts, pipes, sprinklers, walkways, signs and beams). This also applies to vegetation overhanging roads.

Figure A3.1

Vertical clearance.



A3.2 Vehicle turning requirements

Curved carriageways should be constructed using the minimum swept path as outlined in Table A3.2.

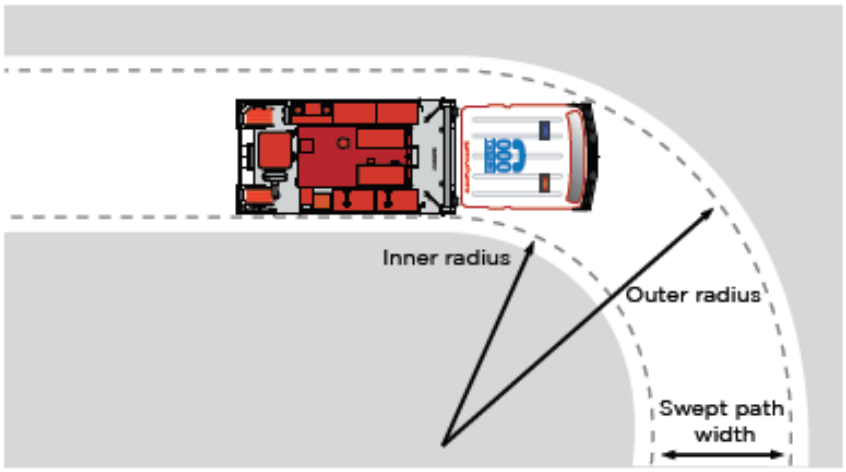
Table A3.2

Minimum curve radius for turning vehicles.

Curve radius (inside edge in metres)	Swept path (metres width)
< 40	4.0
40 - 69	3.0
70 - 100	2.7
> 100	2.5

Figure A3.2a

Swept path width for turning vehicles.



The radius dimensions given are for wall to wall clearance where body overhangs travel a wider arc than the wheel tracks (vehicle swept path). The swept path shall include an additional 500mm clearance either side of the vehicle.

Figure A3.2b

Roundabout swept path.

Example of a swept path as applied to a roundabout. The distance between inner and outer turning arcs allows for expected vehicle body swing of front and rear overhanging sections (the swept path).

A3.3 Vehicle turning head requirements

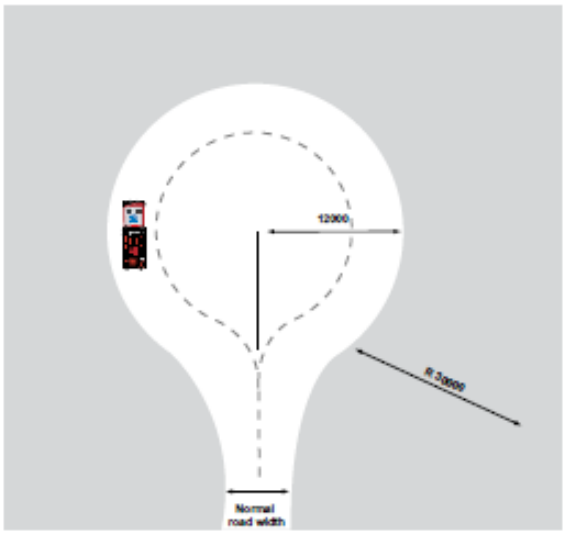
Dead ends that are longer then 200m must be provided with a turning head area that avoids multipoint turns. "No parking" signs are to be erected within the turning head.

The minimum turning radius shall be in accordance with Table A3.2. Where multipoint turning is proposed the NSW RFS will consider the following options:

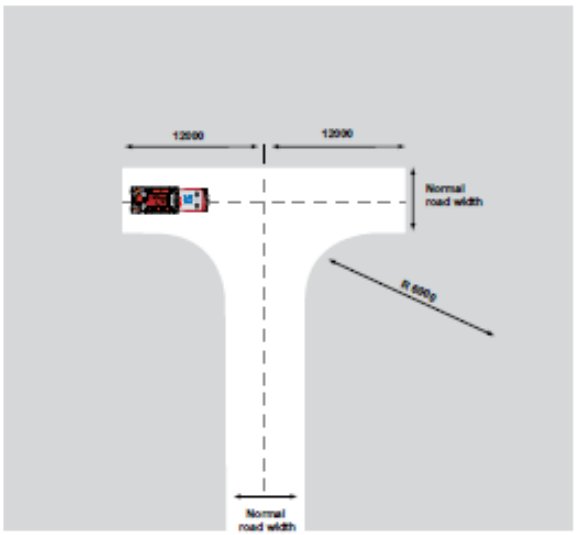
Figure A3.3

Multipoint turning options.

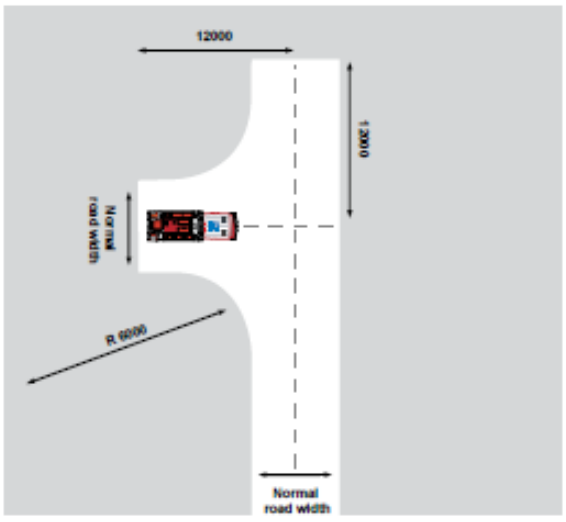
Type A



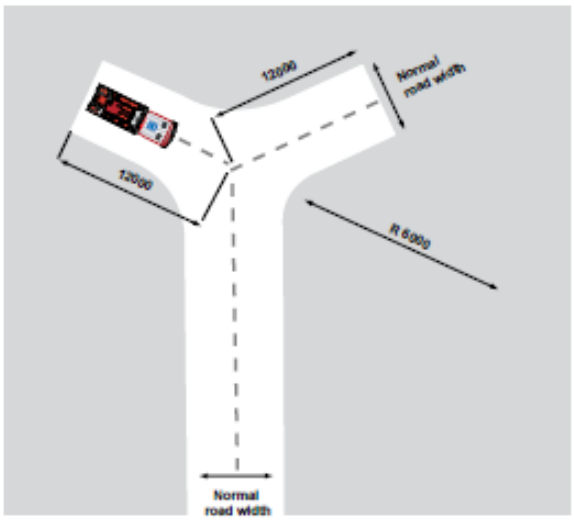
Type B



Type C



Type D



A3.4 Passing bays

The construction of passing bays, where required, shall be 20m in length and provide a minimum trafficable width at the passing point of 6m.

Figure A3.4

Passing bays can provide advantages when designed correctly. Poor design can and does severely impede access.

A3.5 Parking

Parking can create a pinch point in required access. The location of parking should be carefully considered to ensure fire appliance access is unimpeded. Hydrants shall be located outside of access ways and any parking areas to ensure that access is available at all times.

Figure A3.5

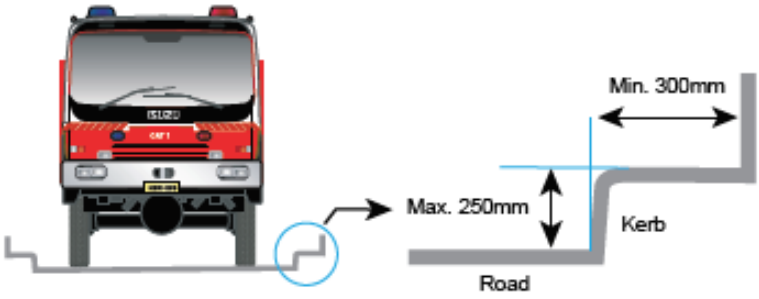
Hydrants and parking bays.

A3.6 Kerb dimensions

All kerbs constructed around access roads should be no higher than 250mm and free of vertical obstructions at least 300mm back from the kerb face to allow clearance for front and rear body overhang.

Figure A3.6

Carriageway kerb clearance dimensions.



A3.7 Services

Hydrant services should be located outside the carriageway and parking bays to permit traffic flow and access. Setup of standpipes within the carriageway may stop traffic flow. Hydrant services shall be located on the side of the road away from the bush fire threat where possible.

A3.8 Local Area Traffic Management (LATM)

The objective of LATM is to regulate traffic an acceptable level of speed and traffic volume within a local area.

Traffic engineers and planners should consider LATM devices when planning for local traffic control and their likely impact on emergency services. LATM devices by their nature are designed to restrict and impede the movement of traffic, especially large vehicles.

Where LATM devices are provided they are to be designed so that they do not impede fire vehicle access.

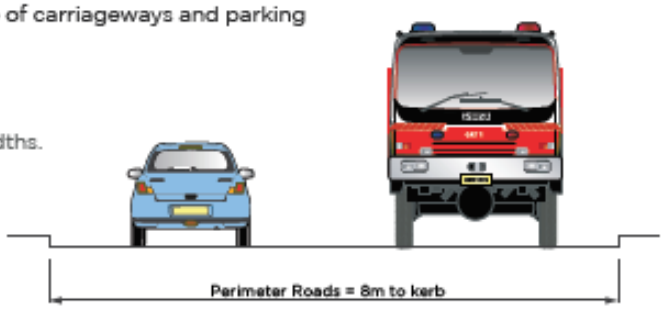
A3.9 Road types

A3.9.1 Perimeter Roads

Perimeter roads are to be provided with a minimum clear width of 8m. Parking and hydrants are to be provided outside of carriageways. Hydrants are to be located outside of carriageways and parking areas.

Figure A3.9a

Perimeter road widths.

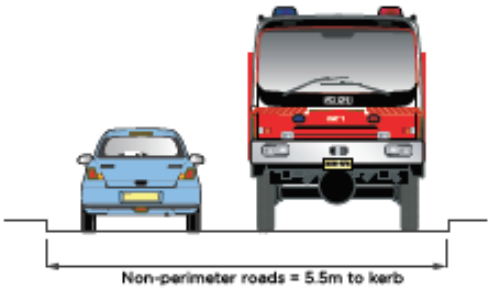


A3.9.2 Non-perimeter Roads

Non-perimeter roads shall be provided with a minimum clear width of 5.5m. Parking is to be provided outside of the carriageway and hydrants are not to be located in carriageways or parking areas.

Figure A3.9b

Non-perimeter road widths.



A3.9.3 Property access

Property access roads are to be a minimum of 4m wide.

Figure A3.9c

Property access road widths.