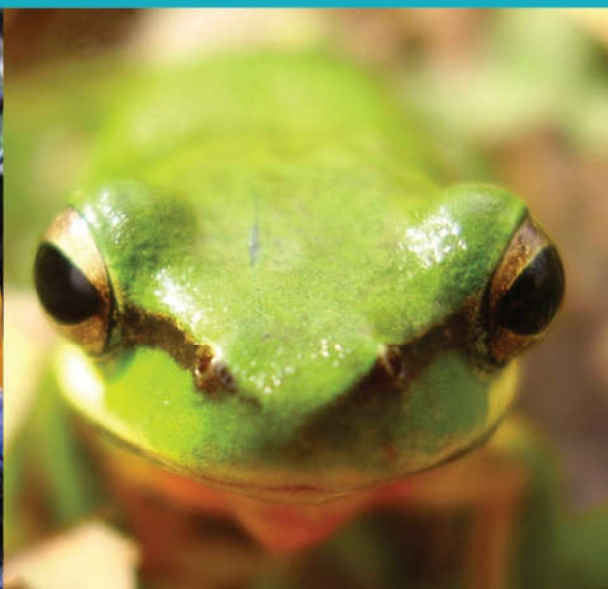




TRAVERS BUSHFIRE & ECOLOGY

A TBE ENVIRONMENTAL COMPANY



BUSHFIRE PROTECTION ASSESSMENT MORGAN RD BELROSE

Planning Proposal

Patyegarang Project

14 February 2024

(REF: 18CR12)



BUSHFIRE PROTECTION ASSESSMENT MORGAN RD BELROSE

Planning Proposal Patyegarang Project

Belrose

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Date:	14 February 2024
File:	18CR12

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

EXECUTIVE SUMMARY

Background

This report has been prepared as part of a Patyegarang Planning Proposal to enable future residential areas, environmental conservation areas, open spaces / green corridors, an aboriginal cultural centre and asset protection zones.

Each of these elements has been designed in an integrated manner to utilise the natural landscape as a defining element and to mitigate any potential impacts upon biodiversity - including water quality.

This report identifies matters for consideration within the future Planning Proposal and highlights the required 'bushfire protection measures' for future development as required by the *Environmental Planning and Assessment Act 1979, Section 9.1 (2) Direction 4.4* and in accordance *Planning for bush fire protection 2019 (PBP)* and *Community Resilience Practice Note 2/12 Planning Instruments and Policies*.

Planning principles for the proposal including the provision of adequate traffic access and the instigation of asset protection zones (APZs) for future housing along with the introduction of controls which avoid placing inappropriate developments in hazardous areas and placement of combustible material in APZs. This report also considers fire history and the potential for impacts beyond the scope of *PBP 2019*.

A comprehensive strategic bush fire study (7 February 2024) has been prepared by *Travers bushfire & ecology* and should be read in conjunction with this assessment.



Figure X1 – Concept plan (Cox 2022)

Assessment overview

The development design provides for three large precincts separated by Snake Creek and or Morgan Rd – see Figure X2 (see A3 version at Figure X8).

Notwithstanding the removal of native vegetation throughout the development landscape there is a residual portion of vegetation retained via the narrow riparian corridor of Snake Creek; and several other narrow watercourse corridors. Additional native vegetation is retained on lands to the south and east and separated by a perimeter road system and wide asset protection zones – see Figure X2.

Overall radiant heat affectation is minimised to no greater than 29 k/Wm² whilst ember attack is certainly possibly throughout the development landscape however the provision of extensive APZ's and housing construction being ember proofed through AS3959 building construction standards provides resilience.

Bushfires burning from the south have a 100m APZ before development occurs whilst in the east a similar 100m APZ is provided.

The bushfire design provides inbuilt defensible space as required by the RFS published *Planning for bushfire protection (2019)*.

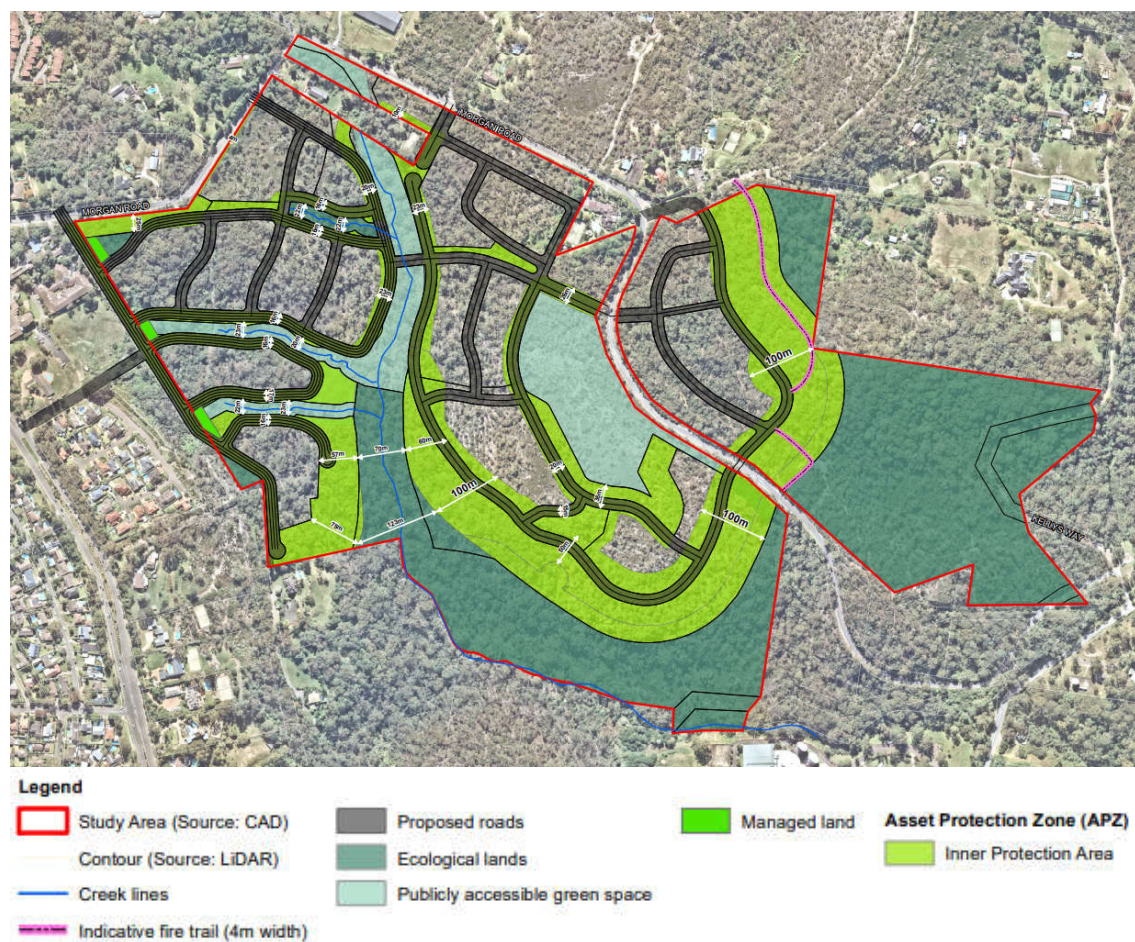


Figure X2 – Depiction of retained vegetation to the south and east of Snake Creek in the central zone

Evacuation planning during bushfire events

During a bushfire evacuation the following traffic egress routes would be available to residents:

- Morgan Road (westbound) via the Morgan Road / Forest Way intersection. This is assumed to be the primary egress route and would accommodate approximately 90% of traffic movements. A new slip-road will be provided on Forest Way to enable vehicles leaving Morgan Road heading east.
- Via the Oates Place / Forest Way intersection as a secondary egress route which is used only in the event of a bushfire emergency, assumed to take the remaining 10% of traffic movements.

A transport assessment report has been prepared by *JMT Consulting* (December 2023) dealing with evacuation capability. Key findings were;

- The surrounding road network, including Forest Way and the signalised intersection of Morgan Road / Forest Way can accommodate the expected level of day to day traffic generated under the rezoning proposal.
- Egress in a bushfire evacuation scenario can be accommodated safely pending the upgrade of the Morgan Road / Forest Way intersection to accommodate a free flow slip lane from Morgan Road.
- Suitable site access arrangements can be provided along Morgan Road with multiple accesses envisaged to distribute traffic movements across the site. No direct vehicle access would be provided from Forest Way given it's function as a State classified road.
- The internal street network will be designed to limit through traffic movements within the site, accommodate movement of pedestrians and cyclists and allow for the safe and efficient movement of various vehicle types (including first responder vehicles).
- The development would facilitate the formalisation of existing cycling routes through the site and well as provide good quality pedestrian connections through to nearby public transport stops on Forest Way.

JMT Consulting identified that to enable safe and efficient vehicle egress from the site during major bushfire events all traffic would need to be directed to the west to access Forest Way and depart the area.

They advised that under current conditions traffic leaving the site via Morgan Road needs to stop at the traffic lights before then turning left onto Forest Way. In this context an upgrade of the Morgan Road / Forest Way intersection has been identified to facilitate safe and efficient access out of the precinct as indicatively illustrated in Figure 24 below. This involved the creation of a slip lane from Morgan Road onto Forest Way which includes an acceleration lane as per Austroads requirements. This upgrade will allow traffic leaving Morgan Road to bypass the existing traffic lights and enter directly onto Forest Way without delay.

JMT Consulting undertook an analysis of the road network to accommodate additional traffic flows during a major bushfire event using SIDRA INTERSECTION 9.0, a computer-based modelling package which assesses intersection performance under prevailing traffic conditions.

SIDRA modelling has been undertaken at the Forest Way / Morgan Road intersection which considers existing traffic movements as well as those generated by the rezoning, taking into consideration the upgrade of the intersection through a new slip lane as summarised in Section 5.6.2 of their report. The traffic modelling has considered both:

- The performance of the overall intersection (taking into account traffic movements from all directions); and
- The performance of the specific traffic movement from Morgan Road onto Forest Way, which is critical with respect to bushfire evacuation.

The findings of the traffic modelling were summarised in their Table 5, which in essence, recommended the need to implement upgrades in the form of the slip lane. The modelling has concluded that, subject to the implementation of the Morgan Road slip lane, traffic can efficiently exit the precinct during a bushfire evacuation.

JMT Consulting concluded that the slip lane provides enough capacity for the evacuating vehicles to turn left onto Forest Way, as well as spare capacity to accommodate vehicles external to the proposed site travelling along Morgan Road.

They further advised that a detailed concept design, including extent of civil and infrastructure works required, has separately been prepared by Craig and Rhodes. The land required to facilitate the upgrade is owned by Council and currently zoned RE1 – making it suitable for the purposes of road widening. Separate traffic modelling for a bushfire emergency evacuation event indicates the upgrade will be required once more than 230 dwellings have been developed and are occupied on the site

Figure X3 below demonstrates the extensive layout of the perimeter and the internal road design and linkages to Forest Way and Morgan Road.

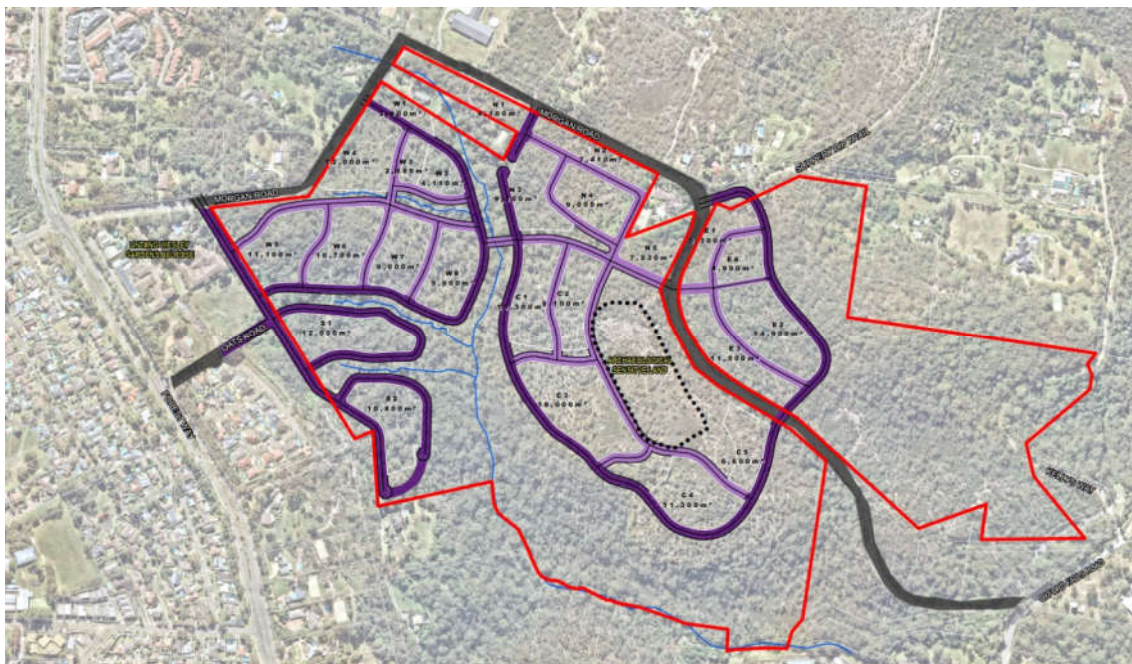


Figure X3 – proposed road perimeter road and internal road layout change figure

The assessment has concluded that future development on site will provide compliance with the planning principles of *PBP* and *Community Resilience Practice Note 2/12– Planning Instruments and Policies* as summarised in Table A1 below.

Table A – Planning Principals

Direction 4.4	Compliance statement
4) In the preparation of a planning proposal the relevant planning authority must consult with the Commissioner of the NSW Rural Fire Service following receipt of a gateway determination under section 3.34 of the Act.	Extensive formal liaison with the RFS has occurred with written advice provided on the 1 st October 2021 and May 2022.
A planning proposal must:	
a) have regard to Planning for Bushfire Protection 2019	Yes. The following assessment has been undertaken in accordance with <i>PBP 2019</i> .
b) ensure that bushfire hazard reduction is not prohibited within the APZ.	Yes. Significant environmental studies have been undertaken to ensure APZs have been excluded from environmentally sensitive land.
c) introduce controls that avoid placing inappropriate developments in hazardous areas, and	Yes. The nature of the residential development is an appropriate use and the proposed hazard management controls are in accordance with, and often beyond, <i>PBP 2019</i> to effectively address the level of hazard. The proposal does not propose “inappropriate development” such as schools or retirement villages. A cultural interpretive centre is also planned for the site. At this stage of the proposal, it is assumed that the interpretative centre will not include development uses that would determine the use as Special Fire Protection Purpose and as such, that usage is not considered within this study.
A planning proposal must, where development is proposed, comply with the following provisions, as appropriate:	
(a) provide an Asset Protection Zone (APZ) incorporating at a minimum: (i) an Inner Protection Area bounded by a perimeter road or reserve which circumscribes the hazard side of the land intended for development and has a building line consistent with the incorporation of an APZ, within the property, and (ii) an Outer Protection Area managed for hazard reduction and located on the bushland side of the perimeter road,	Yes. Perimeter roads are proposed and the APZs match or exceed the minimum requirements outlined in <i>PBP 2019</i> for residential subdivision development.

(b) for infill development (that is development within an already subdivided area), where an appropriate APZ cannot be achieved, provide for an appropriate performance standard, in consultation with the NSW Rural Fire Service. If the provisions of the planning proposal permit Special Fire Protection Purposes (as defined under section 100B of the Rural Fires Act 1997), the APZ provisions must be complied with,	This is an integrated Planning Proposal that will result in a new residential subdivision and this be responsive to Section 100B of the Rural Fire Act.
(c) contain provisions for two-way access roads which links to perimeter roads and/or to fire trail networks	Yes
(d) contain provisions for adequate water supply for firefighting purposes	Yes
(e) minimise the perimeter of the area of land interfacing the hazard which may be developed,	Yes. The perimeter is approximately a large circle and therefore circumscribes the development. Large intrusions of bushland >50m in width into the development have been removed and minimised to allow safe evacuation.
(f) Introduce controls on the placement of combustible materials in the Inner Protection Area	Yes. Can be a condition of consent at DA stage.

Community benefit

As required by *PBP* in Section 4 Table 4.2.1 there is a need to review *‘the impact upon adjoining landowners and their ability to undertake bushfire management’*. The predevelopment bushfire risk is principally the manner in which the unmanaged vegetation within the PP site provides a major threat to;

In essence, the bushfire design provides a marked improvement affect upon the existing residential communities living along Morgan Road, Hilversum Crescent, Slippery Dip Trail, Oates Place, Lyndhurst Way, Caley Way and Ocean View Way. In addition, there will be a similar benefit for special protection facilities such as the;

- Uniting Church Pre School and the Uniting Church aged Care facility on the corner of Morgan Road and Forest Way, and
- The proposed aged care facility at 181 Forest Way Belrose and the evacuation capabilities of the CSIRO radar unit on Oxford Falls Road.
- Rural residential development to the north and east of Morgan Road.
- Two rural residential allotments to the immediate south of the PP site.
- The residential estate to the southeast of the PP site south of Childs Circuit and Laurie Place.
- OPTUS infrastructure in the south.

The current urban and rural residential landscape that surrounds the PP site can be seen in Figure X5 below.

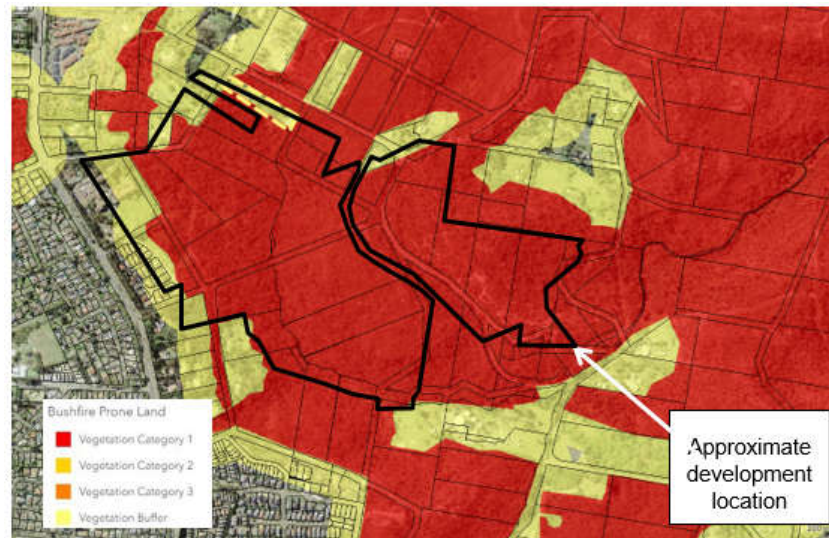


Figure X4 – bushfire prone mapping as at 2023

The planning proposal either removes or significantly fragments the bushfire hazard – see Figure X6.

This demonstrates a significant amount of bushfire prone lands (red colour) over the internal PP landscape which ensures a bushfire attack upon the existing community located on the eastern side of Forest Way (see Yellow polygon on Figure X5) and by default a similar exposure to the existing residential community to the south of the PP area (see Red polygon on Figure X5) south of Childs Circuit and Laurie Place; and to a lesser extent the OPTUS facility (See Blue polygon).

The vegetation removal proposed by the planning proposal will dramatically lessen the bushfire threat upon those locations whilst also providing a significant level of protection to the rural residential properties as shown in the Orange polygon. Figure X7 depict the final managed / APZ lands surround and including the proposed development areas and this represents a significantly lower bushfire risk.

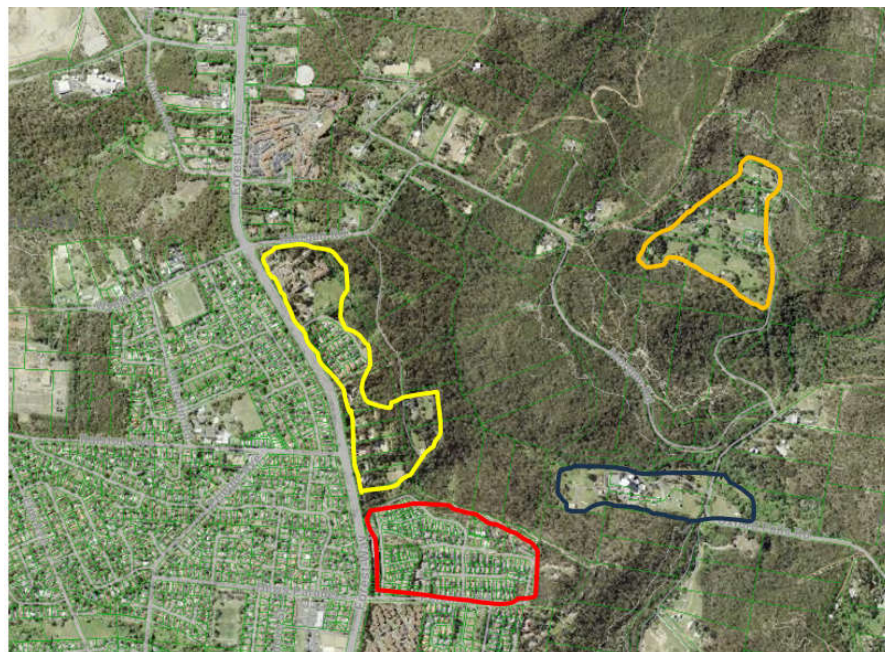


Figure X5 – Residential areas gaining from the revised bushfire prone lands mapping



Figure X6 – Post development bushfire prone mapping



Figure X7 – Post development managed areas and asset protection zones
(Green colour represents managed areas or proposed asset protection zones)

Outcomes of the strategic bushfire study

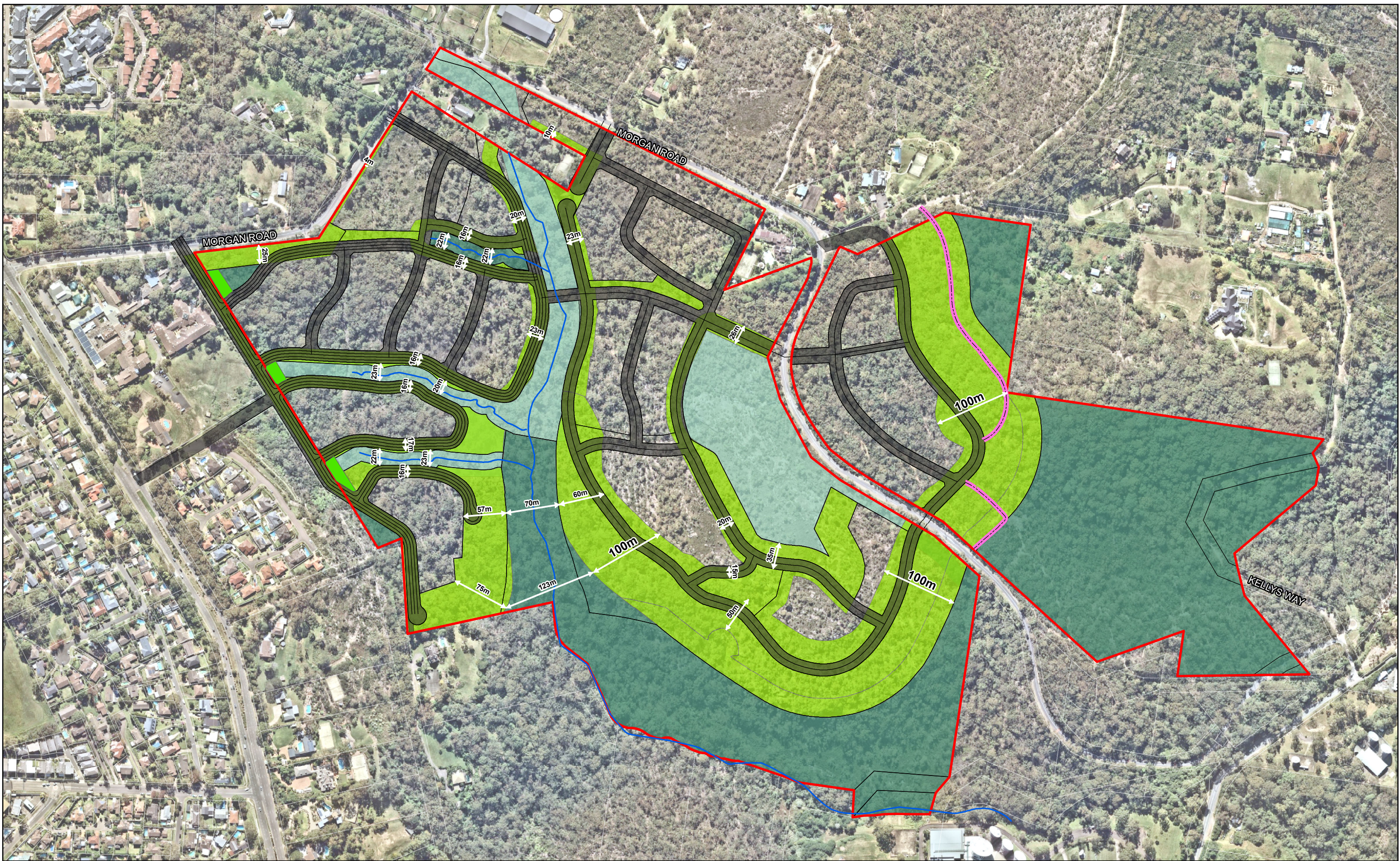
- The existing bushfire hazards provide significant risk to the existing residential community and the aged care facility; and potentially denies safe evacuation in a bushfire emergency event to approximately 50 local families.
- The planning proposal will remove substantial bushfire hazards that threaten the community.
- The study found the site was not a high-risk bushfire site due to the non-remote nature of the proposal and the limited bushfire hazard exposures affecting the site. Strategically, the site is surrounded by rural residential development in the north and east and low-density residential development in the west leaving only two unmanaged bushland areas in the northeast and south both of which produce a moderate exposure to radiant heat (17.4 k/Wm²) which is well below the RFS permitted standard of 29k/Wm².
- The development proposes a new slip lane from Morgan Road onto Forest Way and a full reconstruction of Morgan Rd to a point 1.8 km from the intersection with Forest Way thus enabling free flowing traffic in the event of an emergency evacuation.
- Traffic modelling advises there will be no traffic queuing at the Forest Way / Morgan Road intersection.
- As also required by PBP 2019 in Section 4 Table 4.2.1 there is also a significant benefit for the volunteers who fight the fires for the RFS in that they have roads and asset protection zones where there are currently no such opportunities.

Conclusion

In conclusion the Patyegarang proposal is a logical extension of existing urban landscape and enables significant benefits to local families either in the relocation of bushfire prone land or through increased evacuation capability with the reconstruction and widening of Morgan Road coupled with the new slip lane onto Forest Way.

See A3 version of the development plan at Figure X8.

Figure X8 - Proposed development
plan with asset protection zones



Legend

- Study Area (Source: CAD)
- Contour (Source: LiDAR)
- Creek lines
- Indicative fire trail (4m width)

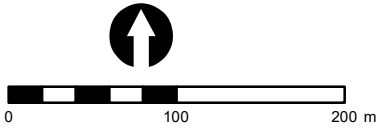
- Proposed roads
- Ecological lands
- Publicly accessible green space

- Managed land

Asset Protection Zone (APZ)

- Inner Protection Area

Aerial source: Nearmap



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

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GLOSSARY OF TERMS

AHIMS	Aboriginal Heritage Information System
APZ	asset protection zone
AS1596	<i>Australian Standard – The storage and handling of LP Gas</i>
AS2419	<i>Australian Standard – Fire hydrant installations</i>
AS3745	<i>Australian Standard – Planning for emergencies in facilities</i>
AS3959	<i>Australian Standard – Construction of buildings in bushfire-prone areas 2018</i>
BAL	<i>bushfire attack level</i>
BCA	<i>Building Code of Australia</i>
BSA	bushfire safety authority
DA	development application
DLUP	Development Land Use Plan
EEC	Endangered ecological community
EP&A Act	<i>Environmental Planning & Assessment Act 1979</i>
EP&A Regulation	<i>Environmental Planning and Assessment Regulation 2000</i>
FFDI	forest fire danger index
IPA	inner protection area
LEP	Local Environmental Plan
LGA	local government area
m	metres
NCC	<i>National Construction Code</i>
OPA	outer protection area
PBP 2019	<i>Planning for Bush Fire Protection 2019</i>
RF Act	<i>Rural Fires Act 1997</i>
RFS	NSW Rural Fire Service
SEED	Sharing and Enabling Environmental Data (NSW Government)
SFR	short fire run
SFPP	special fire protection purpose
TBE	<i>Travers bushfire & ecology</i>

TABLE OF CONTENTS

1. INTRODUCTION	1
1.2 Aims of the assessment	1
1.3 Project Synopsis	2
1.4 Information collation	7
1.5 Site description.....	9
1.6 Strategic neighbouring land use	10
1.7 Legislation and planning instruments	14
2. BUSHFIRE THREAT ASSESSMENT	16
2.1 Hazardous fuel formation assessment.....	16
2.2 Effective slope	17
2.3 Bushfire attack assessment.....	18
2.4 Fire behaviour	20
2.4.1 Potential fire threats to current unmanaged landscape	20
2.4.2 Potential fire threats post development	22
3. SPECIFIC PROTECTION ISSUES.....	25
3.1 Asset protection zones (APZs)	25
3.2 Building protection.....	26
3.3 Hazard management.....	26
3.4 Fuel management	26
3.5 Access and egress capability	27
3.5.1 General vehicle access (outside of emergencies).....	27
3.5.2 Evacuation Opportunities.....	30
3.5.2.1 Road evacuation network	32
3.5.2.2 New Slip Lane onto Forest Way	34
3.5.2.3 Road network performance during a bushfire emergency	35
3.5.2.4 Radiant heat impact upon slip lane.....	36
3.6 Evacuation	44
3.7 Water supplies	45
3.8 Gas	45
3.9 Electricity.....	46
4. STRATEGIC overview.....	47
5. CONCLUSION & RECOMMENDATIONS.....	49
5.1 Conclusion	49
5.2 Recommendations	51
6. REFERENCES	52

ATTACHMENTS

APPENDIX 1. Plan Of Bushfire Protection Measures 53

APPENDIX 2. Management Of Asset Protection Zones 54

1. INTRODUCTION

Travers bushfire & ecology has been engaged to undertake a bushfire protection assessment for the Planning Proposal located at Morgan Road, Belrose.

Direction 4.4 of the *EP&A Act* identifies matters for consideration for Planning Proposals which are in proximity to land mapped as bushfire prone.

The proposed development is identified as bushfire prone on the *Northern Beaches Council* as bushfire prone land map (refer Figure 1-1) and is therefore subject to the requirements of *Section 9.1 (2) of the EP&A Act (1979)* which requires Council to consult with the Commissioner of the *NSW Rural Fire Service (RFS)* and to take into account any comments made by the Commissioner.

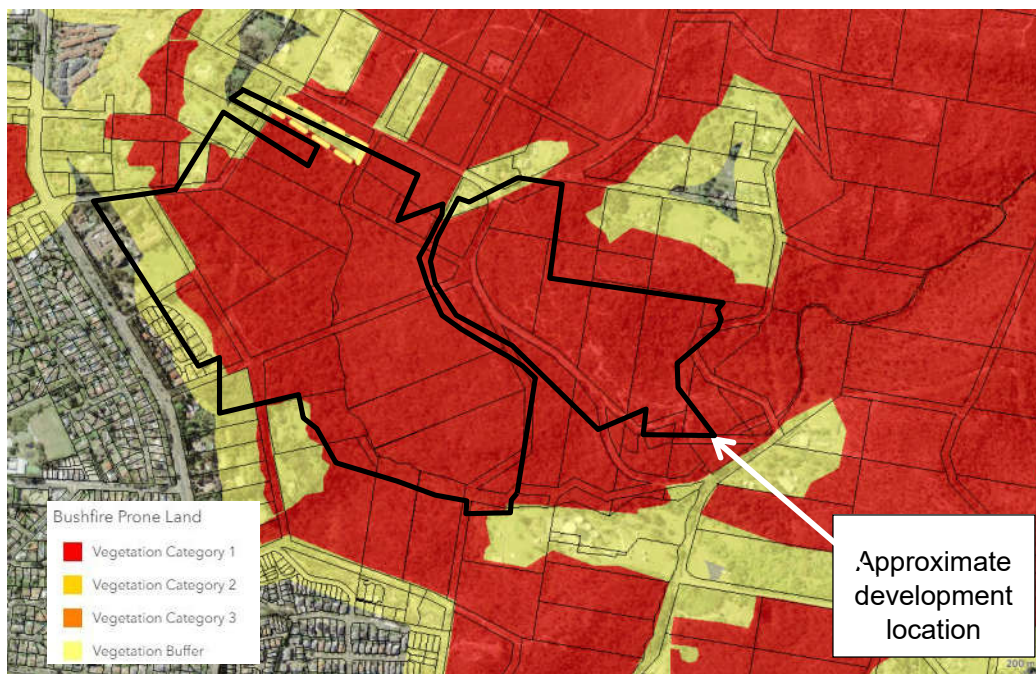


Figure 1-1 – Bushfire Prone Land Map

(source: Planning Portal, 2021)

1.2 Aims of the assessment

The aims of the bushfire protection assessment are to:

- review the bushfire threat to the landscape
- undertake a bushfire attack assessment in accordance with *PBP*
- provide advice on mitigation measures, including the provision of asset protection zones (APZs), construction standards and other specific fire management issues
- review the potential to carry out hazard management over the landscape.

1.3 Project Synopsis

The purpose of this Planning Proposal is to implement the Development Delivery Plan for the subject site created under State Environmental Planning Policy (Planning Systems) 2021.

The objective of the Planning Proposal is to create a residential community which embodies strong conservation principles to support the enhancement of the unique environmental and Aboriginal cultural heritage characteristics of the site.

The intended outcome of the Planning Proposal is to amend the applicable local planning controls to accommodate up to 450 new residential dwellings with a variety of scale and character reflective of the dominant dwelling type in the Belrose locality, as well as a new cultural community centre and protection of aboriginal heritage sites.

In 2022 a draft structure plan was prepared by COX Architecture that is reflective of the site's opportunities and constraints in the areas of flora and fauna biodiversity, bushfire management, transport planning, Aboriginal heritage and stormwater management.

The Planning Proposal intends to ensure development outcomes align with traditional indigenous 'Caring for Country' practices and relevant 'Connecting with Country' and 'Designing with Country' principles and strategies. In that regard Figure 1.2 below depicts the proposed rezoning plan and the subsequent development precincts. In essence the land uses are as follows;

- **Developed Area** including: residential / aboriginal cultural heritage and associated cultural centre / pocket park, pedestrian and vehicular network
- **Road network** – Morgan Road will be reconstructed to a collector road standard from Forest Way to the south eastern location of Morgan Road as shown on the plans. The road will be a 13m wide pavement width with 3.5m wide pedestrian verges and pathways on both sides. Kerb and gutter will be on both sides together with vegetation removed from both sides. Street trees will be planted. The road will be a bus route and will allow access for garbage trucks and fire trucks at all times
- **Asset Protection Zones** -These lands will be contained within the developable area and managed as asset protection zones in compliance with NSW Rural Fire Service guidelines for APZ management – see Figure 1.4. Habitat retention (caves, crevices, sandstone rocks etc') will be a key priority for the fuel management works given the dual role that the asset protection zones play in buffering the impacts of development on the urban/bushland interface. Retention of trees, shrubs and surface fuels will be targeted for their intrinsic ecological value with ongoing management specified through a legally applied 'fuel management plan' – see Figure 1.5.
- **Conservation land** - The environmental management zone will be maintained in perpetuity by the future community association and Metropolitan Local Aboriginal Land Council. The area is an ecologically significant landscape which is known to contain threatened flora, fauna, ROTAP species and the EEC, Coastal Upland Swamp.

Recommendations have also been made for future road and fire design, fuels management, traffic management, emergency management, building construction, water supply and peripheral land management. Of significance is the access / egress capability which has been given significant weight for the overall development design. In this regard the development area is proposed to be accessed via;

- Morgan Road at three (3) locations. Strategically a left turning slip lane detailed design has been completed by the surveyors in liaison with the traffic consultants for the Morgan Rd / Forest Way intersection. This will not be controlled by traffic lights.
- Forest Way at two (2) locations - see Figure 1.3 below.



Legend: Dark Green – C2 Zone, Light Green – RE2 Zone, Pink – R2 Zone

Figure 1-2 – Rezoning Map

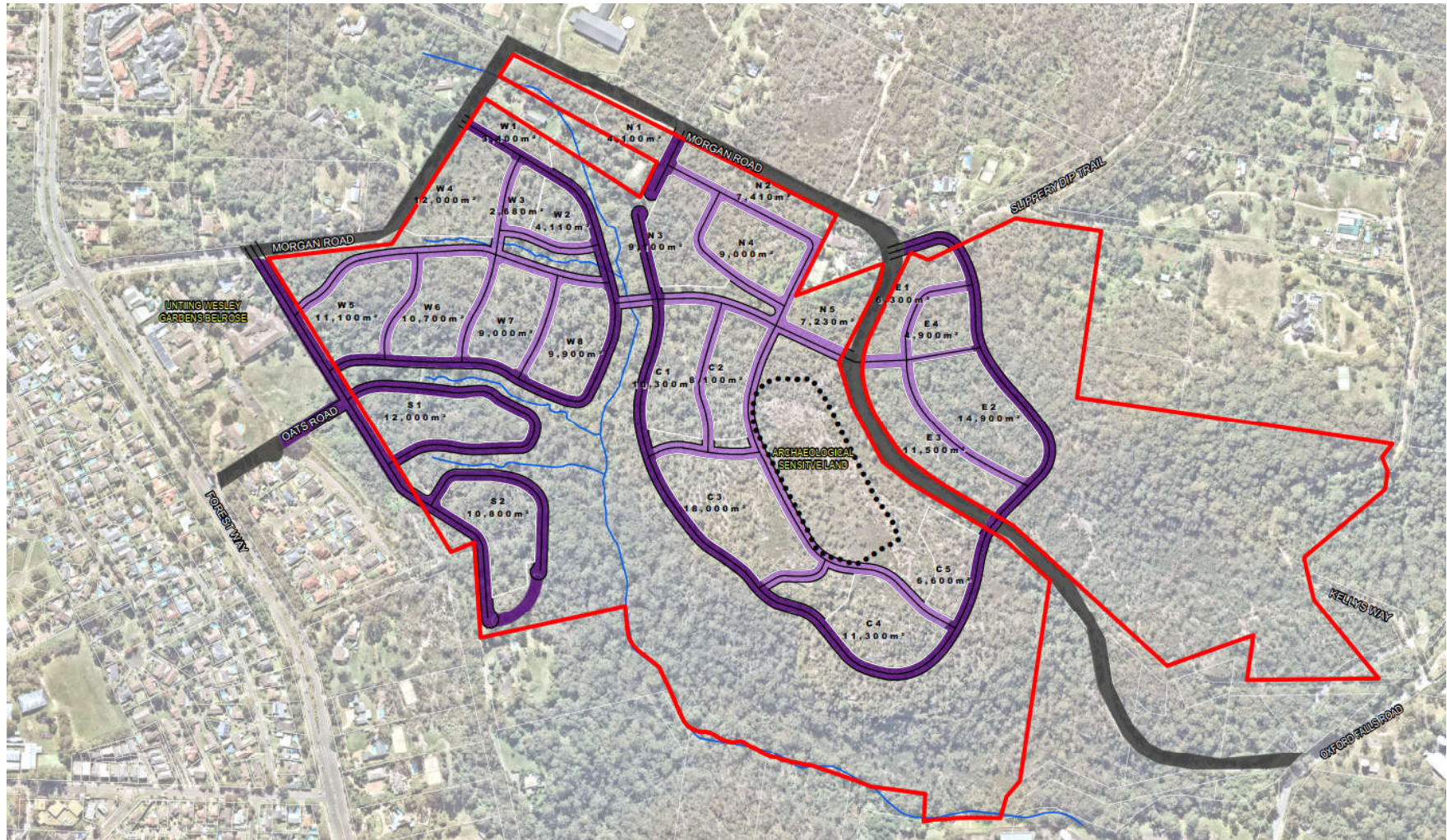


Figure 1-3 - Proposed road layout identifying perimeter roads and non-perimeter roads



Figure 1-4 - Proposed asset protection zones



Figure 1-5 - Illustrative master plan

1.4 Information collation

Information sources reviewed for the preparation of this report include the following:

- Draft Constraints Plan prepared by *COX Architecture*, dated 14.09.2022
- Draft Structure Plan prepared by *COX Architecture*, dated 14.09.2022
- Patyegarang Project Belrose Transport Assessment *JMT Consulting* December 2023
- Warringah Local Environmental Plan 2011
- Vegetation mapping prepared by Hayes Environmental (January 2024)
- Survey of slope gradients by *Craig & Rhodes* (February 2021)
- Stormwater management Plan *Craig & Rhodes* (July 2023)
- *NearMap* aerial photography
- Topographical maps DLPI of NSW 1:25,000
- *Australian Standard 3959 Construction of buildings in bushfire-prone areas (2018)*
- *Planning for Bush Fire Protection 2019 (PBP)*
- *Community Resilience Practice Notes 2/12 Planning Instruments and Policies*

An inspection of the proposed development site and surrounds was undertaken by John Travers on numerous occasions between 2002 and 2022 to assess the topography, slopes, aspect, drainage, vegetation and adjoining land use. The identification of existing bushfire measures and a visual appraisal of bushfire hazard and risk were also undertaken.

More precise slope mapping and interpretation was undertaken in March 2021 by *Craig & Rhodes* (surveyors) whilst ecological mapping and analysis was undertaken by *Hayes Environmental* (Rebecca Hayes).

1.4.1 Pre DA assessment by the Rural Fire Service

The report was lodged with the RFS in late August 2021 and on the 1st October 2021 the RFS provided comments which were both favourable and supportive. Most importantly the RFS provided advice on what should be covered in the next iteration of the bushfire report. Their advice is in Column 1 and a response in Column 2.

RFS comments	Response from Travers bushfire & ecology
The following should be provided to support the future planning proposal:	
1. Additional information should be provided on the nature of the proposed community centre/offices and retail space.	This has been provided within
2. The use of Short Fire Run (SFR) Methodology is not supported, and any mention of SFR should be removed from the bush fire report.	Noted and now has been removed as it was a typographical error. There was no short fire run procedures or calculations used in this assessment
3. The APZ distances shown in the bush fire report must be updated as discussed with John Travers, with the thin riparian areas (less than 20 metre width) treated as	The plan has now been updated and is shown on Schedule1

remnant, and the wider riparian trunk treated as Forest.	
4. As some areas of the proposed APZs are on slopes greater than 18°, a management plan must be submitted at the development application (DA) stage to demonstrate how the APZ will be implemented and maintained as per Section 3.2.2 of <i>Planning for Bush Fire Protection (PBP) 2019</i> .	A Geotech statement from a qualified practitioner will be provided at DA stage and this is normally acceptable and satisfactory to the RFS. As advised within the report these slopes are on land mainly composed of sandstone bedrock and escarpments which are solid and stable landscapes.
5. Sector S2 will require the provision of a compliant perimeter road.	This is noted and a preliminary engineering design has been prepared and considered noting an expected completion of that design at DA stage.
6. The proposed slip-road on Forest Way is seen as essential to enable vehicles to enter Forest Way from Morgan Road and head easterly without being subject to traffic light control.	Noted and this is why it was designed that way with the Draft Structure Plan now amended to show its presence.
7. As suggested in the bush fire report, a Bush Fire Emergency Management and Evacuation Plan must be prepared consistent with <i>Development Planning- A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan December 2014</i> .	These documents are typically required for DA stage and they will be thoroughly considered and assessed prior to their lodgement with DA documentation.

The additional information sought by the RFS on the 1st October 2021 was provided in an amended bushfire report dated 6th October 2021. The report was re-submitted back to the RFS earlier this year whereby the RFS provided comments on 13 May 2022 whereby they advised they had no specific objections.

Direct consultation with the RFS occurred on the 17th March 2022 where representatives of the RFS and the applicant met on zoom for a specific bushfire session that also involved traffic and biodiversity consultants - as these disciplines are central to effective bushfire planning in terms of traffic safety and fuel management of the residual hazardous vegetation assemblages.

The meeting sought to provide an overview for the participants of the meeting such that they were all on the same page in terms of bushfire, traffic planning and ecology.

Indeed, the meeting enabled the RFS to express any concerns they may have had with other members of the government team especially with DPIE staff and had there been misunderstandings then the applicant's consultants were there to clarify or to go away and reflect.

Arising from the meeting was a request from the RFS to provide detail in respect of traffic evacuation scenarios for example to provide further detail on the slip road design and to undertake traffic scenario modelling on various scenarios such as when the emergency Oates Place gate was closed, any flood restrictions, tonnage limits, rat run etc); provide road designs assurances that roads would be designed as specified in PBP. *JMT Consulting* were engaged to undertake the requested modelling and their report was produced in June 2022.

In terms of fuel management of the asset protection zones the RFS sought information on 'who and how' fuel management would occur within those APZ's. The bushfire author herein advised that significant field work with *Hayes Consulting* discussing and reviewing the various vegetation assemblages on the site was thus able to provide clarity on bushfire APZ's and fire

trails. Lastly, they sought to know who would have the key to open the emergency egress gate at Oakes Rd.

As a follow up to that zoom meeting Assistant Commissioner Matt Smith emailed Susan Fox (DPIE) referring to the need to consider the current 3 tonne load limit on the Morgan Rd / Oxford Falls Road bridge. Upon investigating this advice from Commissioner Smith we were advised that Council was planning to replace that bridge in the near future; and the bridge was completed in late 2023.

1.5 Site description

The development site is located within the local government area (LGA) of Northern Beaches Council and situated to the east, south and west of Morgan Road, Belrose (refer Figure 1-7).

The site supports native vegetation and an archaeological site of indigenous significance.

Snake Creek traverses the site in an approximate north south orientation. The land use in the west supports existing residential development along with Uniting Wesley Gardens Aged Care Facility, whilst the land to the east consists of a mixture of bushland and rural residential land. An existing Telstra telecommunication facility and several rural residential properties are located to the south.

The remaining perimeter to the south comprises of gentle to steep sloping sandstone escarpments that consist of a variety of vegetation formations ranging from forest to heathland communities. Table 1-1 provides a summary of the planning, cadastral, topographical and disturbance details of the subject site.

Table 1-1 – Site features

Location	Morgan Road
Size	Approximately 60ha
Local Government Area (LGA)	Northern Beaches Council
Elevation	Approximately 150-170m AHD
Topography	Bushland to the south sits on the southern side of a broad naturally vegetated ridgetop, which falls to a large sandstone escarpment and into Snake Creek. The western portion of the site sits on a ridge broken by associated tributaries / drainage lines of Snake Creek. The central and northern areas of the site support a bushland plateau exhibiting large sandstone outcrops.
Geology and soils	Geology; Sandstone Soils; Lambert Soil Landscape, Somersby Soil Landscape and Hawkesbury Soil Landscape
Catchment and drainage	Snake Creek
Vegetation	Sydney Sandston Gully Forest, Coastal Sandstone Heath and Sydney Sandstone Ridgetop Woodland (predominately)
Existing land use	Private land owned by Metropolitan Aboriginal Land Council

1.6 Strategic neighbouring land use

Neighbouring land use vary with low density residential located in the west and rural residential and industrial in the north east and south - see breakdown in Table 1-2 below and refer to aerial photograph at Figure 1.6 below.

Table 1-2 – Neighbouring land use

Aspect	Land use	Intensity	Location	See Figure
Northwest	Aged care facility at 'Wesley Gardens'; and Uniting Church Australia	High density occupation being 317 beds	Crn Morgan and Forest Way	1.9
West	Aged care facility 'Chriroseph'	Approved in 2019 for 100 beds but not yet constructed	181 Forest Way	1.6 & 1.7
West	Residential	Low density residential	Oates Place, Caley Crescent, Lyndhurst Way & Ocean View Way	1.6 & 1.7
Southwest	Residential	Low density residential	Child's Circuit	1.6, 1.7 & 1.11
North	Rural residential	6 rural residential lots	Along Morgan Rd	1.8
East	Rural Residential	9 rural residential lots	Along Morgan Rd	1.10
Northeast	Residential	4 rural residential lots	Hilversum Crescent	1.8 & 1.10
South	Rural Residential	2 rural residential lots	Immediately south of the development area	1.7
South	Industrial technology facility	Telstra satellite hub	Immediately south of the development area	1.11
South of Telstra land	Rural Residential	5 rural residential lots	Immediately south of the development area	1.11
Southeast	Rural Residential	4 rural residential lots	Immediately southeast and east of Telstra lands	1.11

1.6.1 Nearby strategic fuel hazards

Hazardous fuels are located in the northwest, north, east and south and contain varying degrees of fragmentation – see Figure 1.6 & 1.7 below.

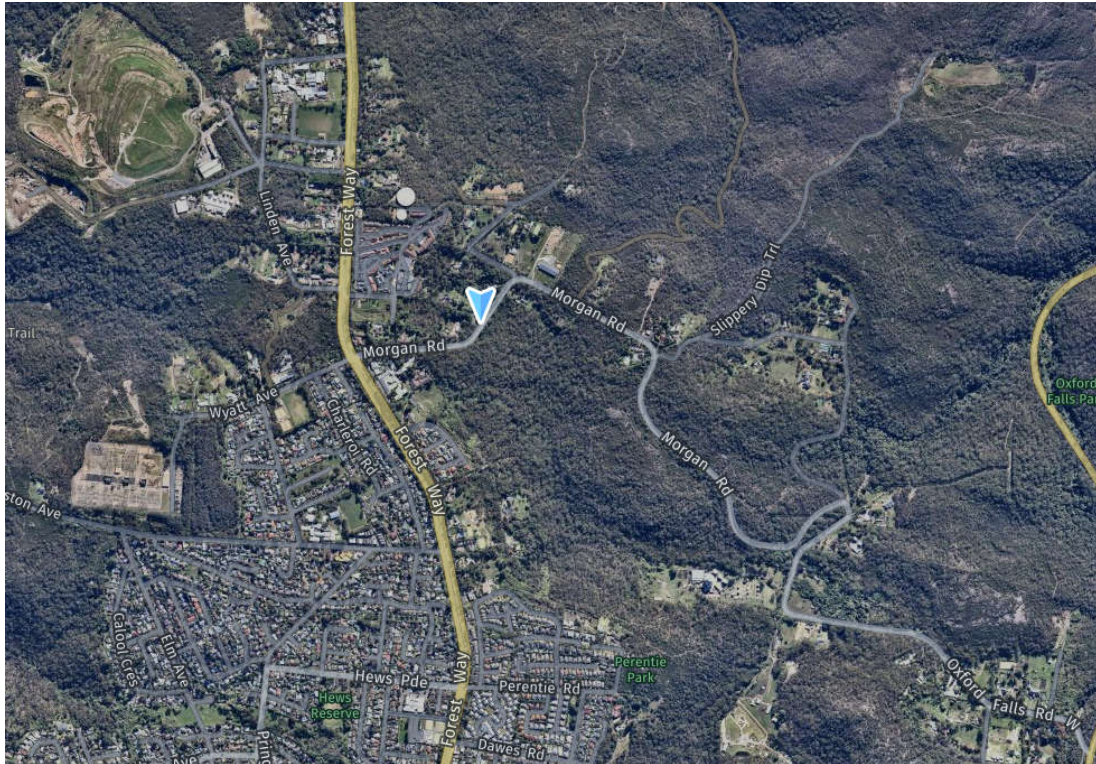


Figure 1.6 - Aerial appraisal of nearby vegetation hazards (Source: Nearmaps, 2022)



Figure 1-7 – Aerial appraisal of development boundary (source: NearMap, 2021)

1.6.2 Breakdown of peripheral hazardous fuels

Hazardous fuels are located on the periphery of the development area, as follows;

- North of Morgan Rd is comprised of private rural residential lands with manicured gardens and mostly non-contiguous vegetation. Contiguous 'scrub' vegetation occurs in the northeast portion - see Figure 1.8.

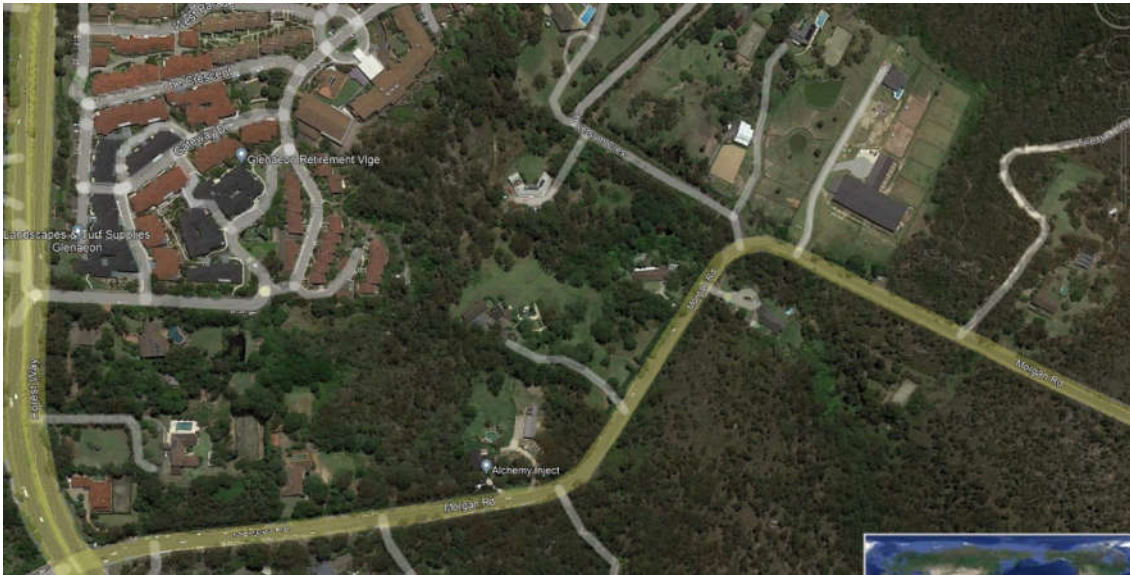


Figure 1.8 – Aerial appraisal north of Morgan Rd

- Northwest of the intersection of Morgan Rd and Forest Way – This is a mixture of private and public lands containing scrubland with interspersing trees – see Figure 1.9.

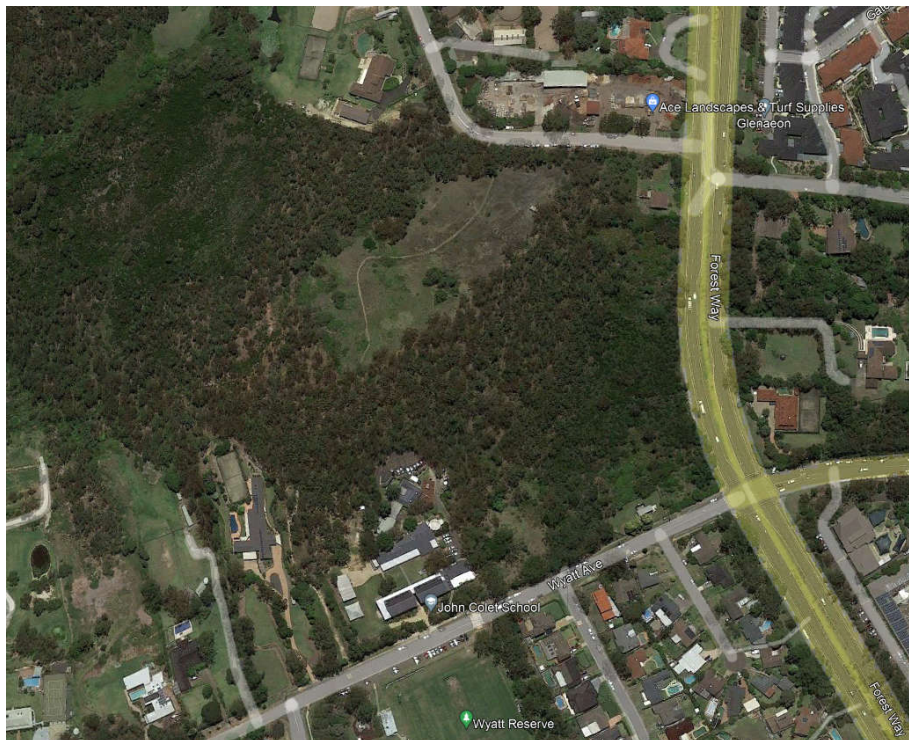


Figure 1.9 - Northwest of the intersection of Morgan Rd and Forest Way

- East of Morgan Rd is contiguous shrub native vegetation set amidst private rural lands north of the development area and contiguous native vegetation east of Kelly's Way – see Figure 1.10.



Figure 1.10 – Aerial appraisal east of Morgan Rd

- South of the development area is comprised of small rural lots in the immediate southwest, residential lands in the south west and government satellite and in the south east – see Figure 1.11.

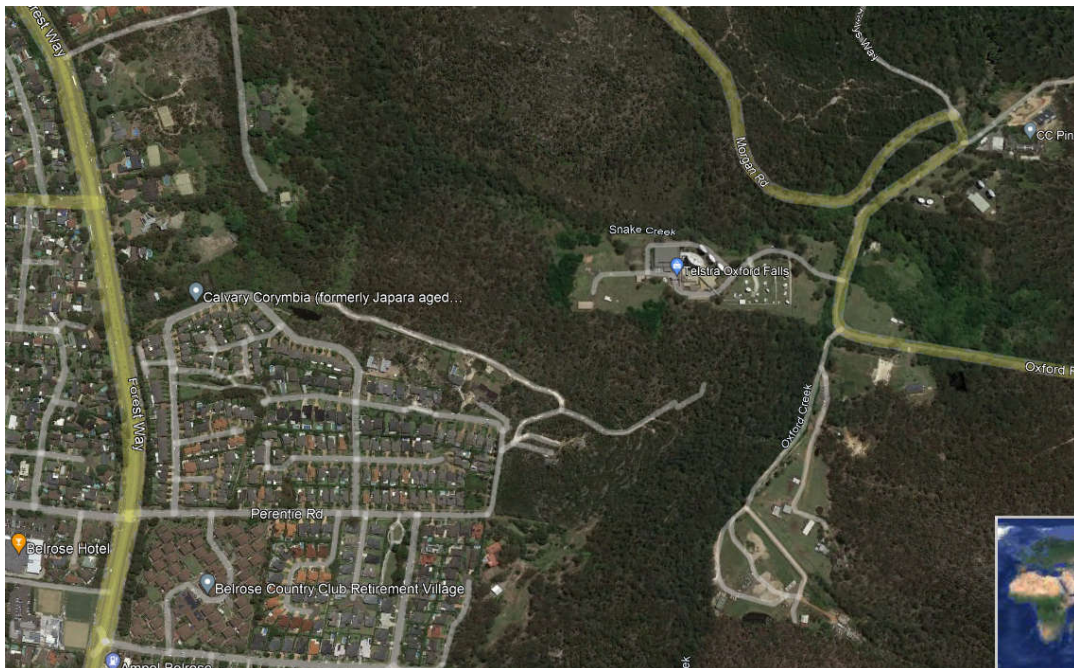


Figure 1.11- Aerial appraisal south of the development area

1.7 Legislation and planning instruments

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

The *EP&A Act* governs environmental and land use planning and assessment within New South Wales (NSW). It provides for the establishment of environmental planning instruments, development controls and the operation of construction controls through the National Construction Code (NCC) and the *EP&A Act*. Bushfire prone land maps provide a trigger for the development assessment provisions. The proposed rezoning is located on land that is mapped by Northern Beaches Council as being bushfire prone (refer Figure 1-1).

PBP 2019 stipulates that if a proposed amendment to land use zoning or land use affects a designated bushfire prone area then *Section 9.1(2) of the EP&A Act (1979)* must be applied. This requires Council to consult with the Commissioner of the *NSW RFS* and to take into account any comments by the Commissioner and to have regard to the planning principles of *PBP 2019* (detailed within Section 1.5.3).

1.7.2 Local Environmental Plan (LEP) and Development Control Plan (DCP)

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

The site is identified on the *Warringah LEP 2011* Land Application Map as a DM ‘deferred matter’. LEP 2000 applies to all deferred land until a review of deferred lands is complete and a planning proposal process is undertaken to bring this land into Warringah’s standard LEP 2011.

Warringah Local Environmental Plan (LEP) 2000

The site is zoned under *Warringah LEP 2000* as Locality C8 – Belrose North (refer

Figure 1-3). The land surrounding the property to the north, south and west is zoned under the current LEP 2011 as E1 – National Parks and Reserves.

The proposal seeks to amend the *LEP 2000* and contribute to the planning process to bring this land into Warringah’s standards LEP. The proposal is to rezone the central development area as R2 low density residential whilst maintaining the land surrounding the development as an offset area will be rezoned as E3 – Environmental Management. The proposal also includes the rezoning of a small parcel of land to RE2 – Public Recreation.

The proposal, including the provision of APZs, would seek to comply with the objectives of the proposed rezoning.

1.7.3 Planning for Bush Fire Protection 2019

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

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

The Planning Proposal has been assessed in entirety in compliance with *PBP 2019*. This includes a separate *Bushfire Strategic Study* and assessment against the following bushfire protection measures to ensure that future development is capable of complying with *PBP 2019*:

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

1.7.4 National Construction Code (NCC) and the Australian Standard AS3959 Construction Standards in bushfire-prone areas 2018 (AS3959-2018)

The NCC is given effect through the *EP&A Act* and forms part of the regulatory environment of construction standards and building controls.

The NCC outlines objectives, functional statements, performance requirements and deemed to satisfy provisions. For residential dwellings these include Classes 1, 2 and 3 buildings. The construction manual for the deemed to satisfy requirements is AS3959.

Consideration of AS3959 is not specifically required in a planning proposal application. The APZs provided in this report are equivalent to a bushfire attack level (BAL) 29 construction standard for those dwellings with frontage to the bushfire hazard.

2. BUSHFIRE THREAT ASSESSMENT

To assess the bushfire threat and to determine the required width of an APZ for a development, an assessment of the potential hazardous vegetation and the effective slope within the vegetation is required. These elements include the potential hazardous landscape that may affect the site and the effective slope within that hazardous vegetation.

2.1 Hazardous fuel formation assessment

PBP guidelines require the identification of the predominant vegetation formation in accordance with David Keith (2004) if using the simplified acceptable solutions in PBP 2019, or alternatively the vegetation class if adopting the comprehensive vegetation fuel loads (as allowable when undertaking an assessment under Method 2 of AS3959). The hazardous vegetation is calculated for a distance of at least 140m from a proposed building envelope.

Extensive vegetation survey of the development site was undertaken by *Hayes Environmental* with the preparation of a BDAR assessment for the planning proposal. The results of the vegetation ID are detailed in Table 2-1 – Vegetation and as mapped by *Hayes Environmental* – see Figure 2-1 Vegetation Communities. PCT classifications are derived from the OEH Bionet database. Fuel loads shown within Column 5 of Table 2-1 are derived from the RFS 'Classification of vegetation fuel loads March 2019'.

<https://www.environment.nsw.gov.au/NSWVCA20PRapp/search/pctsearch.aspx>

Table 2-1 – Vegetation communities - their PCT category and their fuel load

Vegetation PCT	Vegetation formation	Vegetation classification	Comprehensive fuel loads (t/ha) as per RFS	Acceptable solution fuel loads (t/ha) (RFS)
1783	Sydney North exposed sandstone woodland	Forest (Shrubby)	21.3 / 27.3	22.0 / 36.1
1250	Coastal sandstone gully forest	Forest (Shrubby)	21.3 / 27.3	22.0 / 36.1
1824	Coastal sandstone Heath-Mallee	Heathland	36.9 / 36.9	36.9 / 36.9

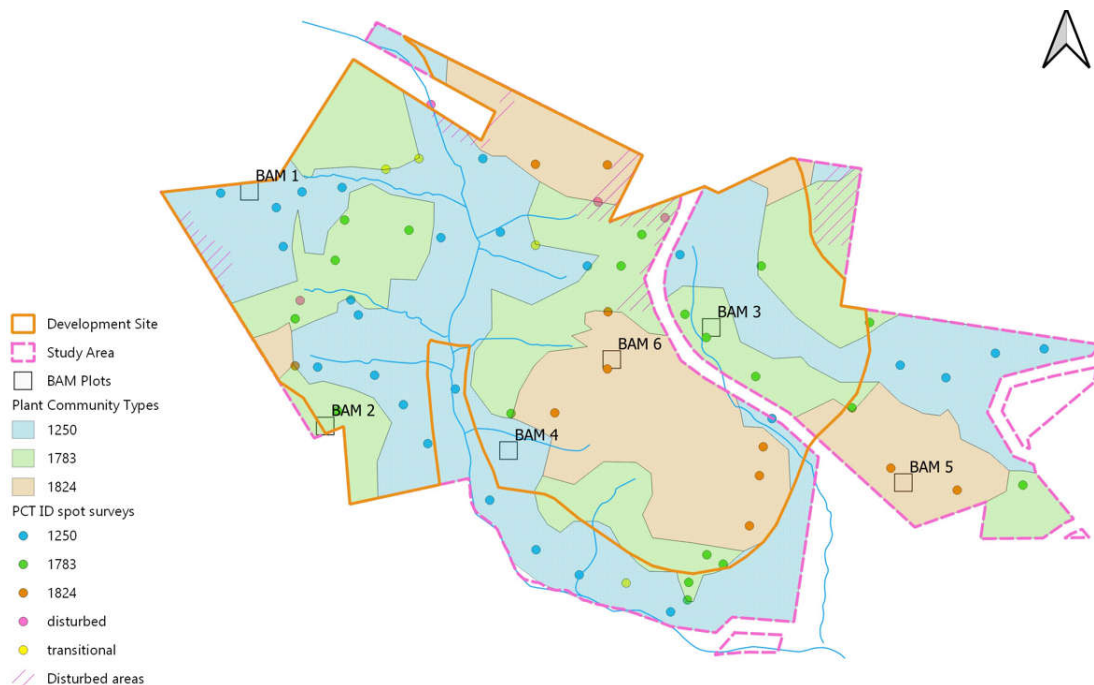


Figure 2-1 – Vegetation communities within the development area
(source: Hayes Environmental 2021)

2.2 Effective slope

The effective slope (post earthworks) has been assessed for up to 100m from the development site. The effective slope refers to the slope gradient which provides the most effect upon likely fire behaviour. In that regard the RFS advises that a mean average slope may not in all cases provide sufficient information such that an appropriate assessment can be determined and the effective slope should / could be determined as valuable for the assessment process.

The effective slope within the hazardous vegetation is described in detail within Table 2-2 below. Slopes have been extensively mapped by surveyors *Craig & Rhodes* – see Figure 2-2.

The '20 degrees and above' slope has been mapped to illustrate the areas that are outside of the PBP 2019 'deemed to Satisfy' '0-20' degrees range. Arising from the 20+ degrees mapping those areas require an APZ of 100m 'as a default dimension' because they do not accord with Table A12.5 of PBP 2019.

The RFS advise in A1.4 on page 83 of PBP that *APZ tables within PBP are provided for acceptable solutions with slopes of up to 20 degrees. Effective slopes are to be assessed with hazards on slopes in excess of 20 degrees will require a detailed performance assessment. This may include a consideration of the potential flame length and its impact on the proposed development. Please see section A1.5 for information on determining the effective slope.*

It is readily acknowledged that the 100m APZ dimension has an environmental consequence on biodiversity however for a Planning Proposal this is not able to be amended unless the RFS agrees to a reduction and at a Planning Proposal stage of development design this is not advised.

However, it is the authors belief this can be reduced by the RFS following the acknowledgment of the southern escarpment wall which is approximately 8-10m in height and this acts as a radiant heat barrier.

If this barrier is modelled, using ASA3959 Method 2 (2018), (as explained within B1 General on page 92 of the Standard) the APZ could be reduced markedly. Indeed, Method 2 permits a down slope of up to 30 degrees to be modelled. If so, then the APZ distance could be reduced to a 74m dimension (based on the insitu 25 degree down slope using a fuel load of 23.1 / 27.1 (tonnes per hectare) based on Sydney dry sclerophyll fuels.

This approach would save approx' 1.0 ha of biodiversity land.

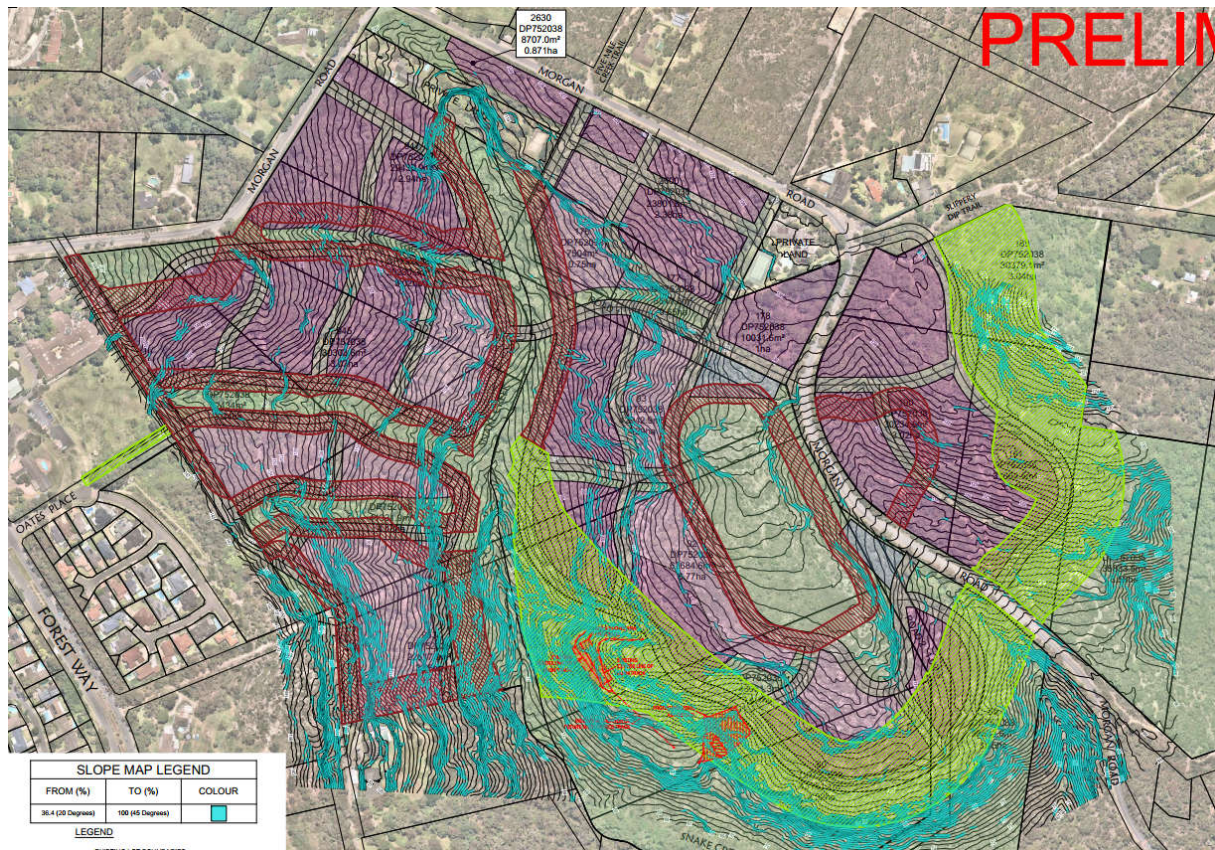


Figure 2-2 – 20 degrees slopes

2.3 Bushfire attack assessment

The following assessment has determined the APZ and BAL levels via the following approaches;

- Table A1.12.2 & A1.12.5 of *PBP 2019*;
- Appendix B Method 2 (alternative solution) of *AS3959 Construction of buildings in bushfire prone areas* (2009); and

A fire danger index (FDI) of 100 has been used to calculate bushfire behaviour on the site based on its location within the Greater Sydney region.

See Appendix 1 herein to visualise an A3 depiction of the proposed APZ's.

Table 2-2 provides a summary of the bushfire attack assessment based on residential development and the methodologies identified above.

See Appendix 1 herein to visualise an A3 depiction of the proposed APZ's.

Table 2-2 – Bushfire attack assessment

Site locality	Proposed development precincts (Should be read in conjunction with Figure 1.4)	Minimum APZ required for residential development (metres)	APZ provided (metres)
North	N1 & N2 (north)	24	24
	N1 (South)	29	Protected by other zones
	N4	29	Protected by other zones
North	N5 (south)	24	26
Northwest	W4	24	24 including road reserve
	Area north of W5	24	25 excluding the 20m wide Morgan Rd reserve
East & south-east	C3 to C5 E1 to E4	100	100
Central	C2 to C5 (east)	29	40
	C2 to C5 (west)	60-100	60-100
Central	Between C3 & C4	15	15
West	W5, S1 & S2 (west)	24	24
West (Waterway Corridors)	W2-W8	Not stated	16m Road width plus building setback
Central (east of Snake Creek)	C1 (east)	23	23
	N3	Variable	23-26
	C1 & C2	Between 20-26	Protected by other development
Southwest		60-75	60-75

2.4 Fire behaviour

The proposed site is located downhill of fire threats and potential fire runs located to the northwest, north and northeast which mitigate fire intensity significantly whilst upslope scenarios can potentially occur from the south and southeast aspects.

2.4.1 Potential fire threats to current unmanaged landscape

The mixed vegetation landscape that surrounds the PP site is a combination of forest and tall heath both of which can produce ember attack which advance into unburnt country and begin new fire ignitions.

Fire history shows that no wildfires have occurred in the PP area over the past 30 years apart from a fire started from a hazard reduction burn gone wrong. Onsite investigations by the undersigned recognized that the former bush rock quarry, that was in the middle of the site on the west bank of Snake Creek, may have a lot to do with that lack of fire history as staff were on site to suppress any ignitions. There is clear evidence of former trails on the site, extending all over, which are most likely to have been used for bush rock collection, and as a result would have assisted any early fire suppression or simply as fire breaks.

The potential fire runs are shown on Figure 2.3 and represent possible directions of fire runs.

Bushfires and ember attack from the north

In the case of the PP area fires from the north would need to burn downslope from their highest point 484m in distance to the north. The fires were held on the 5 Mile Creek Trail and The Slippery Dip Trail and did not progress to Morgan Road north but did penetrate towards Beacon Hill and Oxford Falls.

Bushfires and ember attack from the East

In the case of the PP area fires from the west would need to burn downslope from their highest point 302m in distance to the northeast. Wildfires near the coastal zone can burn from the northeast but it is highly likely to burn from the east and also probable during the autumn cool period, albeit with its moist conditions, where winds from the southeast are common. These are not threatening bushfire conditions.

Bushfires and ember attack from the south

To the south, potential fire runs are reduced by the presence of existing cleared areas (Telstra telecommunications facility) and a reduced fire front width. Further mitigation is provided by the presence of Morgan Road, acting as a fire break to the southeast and east. However, fires from the south are possible and would run up steep slopes towards the more reduced slopes within the PP area and beyond to rural residential areas north and east of Morgan Road.

Bushfires and ember attack from the west

Traditionally fires are worst from the northwest when they are often fanned by hot dry winds and in many cases they are also exacerbated from southerly busters during summer months from late afternoon wind changes from the south. In the case of the PP area fires from the west would need to burn downslope from their highest point 474m in distance from the west. The vegetation within the PP site enables fires to threaten the rural residential estates north and east of Morgan Road.

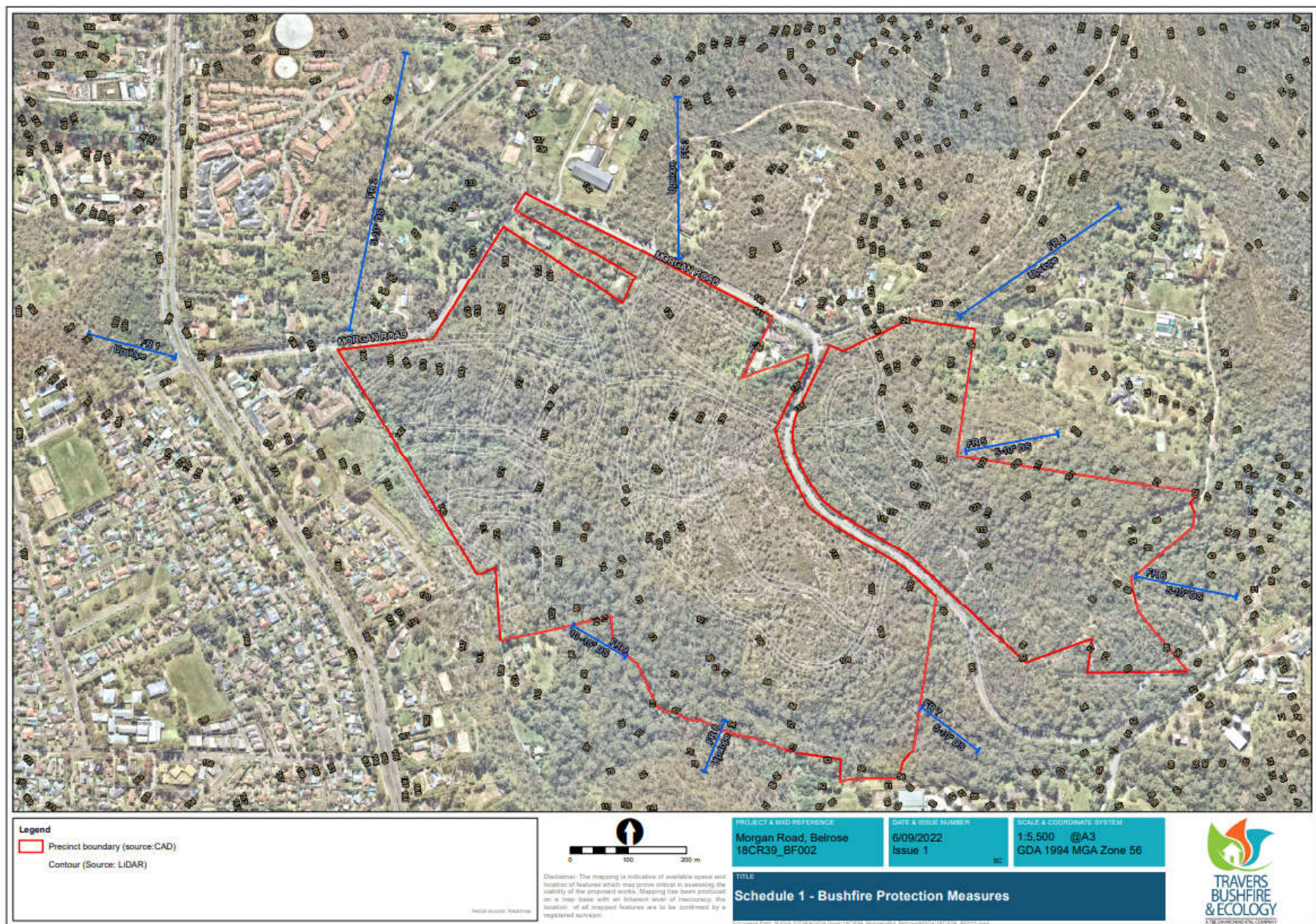


Figure 2.3 – Potential fire runs

2.4.2 Potential fire threats post development

Post development will see the retention of a conservation zone along Snake Creek and a rectangular shape in the east which can be subject ember attack from external areas - as demonstrated on Figure 3.5.

2.4.2.1 Bushfires and ember attack affecting Snake Creek environ

The Snake Creek retained bushland reserve is a forest vegetation assemblage and is approximately 300m in length and 120m in width. This vegetation is capable of being ignited by bushfires burning from all peripheral aspects external to the site.

Bushfire protection to this landscape is provided by way of perimeter roads and or asset protection zones that comply with PBP 2019. It is not perceived that any additional protection is required.

Should a bushfire occur within this landscape then its travel direction is limited to north or south directions; except in the south where the width of the bushland could enable a fire to move from west to east and or northeast to southwest in summer months. East to west is highly unlikely given the dominant wind directions in summer.

The positioning of Snake Creek bushland is not an unusual scenario and is well reflected in many bushland settings in bushfire prone areas and reflects the need to protect our environmental whilst applying asset protection zones between future dwellings and that bushland. This is especially so in the northern suburbs that surround the harbour with its river and or creek tributaries.

2.4.2.2 Bushfires and ember attack affecting the rectangular Lizard Rock vegetation assemblage

The Lizard Rock retained bushland reserve is a tall heath vegetation assemblage and is approximately 300m in length and approximately 120m in width. This vegetation is capable of being ignited by bushfires burning from all peripheral aspects external to the site.

Bushfire protection is provided by way of perimeter roads and or asset protection zones that comply with PBP 2019. It is not perceived that any additional protection is required apart from a small additional zone in the northwestern corner between the proposed roadway and a short escarpment some 20m from the roadway. This can be determined as DA stage.

Should a bushfire occur within this environment it could be subject to a variety of wind directions. The rocky nature of the landscape means soil is minimal and fuel moisture content is mostly low so the vegetation assemblage is able to burn freely.

The positioning of this rectangular shape is not an unusual scenario in Western Sydney where endangered ecological communities are regularly protected and require separation from proposed dwellings that are part of new urban subdivisions.

2.4.2.3 Post development separation from bushland

Modelling has been undertaken to demonstrate *radiant heat flux* (RHF) affectation upon the various fire runs shown in Figure 3.5. Table 3.3 provides the modelled results in Column 4 against the various fire runs considered.

Table 3.3 – Potential fire runs and RH outputs

Fire run ID	Slope	Vegetation classification (PBP 2019)	Modelled radiant heat outputs k/Wm ²	Impact on site
FR-1	Flat to upslope	Forest	1.81	FR-1 models the likely impact of radiant heat upon the proposed slip lane which is 230m from the nearest portion of the development site.
FR-2	5-10° downslope	Forest	17.41	FR-2 has been calculated on the basis of a 55m wide forest width on a slope of 10 degrees; from the nearest residential buildings
FR-3	Flat to upslope	Shrubland	10.13	FR - 3 has been calculated on the basis of an 8 degree upslope and allowing for 25m to the nearest residential buildings
FR-4	Flat to upslope	Forest	16.33	FR-4 is shown as occurring to the northeast of the site, outside the area understood to be retained as a fuel managed landscape.
FR-5	5-10° downslope	Forest	5.68	FR-5 has been calculated on the basis of a 100m wide forest width on a slope of 10 degrees and with a 100m wide APZ to the nearest residential buildings
FR-6	5-10° downslope	Forest	5.68	FR-6 has been calculated on the basis of a 100m wide forest width on a slope of 10 degrees and with a 100m wide APZ to the nearest residential buildings
FR-7	5-10° downslope	Forest	5.68	FR-7 has been calculated on the basis of a 100m wide forest width on a slope of 10 degrees and with a 100m wide APZ to the nearest residential buildings
FR-8	Flat to upslope	Forest	1.94	FR-8 has been calculated on the basis of an 8 degree upslope and allowing for 100m to the nearest residential buildings
FR-9	10-15° downslope	Forest	13.73	FR-9 has been calculated on a 15 degree downslope in forest with a 75m APZ

2.4.2.4 What do the potential fire run *RH* outputs mean

The calculated radiant heat outputs on the periphery of the development range from low 1.81 k/Wm² to a moderate 16.33 k/Wm².

PBP 2019 permits residential development to be constructed with a radiant heat affectation is 29 k/Wm² or lower. This means that the proposed development footprint is well below the Catastrophic (FDI 100) design tolerances of PBP 2019.

Importantly, the calculated radiant heat outputs also clarify the fact that, of the nine Fire Runs (FR) analysed, only four fire runs are above 10 k/Wm² with five below 10 k/Wm².

Of significant note is that the calculated radiant outputs;

- For FR 2, 3 & 4 in the north-east and east are less than 17.41 k/Wm².
- The proposed 100 m asset protection zones in the south (covered by FR 5,6,7 & 8 produce very low radiant heat output of 5.68 k/Wm².
- Only FR 9 provided a higher RH of 13.73 k/Wm².

3. SPECIFIC PROTECTION ISSUES

3.1 Asset protection zones (APZs)

Table 3-1 outlines the proposal's compliance with the performance criteria for APZs.

Table 3-1 – Performance criteria for asset protection zones

<i>Performance criteria</i>	<i>Acceptable solutions</i>	<i>Acceptable solution</i>	<i>Performance solution</i>	<i>Comment</i>
Potential building footprints will 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 and A1.12.4 based on the FFDI	☒	☐	Complies with RFS - Refer Section 2.3. An alternative solution approach has been undertaken for lots adjacent to the narrow riparian corridors that feed into Snake Creek from the west. This is based on a width of 20m
APZs are managed and maintained to prevent the spread of a fire towards the building	APZs are managed in accordance with the requirements of Appendix 4	☒	☐	Complies with RFS and can be made a condition of consent at development application stage.
The APZ is provided in perpetuity	APZs are wholly within the boundaries of the development site	☒	☐	Complies with RFS – The APZs will be managed under a Community Title arrangement and will be subject to a detailed fuel management plan (FMP).
APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is minimised	The APZ is located on lands with a slope of less than 18°	☒	☒	Complies with RFS – The APZ's are mostly situated on slopes of less than 18 degrees except for the southern aspects which are 25 degrees. These southern areas contain high rock escarpments and ledges and can be incorporated into future APZ management by the preparation of a FMP.
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	☒	☐	Complies with RFS and can be made a condition of consent at development application stage.
	Fencing is constructed in accordance with section 7.6	☒	☐	Can be made a condition of consent at development application stage.

APZs on steep land:

In accordance with the acceptable solutions and performance solutions permitted by PBP all APZ's in excess of 20 degrees are outside the realm of PBP and the required APZ for those areas must be 100m. Where hazardous slopes are below 20 degrees the provisions of PBP are permissible.

Figure 2-2 has been used to determine the slope gradient following an extensive survey by *Craig & Rhodes* managed in part by the undersigned to this report to gain correct gradients as per RFS expectations of the detail.

3.2 Building protection

The construction of buildings in bushfire prone areas is subject to stringent rules pertinent to the building envelope being located on the non-hazardous side of the APZ. The role of the

In terms of future subdivision approval, the minimum APZ must be provided in accordance with *AS3959 Construction of buildings in bushfire prone areas (2018)* and the specifications provided within Section 7.5 of *Planning for Bush Fire Protection 2019*.

A dwelling cap of 450 residential dwellings will be created within the R2 zone. Based on the assumption of 450 dwellings this would assume a population increase of 1,170 persons. (Based on based on the 2016 *Australian Institute of Family Studies* data which advises there is 2.6 persons, on average, per house hold).

3.3 Hazard management

The management of community lands and fire trails will be via the preparation of a fuel management plan (FMP) with long term management being undertaken and incorporated into the Community Management Statement managed by the Community Association. The fuel management plan will detail the ongoing fuel management requirements of the APZ and fire trails.

APZs will be managed as either an Inner Protection Area (IPA) or Outer Protection Area (OPA) in accordance with RFS guidelines *Standards for Asset Protection Zones* (RFS, 2005), with landscaping design to comply with Appendix 4 of *PBP*. Most of the proposed APZ's will be in the form of an IPA with only a small area subject OPA management regime.

The APZs, as generally depicted in APPENDIX 2 will be assured through a planning agreement and development consent conditions. The funding will be sourced from each new neighbourhood Community Association and through each neighbourhood Community Association lot owner.

3.4 Fuel management

A fuel management plan (FMP) will be prepared to manage the vegetation within the APZ. It will be used a detailed instructional guideline for the community association who would engage a professional bushland management firm to undertake the actual works program.

The FMP is to be prepared to facilitate the ongoing management of bushfire hazards within the asset protection zone (APZ) landscape with the aim that all APZ's will be managed in perpetuity in accord with the relevant development consent and GTA's provided by the NSW Rural Fire Service.

The details will be included within the Stewardship Agreement that includes a fuel management plan to strategically decrease hazards and provide a diverse ecological environment.

APPENDIX 1 provides maintenance advice for vegetation within the APZ.

3.5 Access and egress capability

Morgan Road will be reconstructed to a collector road standard from Forest Way to the south eastern location of Morgan Road as shown on the plans. The road will be a 13m wide pavement width with 3.5m wide pedestrian verges and pathways on both sides.

Kerb and gutter will be on both sides together with vegetation removed from both sides. Street trees will be planted. The road will be a bus route and will allow access for garbage trucks and fire trucks at all times.

3.5.1 General vehicle access (outside of emergencies)

JMT Consulting (JMT) are the traffic consultants engaged in the PP project and they undertook a traffic assessment in Mid 2021 and amended the report several times in response to RFS and TfNSW matters raised with the latest report provided in December 2023.

The purpose of the JMT transport assessment was to understand the implications of the planning proposal on the adjacent transport network and identify any upgrades or mitigation measures required to support the future site development.

Specifically, their assessment considered the following items:

- 1 Existing transport conditions around the site, including:
 - Road network
 - Public transport
 - Walking and cycling network
 - Existing travel behaviours
- 2 Forecast volume of traffic generated by the uses envisaged under the Planning Proposal in the critical peak hours, including the likely direction of travel.
- 3 The overall net change in traffic flows at the Forest Way / Morgan Road intersection (key site access point) and the ability of the adjacent road network to accommodate the level of development proposed.
- 4 Proposed vehicle access arrangements from the broader road network
- 5 Proposed internal street network including proposed connections to the external road network.
- 6 Ability of the road network to accommodate vehicle demands from the site during a major bushfire evacuation event.
- 7 Staging and sequencing of any necessary infrastructure upgrades.

The proposal's compliance with the acceptable solutions outlined in PBP 2019 is detailed within Table 3-2 in terms of road widths and Table 3-3 for further assessment details as required by PBP.

Table 3-2 - Road widths

<i>Perimeter road</i>	<i>Non-Perimeter Road (in metres)</i>	<i>Road width (in metres)</i>	<i>Parking availability on one side or both sides of the road as per PBP</i>	<i>Compliant or not with PBP 2019</i>
Forest Way	>8	33	Variable	Compliant
Morgan Road	>8	20	Both sides	Compliant
Oates Place	>8	20	One side	Compliant
Internal roads	>8	16	Variable	Compliant

Road hierarchy is shown on Figure 3.1 and Figure 3.2 below.



Figure 3-1 - Road layout (Cox, September 2022)

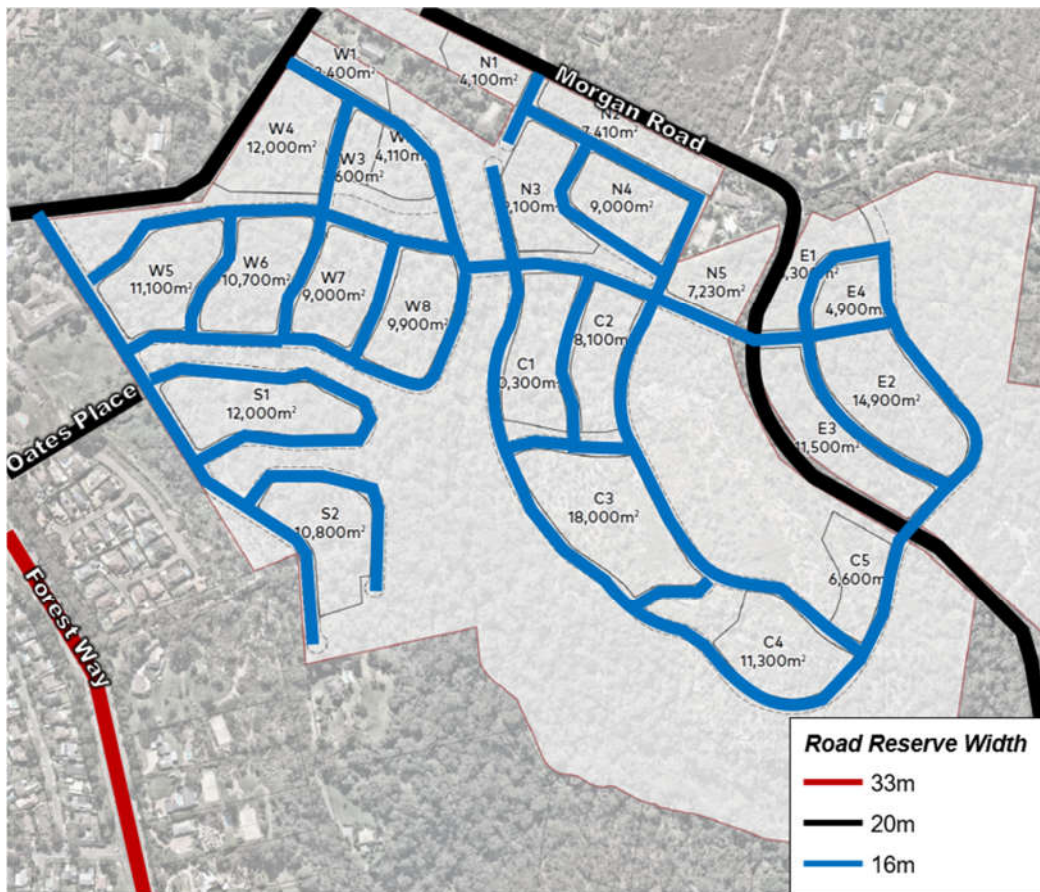


Figure 3-2 - Road widths (JMT Consulting, June 2021)

Note: In Sector S2 of Figure 3.2 above (southwest corner) the length of the dead end road is much shorter being 200m - not as displayed – see Figure 3.1 for reference of the corrected length. At the DA stage this road length can be negotiated with the RFS. Perimeter roads are required for residential subdivisions of three or more allotments (PBP (sect 5.3.2) however PBP is silent on whether or not the road is required to extend the full extent of the allotment boundary or simply the access to the allotment.

The JMT assessment considered the following with respect to internal vehicle circulation outside of an emergency evacuation scenario:

- New streets and perimeter / fire access trails to generally following existing contour lines to avoid steep slopes and improve vehicle sight lines.
- Provision of an interconnected street network that provides linkages to the various access points located on Morgan Road.
- Provision of appropriate access and egress for vehicles in a bushfire emergency including a bridge link connecting the eastern and western precincts of the site.
- Egress via Oates Place to Forest Way only provided during an emergency and will not be available for day to day traffic movements.
- Street network designed to limit through traffic movements within the site to minimise traffic flows and provide for a safer environment for pedestrians.
- Suitable street cross sections provided to allow for the safe and efficient movement of

various vehicle types (including first-responder vehicles) as well as allow for on-street car parking and pedestrian and cycle paths.

Key findings of the JMT assessment were;

- There has been a reduction in daily traffic volumes on Forest Way since records began in 2008 (as sourced from Transport for NSW, traffic station 57025).
- The surrounding road network, including Forest Way and the signalised intersection of Morgan Road / Forest Way can accommodate the expected level of day to day traffic generated under the rezoning proposal. The traffic modelling results demonstrated that the Morgan Road / Forest Way intersection will perform acceptably following the full development of the site at 'Level of Service D' during the AM peak hour and PM peak hours of the day.
- The project would deliver upgrades to the road network to improve traffic capacity for both site users and the general public, including:
 - Introduction a new slip lane from Morgan Road into Forest Way; and
 - Extension of 40m to achieve an 80m lane northbound right turn bay from Forest Way into Morgan Road
- Suitable site access arrangements can be provided along Morgan Road with multiple accesses envisaged to distribute traffic movements across the site. No direct vehicle access would be provided from Forest Way given its function as a State classified road.
- The upgrade of the existing bridge at Morgan Road and Oxford Falls Road West (opened in late 2023) provides for improved access to the site and is capable of carrying Cat 1 fire tankers.
- The internal street network will be designed to limit through traffic movements within the site, accommodate movement of pedestrians and cyclists and allow for the safe and efficient movement of various vehicle types (including first responder vehicles).

Morgan Road eastbound has the capacity in pre-bushfire event to be a valuable evacuation route such as when Extreme and or Catastrophic weather condition are known – usually 3-4 days in advance.

3.5.2 Evacuation Opportunities

JMT undertook investigations to understand the ability of the road network to accommodate traffic flows during a major bushfire evacuation event. The key inputs forming this work were as follows:

- Maximum yield of 450 residential dwellings for the site. In addition, the existing community dwellings adjacent to Morgan Road east of Forest Way have been taken into consideration, which number approximately 50 households.
- 100% of all dwellings in the precinct are considered at risk and would be required to evacuate the precinct during a major bushfire event. This is considered a conservative assumption given the development will remove part of vegetated areas which would in turn reduce the number of dwellings at risk, meaning not all of the population would need to evacuate the area and instead could remain in place. As a comparison the bushfire evacuation modelling undertaken for the Ingleside Precinct assumed 25% of residents would 'stay and defend' rather than evacuate.
- Average of two vehicles per dwelling.

- The number of dwellings occupied at any given time is 90%. Importantly, JMT state that this is conservative as it is highly unlikely that a fire would suddenly threaten the suburb during the night when most people are home. It is likely that it would occur during the day and, most likely late in the day. Therefore, many people will not be home when the fire threatens. Accordingly, the number of dwellings occupied at the time of day that the fire threatens is likely to be considerably less than the number of occupied dwellings on the day of the fire.
- During a bushfire evacuation the following traffic egress routes would be available to residents (see Figure 3.3):
 - Morgan Road (westbound) via the Morgan Road / Forest Way intersection. This is assumed to be the primary egress route and would accommodate approximately 80% of traffic movements.
 - Via the Oates Place / Forest Way intersection as a secondary egress route which is used only in the event of a bushfire emergency and would accommodate 20% of traffic movements.
 - Morgan Road (eastbound) is not considered safe in a bushfire event and is not considered further.
- JMT advised that a study undertaken analysing behavioural aspects of the 2009 Victoria Bushfires indicated that 54% of residents evacuated during a bushfire, and of those residents that evacuated 47% left prior to the last hour before the bushfire arrived. Given the site's more urban location, as well as again considering a highly conservative scenario, only 75% of dwellings have been assumed to depart prior to the final hour before any possible bushfire arrives.

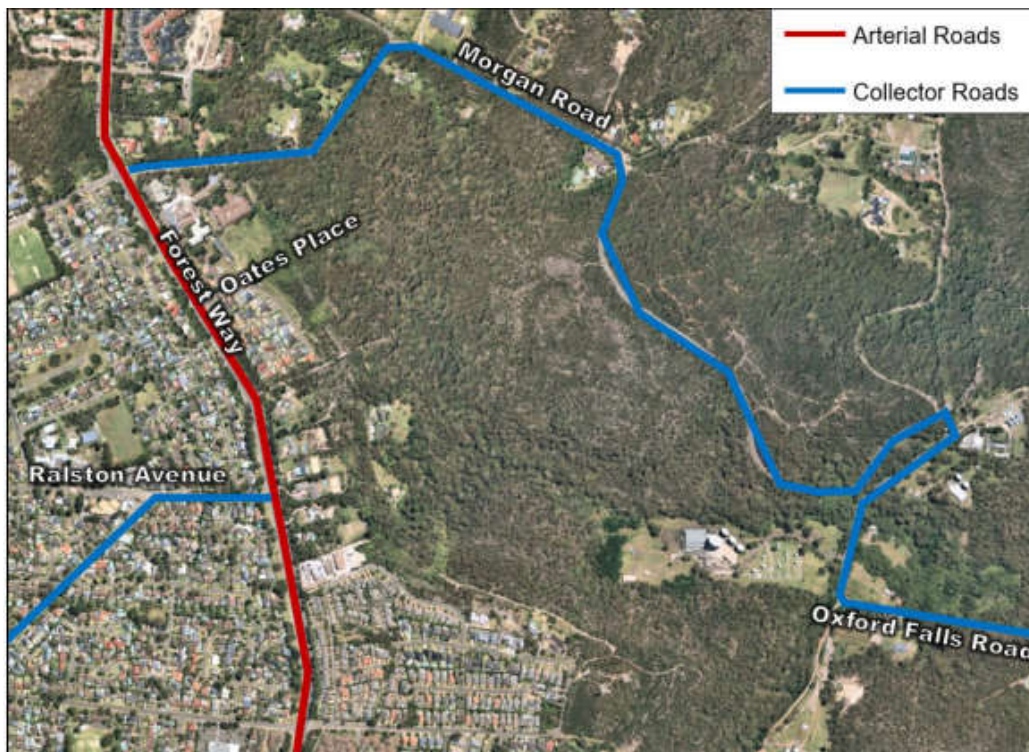


Figure 3.3 – Road hierarchy (Extracted from JMT Consulting report December 2023)

3.5.2.1 Road evacuation network

The RFS raised the issue of Forest Way being inundated with vehicles evacuating from Terry Hills and Duffys Forest and thereabouts and the subsequent impact of adding a further array of vehicles from the PP project.

Terry Hills is a mostly rural residential community and partly urban residential community located to the northeast of the intersection of Forest Way and Mona Vale Road and adjoins the rural residential community of Duffys Forest and combined they have 1,196 dwellings (2021, Mecone).

This area could evacuate to the east to Mona Vale, or to the west to St Ives or to the south to Frenches Forest or a combination of the above; but it is reasonably assumed that the predominant evacuation route for the majority would be to the east via Ingleside to the coastal suburbs of Mona Vale and Warriewood.

The community that adjoins Mona Vale Road are more likely to evacuate to Forest Way as they are located closer to that roadway. It is highly unlikely that evacuation to St Ives would not occur as it requires far too much passage through unmanaged hazard with the national park.

It is also the case that emergency services would create controlled intersections at St Ives, Mona Vale and Belrose to stop traffic movements into the bushfire affected lands. Figure 3.4 depicts the likely traffic control locations by way of red lines with the intersection of Morgan Road and Forest Way as the location of the northern termination for safe traffic movement – see Figure 3.5.

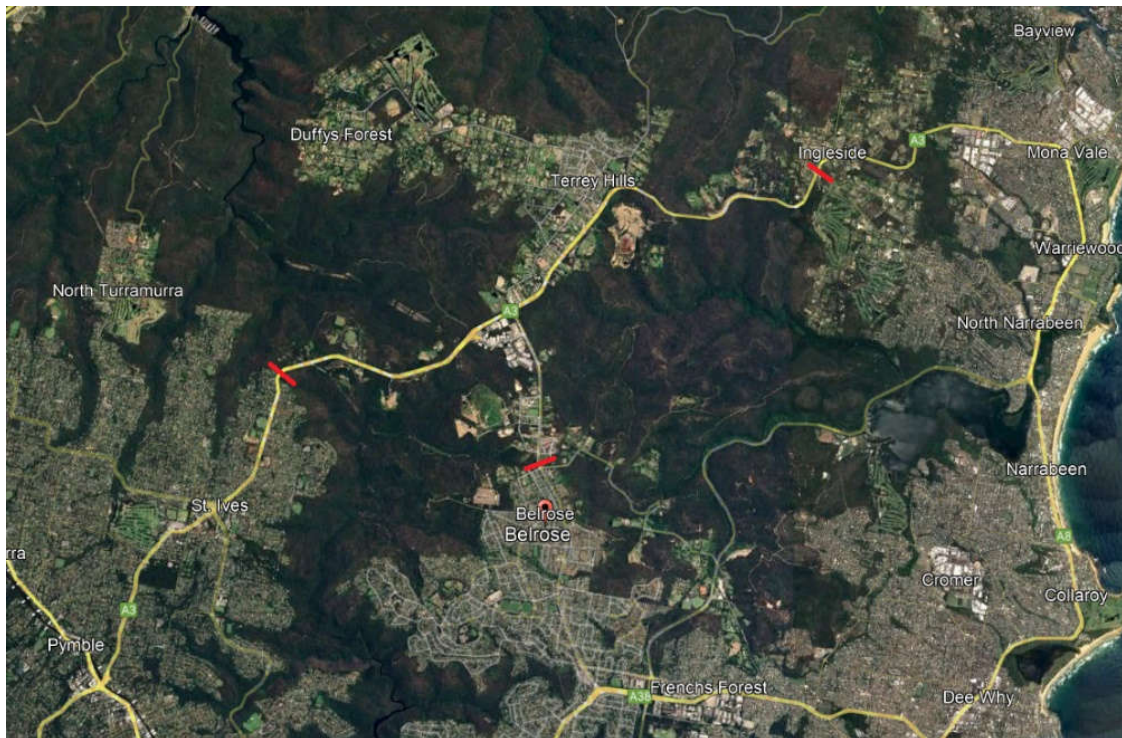


Figure 3.4 – Regional overview of road network for peripheral suburbs

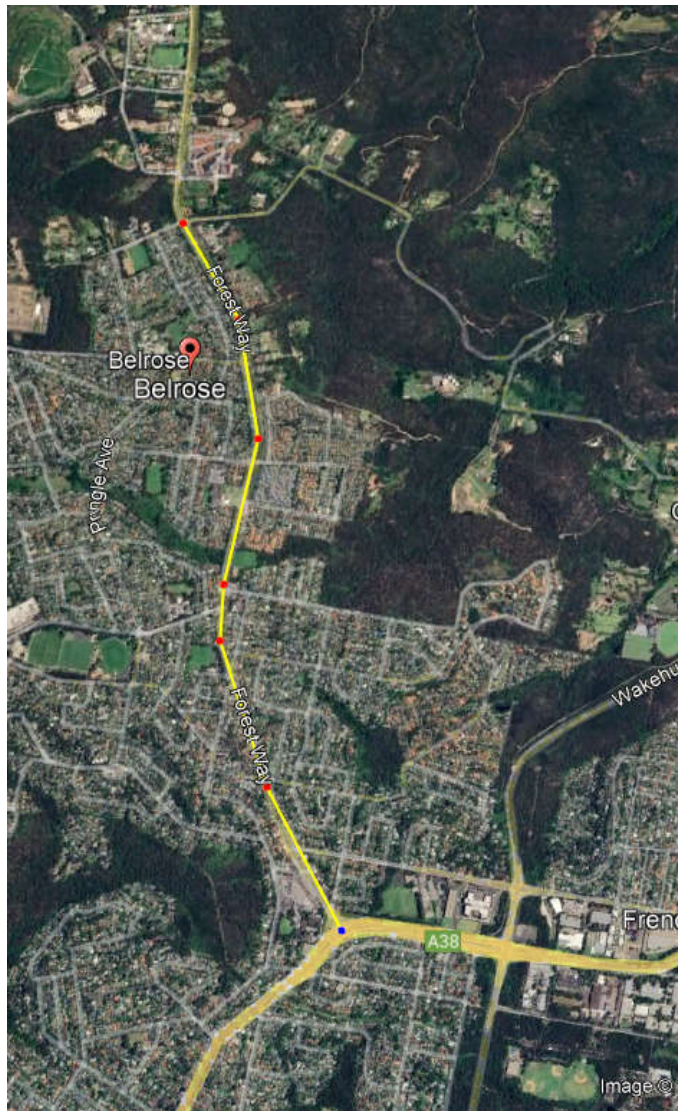


Figure 3.5 – Unhindered evacuation route to Warringah Road

It is recognized that the road between the Mona Vale Road / Forest Way intersection and the Morgan Road / Forest Way intersection, being 2.43 km, is partly affected by forest on the eastern side of the road. This would bring with it the question of when this section should this road section be closed.

This would depend on where a fire was burning but we expect this portion of the roadway to be closed last therefore enabling traffic to head south towards Warringah Road as it is eminently safer than the westward route to St Ives.

This raises the scenario that Duffys Forest and Terry Hill would be encouraged to evacuate early on the likelihood that a fire would be occurring to the northwest or in the north within the Ku-ring-gai national park and therefore affecting Mona Vale Road.

This would also mean that the likely evacuation timing for Terrey Hills / Duffys Forest would not be at the same time as a similarly enforced evacuation from the Patyegarang site.

As a point of significant difference, the evacuation from the Patyegarang site along Forest Way is not affected by hazardous vegetation along the 3.5 km Forest way route to the major intersection with Warringah Road – see Figure 3.5 – as that is a fully urbanized landscape.

Upon arriving at Warringah Road, the southwestern route has three (3) lanes to turn right and one lane to turn left – see Figure 3.6.



Figure 3.6 – Photo showing new intersection with Warringah Road and Forest Way

3.5.2.2 New Slip Lane onto Forest Way

JMT (December 2023) advised;

- During the development of the concept plan for the site it was identified that safe and efficient vehicle egress from the site would be required during major bushfire events. Given the likely bushfire conditions in this scenario, all traffic would need to be directed to the west to access Forest Way and depart the area.
- Under current conditions traffic leaving the site via Morgan Road needs to stop at the traffic lights before then turning left onto Forest Way. In this context an upgrade of the Morgan Road / Forest Way intersection has been identified (initially by *Travers bushfire & ecology*) to facilitate safe and efficient access out of the precinct. This involves the creation of a slip lane from Morgan Road onto Forest Way which includes an acceleration lane as per Austroads requirements. This upgrade will allow traffic leaving Morgan Road to bypass the existing traffic lights and enter directly onto Forest Way without delay.
- A detailed concept design, including extent of civil and infrastructure works required, has separately been prepared by Craig and Rhodes as illustrated in Figure 3.7 below.
- Separate traffic modelling for a bushfire emergency evacuation event indicates the upgrade will be required once more than 230 dwellings have been developed and are occupied on the site.



Figure 3.7 – Proposed new slip lane on Forest Way – NOT on land owned by Council

3.5.2.3 *Road network performance during a bushfire emergency*

JMT provided advice in relation to road network performance during a bushfire emergency and specifically on the ability of the road network to accommodate additional traffic flows. Traffic modelling was undertaken at the Forest Way / Morgan Road intersection which considers existing traffic movements, background traffic growth and traffic movements generated by the rezoning.

The modelling takes into consideration the upgrade of the Forest Way / Morgan Road intersection through a new slip lane. The traffic modelling has considered the performance of the specific traffic movement from Morgan Road onto Forest Way, which is critical with respect to bushfire evacuation. The modelling has summarized the following inputs:

- Traffic movements during the busiest hour of the day (5pm – 6pm) representing the commuter PM peak hour, as previously detailed in Section 2.3 of this document.
- Expected traffic growth over a 10 year period.
- Traffic demands generated by the site and turning left at the Forest Way / Morgan Road intersection (see Section 6.2)

The traffic modelling indicated that the existing intersection of Forest Way and Morgan Road would have a 296m queue length whilst the upgraded intersection with slip lane would have a zero queue length. Without the slip lane in place (i.e. under the current intersection configuration) vehicles attempting to egress the site from Morgan Road will experience a Level of Service 'F' with delays nearly 90 seconds and a queue length of almost 300m. These results therefore trigger the requirement to implement upgrades in the form of the slip lane.

The introduction of the slip lane as proposed allows a free flow of traffic from Morgan Road onto Forest Way, with no queues expected to form. The slip lane provides enough capacity for the evacuating vehicles to turn left onto Forest Way, as well as spare capacity to accommodate vehicles external to the proposed site travelling along Morgan Road during a major evacuation event.

JMT undertook a sensitivity analysis to determine the trigger point when the slip lane would be required and they based that on a maximum queue length of 90m which represents 14 vehicles queued at any one time. The determined this would be when more than 200 dwellings have been developed and are occupied on the site.

3.5.2.4 Radiant heat impact upon slip lane

Radiant heat affectation has been modelled for the slip lane using *Flamesol* software.

The measured affectation is 1.81 kW/m² based on a flame width of 35m (see Figure 3.8) on a downslope of minus 8 degrees in forest with fuel load of 21.3 / 27.3 tph and a distance of 66m to the slip lane – see Flamesol outputs at Figure 3.9 below. This is a very low RH level and enables the slip lane to be used when and if a bushfire is occurring in the nearby hazard west of Forest Way.



Figure 3.8 – Location of the 35m flame width

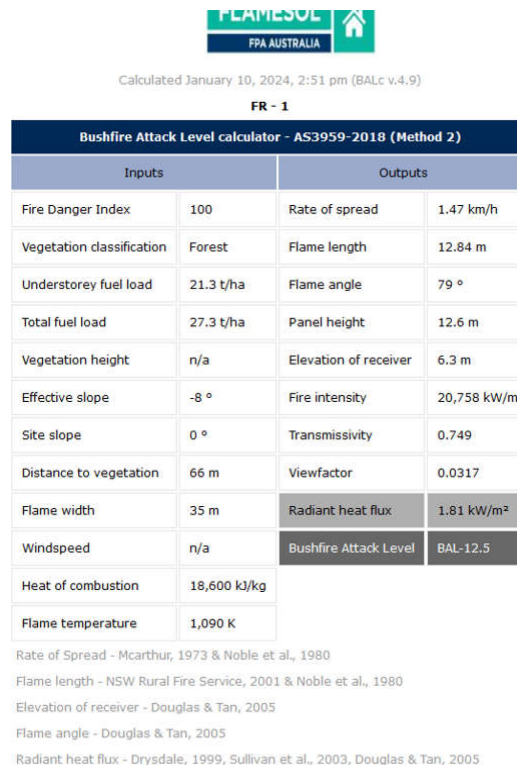


Figure 3.9 – Flamesol calculated modelling output

Table 3-3 – Performance criteria for access within Residential Subdivisions (Source: PBP 2019)

Note: The reading of the following table/s (on pages 20-26) should firstly look at the left side of each table to determine the RFS category being assessed e.g. Access.

Performance criteria		Acceptable solution	Acceptable solution	Performance solution	Comment
ACCESS (GENERAL REQUIREMENTS)	Firefighting vehicles are provided with safe, all weather access to structures.	Property access roads are two-wheel drive, all-weather roads	☒	☐	Complies
		Perimeter roads are provided for residential subdivisions of three or more allotments.	☒	☐	Compliant. See Note 1 below on Page 29
		Subdivisions of three or more allotments have more than one access in and out of the development.	☒	☐	Compliant
		Traffic management devices are constructed to not prohibit access by emergency services vehicles.	☒	☐	Can be a condition of consent
		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.	☒	☐	Complies. All roads will be sealed
		All roads are through roads	☒	☐	Predominantly compliant. Only one short length road in the northwest (at N3) is yet to be resolved as it is currently non-compliant – see Note 1 on page 29 below
		Dead end roads are not recommended, but if unavoidable, dead ends are not more than 200m in length, incorporate a	☒	☐	Turning heads are to be constructed in compliance with Figure 3.1. and

Performance criteria		Acceptable solution	Acceptable solution	Performance solution	Comment
		minimum 12 metres outer radius turning circle, and are clearly sign posted as a dead end.			must provide a 24m circumference if using a culdesac design No parking signs are to be erected within the turning head
		Where kerb and guttering are provided on perimeter roads, roll top kerbing should be used to the hazard side of the road.	☒	☐	Can be a condition of consent
		Where access / egress can only be achieved through forest, woodland or heath vegetation, secondary access shall be provided to an alternate point on the existing public road system.	☒	☐	Alternative public road access is provided via Oates Place onto Forest Way
		One way only public access roads are no less than 3.5 metres wide and have designated parking bays with hydrants located outside of these areas to ensure accessibility to reticulated water for fire suppression.	☒	☐	All roads are two (2) way
	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 / causeways are to clearly indicate load rating.	☒	☐	All roads comply and can be a condition of consent.
	There is appropriate access to water supply.	Hydrants are located outside of parking reserves and road carriageways to ensure accessibility to	☒	☐	Can be a condition of consent.

Performance criteria		Acceptable solution	Acceptable solution	Performance solution	Comment
		reticulated water for fire suppression.			
		Hydrants are provided in accordance with AS 2419.1:2005.	☒	☐	Can be a condition of consent.
		There is suitable access for a Category 1 fire appliance to within 4m of the static water supply where no reticulated supply is available.	☒	☐	Reticulated water is provided.

Performance criteria		Acceptable solution	Acceptable solution	Performance solution	Comment
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 firefighting and emergency management on the interface.	Are two-way sealed roads.	☒	☐	Complies.
		Minimum 8m carriageway width kerb to kerb.	☒	☐	Complies. All roads are 8m.
		Parking is provided outside of the carriageway width.	☒	☐	Complies.
		Hydrants are located clear of parking areas.	☒	☐	Can be a condition of consent.
		There are through roads, and these are linked to the internal road system at an interval of no greater than 500m.	☒	☐	Compliant
		Curves of roads have a minimum inner radius of 6m.	☒	☐	Can be a condition of consent.
		The maximum grade road is 15° and average grade is 10°.	☒	☐	Can be a condition of consent.
		The road crossfall does not exceed 3°.	☒	☐	Can be a condition of consent.
		A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.	☒	☐	Can be a condition of consent

Note 1: The RFS require *that a perimeter road should be provided to separate bush land from urban areas, allowing more efficient use of firefighting resources. A perimeter road is located on the outer extremity of a local area or subdivision and usually runs parallel to the bush land interface. The perimeter road provides space to conduct active firefighting operations and hazard reduction activities. In developments where no perimeter road exists, property defence in a bush fire event may be more difficult.* (PBP 2019 Sect 3.4.1 page 29).

This does not require contiguous perimeter road construction and in this regard the proposed road located on the eastern aspect of precinct N3 complies – see red circle in Figure 3.2 below. This shows a perimeter road with two adjoining cul-de-sac's. This has been caused by a steep cliff denying a contiguous roadway

This scenario is aided by the nature of the private property to the immediate west along with the APZ between the two cul-de-sac's enables ready access for firefighting. Importantly the southern portion is not required for evacuation egress to the north. However, the northern portion can be used for evacuation to the north if required or alternatively that road design provides for evacuation directly to the east and then to the west over the Snake Creek bridge.



Figure 3-3 – location of perimeter road with adjoining cul-de-sac's

<i>Performance criteria</i>		<i>Acceptable solution</i>	<i>Acceptable solution</i>	<i>Performance solution</i>	<i>Comment</i>
NON-PERIMETER ROADS	Access roads are designed to allow safe access and egress for medium rigid firefighting vehicles while residents are evacuating.	Minimum 5.5m carriageway width kerb to kerb.	☒	☐	Complies. All roads are to be in excess of 5.5m plus parking provisions.
		Parking is provided outside of the carriageway width.	☒	☐	Complies. Parking must be provided outside of the 5.5m carriageway width.
		Hydrants are located clear of parking areas.	☒	☐	Can be a condition of consent.
		Roads are through roads, and these are linked to the internal road system at an interval of no greater than 500m.	☒	☐	Predominantly compliant with only one short length internal non-perimeter road in the northwest (at N3)
		Curves of roads have a minimum inner radius of 6m.	☒	☐	Can be a condition of consent.
		The road crossfall does not exceed 3°.	☒	☐	Can be a condition of consent.
		A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.	☒	☐	Can be a condition of consent.

Performance criteria		Acceptable solution	Acceptable solution	Performance solution	Comment	
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.	☒	☐	All allotments are provided with direct frontage to the public road system. No further requirements are necessary.	
		In circumstances where this cannot occur, the following requirements apply: (Assess if the subdivision has a battle axe block.				
		minimum 4m carriageway width;	☒	☐	Can be a condition of consent.	
		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;	☒	☐	Can be a condition of consent.	
		a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches;	☒	☐	Can be a condition of consent.	
		provide a suitable turning area in accordance with Appendix 3;	☒	☐	Can be a condition of consent.	
		curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress;	☒	☐	Can be a condition of consent.	
		the minimum distance between inner and outer curves is 6m;	☒	☐	Can be a condition of consent.	
		the crossfall is not more than 10 degrees;	☒	☐	Can be a condition of consent.	
		maximum grades for sealed roads do not exceed 15 degrees and	☒	☐	Can be a condition of consent.	

Performance criteria	Acceptable solution	Acceptable solution	Performance solution	Comment
	not more than 10 degrees for unsealed roads; and			
	a development comprising more than three dwellings has access by dedication of a road and not by right of way.	☒	☐	Can be a condition of consent.
	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.	☒	☐	

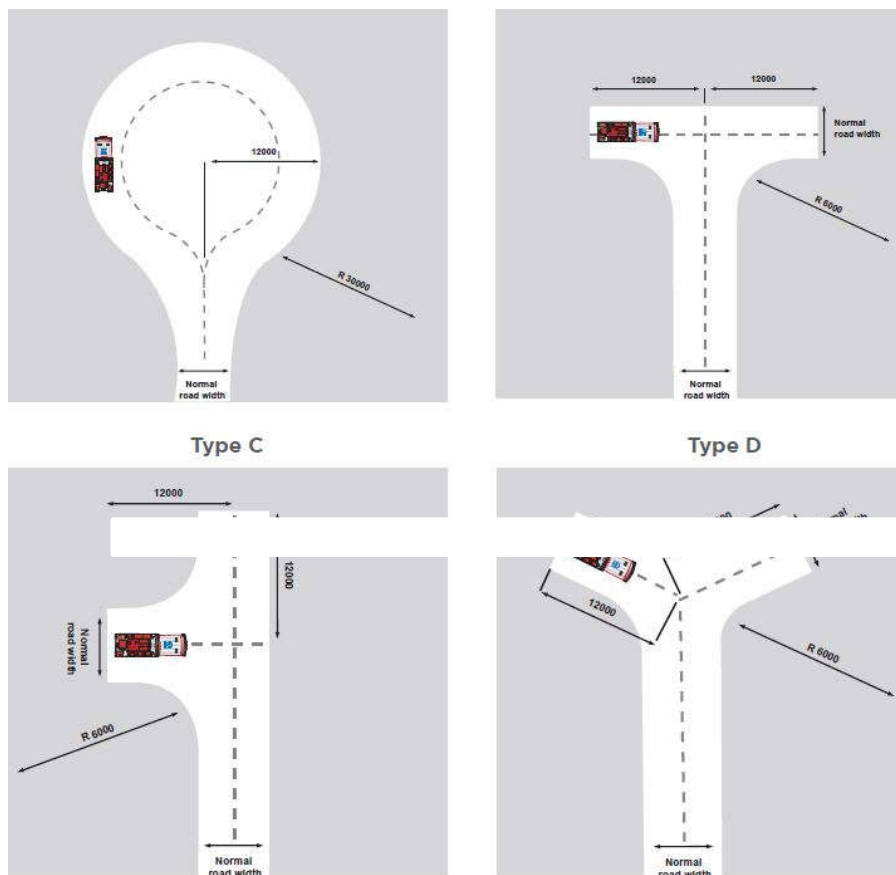


Figure 3-3 – Turning head dimensions

3.6 Evacuation summary

Evacuation capability is critical when considering bushfire planning for new residential developments. Given the inherent bushfire risk posed to future development, there is a need for the close examination of evacuation routes. This has been undertaken by *JMT Consulting* and through their modelling analysis – see Section 3.5 above.

The road design has very specifically created linkages from the residential zone to Forest Way such that traffic flow can move away from the source of fire. This has been accomplished by;

- A new road link through Oakes Place will facilitate road egress.
- A slip lane has been proposed to enable ready access to Forest Way from by vehicles potentially banking up on Morgan Rd.

The site is also situated in close proximity to the nearest RFS *Neighbourhood Safer Place/s*.

- Belrose Public School on the north eastern corner of Ralston Avenue and Contention Road, Belrose. This is a direct 2-minute drive in a westerly direction along Ralston Avenue; and
- Bambara Reserve (Belrose Oval) & Belrose Community Centre. This is a direct 3-minute drive in a southerly direction along Forest Way.

The NSP is a place of safety for a person to shelter during the passage of a bushfire.

Table 3-4 outlines the required performance criteria for the proposal's emergency procedures.

Table 3-4 – Performance criteria for emergency and evacuation planning

Performance criteria	Acceptable Solutions
A bush fire emergency and evacuation management plan is prepared	A bush fire emergency management and evacuation plan is prepared consistent with the: • The NSW RFS document: <i>A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan</i> • NSW RFS <i>Schools Program Guide</i> (where applicable) • Australian Standard AS 3745:2010 <i>Planning for emergencies in facilities</i>; and Australian Standard AS 4083:2010 <i>Planning for emergencies – Health care facilities</i> (where applicable),
Suitable management arrangements are established for consultation and implementation of the emergency and evacuation plan.	An Emergency Planning Committee is established to consult with residents (and their families in the case of aged care accommodation and schools) and staff in developing and implementing an Emergency Procedures Manual. Detailed plans of all emergency assembly areas including 'on-site' and 'off-site' arrangements as stated in AS 3745 are clearly displayed, and an annual (as a minimum) trial emergency evacuation is conducted.

3.7 Water supplies

The intent of measures is to provide adequate services of water for the protection of buildings during and after the passage of bushfire. Table 3-5 outlines the performance criteria and the acceptable solutions for reticulated water supply.

Table 3-5 – Performance criteria for reticulated water supplies

<i>Performance criteria</i>	<i>Acceptable solutions</i>
Adequate water supplies is provided for firefighting purposes.	Reticulated water is to be provided to the development, where available.
	A static water supply is provided for non-reticulated developments or where reticulated water supply cannot be guaranteed
	Static water supplies shall comply with Table 5.3d.
Water supplies are located at regular intervals. The water supply is accessible and reliable for firefighting operations.	Fire hydrant, spacing, design and sizing complies with the relevant clauses of Australian Standard 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 for areas with perimeter roads.
Flows and pressure are appropriate.	Fire hydrant flows and pressures comply with the relevant clauses of AS 2419.1:2005.
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 tank shall be of concrete or metal

3.8 Gas

The intent of measures is to locate gas so as not to contribute to the risk of fire to a building. Table 3-6 outlines the required acceptable solutions for gas supply.

Table 3-6 – Performance criteria for gas supplies

<i>Performance criteria</i>	<i>Acceptable solutions</i>
Location of gas services will not lead to the ignition of surrounding bushland or the fabric of buildings.	Reticulated or bottled gas bottles are to be installed and maintained in accordance with AS/NZS 1596 (2014), the requirements of relevant authorities and metal piping is to be used.
	All fixed gas cylinders are to be kept clear of flammable materials to a distance of 10m and shielded on the hazard side.
	Connections to and from gas cylinders are metal. Polymer sheathed flexible gas supply lines are not used, above ground gas service pipes are metal, including and up to any outlets.

3.9 Electricity

The intent of measures is to locate electricity so as not to contribute to the risk of fire to a building. Table 3-7 outlines the required acceptable solutions for the subdivision's electricity supply.

Table 3-7 – performance criteria for electricity services

<i>Performance criteria</i>	<i>Acceptable Solutions</i>
Location of electricity services limit the possibility of ignition of surrounding bushland or the fabric of buildings.	Where practicable, electrical transmission lines are underground.
	Where overhead electrical transmission lines are proposed:
	• lines are installed with short pole spacing (30m), unless crossing gullies, gorges or riparian areas; and • no part of a tree is closer to a power line than the distance set out in ISSC3 Guideline for Managing Vegetation Near Power Lines.

4. STRATEGIC OVERVIEW

Travers bushfire & ecology was engaged to undertake a strategic bushfire study (SBS) for the Patyegarang Planning Proposal.

This report identifies matters for consideration for the planning proposal and highlighted the required bushfire protection measures required for the future development of the site against Planning for Bush Fire Protection (PBP) 2019 and Ministerial Direction 4.3.

The SBS has analysed the potential and historic threats to the site, the current and projected access provisions and any adverse impacts on the existing and projected infrastructure serving the community. The assessment was based on the determination of the current bushfire risks to the development site and the subsequent bushfire risk post development.

The analysis has required the provision of risk management protocol to be applied in order to ensure the likelihood consequences of the found risks well-qualified or qualified. In this regard the NERAG risk management protocol has been used.

Substantial consultation has occurred with a variety of sources and the commentary has been provided within the context of the SBS. This is included the review of Northern Beaches Council consultants namely Blackash Bushfire Consulting and Meridian Urban. Both assessments validated the PP site as suitable residential low density development.

As a result of discussions with the RFS that extensive review of the traffic management arrangements on Forest way of Morgan Road occur by JMT consulting their report being intrinsically loaded into this SBS review.

Applying the risk management methodology required a series of benchmarks to be developed such that the risk of evaluation could be undertaken in a matter that was both recognisable and acceptable to authorities. In this case 20 benchmarks have been identified and responded to such that *Travers bushfire & ecology* advise the Patyegarang Planning Proposal should proceed.

In addition, this report concluded that infrastructure is suitable for the expansion of residential development in the area. Demand on services is not considered to exceed the current provisions and will, in the future, be improved by natural growth, in response to projected increases in demand.

Outcomes of the study

The Patyegarang Planning Proposal has been found to comply with PBP section 4 and with Ministerial Direction 4.3 on strategic planning grounds.

Benefit to the community

- The strategic bushfire study found the Patyegarang Planning Proposal was a logical extension of existing urban landscape.
- The planning proposal will remove substantial bushfire hazards that threaten the existing community which will benefit approximately 50 local families either in the relocation of bushfire prone land or through increased evacuation capability with the reconstruction and widening of Morgan Road coupled with the new slip lane onto Forest Way.

- The planning proposal proposes a new slip lane from Morgan Road onto Forest Way and a full reconstruction of Morgan Road to a point 1.8 km from the intersection with Forest Way thus enabling free flowing traffic in the event of an emergency evacuation.
- Traffic modelling advises there will be no traffic queuing at the Forest Way / Morgan Road intersection and the reconstruction of Morgan Road will provide a safe platform for fire fighters and emergency services.

Reduction of bushfire hazards

- The existing bushfire hazards provide significant risk to the existing residential community and the aged care facility; and potentially denies safe evacuation in a bushfire emergency event.
- The study found the site was not a high risk bushfire site due to the non-remote nature of the proposal and the limited bushfire hazard exposures affecting the site.
- Strategically, the site is surrounded by rural residential development in the north and east and low density residential development in the west leaving only two unmanaged bushland areas in the north east and south both of which produce a moderate exposure to radiant heat (17.4 k/Wm^2) which is well below the RFS permitted standard of 29 k/Wm^2 .
- Figure 4.1. shows the reduced extent of bushfire hazards with the proposed developments APZ's and the existing managed lands within development landscapes.



Figure 4.1 - Post development asset protection zones

5. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

This bushfire protection assessment has been undertaken for the proposed rezoning located at Morgan Road, Belrose.

A separate bush fire study has been prepared by *Travers bushfire & ecology* and should be read as a supporting this bushfire assessment submission.

The key principle for the proposal is to ensure that future development is capable of complying with the *Section 9.1(2) of the EP&A Act (1979)* and *PBP 2019*.

Planning principles for the proposal include the provision of adequate access including perimeter roads, establishment of adequate APZs for future housing, allowing for minimum lot depths to accommodate APZs and the introduction of controls which avoid placing inappropriate developments (such as petrol stations) in hazardous areas and the inappropriate placement of combustible material in APZs.

The bushfire risk posed to the rezoning proposal can be mitigated if a suite of bushfire protection measures (including APZs) are implemented and managed in perpetuity.

Upon final design engagement with the recommendations made within this report the future development of these lands will provide compliance with the planning principles of *Planning for bush fire protection 2019* and *Community Resilience Practice Note 2/12 – Planning Instruments and Policies* as summarised in Table 5-1 below.

Table 5-1– Planning Principals

Direction 4.4	Compliance statement
In the preparation of a planning proposal the relevant planning authority must consult with the Commissioner of the NSW Rural Fire Service following receipt of a gateway determination under section 3.34 of the Act.	Completed with RFS
A planning proposal must:	
(a) have regard to Planning for Bushfire Protection 2019	Yes. The following assessment has been undertaken in accordance in full accord with <i>PBP 2019</i> .

Direction 4.4	Compliance statement
b) introduce controls that avoid placing inappropriate developments in hazardous areas, and	Yes. The nature of the residential development is an appropriate use and the proposed hazard management controls are in accordance with, and often beyond, <i>PBP 2019</i> to effectively address the level of hazard. The proposal does not involve “inappropriate development” such as schools or retirement villages. The proposed Aboriginal Cultural Centre is a semi -commercial type facility (much like a national park visitor centre) and will provide no accommodation capability or anything other than a small number of visitors at any one time.
c) ensure that bushfire hazard reduction is not prohibited within the APZ.	Yes. Significant environmental studies have been undertaken to ensure APZs have been excluded from environmentally sensitive land.
A planning proposal must, where development is proposed, comply with the following provisions, as appropriate:	
(a) provide an Asset Protection Zone (APZ) incorporating at a minimum: (i) an Inner Protection Area bounded by a perimeter road or reserve which circumscribes the hazard side of the land intended for development and has a building line consistent with the incorporation of an APZ, within the property, and (ii) an Outer Protection Area managed for hazard reduction and located on the bushland side of the perimeter road,	Yes. The APZs recommended exceed the minimum requirements outlined in <i>PBP 2019</i> for subdivision development.
(b) for infill development (that is development within an already subdivided area), where an appropriate APZ cannot be achieved, provide for an appropriate performance standard, in consultation with the NSW Rural Fire Service. If the provisions of the planning proposal permit Special Fire Protection Purposes (as defined under section 100B of the Rural Fires Act 1997), the APZ provisions must be complied with,	This is an integrated Planning Proposal that will result in a new subdivision and this be responsive to Section 100B of the Rural Fire Act.
(c) contain provisions for two-way access roads which links to perimeter roads and/or to fire trail networks	Yes
(d) contain provisions for adequate water supply for firefighting purposes	Yes
(e) minimise the perimeter of the area of land interfacing the hazard which may be developed,	Yes. The perimeter is located on a level terrace and circumscribes the edge of the downslopes resulting in the best design possible. Intrusions of bushland into the development have been removed and minimised to allow safe evacuation.

Direction 4.4	Compliance statement
(f) Introduce controls on the placement of combustible materials in the Inner Protection Area	Yes. Can be a condition of consent at DA stage.

In conclusion we can advise that;

- The requirements established in *Section 9.1(2) of the EP&A Act (1979)* and *PBP 2019* have been satisfied.
- APZs can be provided that comply with *PBP 2019*.
- Evacuation design complies with *PBP 2019*.
- The planning proposal will improve bushfire protection measures afforded to existing development through the removal of hazardous vegetation and improved access for firefighting suppression.
- Costs for the development and implementation of bushfire protection measures will be imposed on the developer initially and thence the landowner.
- Environmental impacts have been minimised.

5.2 Recommendations

Recommendation 1 - The development is as generally indicated on the attached APPENDIX 1 - Plan Of Bushfire Protection Measures.

Recommendation 2 - APZs are to be provided to future residential development as outlined in APPENDIX 1-Plan Of Bushfire Protection Measures.

Recommendation 3 - Fuel management within the APZs is to be maintained in accord with a fuel management plan which will detail the ongoing fuel management requirements of fire trails and APZ areas. The developer will implement and carry out the initial vegetation management required for the asset protection zones and ongoing maintenance will be undertaken by the Community Association.

Recommendation 4 - Building construction standards for the proposed future dwellings are to be applied in accordance with AS3959 Construction of buildings in bushfire prone areas (2009) or NASH Standard (1.7.14 updated) 'National Standard Steel Framed Construction in Bushfire Areas - 2014' as appropriate with additional construction requirements as listed within *Planning for Bush Fire Protection 2019*.

Recommendation 5 - Access is to comply with the performance criteria outlined in Section 5.3.2 of *Planning for Bush Fire Protection 2019*.

Recommendation 6 - Water, electricity and gas supply is to comply with Section 5.3.3 of *Planning for Bush Fire Protection 2019*.

Recommendation 7 - An emergency / evacuation plan is to be prepared consistent with the RFS Guidelines for the Preparation of Emergency / Evacuation Plans.

6. REFERENCES

- Australian Building Codes Board (2018) – *Building Code of Australia*, Class 1 and Class 10 Buildings Housing Provisions Volume 2.
- Chan, K.W. (2001) – *The suitability of the use of various treated timbers for building constructions in bushfire prone areas*. Warrington Fire Research.
- Councils of Standards Australia AS3959 (2018) – *Australian Standard Construction of buildings in bush fire-prone areas*.
- Keith, David (2004) – *Ocean Shores to Desert Dunes – The Native Vegetation of New South Wales and the ACT*. The Department of Environment and Climate Change.
- Rural Fire Service (2019) - *Planning for bushfire protection – a guide for councils, planners, fire authorities and developers*. NSW Rural Fire Service.
- Tan, B., Midgley, S., Douglas, G. and Short (2004) - *A methodology for assessing bushfire attack*. RFS Development Control Service.

APPENDIX 1. PLAN OF BUSHFIRE PROTECTION MEASURES



Legend

- Study Area (Source: CAD)
- Contour (Source: LiDAR)
- Creek lines
- Indicative fire trail (4m width)

- Proposed roads
- Ecological lands
- Publicly accessible green space

- Managed land

Asset Protection Zone (APZ)

- Inner Protection Area

Aerial source: Nearmap


0 100 200 m

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

PROJECT & MXD REFERENCE

Morgan Road, Belrose
18CR12_BF001

DATE & ISSUE NUMBER

1/02/2024
Issue 1

SCALE & COORDINATE SYSTEM

1:4,500 @A3
GDA 1994 MGA Zone 56

TITLE

Schedule 1 - Bushfire Protection Measures

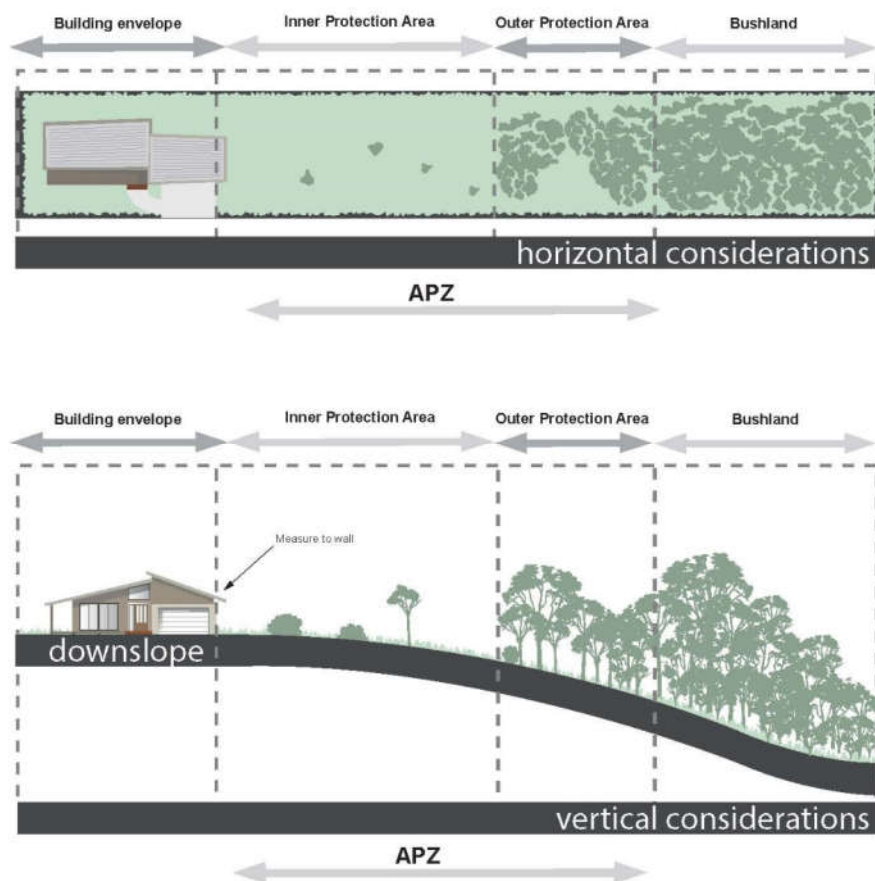
Document Path: N:\GIS STORAGE\IN Drive\18CR02_MorgansRd_Belrose\MXDs\18CR12_BF001.mxd



APPENDIX 2. MANAGEMENT OF ASSET PROTECTION ZONES

The RFS provides basic advice in respect of managing APZs through documents such as, *Standards for Asset Protection Zones* (RFS, 2005), with landscaping to comply with Appendix 4 of *PBP*.

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



APZs and progressive reduction in fuel loads

(Source: PBP, 2019)

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

The following provides maintenance advice for vegetation within the IPA and OPA. The APZ is to be maintained in perpetuity and should be undertaken regularly, particularly in advance of the bushfire season.

Inner protection area (IPA)

Fuel loads within the IPA are to be maintained so it does not exceed 4t/ha.

Trees are to be maintained to ensure;

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

Shrubs are to be maintained to ensure;

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

Grass is to be maintained to ensure:

- 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 (litter fuel within the IPA should be kept below 1cm)

Outer Protection Area (OPA)

Fuel loads within the OPA are to be maintained so it does not exceed 8t/ha.

Trees are to be maintained to ensure;

- Canopy cover does not exceed 30%
- Canopies should be separated by 2 to 5m

Shrubs are to be maintained to ensure;

- They do not form a continuous canopy
- Shrubs should be no more than 20% of ground cover

Grass is to be maintained to ensure:

- Grass should be kept mown to a height of less than 100mm: and
- Leaves and debris should be removed.

General advice for landscaping is provided below:

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



Juliet Grant
Executive Director
Glyde Consulting
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Dear Juliet

**Re: Response in respect of advice from
Director, Planning Proposal Authority (Louise McMahon) 3rd July 2024**

I refer to correspondence from the Director of the Planning Proposal Authority in respect of bushfire matters for planning proposal PP-2022-3802 Morgan Rd Belrose and the need to reconsider strategic zoning changes and some more precise planning for perimeter roadways.

Draft zone plan

Following team consultation and taking into consideration the matters raised by the PPA we can advise the amended draft zone plan (August 2024), along with its C2 additions, does not reduce or alter in any way the proposed asset protection zone areas defined in our strategic bushfire study dated February 2024.

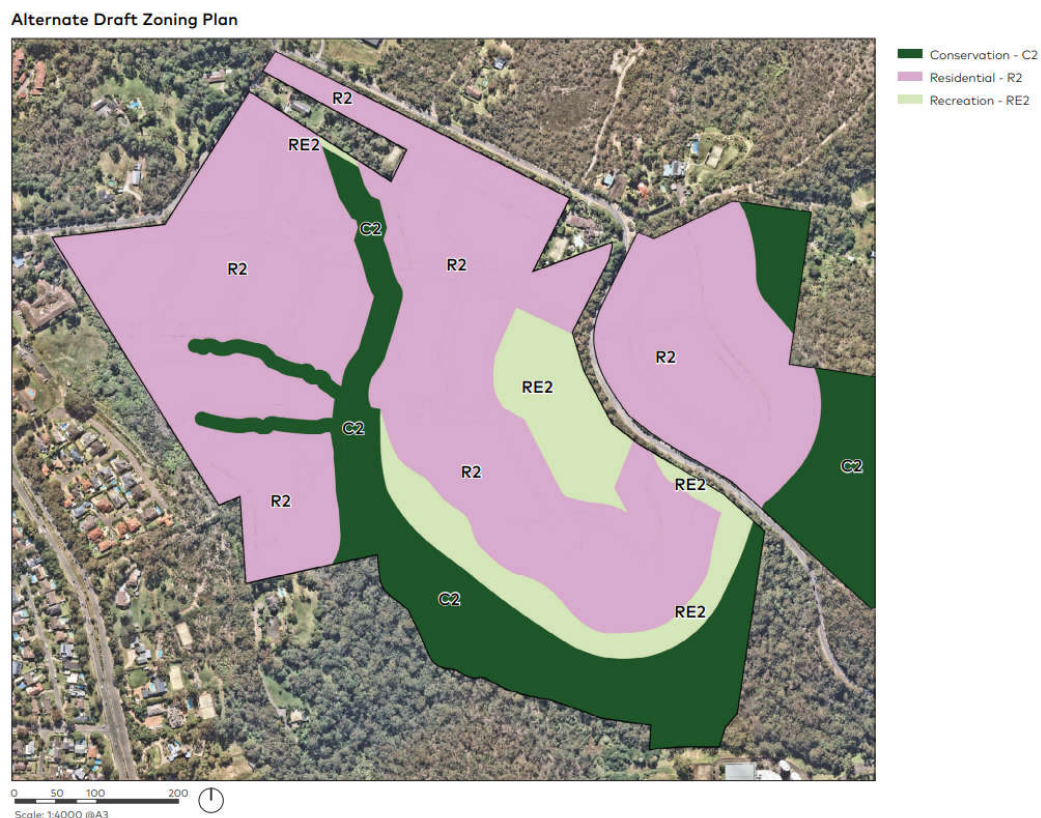


Figure 1 – draft zoning plan

This amended zoning would see Snake Creek be C2 being a conservation zone. We have advised our client that the most upper portion Snake Creek (10m in depth) where it adjoins Lot 1 in DP 1285945 will require an alternative zoning to C2 in order that the private land can be protected from a possible fire run into that property. Thus, this 10m zone will act as a buffer so that APZ management can be affected without limitation from a C2 zoning.

Together these changes have no detrimental impact bushfire planning and therefore the amended draft zone plan complies with the RFS Planning for Bushfire Protection 2019 (PBP, 2019).

Perimeter roads

With respect to the query raised on perimeter roads we can also advise that the perimeter road has been extended in the southwestern portion of the development landscape – see Figure 2 below.

Slip Lane to Forest Way from Morgan Rd

We can advise that the planned slip lane to Forest Way will fully be located within the existing public roadway resulting in no impact on Council owned lands.

Draft Structure Plan



Figure 2 – Draft structure plan showing extended roadway in south western portion

In conclusion, we advise that the above changes confirm with the aims and objectives of PBP 2019.

Should you require any assistance in this matter please contact John Travers at bushfire@bigpond.com or at 0418 630 048.

Yours faithfully

A handwritten signature in black ink, appearing to read 'J. Travers', with a large loop at the end of the first name.

John Travers *BA Sc / Ass Dip / Grad Dip*
Travers Bushfire & Ecology
0418 630 048