Bushfire Management

REPORT

Valdal Projects

1F Alderley Street,
Rangeville, QLD 4350

Lot 62 CC555

Prepared by Designconxion
July 2019

TOOWOOMBA REGIONAL COUNCIL

APPROVED DOCUMENT

referred to in Council's Compliance Certificate dated

30 June 2026

This plan is subject to conditions of Approval Number

MCUI/2019/3145/B

Assessment Manager

RECEIVED
05.09.2019
TOOWOOMBA
REGIONAL COUNCIL

BMR No: 190213

DOCUMENT CONTROL RECORD

Title	Bushfire Management Report
Address	1F Alderley Street, Rangeville
Client	Valdal Projects

DOCUMENT ISSUE

Issue	Date	Prepared By
1	19 July 2019	Rick Galbraith
2	5 August 2019	Rick Galbraith
3	4 September 2019	Rick Galbraith

Disclaimer

This report has been prepared for Valdal Projects. Designconxion cannot accept responsibility for any use of or reliance upon the contents of this report by any third party.

It details a number of bushfire protection measures that when followed will increase the survival prospects of residents and built assets in the event of a bushfire. It must be borne in mind that the measures dealt with in this report cannot guarantee the survival of a building or other assets in a bushfire event. This is due mainly to the unpredictable nature and behaviour of fire, difficulties associated with extreme weather conditions and vegetation management on and surrounding the site subsequent to development.

It must also be stated that this report is based on site conditions prevailing at the time the inspection was undertaken. These conditions can and will change dependent on both weather conditions and the maintenance undertaken by property owners.

This fire report has been prepared on the basis that bushfire mitigation measures identified are implemented and maintained into the future. Failure to maintain these measures may contribute to the development being exposed to a higher level of bushfire threat and attack.

As site conditions can and will change over time this report is valid for a period of 24 months.

Bushfire Management Report prepared by

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5th August 2019

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This report is a site-specific assessment of the subject property that has been prepared in accordance with the Toowoomba Regional Council Planning Scheme (2012 Version 19) Bushfire hazard overlay code, the State Planning Policy (July 2017) and the Australian Standard Construction of buildings in bushfire-prone areas (AS3959-2018).

Executive summary

The proposal is to establish a dwelling on the subject land (hereafter referred to as 'the site') at 1F Alderley Street, Rangeville, and described as Lot 62 on CC555. The site is accessed via Alderley Street on the south-western boundary.

The site is located within an identified bushfire hazard area. A site specific bushfire assessment has been prepared in compliance with the Toowoomba Regional Council's 2012 Planning Scheme Bushfire overlay code, the *State Planning Policy* (July 2017) and Australian Standard *Construction of buildings in bushfire-prone areas* (AS3959-2018). The purpose of the Code, SPP and Australian Standard is to ensure the appropriate design and construction of a development in bushfire prone areas so as to minimise the exposure of people and assets to undue Bushfire Risk.

This report provides recommendations for a number of measures that will assist in ensuring the safety of life and property and mitigating the impacts of bushfire.

Bushfire mitigation

The site has been identified by the Toowoomba Regional Council Planning Scheme (2012) as being largely contained within an area of "*Medium*" Fire Risk with smaller areas of "*High*" Fire Risk present due to the location of native vegetation on and surrounding the site. The implementation of the following measures will assist in mitigating the bushfire threat to an acceptable level for future residents and assets on the site.

Construction of buildings

Careful design of new buildings should be undertaken; taking into consideration site characteristics and relevant building standards including the Australian Standard for Construction of buildings in bushfire-prone areas (AS3959-2018) and the Building Code of Australia.

Access and egress

Access to the site is via Alderley Street at the southwest of the site. Existing tracks provide 4 wheel drive vehicular access through the site.

Vegetation management

Vegetation on the development site comprises areas of native bushland open grassed areas that are currently maintained. The woody and highly flammable environmental woody weeds, Lantana and Broadleaf Privet are prevalent in the area but have been well controlled on the site. Areas of potentially hazardous vegetation are well separated from the proposed residence.

An Asset Protection Zones is to be created and maintained between new buildings and bushland areas comprising an Inner Protection Area of 30 metres width and an Outer Protection Area of 20 metres. Contrary to common belief, the area surrounding a building does not need to be totally devoid of vegetation, and in fact some trees in this area can serve a valuable role in trapping embers before they impact on the asset. It is important however that:

- There are substantial gaps (of at least 2 - 5m) between the canopies of any trees in this area.
- Surface and near surface fuels are kept to a minimum. This includes lawns to be kept short and removal of accumulated leaf and bark litter.
- Avoidance of flammable mulches on garden beds such as woodchip or straw within 10 metres of buildings.

- Plants with a higher tolerance to fire should be utilised closest to buildings and be maintained in a healthy and moist state throughout the fire season.

Fire trails

A number of internal tracks and trails are present of the site that are constructed to a standard suitable for use by Queensland Rural Fire Service vehicles in bushfire mitigation activities. The trails are also suitable for use when undertaking fuel reduction management activities on the site. No additional fire trails are proposed for the site.

Water supply

The Toowoomba Regional Council Planning Scheme (2012 Version 19) Bushfire hazard overlay code requires that an adequate water supply suitable for fire-fighting purposes should be available at all times. This can be achieved by connection to a reticulated water supply having sufficient pressure for fire-fighting purposes or a water tank, dam or swimming pool with a minimum available capacity of 10,000 litres.

Prepare, Act, Survive

It is critically important that residents are well prepared during times of high fire danger and have well made plans that can be readily enacted in a time of bushfire emergency. This includes having plans in place to guide actions on days of extreme and catastrophic, identifying safe refuge areas and planning to either 'stay' or 'go'. If the decision is made to go, then residents need to be prepared to evacuate early. The key message being; Prepare, Act and Survive.

Maintenance of bushfire mitigation measures

This fire report has been prepared on the basis that bushfire mitigation measures identified are implemented and maintained into the foreseeable future. Failure to maintain these measures may contribute to the development being exposed to a higher level of bushfire threat and attack.

1.0 Property details

1.1 Introduction

This report has been prepared in support of an application for a Material Change of Use for the establishment of a single dwelling on the site.

1.2 General site details

Address	1F Alderley Street, Rangeville
Lot on Plan	Lot 62 CC555
Area	19,754 square metres
Local Government Area	Toowoomba Regional Council
Planning Scheme / Local Plan	Toowoomba Regional Planning Scheme (2012)
Overlay Codes	Environmental Significance Overlay, Bushfire Hazard Overlay, Landslide Hazard Overlay
VMA 1999	Category B (Least concern RE 12.8.18 & 12.8.17) and Category X
Area Classification / Zone	Limited Development (Constrained Land)

The site is situated in the suburb of Rangeville on the edge of the Great Dividing Range approximately 5 kilometres southeast of the Toowoomba CBD. Access to the site is via Alderley Street to the southwest. A building location has been identified on the south western portion of the site which is relatively clear of woody vegetation. Open grassy woodland is present on the balance of the site.

Figure 1 provides an aerial view of the site and its context within the surrounding landscape, Figure 2 provides an aerial view of the property, the location of the proposed dwelling and presence of native vegetation with Figure 3 showing the topography.

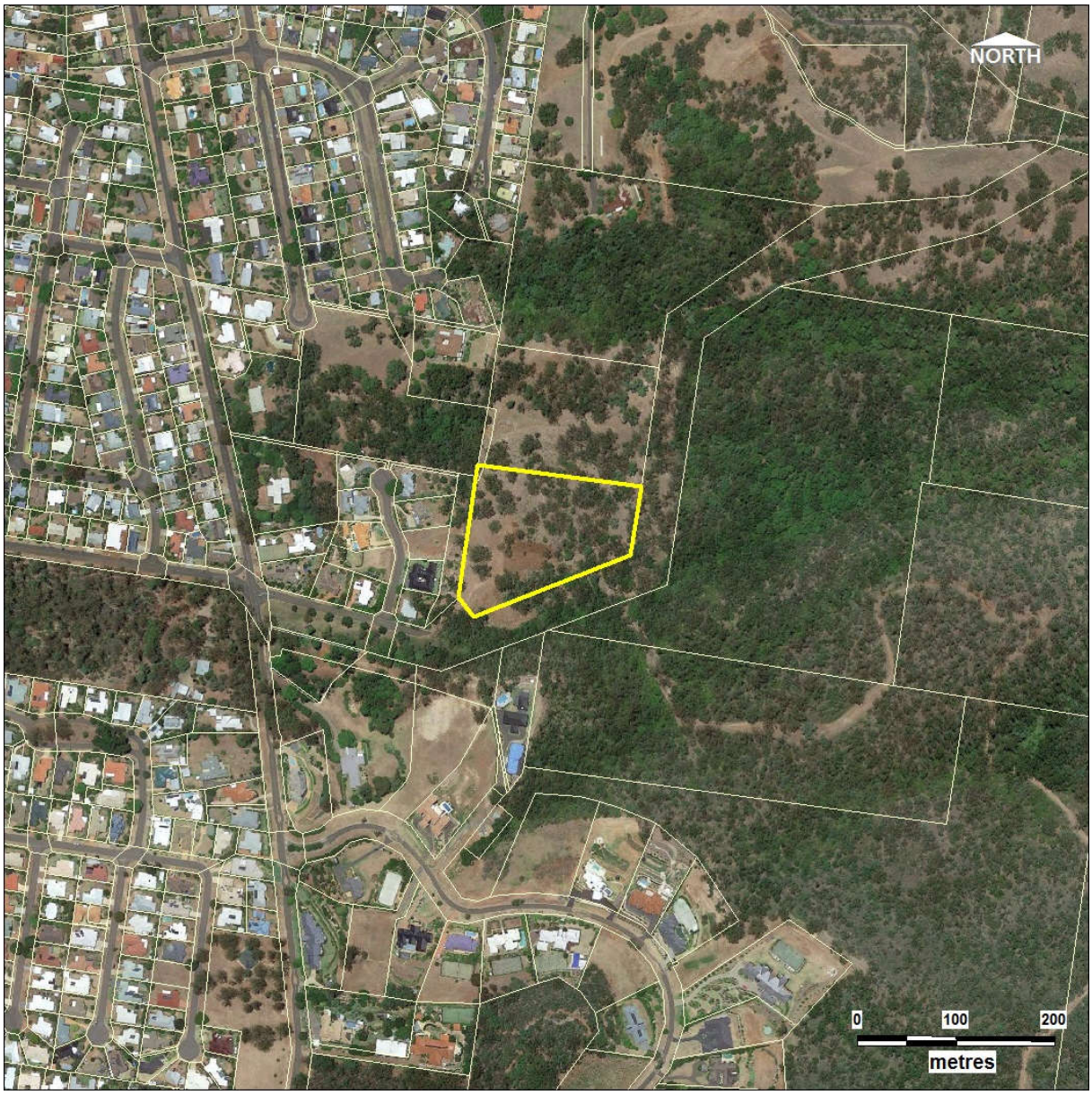

Figure 1: Aerial view providing landscape context for the site which is highlighted with a yellow border. Imagery sourced from Google Earth was captured on 27 January 2019.

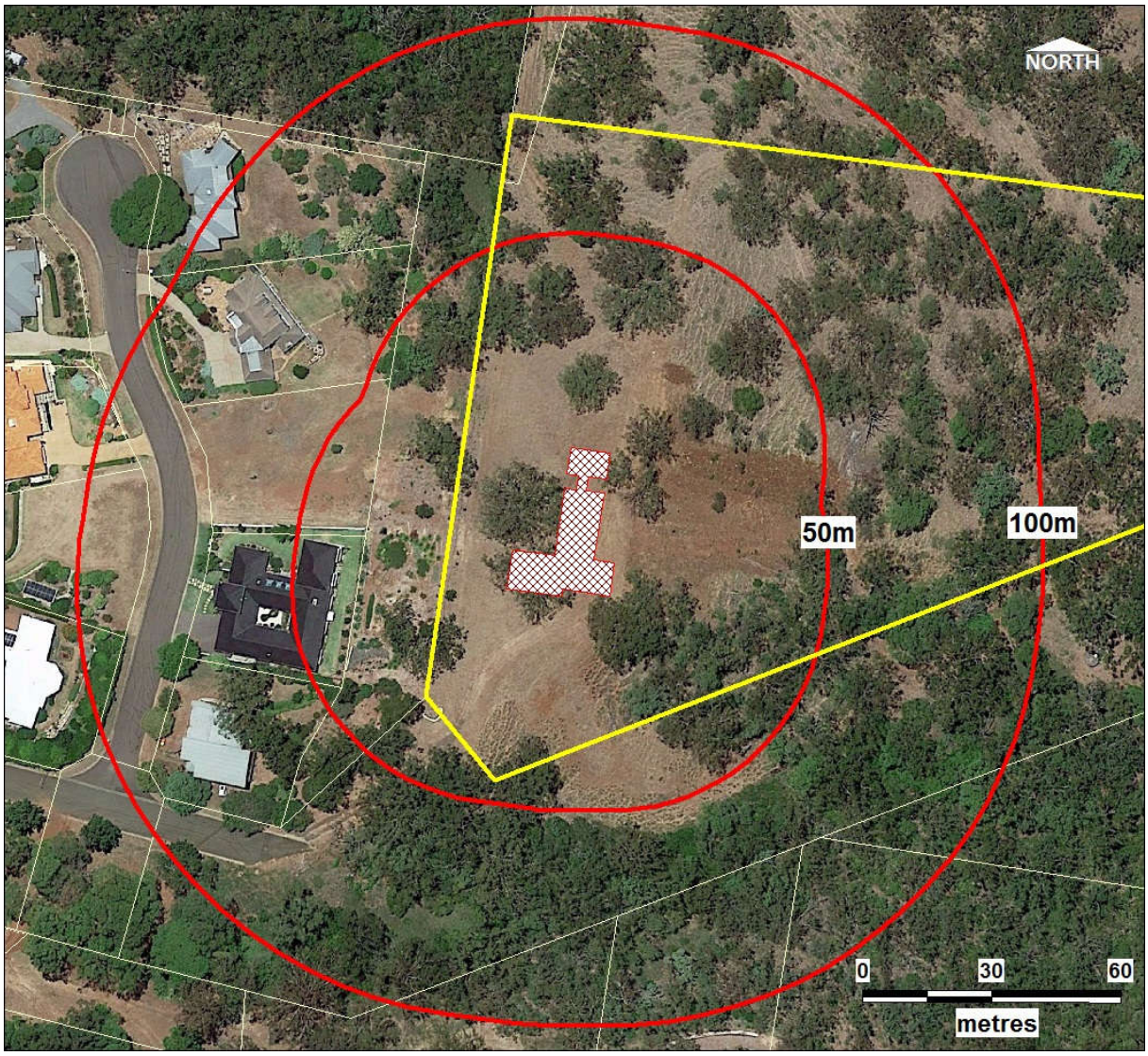

Figure 2: Aerial view of the proposed dwelling location. The red rings indicate radius' distance in metres from the dwelling which can be used to determine the applicable Bushfire Attack Level.

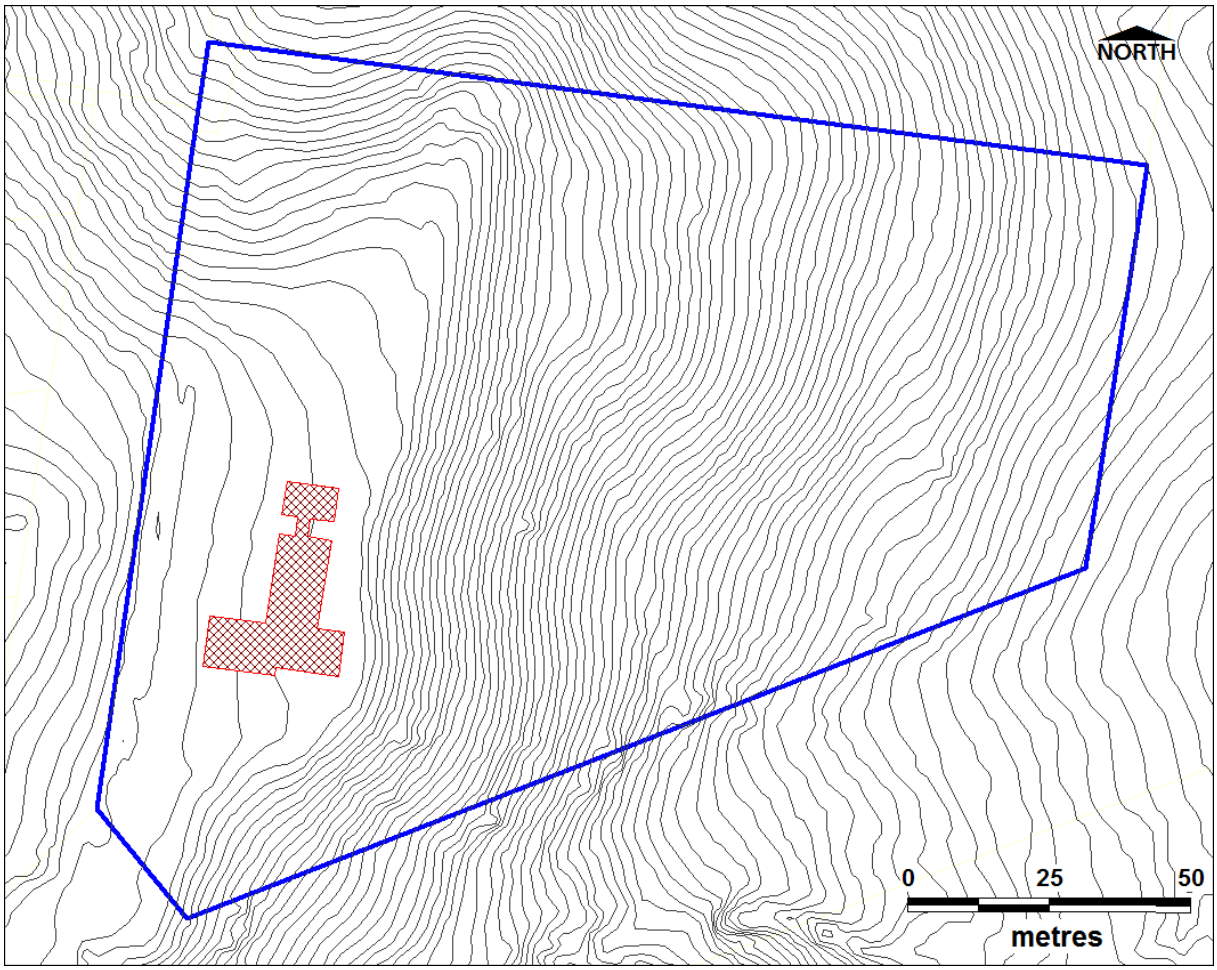

Figure 3: Topography of the site. Contour intervals are 1 metre. Topography information sourced from http://qldspatial.information.qld.gov.au/

1.3 Site description

The site is accessed via Alderley Street to the southwest of the property. The house site is located on a level site with the land rising to the west with slopes in the order of 29% or 16 degrees and falling to the east and southeast with underlying slopes of up to 61% or 31 degrees.

A building location has been identified on the south western portion of the site which is relatively clear of woody vegetation. Open grassy woodland is present on the balance of the site. Extensive areas of native vegetation are located further to the north, east and southeast of the site. This vegetation comprises eucalypt woodland and forest with an open grassy to shrubby understorey. The woody environmental weeds *Ligustrum lucidum* (Broadleaf Privet) and *Lantana camara* (Lantana) are prevalent in the area but have been controlled on the site. Landuse in the area consists of urban residential living to the west and southwest with rural lands to the north and east.

The following photographs provide a visual representation of the site and vegetation present.

Photo 1: View to the west over the site of proposed dwelling.

Photo 2: View to the north from the proposed house site.

Photo 3: View to the east from the proposed house site.

Photo 4: View to the south from the proposed house site.

Photo 5: View to the west from the proposed house site.

Photo 6: View to the northwest across the site from the southeast corner showing grassy woodland vegetation on the site.

1.4 Vegetation

The current Vegetation Management Supporting Map identifies that the property contains areas of mapped remnant vegetation. Remnant vegetation present is identified as Category B vegetation comprising Regional Ecosystems 12.8.14 and 12.8.17 which cover approximately 40% of the site. The extent of mapped remnant vegetation in the area and its conservation status is shown in Figure 4. Table 1 contains a description of these Regional Ecosystems and their conservation status.

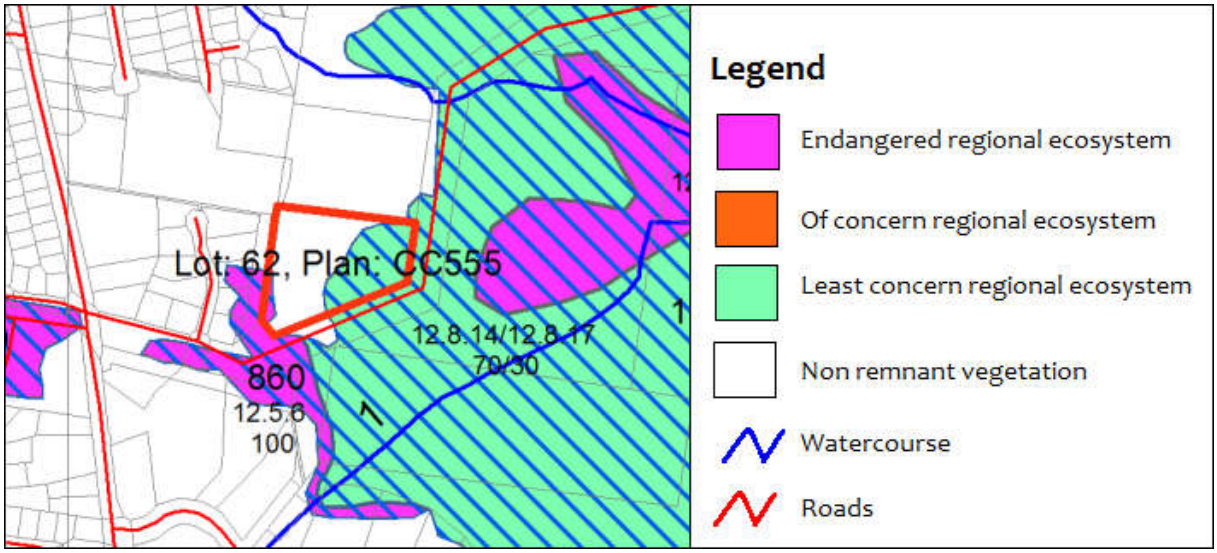

Figure 4: Extent of mapped remnant vegetation on Lot 62 CC555 as identified by the Vegetation Management Supporting Map accessed on 3 July 2019 from the Queensland Department of Natural Resources and Mines website.

Table 1: Regional Ecosystem Vegetation Descriptions

Regional ecosystem:	**12.8.14**	**Conservation status**	**Least concern**
Description	*Eucalyptus eugenioides* (Thin-leaved Stringybark), *E. biturbinata* (Grey Gum), *E. melliodora* (Yellow Box) +/- *E. tereticornis* (Forest Red Gum), *Corymbia intermedia* (Pink Bloodwood), *E. crebra* (Narrow-leaf Ironbark) woodland. *Allocasuarina torulosa* (Forest Sheoke) is a common understorey species. Localised occurrences of *Eucalyptus laevopinea* (Silvertop Stringybark) *and E. banksii* (Tenterfield Woollybutt) may occur. Occurs on Cainozoic igneous rocks, especially basalt.		
Regional ecosystem:	**12.8.17**	**Conservation status**	**Least concern**
Description	Eucalyptus melanophloia (Silver-leaved Ironbark) +/- E. crebra (Narrow-leaved Ironbark), E. tereticornis (Forest Red Gum), Corymbia tessellaris (Moreton Bay Ash), C. intermedia (Pink Bloodwood) and/or C. clarksoniana (Clarkson's Bloodwood), E. melliodora (Yellow Box), Angophora subvelutina (Broad-leaf Apple) grassy woodland. Occurs on Cainozoic igneous rocks, especially basalt.		

The information above was sourced from the Queensland Herbarium (2019) Regional Ecosystem Description Database (REDD). Version 11.1 (April 2019) (DES: Brisbane)

Native trees species present included *Eucalyptus tereticornis* (Forest Red Gum), *E. biturbinata* (Grey Gum), *E. melliodora* (Yellow Box) and *C. intermedia* (Pink Bloodwood). Mature trees in the vicinity of the proposed dwelling have a height range of 22 to 28 metres.

1.5 Bushfire

The site has been identified by the Toowoomba Regional Council Planning Scheme (2012) as being largely contained within an area of "*Medium*" Fire Risk with smaller areas of "*High*" Fire Risk present. The bushfire risk category for the site and the surrounding area is shown in Figure 5.

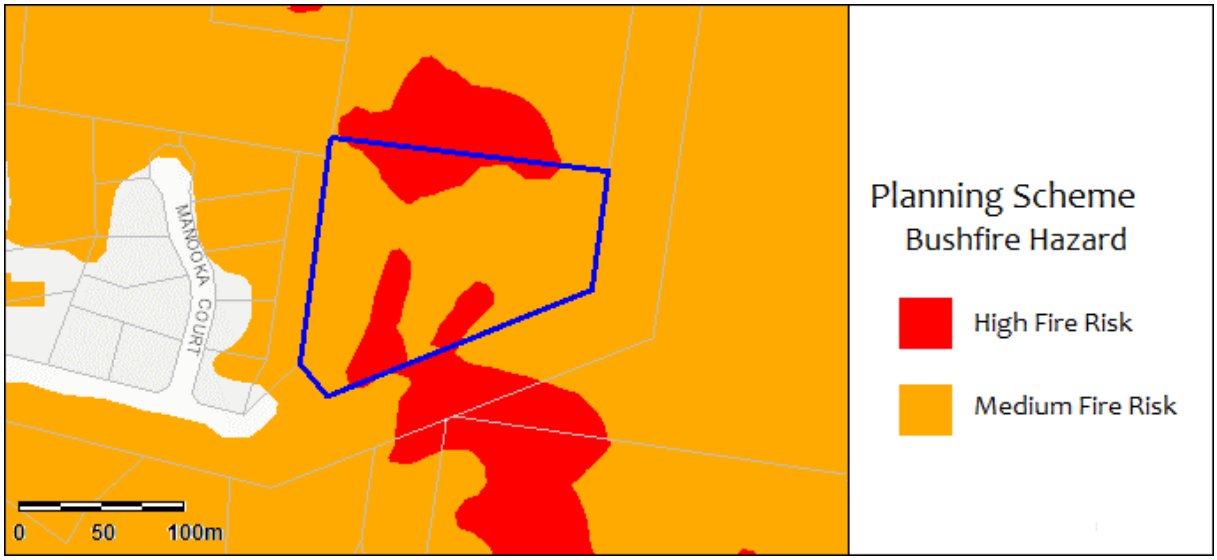

Figure 5: Bushfire Hazard as identified by the Toowoomba Regional Council Planning Scheme (2012).

The most likely direction for bushfire attack is from the east, however under adverse conditions, a bushfire could potentially approach from the north or south. Severe fire weather conditions are typically associated with hot strong westerly to northerly winds. Bushfires in the area have the potential to generate quantities of embers that could impact on a building even though the fire does not necessarily reach it.

1.6 Fire brigade

The development site is contained within the Queensland Fire and Rescue Service Toowoomba Urban Fire Brigade district. The closest fire brigade equipped to fight structural fires is the East Toowoomba Fire Station located at Kitchener Street, Toowoomba, approximately 2.5 kilometres by road to the northwest of the site (i.e. less than 5 minutes away). This is a professional, fully manned urban brigade. The Withcott Rural Fire Brigade district is located to the east of the site.

1.7 Fire run

The length of fire run influences the area in which a fire has to develop and reach its potential maximum intensity for the conditions prevailing at the time. It is important to assess the length of fire run to determine the potential scale and intensity of fires that may occur in the area. Fire runs less than 1 kilometre in length are generally considered to pose a lesser risk than those with a longer run. Fire runs may be modified by natural features such as creeks, rock formation and vegetation types and be influenced by weather and fuel conditions.

The main fire run in the area is from the east and is greater than 1 kilometre. The most likely scenario for a fire approaching from the east would be for it to move up the gullies located to the north and south of the site. Continuity of hazardous vegetation and associated fuel loads have been reduced to an extent by historical and current land management practices. A Council maintained fire trail contained within a 40 metre wide fuel reduced zone is located on the eastern boundary of the site. Figure 6 shows the location of potential fire runs in relation to site.

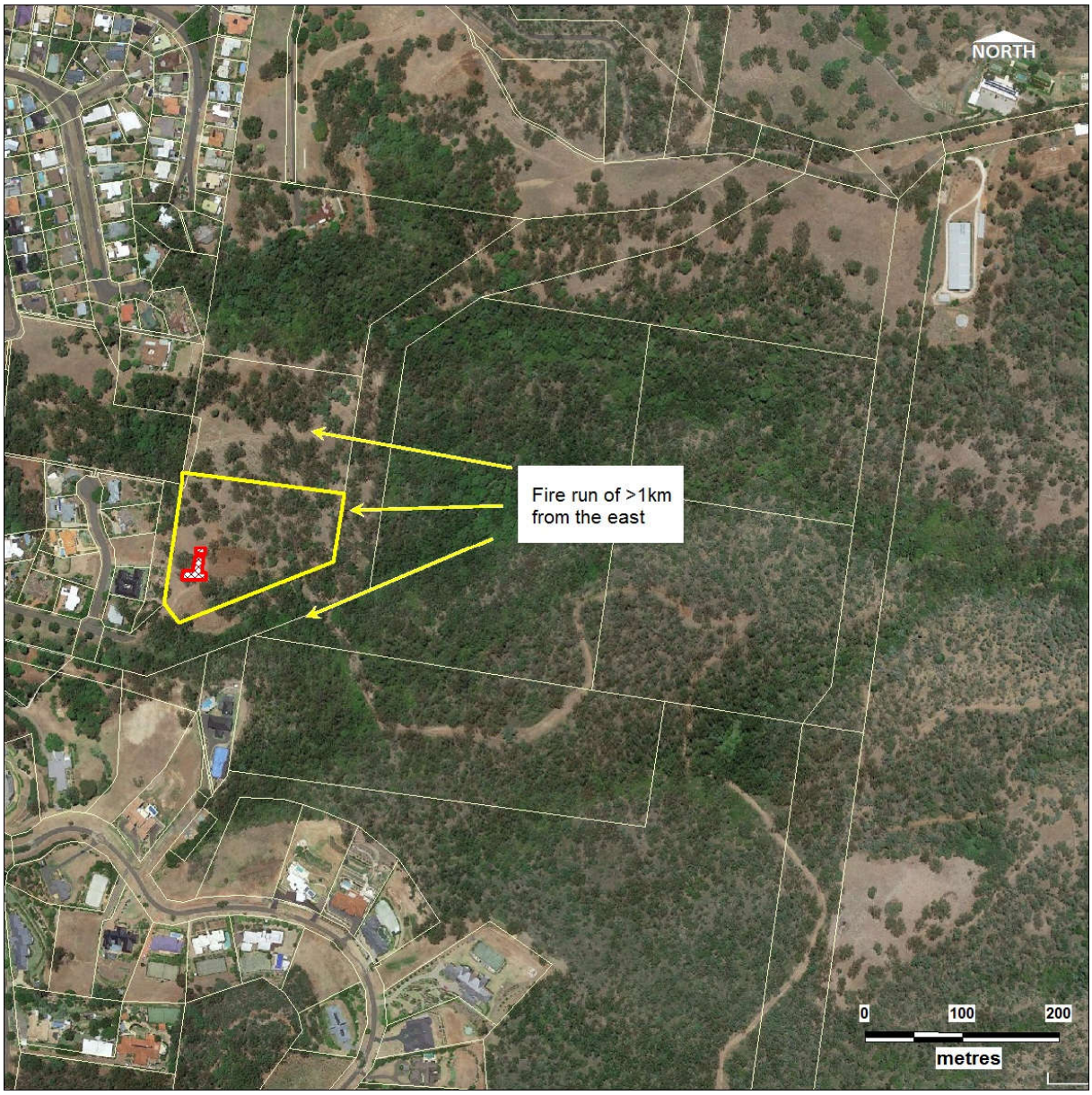

Figure 6: Direction of potential fire run and associated threat for bushfire and ember attack on the site.

2.0 Mitigating potential bushfire impact

A number of actions should be undertaken to mitigate the potential impacts of bushfire to the development. This suite of bushfire mitigation measures, when implemented in an integrated manner can achieve a better outcome for the site than when used individually and in isolation from other measures. This suite of potential measures is illustrated in Figure 7.

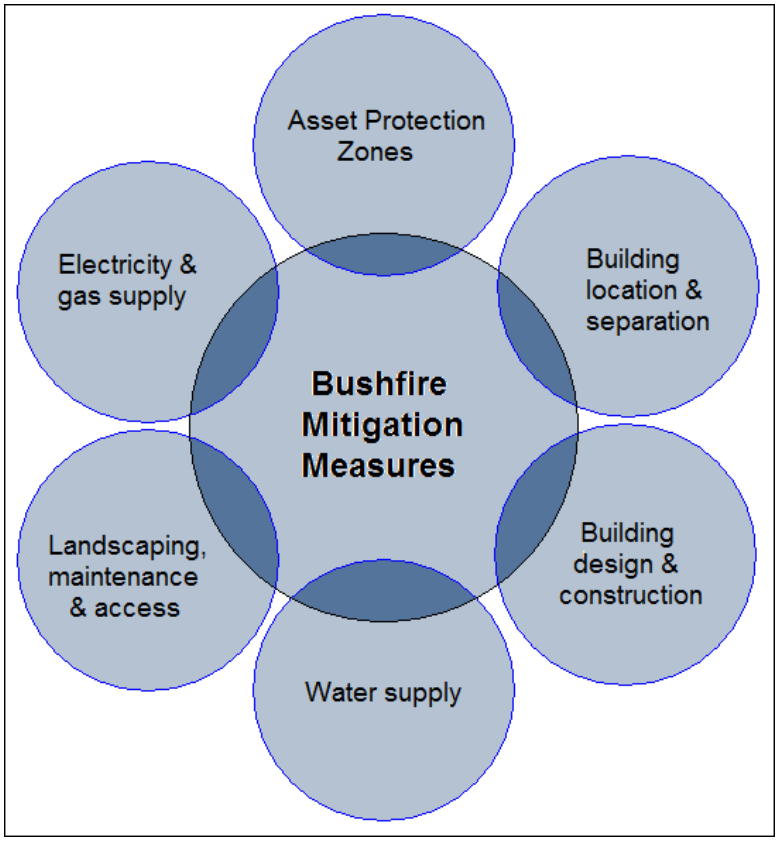

Figure 7: Bushfire mitigation measures in combination. (Redrawn from Guideline for Building in Bushfire Prone Areas. Emergency Management Victoria 2016).

2.1 Building location and asset protection zones (APZ)

The location of buildings and their relationship with vegetation in the immediate surrounding area is critical for ensuring their survival in the event of a bushfire. The proposed dwelling is to be located within an area of low fuel loads that is well separated from areas of high potential bushfire hazard. The establishment of an asset protection zone (APZ) is an effective mechanism for reducing bushfire hazards. An APZ is a fuel-reduced area surrounding a built asset or structure.

Potential bushfire fuels should be minimised within an APZ. This is so that the vegetation within the APZ does not provide a path for the transfer of fire to the asset either from the ground level or through the tree canopy. An APZ, if designed correctly and maintained regularly, will reduce the risk of:

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

The APZ should be located between the asset and the bushfire hazard. An APZ comprising an Inner Protection Area of 30 metres width and an Outer Protection Area of 20 metres is proposed for the

dwelling. Figure 8 provides a visual representation of the dwelling and required separation distances from areas of potentially hazardous vegetation.

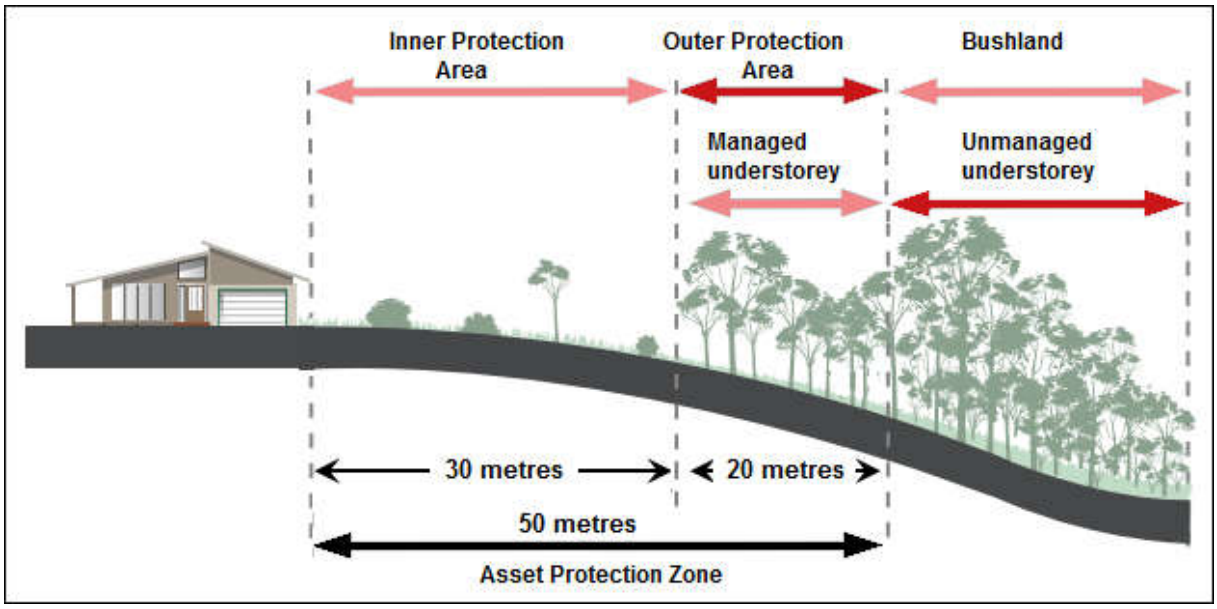

Figure 8: Dimensions of the Asset Protection Zone to be established at time of construction of the dwelling. (Adapted from Planning for Bushfire Protection 2017)

2.2 Building design and construction

Careful design of new buildings in areas of mapped bushfire hazard needs to be undertaken; which includes consideration of site characteristics. The dwelling is to be designed and constructed in accordance with the requirements of the relevant building standards and Council bylaws prevailing at the time and to take into account the prevailing site conditions. This includes the Building Code of Australia (BCA) and the Australian Standard for "Construction of buildings in bushfire-prone areas (AS3959 – 2018).

A Bushfire Attack Level (BAL) of BAL-29 is applicable for buildings identified in this development application.

Appendix 3 Calculation of bushfire hazard contains information on the potential Bushfire Attack Levels that could be experienced on the site, Appendix 4 provides a summary of construction requirements from AS3959-2018 with Appendix 5 providing an explanation of BAL's.

2.3 Access and egress

Unhindered access and egress is required to the site to enable ready access by emergency services in a time of need and to facilitate the orderly evacuation of residents if necessary. Access to the proposed development site is to be provided by a driveway of all-weather construction. It is to connect with Alderley Street to the southwest which is of sealed, all-weather construction and provides good ingress and egress to the site.

2.4 Vegetation management

Vegetation on the site currently comprises areas of open eucalypt woodland with a grassy understorey and open maintained grassed areas. Maintenance of vegetation on the site including, the ongoing control of woody environmental weeds (e.g. Lantana) will assist in the management of fuel loads and keep associated bushfire risks to an acceptable level. Contrary to common belief, the area surrounding buildings does not need to be totally devoid of vegetation, and in fact some

trees in this area can serve a valuable role in trapping embers before they impact on the asset. It is important however that:

- There are substantial gaps (of at least 2 - 5m) between the canopies of any trees in this area.
- Surface and near surface fuels are kept to a minimum. This includes lawns to be kept short and removal of accumulated leaf and bark litter.
- Avoidance of flammable mulches on garden beds such as woodchip or straw within 10 metres of the dwelling.
- Use of non-flammable mulches such as river pebbles or stones on garden beds near dwellings and buildings.
- Plants with a higher tolerance to fire should be utilised closest to the house and be maintained in a healthy and moist state throughout the fire season.

2.5 Fire trails

The site contains access tracks that are suitable for use by 4 wheel drive light and medium attack Queensland Fire and Emergency Service Rural Fire Brigade vehicles. These tracks can be utilized for undertaking fuel management activities including hazard reduction burns if required. The tracks can readily be linked to a Council maintained firebreak that is approximately 40 metres wide on the eastern perimeter of the site. The firebreak contains a fire trail that can be readily accessed by Council and Emergency Service vehicles. No new trails are proposed for the site. Appendix 2: Bushfire Management Plan, shows the location of existing trails suitable for use by rural fire brigade vehicles.

Photo 7: Fire trail located on eastern boundary of property. A Council maintained fire break and trail is located to the immediate east of the property.

2.6 Water supply

The Toowoomba Regional Council Planning Scheme (2012) requires that an adequate water supply suitable for fire-fighting purposes should be available at all times. This can be achieved by:

- The premises are connected to a reticulated water supply having sufficient pressure for fire-fighting purposes in times of bushfire emergency (minimum pressure and flow of 10 litres per second at 200 kPa); **or**
- The premises having a water tank fitted for connection to standard fire-fighting appliance fittings, dam or swimming pool, with a minimum capacity of 10,000 litres for fire-fighting

purposes in times of bushfire emergency. Any tanks that are designated for fire-fighting purposes should be fitted for connection to standard rural fire fighting appliance fittings.

2.7 Prepare, Act, Survive

It is critically important that residents are well prepared during times of high fire danger and have well made plans that can be readily enacted in a time of bushfire emergency. This includes having plans in place to guide actions on days of extreme and catastrophic, identifying safe refuge areas and planning to either 'stay' or 'go'. If the decision is made to go, then residents need to be prepared to evacuate early. The key message being; Prepare, Act and Survive. The Queensland Fire and Emergency Services have information readily available to assist people living in bushfire prone areas to develop their own plans. Details can be downloaded from:

www.ruralfire.qld.gov.au/Publications/Documents/PAS-BushfireSurvivalPlan.pdf

2.8 Maintenance of bushfire mitigation measures

This fire report has been prepared on the basis that bushfire mitigation measures identified are implemented and maintained into the foreseeable future. Failure to maintain these measures may contribute to the development being exposed to a higher level of bushfire threat and attack.

3.0 Planning Requirements

3.1 State Planning Policy - Bushfire

The State Planning Policy (July 2017) provides a comprehensive set of principles which underpin Queensland's planning system to guide local government and the state government in land use planning and development assessment. The State's interest in relation to natural hazards is: "*The risks associated with natural hazards are avoided or mitigated to protect people and property and enhance the community's resilience to natural hazards*". The State Planning Policy (July 2017) development assessment requirements have been addressed in Table 2.

Table 2: State Planning Policy development assessment requirements

Development assessment requirement	**Proposed solution**
A development application for a material change of use, reconfiguration of a lot or operational works on premises in any of the following: (1) bushfire prone areas (2) flood hazard areas (3) landslide hazard areas (4) storm tide inundation areas (5) erosion prone area.	The proposal involves the establishment of a new dwelling in an identified bushfire hazard area.
Bushfire, flood, landslide, storm tide inundation, and erosion prone areas outside the coastal management district: **(1)** Development other than that assessed against (1) above, avoids natural hazard areas, or where it is not possible to avoid the natural hazard area, development mitigates the risks to people and property to an acceptable or tolerable level.	PS1. The development is located in an area of mapped bushfire hazard. The new dwelling is to be constructed in an area well separated from patches of potentially hazardous vegetation. A site specific hazard assessment was undertaken and a Bushfire Management Plan prepared that identifies measures to mitigate the risks to people and property to an acceptable level. Mitigation measures identified include: ▪ Establishment of an Asset Protection Zone at the time of constructing the new dwelling; ▪ Building to comply with relevant standards of building construction including the Building Code of Australia (BCA) and the Australian Standard Construction of buildings in bushfire-prone areas AS3959-2018. A BAL of 29 has been identified for the site; ▪ Provision of an adequate water supply that can be readily accessed for fire-fighting purposes; and ▪ Constructed ingress and egress be maintained to the site. Provided the measures identified in the bushfire management plan are implemented and maintained, the bushfire risk to people, property and infrastructure can be kept to an acceptable level.
All natural hazard areas: (2) Development supports and does not hinder disaster management response or recovery capacity and capabilities.	PS2. Development comprises the establishment of a new dwelling in a mapped area of bushfire hazard. The development actively assists and supports disaster management capacity and capabilities by: ▪ Providing ready access to a water supply suitable for fire-fighting purposes. This will be provided by:

Development assessment requirement	Proposed solution
	i. Connection to a mains reticulated water supply; ii. a stored and readily accessible water supply; or iii. a combination of i and ii. ▪ Provision of constructed clear and unobstructed access to the dwelling enabling safe ingress and egress; and ▪ Maintenance of existing fire trails on the site to enable bushfire mitigation activities to be undertaken and to provide access during an emergency event.
(3) Development directly, indirectly and cumulatively avoids an increase in the severity of the natural hazard and the potential for damage on the site or to other properties	PS3. The development takes into consideration topography, location of existing vegetation and potential natural hazards. The dwelling is to be sited in an open grassed area well separated from potentially hazardous downslope. Mitigation measures identified include: ▪ Establishment of an Asset Protection Zone around the dwelling at the time of construction; ▪ Effective and ongoing management of woody environmental and highly flammable weeds on the site such as Lantana and Broadleaf Privet; ▪ Landscaping to consist of plants that have low flammability; and ▪ Monitoring and management of fuel loads to prevent hazardous levels accumulating.
(4) Risks to public safety and the environment from the location of hazardous materials and the release of these materials as a result of a natural hazard are avoided.	PS4. Development comprises the establishment of a domestic residence. No hazardous materials are proposed to be stored on the site.
(5) The natural processes and the protective function of landforms and the vegetation that can mitigate risks associated with the natural hazard are maintained or enhanced.	PS5. The development seeks to maintain and enhance the protective function of landforms and vegetation present on the site by: ▪ Ongoing and effective management of environmental weeds on the site, ▪ Retaining the natural landform, i.e. minimising the extent of major earthworks, and ▪ Ensuring that any landscape plantings are compatible with the natural environment and do not contribute to an elevated bushfire hazard. Incorporation of these measures in the development will enable natural processes and functions to continue and aid in the mitigation of risks associated with potential natural hazards.

3.2 Toowoomba Regional Council Planning Scheme – Bushfire

The Toowoomba Regional Council Planning Scheme (2012 Version 19) contains a Bushfire hazard overlay code.

(1) The purpose of this code is to protect the safety of people and property in bushfire risk areas.

(2) The purpose of the code will be achieved through the following overall outcomes:

- (a) development does not increase the exposure of people and property to an unacceptable bushfire hazard risk;
- (b) development located in a bushfire risk area is designed to mitigate the bushfire risk through siting, design and management measures;
- (c) development provides access and evacuation routes for both private and emergency service vehicles which are appropriate to the nature of the development and the level of bushfire risk;
- (d) development for essential community infrastructure is able to function effectively during and immediately after a bushfire event;
- (e) public health and safety and the environment are not put at risk by development involving the manufacture and/or storage of hazardous goods in a bushfire hazard area;
- (f) the reconfiguration of land appropriately responds to bushfire hazard having regard to the appropriate siting of future development and access for evacuation; and
- (g) development provides access to an adequate water supply for fire fighting purposes.

This code identifies Performance outcomes and Acceptable outcomes. Where appropriate, this Code has been applied to the development and outcomes proposed to comply with the accepted development and assessment benchmarks. Table 3 details the response to the relevant portions of the Bushfire hazard overlay code.

Table 3: Bushfire hazard overlay code – requirements for accepted development and assessment benchmarks for assessable development

Performance outcomes	Acceptable outcome	Proposed outcome
PO1 Development is provided with an adequate water supply for fire-fighting purposes that is safely located and freely accessible.	**AO1.1** Development within a water supply area involving the creation of a new lot/s or involving proposed and existing buildings with a combined gross floor area greater than 50m², is connected to Council's reticulated water supply system It will be readily available at all time for fire fighting vehicles and a water supply outlet located within the road reserve is within 40m of the following: (a) All of the land; or	**PO1.1** Development is located within Council's water supply area. A reticulated water supply main and hydrant is located in Alderley Street to the southwest of the proposed house site. The requirements of the Code can be met by: (i) Extending the water supply main to within 40 metres of the house site; or (ii) Provision of a water storage system that permanently holds a minimum of 10,000 litres.

Performance outcomes	Acceptable outcome	Proposed outcome
	(b) A building envelope designated on each lot; or (c) The centre of each lot, excluding access handles (where no building envelope is designated); and (d) All existing and proposed buildings And Fire hydrants are designed and installed in accordance with Queensland Fire and Emergency Services Fire Hydrant and Vehicle Access Guidelines, Unless otherwise specified by the relevant water entity	
	AO1.2 Development outside a water supply area involving proposed or existing buildings with a combined gross floor area greater than 50m², are provided with a dedicated on site water storage system that permanently holds a minimum of 10,000 litres (e.g. dam, swimming pool or water tank) for fire fighting purposes.	**PO1.2** In the event that the dwelling is not provided with a connection to Council's reticulated water supply, then a dedicated water storage system is to be provided that holds a minimum of 10,000 litres.
	AO1.3 A water tank is provided within 10m of each building (other than a class 10 building) which: (a) Is either below ground level or of non-flammable construction; (b) Has a take-off connection at a level that allows the following dedicated, static water supply to be left available for access by fire fighters: i 10,000 litres for residential buildings; ii For industrial, commercial; and other buildings, a volume specified in AS2304- 2011 (c) Includes shielding of tanks and pumps in accordance with AS2304-2011	**PO1.3** In the event that a dedicated water supply for fire-fighting purposes is provided, then the following measures are to be implemented: (a) Water tanks to be provided within 10 metres of each building; (b) A minimum capacity of 10,000 litres is to be available; (c) No requirement - AS2304- 2011 Water storage tanks for fire protection systems, provides details on tank construction but does not specify requirements for shielding of pumps. (d) A hardstand area is to be provided within 6m of the tanks designated to hold fire-fighting water supplies.

Performance outcomes	Acceptable outcome	Proposed outcome
	(d) Includes a hardstand area allowing medium rigid vehicle (15 tonne fire appliance) access within 6m of the tank; (e) Is provided with rural fire brigade tank fittings if serviced by a rural fire brigade (i.e. 50mm ball valve and male camlock coupling and, if underground, an access hole of 200mm (minimum) to accommodate suction lines); and (f) Is clearly identified by directional signage at the street frontage	(e) Any such tanks are be provided with fittings to enable fire brigades to access water supplies (i.e. 50mm ball valve and male camlock coupling). (f) Tanks holding designated fire-fighting water supplies to be clearly identified.
PO2 Development provides for the safety of people and people by avoiding areas of High or Medium bushfire risk.	**AO2.1** Development is located on land that is not subject to High or Medium bushfire hazard. OR **AO2.2** Where development is located in a High or Medium bushfire hazard area (except for single dwellings on existing lots), it complies with a Bushfire Management Plan for the premises.	**PO2.1** Site is mapped by Council as largely comprising 'Medium' bushfire hazard with lesser areas of 'High' bushfire hazard. The bushfire hazard for site was assessed and the Bushfire Attack Level identified using Method 1 and Method 2 of AS3959-2018. A Bushfire Attack Level of 29 was identified for the site **PO2.2** A bushfire Management Plan has been prepared for the site which identifies standard of building required, emergency fire-fighting water supplies and ingress and egress requirements. The dwelling is to comply with current relevant building standards. This includes the Building Code of Australia (Parts 1 and 2) and the Australian Standard for Building in bushfire-prone areas (AS3959-2018).
PO3 Development provides for the safety of people and property by mitigating the bushfire risk through the siting of buildings.	**AO3.1** Buildings and structures: (a) are sited in locations of lowest hazard within the lot; and (b) achieve setbacks from hazardous vegetation of 1.5 times the predominant mature canopy tree height or 10 metres, whichever is the greater; and	**PO3.1** a) Building is located in an area of lowest hazard well separated from potentially hazardous downslope vegetation with good access to Alderley Street; b) Setbacks from hazardous vegetation are in general at least 1.5 times the predominant mature canopy tree height are achieved. Vegetation in nearby areas has a mature height

Performance outcomes	Acceptable outcome	Proposed outcome
	(c) are 10 metres from any retained vegetation strips or small areas of vegetation; and (d) are sited so that elements of the development least susceptible to fire are sited closest to the bushfire hazard.	range of 22 to 28 metres. Setbacks in the order of 50 metres are achieved from areas of potentially hazardous vegetation; c) Separation distances from retained vegetation strips or small areas of hazardous vegetation exceed 10 metres; d) Elements least susceptible to fire such as open grassed and maintained areas are sited closest to the bushfire hazard. Appendix 3 provides additional information on the level of bushfire hazard posed to buildings and the methodology used to calculate it

Table 4: Bushfire hazard overlay code – assessment benchmarks for assessable development

Performance outcomes	Acceptable outcome	Proposed outcome
For all developments		
PO1 Community infrastructure is only located in a bushfire medium and high risk area where the function and role of the infrastructure necessitates its location in the area and there are no suitable alternative sites.	No acceptable outcome is nominated.	**Not applicable –** no community infrastructure proposed.

Performance outcomes	Acceptable outcome	Proposed outcome
For all developments		
PO2 Community infrastructure is able to function effectively during and immediately after bushfire events.	**AO2.1** The community infrastructure is located on land that is not subject to High or Medium bushfire hazard; or **AO2.2** The community infrastructure will not involve any new building work other than a minor extension (<20 m² gross floor area) to an existing building; or **AO2.**3 The community infrastructure development is located within a bushfire hazard area (as identified in the Bushfire Hazard Overlay Maps) but is designed to function effectively during and immediately after bushfire events.	**Not applicable –** no community infrastructure proposed.
Water Supply		
PO3 Development is provided with an adequate water supply for fire-fighting purposes that is safely located and freely accessible	**AO3.1** Development within a water supply area involving the creation of a new lot/s or involving proposed and existing buildings with a combined gross floor area greater than 50m², is connected to Council's reticulated water supply system. It will be readily available at all time for fire fighting vehicles and a water supply outlet located within the road reserve is within 40m² of the following: (a) All of the land; or (b) A building envelope designated on each lot; or (c) The centre of each lot, excluding access handles (where no building envelope is designated); and (d) All existing and proposed buildings And	**PO3.1** Development is located within Council's water supply area. A reticulated water supply main and hydrant is located in Alderley Street to the southwest of the proposed house site. The requirements of the Code can be met by: (i) Extending the water supply main from Alderley Street to within 40 metres of the house site; **OR** (ii) Provision of a water storage system that permanently holds a minimum of 10,000 litres.

Performance outcomes	Acceptable outcome	Proposed outcome
	Fire hydrants are designed and installed in accordance with Queensland Fire and Emergency Services' Fire Hydrant and Vehicle Access Guidelines, Unless otherwise specified by the relevant water entity. **AO3.**2 Development outside a water supply area involving proposed or existing buildings with a combined gross floor area greater than 50m², are provided with a dedicated on site water storage system that permanently holds a minimum of 10,000 litres (e.g. dam, swimming pool or water tank) for fire fighting purposes. **AO3.3** A water tank is provided within 10m of each building (other than a class 10 building) which: (a) Is either below ground level or of non-flammable construction; (b) Has a take-off connection at a level that allows the following dedicated, static water supply to be left available for access by fire fighters: i 10,00 litres for residential buildings; ii For industrial, commercial; and other buildings, a volume specified in AS2304-2011 (c) Includes shielding of tanks and pumps in accordance with AS2304-2011 (d) Includes a hardstand area allowing medium rigid vehicle (15 tonne fire appliance) access within 6m of the tank, (e) Is provided with rural fire brigade tank fittings if serviced by a rural fire brigade (i.e. 50mm ball valve and male camlock coupling and, if underground, an access hole of 200mm (minimum) to accommodate suction lines); and (f) Is clearly identified by directional signage at the street frontage.	**PO3.2** In the event that the dwelling is not provided with a connection to Council's reticulated water supply, then a dedicated water storage system is to be provided that holds a minimum of 10,000 litres. **PO3.3** If a water tank is provided for fire-fighting purposes, then it is to comply with AO3.3

Performance outcomes	Acceptable outcome	Proposed outcome
Hazardous materials		
PO4 Public safety and the environment are not adversely affected by the detrimental impacts of bushfire on the manufacture or storage of hazardous materials in bulk.	**AO4.1** Development complies with a Bushfire Management Plan for the premises.	**PO4.1** The proposed development is the establishment of a residential dwelling. The manufacture or storage of hazardous materials in bulk is not proposed as a component of this development.
Reconfiguring a Lot and Material Change of Use		
PO5 Lot design and the siting of buildings provide safe sites for habitable and non-habitable buildings.	**AO5.1** All development enables buildings and structures to achieve setbacks from hazardous vegetation that are: a) sited within the area of lowest hazard within the lot; and b) provide for adequate setbacks from hazardous vegetation; and c) 1.5 times the predominant mature canopy tree height or 10m, whichever is the greater; and d) 10m from any retained vegetation strips or small areas of vegetation; and e) sited so that elements of the development least susceptible to fire are sited closest to the bushfire hazard.	**PO5.1** The proposed dwelling is sited to provide adequate setbacks from hazardous vegetation. This is achieved by: a) Building is located in an area of lowest hazard well separated from potentially hazardous downslope vegetation with good access to Alderley Street; b) Setbacks from hazardous vegetation are achieved with separation distances in order of 50 metres; c) Separation distances of at least 1.5 times the predominant mature canopy tree height are achieved from areas of potentially hazardous vegetation. Vegetation in nearby areas has a mature height range of 22 to 28 metres. Setbacks in the order of 50 metres are achieved from areas of potentially hazardous vegetation; d) Separation distances from retained vegetation strips or small areas of hazardous vegetation exceed 10 metres; e) Elements least susceptible to fire such as open grassed and maintained areas are sited closest to the bushfire hazard. Appendix 3 provides additional information on the level of bushfire hazard posed to buildings and the methodology used to calculate it.

Performance outcomes	Acceptable outcome	Proposed outcome
PO6 For development that will result in multiple buildings or lots, roads and access are designed to mitigate against bushfire hazard by ensuring adequate access for: a) fire fighting and other emergency vehicles; and b) the evacuation of people in the event of an emergency	**AO6.1** The road design is capable of providing access for fire-fighting and other emergency vehicles, in accordance with the standards identified in SC4.2 PSP No. 2 – Engineering Standards – Roads and Drainage Infrastructure. **AO6.2** The lot layout ensures that all roads are through roads. **AO6.3** The lot layout does not include long narrow lots, long access ways or rear lots. **AO6.4** The road has a maximum gradient of 1 in 8 (12.5%).	**PO6.1 Not applicable** No new roads or multiple buildings are proposed. **PO6.2 Not applicable** **PO6.3 Not applicable** **PO6.4 Not applicable** No new roads are proposed.
PO7 For development that will result in multiple buildings or lots, fire breaks are provided that: a) adequately and effectively separate the development site from surrounding vegetation to mitigate against bushfire hazard; (b) have sufficient width to enable continuous access for fire fighting and other emergency vehicles, residents and equipment; and (c) are in secure tenure and are maintained.	**AO7.1** The development incorporates a fire break provided by a perimeter road that: a) separates the boundary of the lots and the adjacent bushland; b) has a minimum cleared width of 20m; c) has a formed road width of 6m; and d) is constructed to an all-weather standard. **AO7.2** The development includes fire breaks which are located as close as possible to the boundaries of the lot(s) and the adjoining bushfire hazard and the fire breaks have: a) a minimum cleared width of 6m; b) a minimum formed width of 4m; c) a maximum gradient of 1 in 8 (12.5%); d) are constructed and maintained to prevent erosion, provide adequate drainage and provide continuous access for fire fighting vehicles; e) provide passing bays and turning areas for fire-fighting appliances; and	**PO7.1 Not applicable**. Development is the establishment of a single dwelling on a Lot. As such no fire breaks or boundary roads are proposed. **PO7.2 Not applicable** No fire trails are proposed. A Council maintained fire break and fire trail is present on the eastern boundary of the site.

Performance outcomes	Acceptable outcome	Proposed outcome
	f) are either located on public land, or within an access easement that is granted in favour of the Toowoomba Regional Council and the Queensland Fire and Rescue Service. **AO7.3** Vehicular access is provided along and at each end of the fire break to existing fire maintenance trails or roads. **AO7.4** The development includes sufficient cleared breaks of 6m minimum width in retained bushland within the development (e.g. creek corridors and retained vegetation) to allow burning of sections and access for bushfire response.	**PO7.3 Not applicable** No fire breaks or trails are proposed for the development. **PO7.4 Not applicable** Control burns are not proposed on the site due to the size of the Lot, nature of development, the extent and type of vegetation present and options available for other forms of fuel management (e.g. slashing).

4.0 Determination of Bushfire Attack Level (BAL)

The following steps were carried out using information collected from the relevant site and apply this information to the conditions required and set out in Australian Standard 'Construction of Buildings in Bushfire-prone areas' (AS 3959-2018). Full details of the calculations for determining the BAL for the site are provided in Appendix 3 – Calculation of bushfire hazard.

Table 4: Summary of attributes to determine BAL rating

Step	Procedure	Value
1	Fire Danger Index (FDI) for Queensland as per Table 2.1, Jurisdictional and Regional values for FDI	40
2	Classification of vegetation type	A-03
3	Distance of Classified vegetation from the building site	>50m*
4	Location of vegetation (Upslope/Downslope)	Downslope
5	Effective slope of land under classified vegetation	35 degrees
6	Determination of BAL from Table 2.4.5 AS 3959-2018	BAL-29

***Note:** This fire report has been prepared on the basis that a minimum separation distance of **50 metres** can be achieved and maintained between the building and the edge of hazardous understory vegetation. Failure to maintain this separation distance will result in a higher Bushfire Attack Level (BAL) being applied to the building.

The proposed dwelling is to be located in an open grassed area that is maintained in a low fuel load state. Potentially hazardous vegetation is located downslope of the proposed buildings and comprises open eucalypt woodland with a grassy to open shrubby understorey. Isolated and scattered trees are present in the immediate area of the proposed dwelling but do not contribute to an elevated level of bushfire hazard.

Using AS 3959 – 2018, Table 2.3 Classification of Vegetation, the vegetation is classified as Open Forest A-03 which is shown in Figure 9. It is described as: "*Trees 10–30 m high; 30–70% foliage cover (may include understorey of sclerophyllous low trees and tall scrubs or grass). Typically dominated by eucalypts, melaleuca or callistemon*".

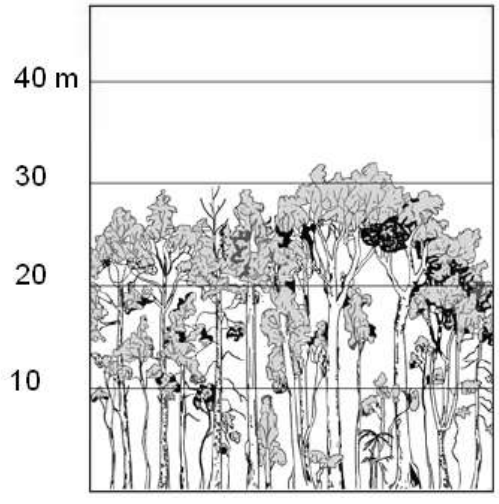

Figure 9: Vegetation Class A-03 Open Forest.

4.1 Minimisation of risk - building

A number of construction measures are required to minimise the risk of bushfire impact on buildings. Key areas include:

- Roof to be fully sarked, **or**
- Gaps under corrugations or roof sheeting sealed at the fascia or wall line and at valleys, hips and ridges,
- Vents and weepholes in walls and eve linings to be screened,
- Cladding to be of bushfire resisting material for walls that are less than 400mm from the ground, decks, awnings, and other horizontal surfaces,
- Openable parts of windows to be screened with corrosion resistant metal mesh, and
- Decking to be of bushfire-resistant or non-combustible material.

A summary of the construction measures required for BAL 29 as specified in AS3959-2018 is provided in Appendix 4.

5.0 Recommendations

Following are a number of recommendations that should be undertaken to mitigate the potential impacts of bushfire on the development. These are as follows:

Construction of buildings

- Buildings are to be designed and constructed to meet the requirements of the relevant building standards prevailing at the time. This includes the Building Code of Australia (BCA), the Australian Standard for "Construction of buildings in bushfire-prone areas (AS3959 – 2018) and relevant Council bylaws and building regulations.

Ingress and egress

- That constructed access be provided and maintained to the dwelling to enable the ready and safe access of emergency services vehicles in an emergency event.

Vegetation management

- That an Asset Protection Zone with a radius of 50 metres be established around facilities comprising an Inner Protection Area of 30 metres width and an Outer Protection Area of 20 metres. Vegetation management within the Asset Protection Zone is to comprise:
  - Inner Protection Area –
    - substantial gaps of at least 2 - 5m are to be achieved between canopies of retained trees,
    - lawns to be kept short (less than 10cm) and accumulations of leaf and bark litter be avoided,
    - avoidance of flammable mulches within 10 metres of buildings, and
    - plants with a higher tolerance to fire be utilised closest to buildings.
  - Outer Protection Area –
    - woody environmental weeds including Lantana and Broadleaf Privet to be effectively controlled,
    - grass to be kept to less than 10cm in height throughout the fire season.

Water supply

- That an adequate water supply for fire-fighting purposes that is safely located and freely accessible be provided for the dwelling. This is to be achieved by:

i. Connection to Council's reticulated water supply system, or
ii. Provision of a dedicated on site water storage system that permanently holds a minimum of 10,000 litres.

Maintenance of bushfire measures

- That bushfire mitigation measures identified in this bushfire management report are implemented and maintained.

6.0 References

Australian Standard; 2018. Construction of buildings in bushfire-prone areas (AS3959–2018). Sydney.

Australian Standard; 2019. Water storage tanks for fire protection systems (AS2304-2019). Sydney

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Emergency Management Victoria; 2016. Guideline for Building in Bushfire Prone Areas. Melbourne.

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Ramsay, C & Rudolph, L.; 2003. Landscape and Building Design for Bushfire Areas. CSIRO,

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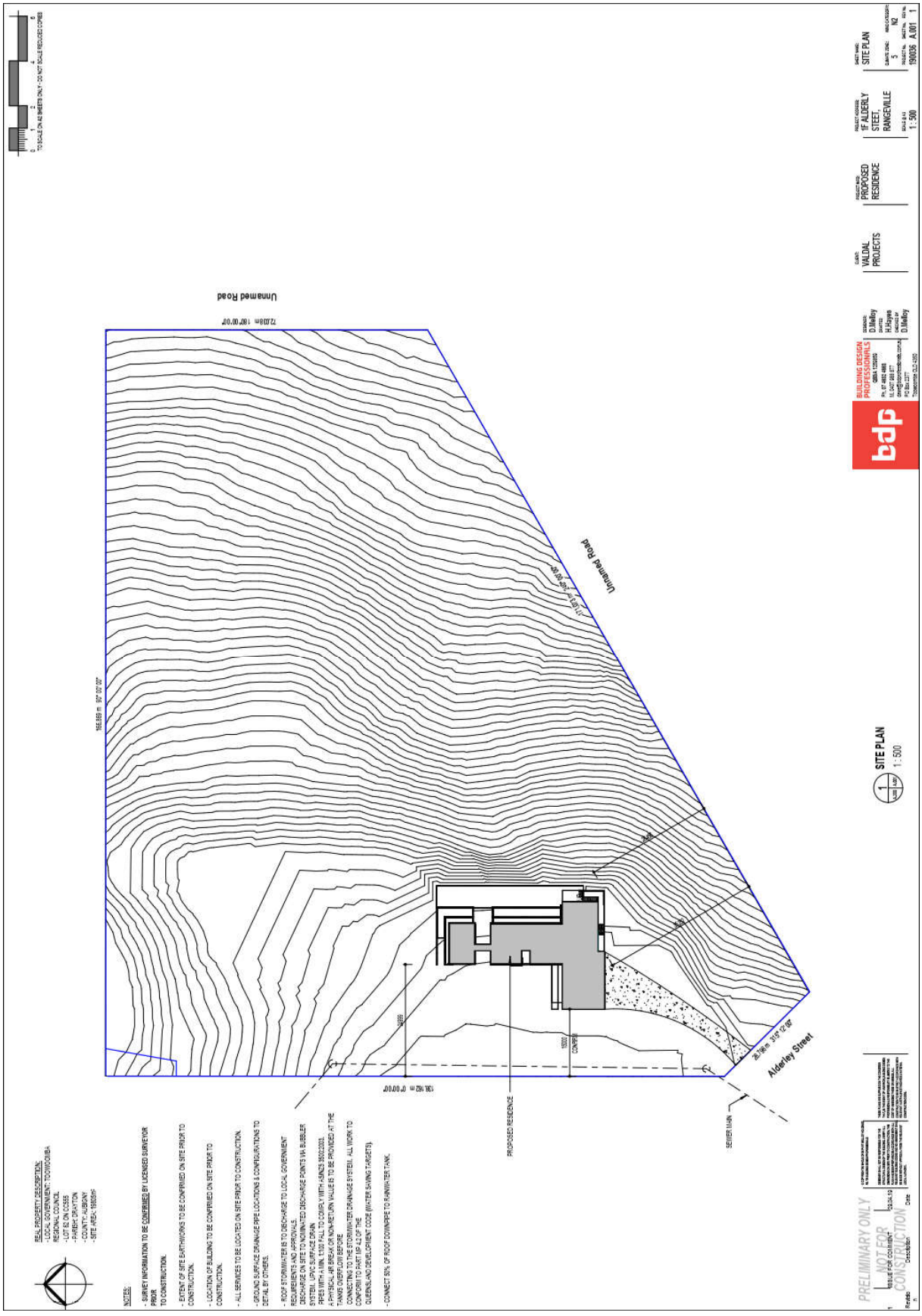
http://www.dilgp.qld.gov.au/planning/state-planning-instruments/spp-interactive-mapping-system.html

The State of Queensland, July 2017. Queensland State Planning Policy (July 2017) Queensland Department of Infrastructure, Local Government and Planning.

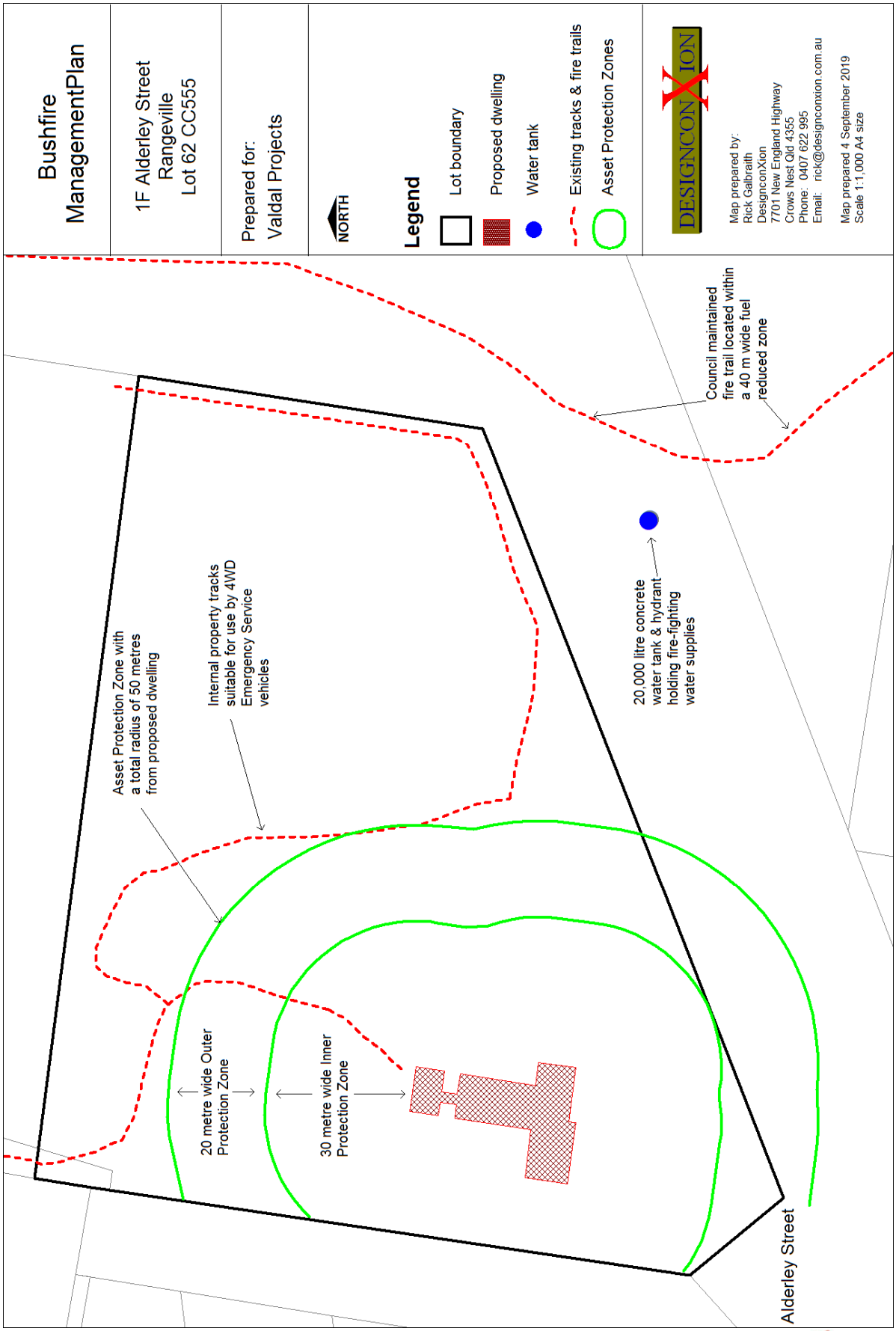
Victoria State Government, July 2010. Overall Fuel Hazard Assessment Guide 4th edition.

Victoria State Government; 2014. Planning Practice Note 65. Melbourne.

Appendix 1 – Overall site plan



Appendix 2 – Bushfire Management Plan



Appendix 3 – Calculation of Bushfire Hazard

The site has been identified by the Toowoomba Regional Council Planning Scheme (2012) as being largely contained within an area of "*Medium*" Fire Risk with smaller areas of "*High*" Fire Risk present. A site assessment was undertaken which confirmed that this site is of Medium bushfire risk.

Overall Fuel Hazard Assessment

An overall fuel hazard assessment was undertaken of the site and an adjacent bushland area in accordance with the 'Overall Fuel hazard Assessment Guide (Victorian State Government 2010) to assess the hazard posed by various fuel components present. Attributes measured were:

- bark fuel;
- elevated fuel;
- near-surface fuel; and
- surface fuel.

Figure 10 identifies the locations where the overall fuel hazard assessments were undertaken with Figure 11 providing a diagrammatic view of the fuel hazard layers. A summary of the data collected is presented in Table 5.

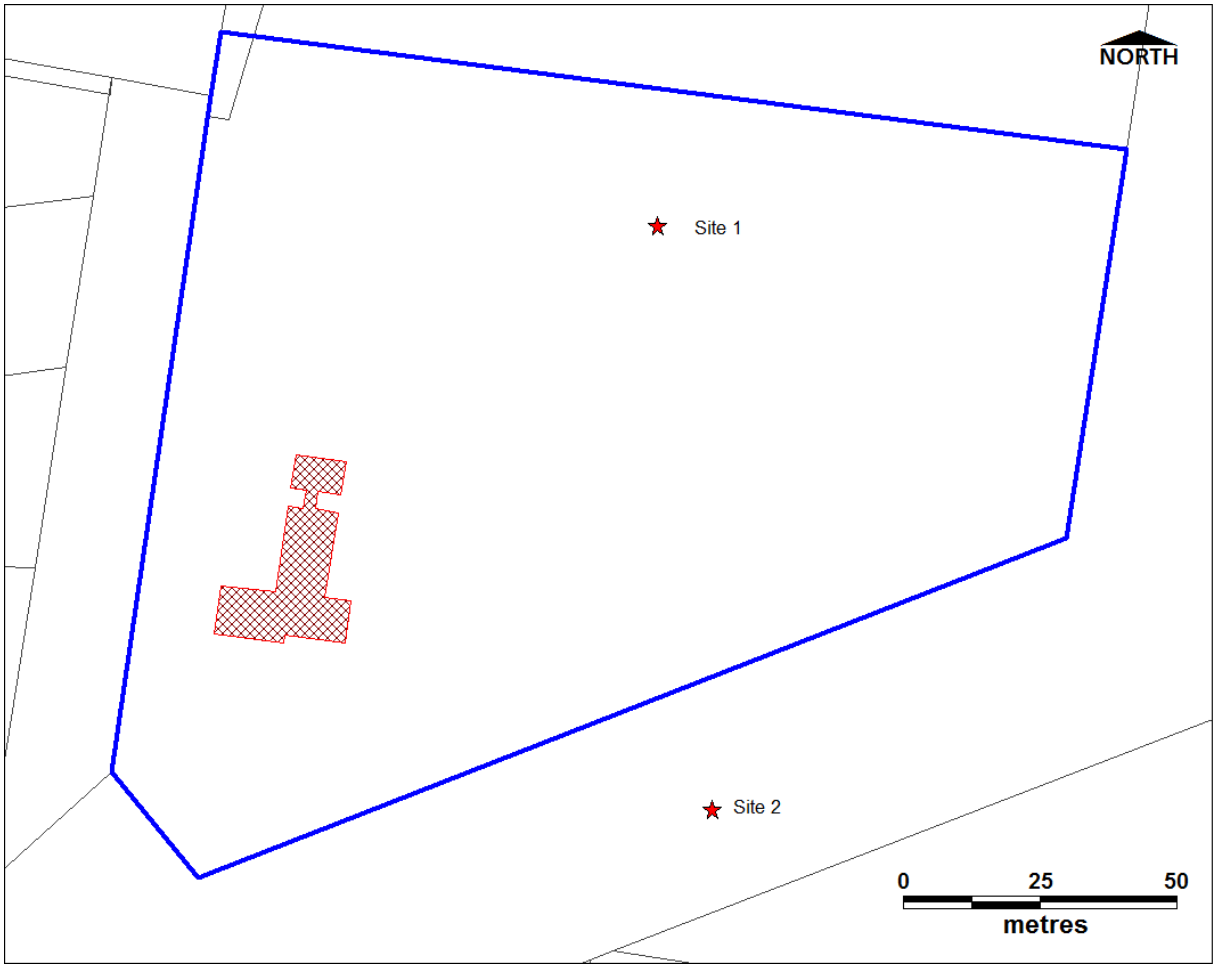


Figure 10: Locations where overall fuel hazard assessments were undertaken.

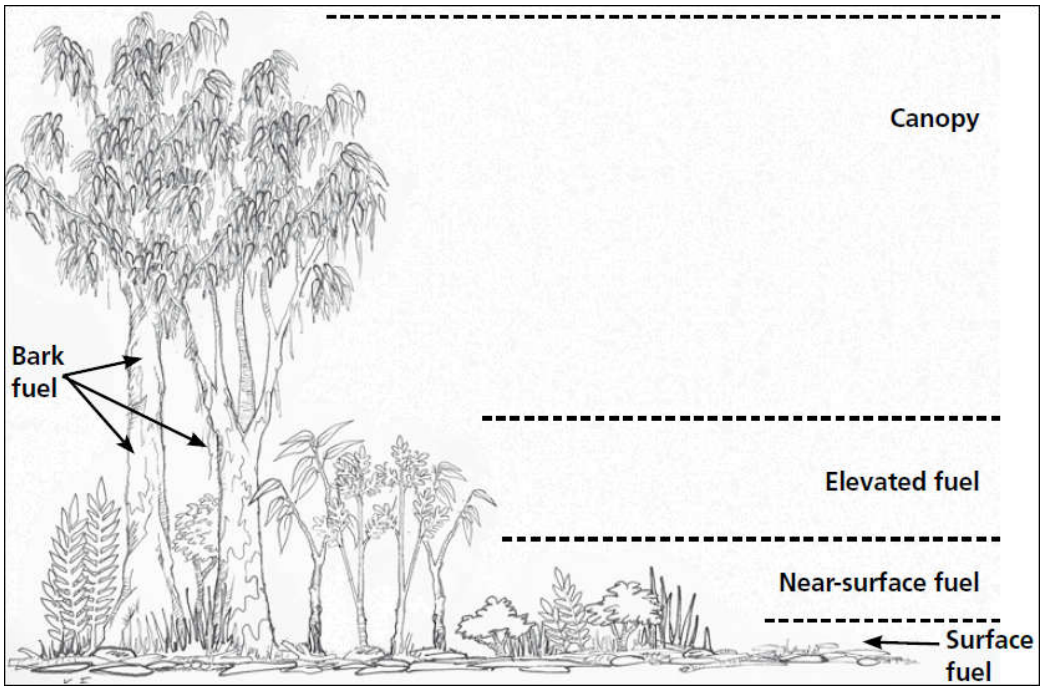


Figure 11: Fuel hazard layers used to determine the overall fuel hazard for a site. (Image from Overall fuel hazard assessment guide 2010).

Table 5: Summary of overall fuel hazard layers assessed

Attribute	Site No. 1	Site No. 2
Emergent Canopy Height	27 metres	33 metres
Main Canopy Height	18 metres	22 metres
Bark Fuel Hazard	Moderate	Moderate
Elevated fuel layer hazard	Low	Very high
Near-surface fuel layer hazard	High	Medium
Surface fuel hazard	Medium	High
Combined surface & near-surface fine fuel hazard	High	High
Overall fuel hazard	**Medium**	**Very high**

Overall fuel hazard assessments were undertaken in areas representative of vegetation on and surrounding the site. Site 1 was located downslope and to the northeast of the site in an area of open woodland / forest with a grassy understorey with isolated shrubs present. This vegetation and associated fuel hazards is representative of areas downslope of the house site on the property. Site 2 was located to the southeast of the property in a gully that runs parallel to the property boundary. Vegetation in this area comprises open eucalypt forest with a dense shrubby understorey largely comprised of the woody environmental weeds Broadleaf Privet and Lantana.

Photos of both sites are presented which illustrate the various fuel layers present.

Photo 8: Overall fuel hazard assessment Site 1 showing surface and near surface fuel layers.

Photo 9: View to the north showing the fuel hazard layers present at Site 1.

Photo 10: View to the west showing the fuel hazard layers present at Site 1.

Photo 11: Overall fuel hazard assessment Site 2 showing surface and near surface fuel layers.

Photo 12: View to the south showing the fuel hazard layers present at Site 2.

Photo 13: View to the west showing the fuel hazard layers present at Site 2.

Bushfire Hazard – Building

The bushfire hazard for the proposed dwelling location was identified using the:

- Australian Standard Construction of buildings in bushfire-prone areas (AS3959-2018) Method 1, and where appropriate
- AS3959-2018 Method 2.

These methods identified that the dwelling could potentially be exposed to a Bushfire Attack Level (BAL) of 29. This Bushfire Attack Level is quite manageable and does not expose residents and structures to an unacceptable level of risk.

Australian Standard Construction of buildings in bushfire-prone areas (AS 3959-2018)

The Australian Standard, "Construction of buildings in bushfire-prone areas" (AS 3959-2018) identifies the level of construction required for the purpose of ensuring that a building is constructed to withstand a potential bushfire attack. This Standard is primarily concerned with improving the ability of buildings in designated bushfire-prone areas to better withstand attack from bushfire, thus giving a measure of protection to the building occupants (until the fire front passes) as well as to the building itself. Table 6 identifies the various site specific parameters used in determining the BAL for the proposed dwelling.

AS3959-2018 requires that vegetation be assessed within 100 metres of a building when determining the Bushfire Attack Level. Figure 2 shows the location of the proposed dwelling with a radius of 100 metres from the edge of it identified. It should be borne in mind that the measures contained in the Standard cannot guarantee that a building will survive a bushfire event on every occasion. This is substantially due to the unpredictable nature and behaviour of fire and extreme weather conditions.

Table 6: Determination of Bushfire Attack Level (BAL) for Lot 13 – parameters assessed

Step	Procedure	North	East	Southeast	South	West
1	Fire Danger Index (FDI) for Queensland as per Table 2.1, Jurisdictional and Regional values for FDI	40	40	40	40	40
2	Classification of vegetation type	A-03	A-03	A-03	A-03	A-03
3	Distance of Classified vegetation from the building site (metres)	40	35	50	40	>100
4	Location of vegetation (Upslope/Downslope)	Down	Down	Down	Down	Up
5	Effective slope of land under classified vegetation	16	35	35	23	15
6	AS3959 Method used to determine Bushfire Attack Level	Method 1	Method 2	Method 2	Method 2	Method 1
7	Determination of BAL from Table 2.7 AS 3959-2018	29	29	29	19	Low

Appendix 4: Summary of AS3959-2018 BAL 29 construction requirements

Note: this is a summary of some portions of the standard - the building designer, builder and subcontractors should refer to AS3959-2018 in full prior to construction.

Subfloor supports

The Standard does not provide construction requirements for sub-floor supports where the sub-floor is enclosed in accordance with wall that conforms to the requirements for walls listed below or is enclosed with corrosion resistant steel, bronze or aluminium mesh with a maximum aperture of 2 mm.

Where the subfloor space is unenclosed, the support posts, columns, stumps, piers and poles are to be of non-combustible material or bushfire resisting timber.

Floors

The Standard does not provide construction requirements for concrete slabs on the ground.

Unenclosed subfloor space

The standard does not provide construction requirements for bearers, joists and floors if the underside element is greater than 400mm above finished ground level

External walls

External walls are to be:

(a) made of non-combustible materials (e.g. full masonry, brick veneer etc.) with a minimum thickness of 90 mm, or

(b) timber logs with a density of 680 kg/m^3 and a minimum nominal thickness of 90mm; or

(c) cladding that is fixed externally to a timber or metal frame and is:

  (i) non-combustible; or

  (ii) fibre cement a minimum of 6mm thick; or

  (iii) bushfire-resisting timber.

Joints

All joints in the external surface material of walls shall be covered, sealed, overlapped, backed or butt-jointed.

Vents and weepholes

Vents and weepholes in external walls are to be screened with corrosion-resistant steel, bronze or aluminium mesh with a maximum aperture of 2 mm.

External glazed elements, assemblies and doors

Screens for windows and doors

Where fitted, screens for windows and doors shall have mesh or perforated sheet made of corrosion-resistant steel, bronze or aluminium with a maximum aperture of 2 mm, with framing made from metal or bushfire resisting timber.

Windows

Frame material for windows are to be made from bushfire-resisting timber, metal or metal-reinforced uPVC.

Glazing is to be toughened glass with a minimum thickness of 5 mm.

The openable portions of windows shall be screened with a mesh with a max aperture of 2 mm made of corrosion resistant steel, bronze or aluminium.

Doors - side hung external doors, panel fold & sliding doors

Doors- shall be completely protected externally by a screen with a mesh with a max aperture of 2mm made of corrosion resistant steel, bronze or aluminium, **OR**

Door panel material shall be:

(a) non-combustible; or

(b) solid timber, laminated timber or reconstituted timber, having a minimum thickness of 35 mm for the first 400 mm above the threshold; or

(c) hollow core, solid timber, laminated timber or reconstituted timber with a non-combustible kickplate on the outside for the first 400 mm above the threshold; or

(d) fully framed glazed door panels with framing made from metal, bushfire resisting timber or uPVC.

Door frames shall be made from metal bushfire resisting timber, metal or metal reinforced uPVC.

Where doors incorporate glazing, the glazing shall be toughened glass with a minimum thickness of 6mm.

Doors shall be tight fitting to the door frame and to an abutting door, if applicable.

Weather strips, draught excluders or draught seals shall be installed.

There is no requirement to screen the openable part of a door at this level.

Garage doors

Vehicle access doors shall be made from:

(i) non-combustible material; or

(ii) bushfire-resisting timber; or

(iii) fibre-cement sheet, a minimum of 6 mm in thickness; or

(iv) a combination of any of items (i), (ii) or (iii) above.

All vehicle access doors to be protected with suitable weather strips, draught excluders, draught seals or brushes.

Roofs

The following apply to all types of roofs and roofing systems:

(a) roof tiles, roof sheets and roof covering accessories shall be non-combustible,

(b) the roof/wall and roof/roof junction shall be sealed, or otherwise protected to prevent openings greater than 2mm,

(c) roof ventilation openings, such as gable and roof vents, shall be fitted with ember guards made of non-combustible material or a mesh or perforated sheet with a max aperture of 2mm made of corrosion resistant steel, bronze or aluminium.

Tiled roofs shall be fully sarked with the sarking covering the entire roof area including ridges and hips and extend into gutters and fascias.

Sheet roofs shall:

(a) be fully sarked with sarking, except that foil backed insulation blankets may be installed over battens; **OR**

(b) have any gaps sealed at the fascia, or wall line, hips and ridges by:

(i) a mesh or perforated sheet with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium, or

(ii) mineral wool, or

(iii) other non-combustible material, or

(iv) -a combination of any of the above.

Roof penetrations

The following apply to roof penetrations:

(a) roof penetrations, including roof lights, roof ventilators, roof-mounted evaporative cooling units, aerials, vent pipes and supports for solar collectors, shall be adequately sealed at the roof to prevent gaps greater than 3 mm. Sealing material is to be non-combustible.

(b) openings in vented roof lights, roof ventilators or vent pipes shall be fitted with ember guards made from a mesh or perforated sheet with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.

(c) all overhead glazing shall be Grade A safety glass complying with AS 1288.

(d) Flashing elements shall be non-combustible.

Eaves linings, fascias and gables

The following apply to eaves linings, fascias and gables:

(a) gables shall comply with requirements for walls.

(b) fascias and bargeboards shall be made from bushfire-resisting timber or metal.

(c) eave linings shall be fibre-cement sheet with a minimum thickness of 4.5mm or bushfire resisting timber.

(d) Eave penetrations shall be protected as for roof penetrations.

(e) eaves ventilation openings are to be fitted with ember guards and be made of corrosion resistant steel, bronze or aluminium.

(f) Joints in eave linings, fascias and gables may be sealed with plastic joining strips or timber storm moulds.

Gutters and downpipes

The Standard does not provide material requirements for gutters and downpipes, with the exception of box gutters.

Box gutters are to be non-combustible and flashed at the roof junction with non-combustible material.

If installed, gutter and valley leaf guards are to be non-combustible.

Verandahs, decks, steps, ramps and landings

Decking may be spaced. There is no requirement to enclose the subfloor spaces of verandas, decks, steps, ramps or landings.

Decking, stair treads, trafficable surfaces of ramps and landings, balustrades and handrails are to be made from:

(a) of non-combustible material; or

(b) of bushfire-resisting timber; or

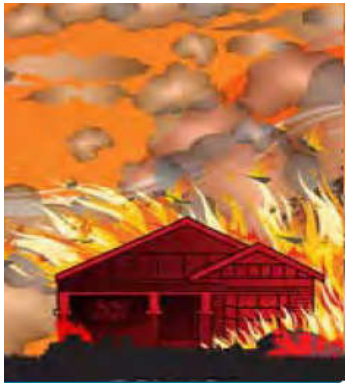
(c) a combination of items (a) and (b) above.

Verandah posts shall be made from non-combustible material or bushfire-resisting timber.

Water and gas supply pipes

Above ground, exposed water and gas supply pipes shall be metal. The metal pipe shall extend a minimum of 400mm within the building and 100mm below the ground.

Appendix 5 – Explanation of bushfire attack levels

				
BAL-12.5	**BAL-19**	**BAL-29**	**BAL-40**	**BAL-FZ**
The risk is considered to be **LOW**	The risk is considered to be **MODERATE**	The risk is considered to be **HIGH.**	The risk is considered to be **VERY HIGH.**	The risk is considered to be **EXTREME.**
There is a risk of ember attack. The construction elements are expected to be exposed to a heat flux not greater than 12.5 kW/m^2.	There is a risk of ember attack and burning debris ignited by wind borne embers and a likelihood of exposure to radiant heat. The construction elements are expected to be exposed to a heat flux not greater than 19 kW/m^2	There is an increased risk of ember attack and burning debris ignited by windborne embers and a likelihood of exposure to an increased level of radiant heat. The construction elements are expected to be exposed to a heat flux not greater than 29 kW/m2.	There is a much increased risk of ember attack and burning debris ignited by windborne embers, a likelihood of exposure to a high level of radiant heat and some likelihood of direct exposure to flames from the fire front. The construction elements are expected to be exposed to a heat flux not greater than 40 kW/m^2.	There is an extremely high risk of ember attack and burning debris ignited by windborne embers, and a likelihood of exposure to an extreme level of radiant heat and direct exposure to flames from the fire front. The construction elements are expected to be exposed to a heat flux greater than 40 kW/m^2.

Images sourced from Planning Practice Note 65 September 2014 Victoria State Government

BAL Descriptions - Australian Standard - Construction of buildings in bushfire-prone areas (AS 3959-2018)

Appendix 6 – Living in a Bushfire Prone Area

A bushfire can ignite fuel and spread in three ways:

- Embers and burning debris carried by wind,
- Heat radiation from fire, and
- Direct flame contact.

Ignition of buildings by burning embers carried by the wind	
Ignition of buildings by heat radiation from the fire	
Ignition of buildings by direct flame contact	

Figure 12: The three main elements of bushfire which threaten life and property. (Ramsay & Rudolf 2003)

Overall the intention of bush fire protection measures should be to prevent flame contact to a structure, reduce radiant heat to below the ignition thresholds for various elements of a building, to minimise the potential for wind driven embers to cause ignition and reduce the effects of smoke on residents and firefighters.

Asset Protection Zones

The most immediate form of defence for an asset is a well-designed Asset Protection Zone (APZ). This zone serves to protect the asset from flames and radiant heat. It improves the chances of the asset surviving the passing of the fire front, providing a safe refuge for occupants during this period and providing a relatively "defendable space" for firefighting activity.

Whilst research shows that ember attack ultimately claims more vacant houses than radiant heat or flames, if a house is occupied, ember attack can be relatively easily dealt with.

The consequence of leaving a house unattended is that there will probably be nobody there to prevent the small fires which initially start, from gradually taking hold of various parts of the structure. This process can occur over a significant period of time, usually simply with embers which fly about and settle, and start smouldering. The hot windy conditions associated with the fire help fan the smouldering clumps of fuel, and bring many small fires to life. These are usually easy fires to extinguish if there is someone there with the equipment and water to put them out. In their absence, often some time, even hours after the initial fire front, the house succumbs to small fires which have grown to larger ones.

Over 90% of houses burnt down in bushfires are attributable to ember attack, and the vast majority of these are unattended at the time. In the 1984 study of the Ash Wednesday Fires around Mt Macedon, the survival rate amongst the 450 houses was 82% where they were occupied and 90% where the occupants were active, able bodied defenders, while only 30% of houses survived without someone to patrol them (Wilson & Ferguson, 1984).

Outer Protection Area (OPA) is effectively the fuel-reduced outer protection area which serves to deprive attacking fire of fuel and reduce the intensity of the fire front. Removal of mid layer fuels prevents flames from transferring from ground fuels to the canopy where destructive potential is greatest. The OPA will also help shield a building from radiant heat, minimize the rate of spread and also intercept burning embers carried by the wind. Understorey fuel levels in the OPA should be kept below 8t/ha.

Inner Protection Area (IPA) refers to the area between the fuel reduced zone and the asset, and its design may serve to considerably reduce risks posed to the asset. Contrary to common belief, this area does not need to be devoid of vegetation, and in fact some trees in this area can serve a valuable role in trapping embers before they impact on the asset. It is important however that:

- There are substantial gaps (or at least 2 - 5m) between the canopies of any trees in this area.
- There are no continuous fuels linked horizontally or vertically. Smooth barked trees provide a lesser fuel ladder to the canopy than rough barked or ribbon barked species.
- Tree canopies do not overhang the roof.
- Surface and near surface fuels are kept to a minimum. This includes lawns (to be kept short) leaf litter and garden mulches.
- Plants with a higher tolerance to fire should be utilised closest to the house and are maintained in a healthy moisture state throughout the fire season.

Asset Protection Zones act as a buffer zone between a dwelling and the hazard. The primary purpose of an Asset Protection Zone is to ensure that a progressive reduction of bushfire fuels occurs between the bushfire hazard and any habitable structures.

Asset Protection Zones should be in place for dwellings adjoining a bushfire hazard area, whether it is a single building, a group of isolated buildings or an urban subdivision.

Various amenities can contribute to the Asset Protection Zone, provided they are not combustible or otherwise add to radiant heat levels. Such amenities include driveways, tennis courts, swimming pools or firetrails, each adding to the distance from the hazard.

Radiant heat barriers such as non-combustible walls or water tanks can help shield assets from radiant heat, thereby complementing the APZ, and in some cases reducing the requirement for distance from the hazard, to a degree.

The required distances for Asset Protection Zones are dependent on the vegetation type (hazard), the slope of the site and whether the hazard is upslope or downslope from the asset. Figure 13 illustrates how APZ's can be achieved on the site.

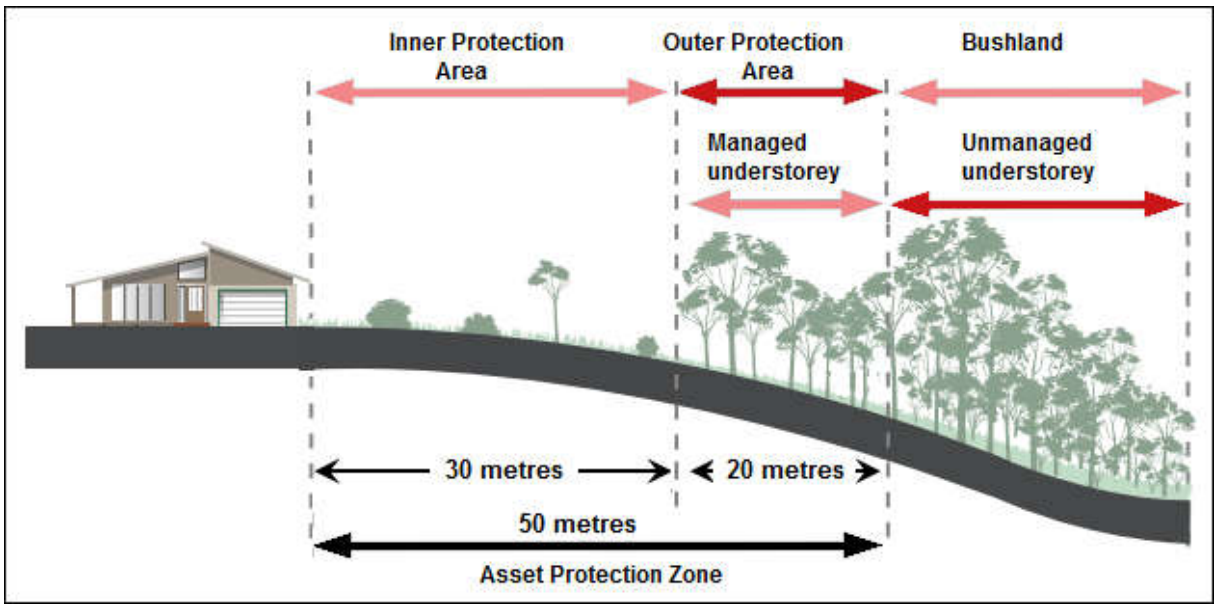


Figure 13: Proposed APZ dimensions. (Adapted from Planning for Bushfire Protection 2017)