QUEENSLAND BUSHFIRE PLANNING

BUSHFIRE HAZARD ASSESSMENT (BHA)

Property

12, 18, 26 Cloverdale Road, Doolandella
Lot 101-102-103 on RP90234

WUCON Pty Ltd
October 2021

Disclaimer

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EXECUTIVE SUMMARY

A Reconfiguration of Lot (3 into 41) has been proposed at 12, 18, 26 Cloverdale Road, Doolandella, Lot 101-102-103 on RP90234. The proposal seeks to establish 41 Lots. The site is captured by the State Planning Policy Natural Hazards and Resilience - *Bushfire Prone Area* mapping and in accordance with the provisions of the Brisbane City CouncilCouncil Bushfire Hazard Overlay Code, a detailed Bushfire Hazard Assessment has been prepared.

Lot 41 (environmental management) to the south will form part of the proposed RoL. No hazardous vegetation will remain within the proposed residential development. This report has been prepared in accordance with the methodology in the CSIRO report: *A new methodology for state-wide mapping of bushfire prone areas in Queensland by J. Leonard, G. Newnham, K. Opie, R. Blanchi. 2014, CSIRO, Australia.*

The original vegetation on and about Lot 26 on RP49475 is identified as Regional Ecosystem (RE) 12.5.3a Corymbia intermedia, Eucalyptus seeana Â± E. racemosa subsp. racemosa, Angophora leiocarpa open woodland on remnant Tertiary surfaces occurring mainly to the south of Brisbane, vegetation hazard Class 9. – 10.4. The vegetation now exiting on Lot 26 on RP49475 is classified as non – remnant woodland. The non – remnant vegetation has been assessed in its mature state for the purposes of establishing the potential bushfire impacts.

The site been identified in the Queensland State Planning Policy (2017) as being within a potential bushfire impact zone. This report includes a number of recommendations regarding bushfire risk mitigation in accordance with AS3959-2018 and Bushfire Planning Scheme Policy, Schedule 6 – Planning Scheme Policies – SC6.4 of the Brisbane City Plan 2014 V19.00/2020. All buildings within the development impacted by the classified vegetation will be required to be constructed to BAL 12.5 as a minimum. All buildings will comply with the construction standards of the AS 3959/2018 – *Construction of buildings in bushfire prone areas*. The BAL rating is expressed in kW/m2 (Heat Flux) as a function of fire line intensity and the distance of a building from the hazardous vegetation, is contained within Appendix 1 of this Report.

Recommendation	
1	Proposed buildings will be constructed to meet the requirements of the Australian Standard AS3959- 2018 - *Construction of buildings in bushfire prone areas.*
2	The vegetation on 12, 18, 26 Cloverdale Road, Doolandella will be managed to achieve requirements and will be maintained in managed low hazard state.
3	Fencing on 12, 18, 26 Cloverdale Road, Doolandella will be constructed of non – combustible materials.
4	Ingress and egress for residents and emergency services will be via internal constructed roads to Cloverdale Road.
5	Reticulated water will be provided to the reconfiguration.
6	A bushfire information kit will be provided to residents to inform them of the bushfire risks and their roles and responsibilities for prevention, preparedness and response to any fire event.

INTRODUCTION

Queensland Bushfire Planning has been engaged on behalf of WUCON Pty Ltd to conduct a site-based Bushfire Hazard Assessment in relation to a Reconfiguration of Lot (3 into 41)development at 12, 18, 26 Cloverdale Road, Doolandella. This Report has been prepared in accordance with the Brisbane City Plan 2014 V19.00/2020. The aim of this report is to demonstrate the level of bushfire hazard, utilising the methodology as required by Bushfire Planning Scheme Policy, Schedule 6 – Planning scheme policies – SC6.4 of the Plan.

The focus of this Report refers to the statutory planning and building requirements as they may apply, pursuant to all relevant policies, standards and regulation, along with end-user consideration. In addition, this report seeks to ensure fire risk and evacuation for adjoining and nearby properties is not inadvertently adversely impacted. This assessment report aims to mitigate the risk to life and property from bushfire threat and the impact of bushfire attack which includes:

- Direct flame contact;
- Ember and firebrand attack;
- Radiant heat; and
- Fire-driven wind.

This assessment does not seek to remove the threat of any bushfire risk, but provide detailed siting, layout, building and/or servicing information to assist the ability of the owner(s) to manage the potential threat of this risk. This assessment report is prepared in accordance with best practice industry standards as applicable in Queensland and pursuant to both State and local government bushfire hazard policies and guidelines.

SITE DESCRIPTION AND DETAILS

Site Address	**12, 18, 26 Cloverdale Road, Doolandella**
Local Government	Brisbane City Council
Real Property Description	Lot 101-102-103 on RP90234
Zoning	Emerging Community
Area of Site (square meters)	23140
Applicant	WUCON Pty Ltd
Current Land Use	Residential
Proposed Land Use	Residential

The site is located at 12, 18, 26 Cloverdale Road, Doolandella and is described as Lot 101-102-103 on RP90234 within Brisbane City Council (Figure 1).

Figure 1

Lot 101-102-103 on RP90234 has an area of 23140 square metres and is aligned north-south with a southerlyaspect (Figure 2).

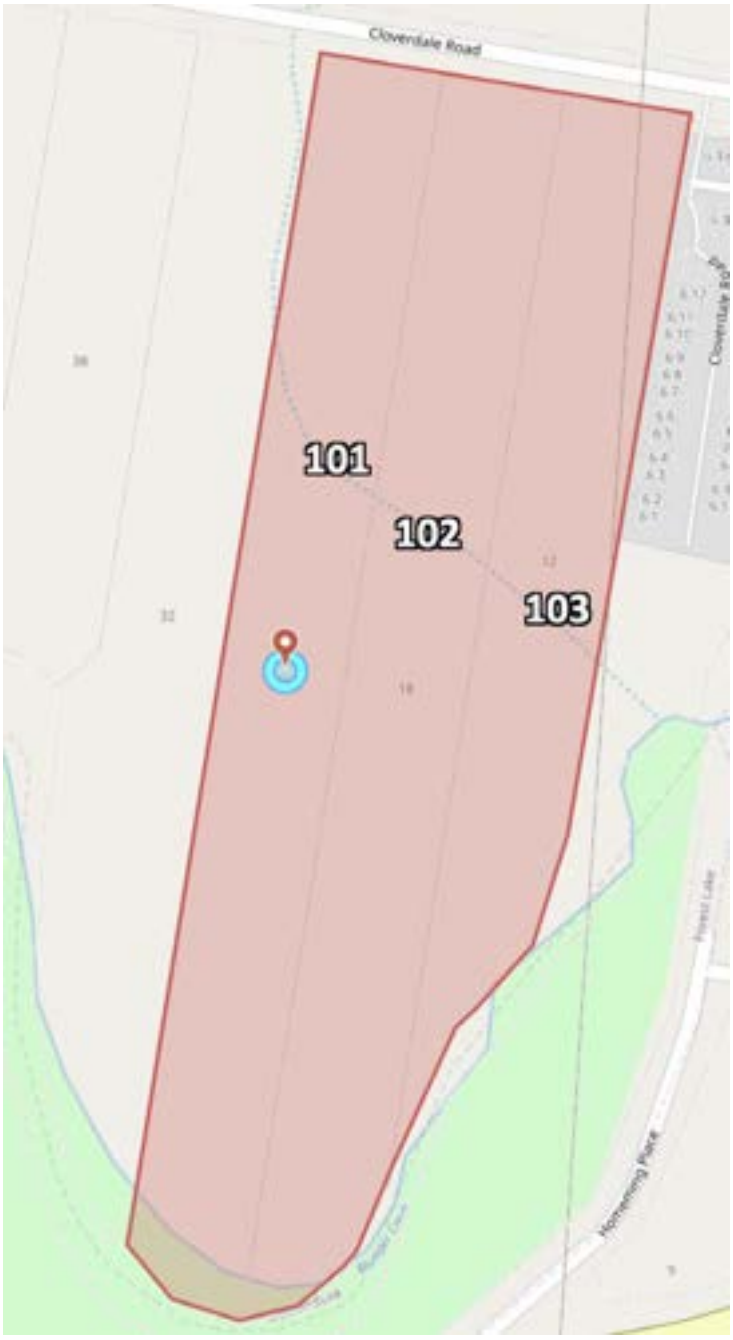

Figure 2

Lot 101-102-103 on RP90234 are currently zoned Emerging Community (Figure 3).

Figure 3

PROPOSED DEVELOPMENT

The proposed development Reconfiguration of Lot (3 into 41) proposes the establishment of 41 Lots. A 12 metre covenant area will be established along the western and southern boundary (Lots 24 to 41). No built structures, garden and planting only (Figure 4).

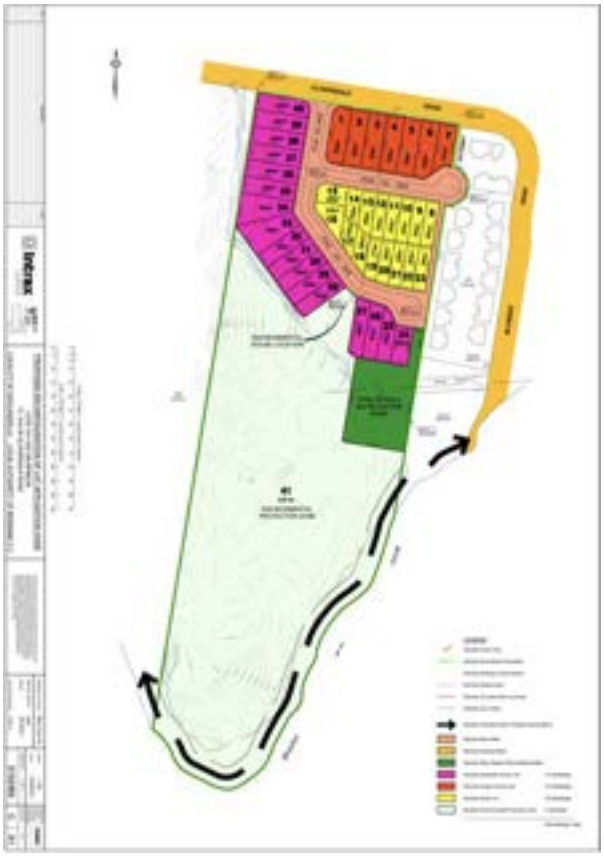

Figure 4

SCOPE OF BUSHFIRE HAZARD ASSESSMENT

12, 18, 26 Cloverdale Road, Doolandella, Lot 101-102-103 on RP90234 is captured by the Brisbane City *Bushfire Hazard Overlay Ma*p and in accordance with the provisions of the Brisbane City Council Bushfire Hazard Overlay Code Bushfire Planning Scheme Policy, Schedule 6 – Planning scheme policies – SC6.4 of the Plan, a detailed Bushfire Hazard Assessment has been prepared.

UNDERSTANDING BUSHFIRE HAZARD

Bushfires are an intrinsic part of Australia's environment. Natural ecosystems have evolved with fire and the landscape, along with its biological diversity, has been shaped by both historic and recent fires. Many of Australia's native plants are fire prone and very combustible, while numerous species depend on fire to regenerate. Indigenous Australians have long used fire as a land management tool and it continues to be used to clear land for agricultural purposes and to protect properties from intense, uncontrolled fires. Historically, bushfires have caused loss of life and significant damage to property. While naturally occurring bushfires cannot be averted, their consequences can be minimised by implementing mitigation strategies and reducing the potential impact to areas which are most vulnerable.

Bushfire Attack

Bushfire attack refers to the various methods in which bushfire may impact upon life and property and principally encompass:

- Direct flame contact;
- Ember and firebrand attack;
- Radiant heat; and
- Fire-driven wind (Figure 5).

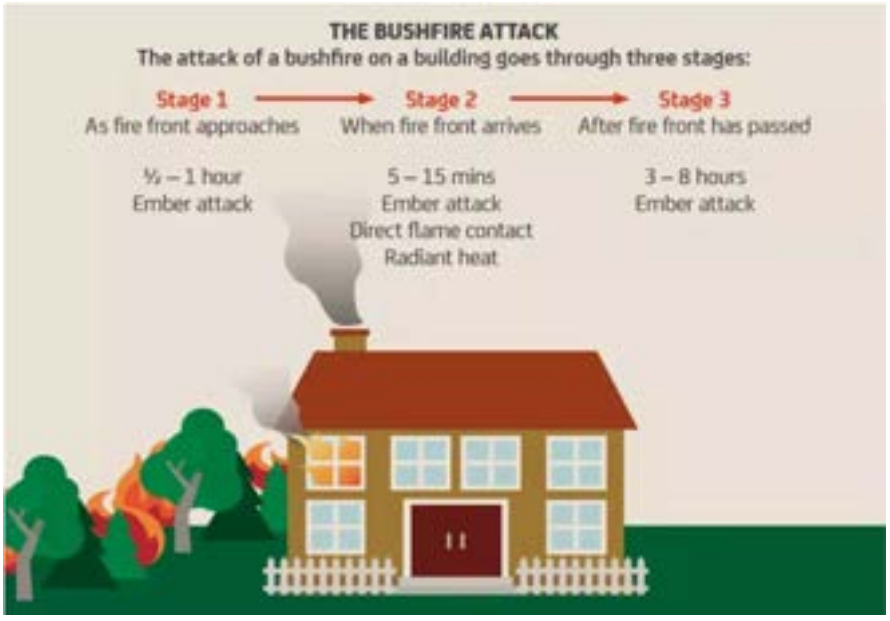

Figure 5

Direct Flame Contact

Direct flame attack refers to flame contact from the main fire front, the flame that engulfs burning vegetation is the same flame that contacts the building. It is estimated that only 10 to 20 per cent of buildings lost to bushfire occur as a direct result of flame attack.

Ember and Firebrand Attack

CSIRO research has shown that ember attack is the cause of up to 80% of house loss in Australia. The convective forces of bushfire raise burning embers into the atmosphere on prevailing winds and deposit them to the ground ahead of the fire front. Typically, ember attack occurs approximately 30 minutes prior to the arrival of the fire front and continues during the impact of the fire front and for several hours afterwards. Building loss via ember attack relates largely to the vulnerabilities and peculiarities of each building, its distance from the classifiable vegetation and whether someone is present to actively defend the building.

Radiant Heat

Measured in kilowatts per m2, radiant heat is the heat energy released from the fire front which radiates to the surrounding environment, deteriorating rapidly over distance. In terms of impacts on buildings, radiant heat can pre-heat materials making them more susceptible to ignition. Radiant heat can also damage building materials such as window glazing, allowing openings into a building through which embers may enter.

Fire Driven Wind

The convective forces of a bushfire typically result in strong fire-driven winds, which can lead to building damage. The typical effects of fire driven wind include conveyance of embers, damage from branches and debris hitting the building, as well as direct damage to vulnerable building components, such as lifting roofs and the breakage of windows.

Vegetation

The Australian bush varies greatly around the country. There are regions of open woodlands, grassland savannas, dense rainforest. Different types of vegetation burn differently. Generally, fuel is classified as being fine (grasses and twigs that are less than 6 millimetres in diameter) or heavy (branches, logs or stumps). Finer fuels burn more easily, increasing the spread of the fire. Another key factor is fuel moisture content, or how dry the fuel is. The drier the fuel, the more easily it will burn. The dryness of the fuel depends on seasonal rainfall and temperatures.

Topography

Fires burn faster uphill. This is due to the radiation and convection a fire creates preheating the fuel. A 10-degree increase in slope results in a doubling of the speed of the fire. Fire will spread up a 10-degree slope two times as fast as it will along flat ground (Figure 6). The aspect of a slope (direction that a sloping piece of land is facing) influences a fire's behaviour. Northern and western aspects receive more direct heat from the sun, drying both the soil and the vegetation more than on southern or eastern slopes. The fuels on northern and western aspects are often drier and less dense than fuels on slopes with a different aspect.

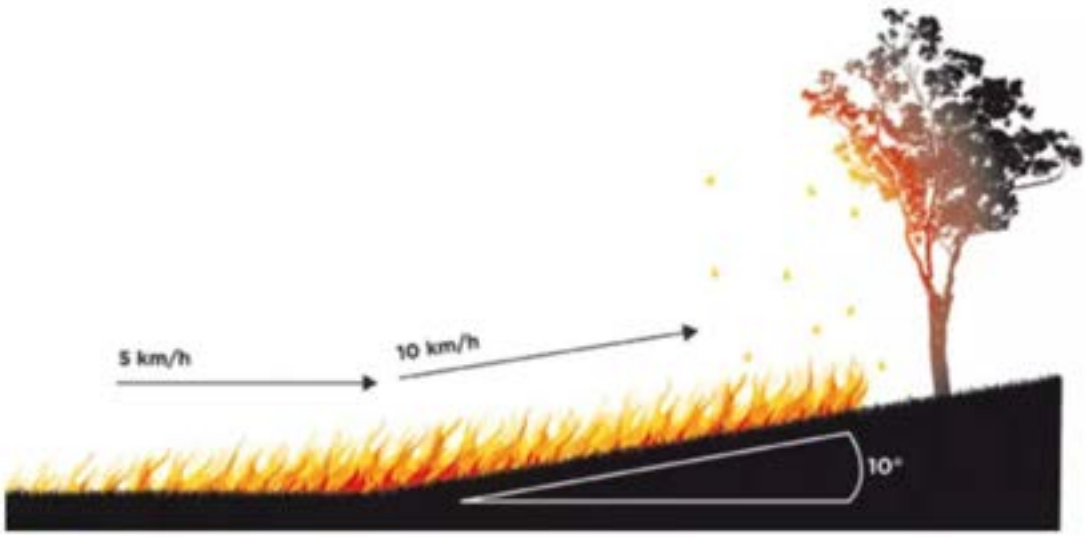

Figure 6

Fire Weather

Fire weather affects bushfire risk levels on a daily, weekly or seasonal basis. The South-east Queensland weather pattern is dominated by a maritime effect. The most common winds are southeast and northeast, the latter being very common during the summer months as an afternoon sea breeze. The most severe fire weather in the area is associated with a northwest wind generated on the back of a high pressure system moving slowly from west to east or from a situation where there is intense low pressure activity in the southeast of Australia extending a trough into southern Queensland (Just, 1978). However, the frequency of these situations in the region is low, being generally of the order of one to two days or fewer per year. The exception can occur in bad fire seasons when fuel conditions are very dry as a result of prolonged dry periods. In Queensland, these bad fire seasons occur about once a decade and are infrequent when compared with the fire situation that prevails frequently in southern Australia.

Whilst an assessment of vegetation types, fuel loads, effective slope and other factors can be readily undertaken, fire weather can fluctuate across days, weeks and seasons and can have a significant impact on the potential for bushfire threat, as well as influence bushfire behaviour and intensity. The Forest Fire Danger Index (FFDI) is a commonly used method to readily advise the community of the likely ability of fire suppression based on fire weather, which is used to inform the Fire Danger Rating (FDR) System (Figure 7). It is important to maintain awareness as to the level of local fire danger during the fire season.

Figure 7

BUSHFIRE HAZARD ASSESSMENT

The State Government Single State Planning Policy (SPP) released in 2017, includes mapping that is an outcome of the new bushfire hazard mapping methodology, developed by the CSIRO and the Queensland Government. The new Bushfire Prone Area mapping was found to have an average reliability of 85%. The new methodology provides a major improvement in bushfire hazard mapping. The new modified approach calculates potential fire line intensity using total fuel loads, landscape slope and fire weather severity. A default 100-metre buffer was determined from analysis of heat and radiation decay curves and research that indicates 80% of housing loss and 80% of life loss occurred within 100 metres of bushland. The subject site is identified on the State Planning Policy Natural Hazards Risk and Resilience mapping and the Brisbane City *Bushfire Hazard Overlay Ma*p as being within a potential bushfire impact zone zone, requiring the bushfire hazard impacts be addressed (Figure 8).

Figure 8

LOCAL GOVERNMENT PROVISIONS

The Brisbane City Plan 2014 V19.00/2020 came into effect in May 2020 and incorporated Bushfire Hazard Overlay Mapping, Overlay Code and Bushfire Hazard Planning Scheme Policy. A Bushfire Hazard Assessment has been conducted as per the Bushfire Planning Scheme Policy, Schedule 6 – Planning Scheme Policies – SC6.4. Assessment has also been conducted against the Overlay Code.

SITE ASSESSMENT

An onsite inspection and assessment were conducted at 12, 18, 26 Cloverdale Road, Doolandella in September 2020 to observe and record the relevant information to determine the bushfire hazard in accordance with the requirements of the Brisbane City Plan 2014 V19.00/2020.

Vegetation

The *Public Safety Business Agency (PSBA) State-wide Bushfire Hazard (Bushfire Prone Area)* mapping identifies the original vegetation on and about this site as Regional Ecosystem (RE) 12.5.3a Corymbia intermedia, Eucalyptus seeana Â± E. racemosa subsp. racemosa, Angophora leiocarpa open woodland on remnant Tertiary surfaces occurring mainly to the south of Brisbane vegetation hazard Class 9.2(Photo 1).

Photo 1

Classified Vegetation

Australian Standard, *Construction of Buildings in Bushfire Prone Areas* (AS 3959–2018*)* requires any classified vegetation within 100 metres of the proposed works must be assessed. The Classified vegetation to be retained on surrounding properties is Regional Ecosystem (RE) 12.5.3a Corymbia intermedia, Eucalyptus seeana Â± E. racemosa subsp. racemosa, Angophora leiocarpa open woodland on remnant Tertiary surfaces occurring mainly to the south of Brisbane. Vegetation hazard Class 9.2 (Photo 2).

Photo 2

Risk Analysis

The potential for an unplanned vegetation fire to occur within retained vegetation is a function of the level of hazard and the opportunity for ignition and fire development. The risk can be quantified in two parts:

- Internal
- External

Internal

The vegetation within the Environmental Protection Zone (Lot 41) will be the primary impact on the proposed development. (Photo 3).

Photo 3

External

Some limited impact may be experienced from Lot 100 on RP90324 adjoining to the west (Photo 4).

Photo 4

ASSESSMENT OF BUSHFIRE HAZARD

Australian Standard - *Construction of Buildings in Bushfire Prone Areas (AS 3959–2018)* requires that any classified vegetation within 100 metres of the proposed works must be assessed. Figure 9 shows the extent of the 100-metre separation zone (BAL Impact Zone) and the managed 12 metre covenant area along the western and southern boundary.

Figure 9

Figure 10 shows the the indicative Bushfire Attack Level (BAL) impacts.

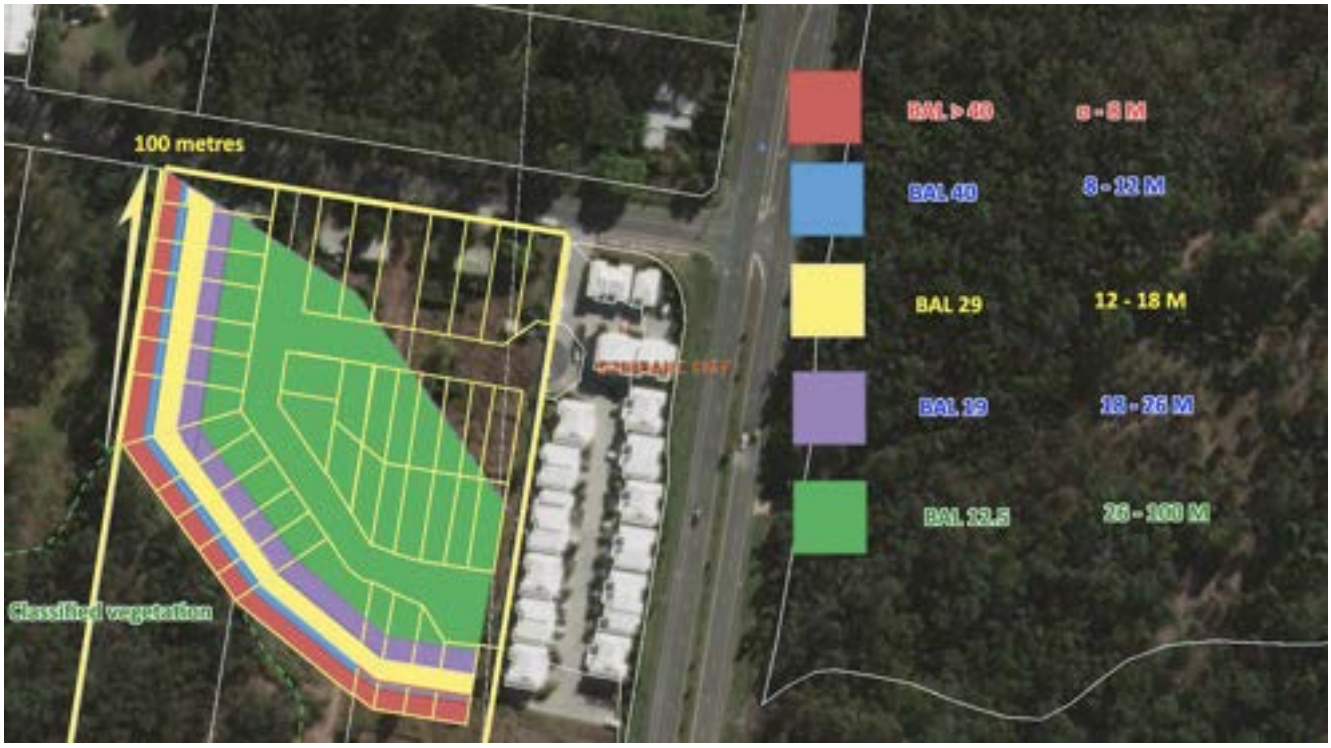

Figure 10

Potential Radiant Heat Flux

The Australian Standard, Construction of Buildings in Bushfire Prone Areas (AS 3959-2018), provides a suitable methodology for identifying assessable vegetation and determining the requirements for the construction of buildings in order to improve their resistance to bushfire attack from burning embers, radiant heat, flame contact and a combination of the three attack forms.

Calculations using AS 3959-2018, in accordance with Appendix B - *Detailed Method for Determining the Bushfire Attack Level (BAL) – Method 2 (Normative)*, indicate the BAL impacts (kW/m2) as a function of separation distance (metres). A building located on the proposed site will be exposed to a radiant heat flux impact Table 1 (kW/M2) as indicated in Appendix 1.

As required by BCC *Technical Assessment Guide "Where continuous fire run is >150m, 10 t/ha is to be added to the 'understory' fuel load (w), to give a 'total fuel load' (W) (i.e. understory fuel load + 10t/ha = overall fuel load) to be used in the calculations to account for canopy fuels."*

Bushfire Protection Measures in Combination

Figure 11 illustrates that effective protection against bushfire can only be achieved by the integration of multiple measures. Removing the bushland (hazard) will remove the risk but this option is neither necessarily possible nor desirable. An acceptable level of protection of life and property can be achieved while still retaining and protecting biodiversity and the natural values of the bushland.

Figure 11

BUSHFIRE RISK MITIGATION

A range of strategies can be applied to mitigate the potential impacts of bushfire:

- Vegetation management
- Access and egress
- Fencing
- Water supply
- Awareness and education
- Building construction.

Vegetation Management

Onsite vegetation and landscape management are important to maintaining low hazard conditions by:

- Limiting fuel accumulation;
- Reducing connectivity of fuels;
- Establishing and maintaining defendable space;
- Appropriate landscaping; and
- The proposed lot size of the development will constrain the development of any additional bushfire hazard.

Clearing

The site of the proposed Lots is cleared of significant vegetation.

Landscaping

Landscaping will be typical small lot urban planting - Low Hazard.

Site Access and Egress

The intent of design requirements for roads is to provide safe egress for residents and access for attending firefighting vehicles. A road system that is compliant with guideline measures provides fire services with easier access to buildings, a safe retreat for firefighters and residents, and can provide a fire control line where hazard reduction and back burning can take place. In determining safe access to a site, consideration is given to the fire brigade vehicles which are required to access public and private roads. Given the size of these vehicles and the poor visibility in which they often operate, roads need to be designed to specific requirements, including road width, grade, cross-fall, weight capacity, passing bays and turnaround areas, all of which may vary depending on whether it is a perimeter, access, cul-de-sac or battle-axe road type. The proposed internal roads will provide safe and effective egress and ingress to Cloverdale Road the north, away from the potential hazard. Internal constructed roads will connect the development to Cloverdale Road providing safe and effective access for residents and Emergency Services.

Fencing

Fencing materials have the capacity to contribute to fire spread and intensity. It is recommended that non-combustible fencing materials should be used where required.

Water Supply

Providing a sufficient water supply provides firefighters and residents with the appropriate levels of water to undertake building defense. There are two options in which a house site can be supplied with a sufficient water supply; from either reticulated water accessible via a hydrant, or a dedicated static water supply. Reticulated water will be supplied to the development meeting the required statutory standards.

Community Awareness

Property owners are responsible for developing their own knowledge and understanding of the level of bushfire risk specific to their respective properties. A household bushfire plan is required and must take account of matters such as where occupants are during the day (at home, work or school), if any occupants require special assistance (i.e. infants, the elderly or the ill), evacuation routes available, evacuation destinations, property maintenance and preparation and arrangements for pets. Planning ahead of any perceived bushfire event is essential.

The warning systems now implemented by Emergency Services and Local Authorities provide timely information and advice to occupants. Understanding what to do in the event of bushfire emergency is critical. Prior knowledge as to the steps to take during the lead up to a fire event, during the passage of bushfire, and what to do immediately after the fire front has passed is critical.

The Rural Fire Service Queensland (RFSQ) 'Bushfire Survival Plan' provides detailed information on how to prepare for the bushfire season and how to take action to survive in the event of bushfire. A copy of this publication can be obtained from the RFSQ website. (https://ruralfire.qld.gov.au/Fire_Safety_and_You/Bushfire_Survival_Plan/)

SUMMARY OF RECOMMENDATIONS

This report includes a number of recommendations regarding bushfire risk mitigation in accordance with AS3959-2018 and Brisbane City Plan 2014 V19.00/2020, Schedule 6. A summary of recommendations made by this report is included below.

RECOMMENDATIONS
1. Proposed buildings will be constructed to meet the requirements of the Australian Standard AS3959- 2018 - *Construction of buildings in bushfire prone areas.*
2. The vegetation on 12, 18, 26 Cloverdale Road, Doolandella will be managed to achieve requirements and will be maintained in managed low hazard state.
3. Fencing on Lot 101-102-103 on RP90234if required, will be constructed of non – combustible materials.
4. Ingress and egress for residents and emergency services will be via internal constructed roads to Cloverdale Road.
5. Reticulated water will be provided to the reconfiguration.
6. A bushfire information kit will be provided to residents to inform them of the bushfire risks and their roles and responsibilities for prevention, preparedness and response to any fire event.

CONCLUSIONS

This report considers the bushfire mitigation measures required for 12, 18, 26 Cloverdale Road, Doolandella, Lot 101-102-103 on RP90234. Based upon detailed analysis of the potential future bushfire hazard associated with the adjoining classified vegetation the compliance with the Australian Standard AS 3959 - 2018 *Construction of buildings in bushfire prone areas,* will provide the necessary safety of residents.

Based on this assessment, a range of recommendations has been derived. In addition, it is significant to note that bushfire remains a natural process which is endemic to the Australian bush and it remains subject to a range of contributing factors which are variable on a daily and hourly basis. It is extremely difficult to predict the behaviour and intensity of a fire event at any given time. Therefore, it remains of the upmost importance that residents within identified bushfire prone areas obtain knowledge and remain aware of their options in the event of a bushfire to ensure the preservation of both life and property.

QUEENSLAND BUSHFIRE PLANNING

Appendices

APPENDIX 1

POTENTIAL BUSHFIRE ATTACK LEVEL

The Australian Standard, Construction of Buildings in Bushfire Prone Areas (AS 3959-2018) provides a suitable methodology for identifying assessable vegetation and determining the requirements for the construction of buildings in order to improve their resistance to bushfire attack from burning embers, radiant heat, flame contact and a combination of the three attack forms.

Method for Determination of BAL

The BAL was determined in accordance with Appendix B of *AS 3959-2018, Detailed Method for Determining the Bushfire Attack Level (BAL) – Method 2 (Normative):*

Step 1: Determine the relevant FDI.

Step 2: Determine the vegetation classification, fuel loads.

Step 3: Determine the effective slope in degrees under the classified vegetation.

Step 4: Determine the slope in degrees of the land between the site and the classified vegetation.

Step 5: Determine the distance of the site from classified vegetation.

Step 6: Calculations.

Determination of BAL

Step 1. Relevant Fire Danger Index

The PSBA bushfire hazard mapping identifies the FFDI as 56.

Step 2. Vegetation Classification - Fuel Loads

The vegetation type was classified as Regional Ecosystem (RE) 12.5.3a Corymbia intermedia, Eucalyptus seeana Â± E. racemosa subsp. racemosa, Angophora leiocarpa open woodland on remnant Tertiary surfaces occurring mainly to the south of Brisbane. Vegetation hazard Class 9.2. Available fuel weights were derived from *PSBA State – Wide Bushfire Hazard (Bushfire Prone Area) Mapping. Fuel weight was determined as: 27.2 tonne/hectare.*

Fuel weights were determined as:

- 11.4 tonne/hectare surface fuels
- 3.5 tonne/hectare near surface fuels
- 1.3 tonne/hectare elevated fuels
- 1.0 tonne/hectare bark fuels

- Total fuel weight = *27.2 tonne/hectare.*

Step 3. Determine the effective slope in degrees under the classified vegetation

The classified vegetation is downslope at 2 degrees, calculated using a Nikon Forestry Pro Range Finder and Inclinometer.

Step 4. Determine the slope in degrees of the land between the site and the classified vegetation

The slope between the site and the classified vegetation is with an average slope of 1 degrees.

Step 5. Determine the distance of the site from classified vegetation

Distance is calculated from the closest edge of the classified vegetation. Classified vegetation under AS 3959-2018 does not include low threat vegetation. The distance to the classified vegetation was calculated using a Nikon Forestry Pro Range Finder and Inclinometer at refer appendix 1 metres.

Step 6. Calculations

Effective slope (°) - 2

Site slope (°) - 1

Distance (m) - refer appendix 1

Vegetation classification — Regional Ecosystem (RE) 12.5.3a Corymbia intermedia, Eucalyptus seeana Â± E. racemosa subsp. racemosa, Angophora leiocarpa open woodland on remnant Tertiary surfaces occurring mainly to the south of Brisbane.

Vegetation hazard Class 9.2

Forest Fire Danger Index (FFDI) – 56

Surface fuel load (t/ha) – 11.4

Overall fuel load (t/ha) – *27.2*

Heat of combustion (kj/kg) – 18 600

Flame temperature (K) – 1 090

Outcomes

Intensity (kW/m2) – 15 789

Radiant heat flux (kW/m2) – Table 1

Bushfire Attack Level (BAL) - Table 1

TABLE 1

Fire Danger Index	56
Vegetation classification	Woodland
Understory fuel load	16.2 t/ha
Total fuel load	26.2 t/ha (+10 t/ha) Where continuous fire run is >150m, 10 t/ha is to be added to the 'understorey' fuel load (w), to give a 'total fuel load' (W) (i.e. understorey fuel load + 10t/ha = overall fuel load) to be used in the calculations to account for canopy fuels.) BCC Technical Assessment Guide - Bushfire reporting.
Effective slope	2
Site slope	1
Flame width	100
Heat of Combustion	18 600 kJ/kg
Flame temperature	1 090 K
Fire Intensity	15 789 kW/m

Minimum distance to < 40 kW/m2	8.0 M (BAL > 40)
Minimum distance to < 29 k/W/m2	12.0 M (BAL 40)
Minimum distance to < 19 k/W/m2	18.0 M (BAL 29)
Minimum distance to < 12.5 k/W/m2	26.0 M (BAL 19)

QUEENSLAND BUSHFIRE PLANNING

APPENDIX 2

CODE COMPLIANCE ASSESSMENT

Bushfire Hazard Overlay Code - (8.2.5.3)

Performance Outcomes	Acceptable Outcomes	Compliance
PO1 Development addresses the bushfire hazard determined by a site-specific bushfire hazard assessment. Note—Bushfire hazard is generally assessed based on the vegetation existing on site, adjacent and nearby to the site at the time of application. However, the level of bushfire hazard posed by any areas subject to revegetation or regrowth vegetation is assessed as if that area had reached its mature state. The Bushfire planning scheme policy provides advice about the sources of information to be consulted to determine areas subject to revegetation or regrowth vegetation and the hazard classification of that vegetation in its mature state.	**AO1** Development is designed and sited in compliance with: (a) a current approved bushfire management plan relevant to the full nature of the uses, which identifies the level of bushfire hazard and the location of hazardous vegetation affecting the development; (b) a building protection zone approved as part of the ROL; or (c) for a lot greater than 2,500m2, a site-specific bushfire hazard assessment prepared in accordance with the Bushfire planning scheme policy which: i. is undertaken by a person suitably qualified and experienced with technical expertise in the field of bushfire hazard identification and mitigation, including protection of biodiversity values; ii. determines the relevant bushfire attack level for that part of the site in which development is proposed;	Bushfire Hazard Assessment prepared by Queensland Bushfire Planning (QBP).

Performance Outcomes	Acceptable Outcomes	Compliance
	iii. identifies the location of hazardous vegetation that poses a bushfire risk to the development; or (b) for a lot greater than 2,500m2, a site-specific bushfire hazard assessment prepared in accordance with the Bushfire planning scheme policy which: i. confirms the level of bushfire hazard for the part of the site which development is proposed; ii. identifies the location of hazardous vegetation that poses a bushfire risk to the development. Note—Where a bushfire hazard assessment determines that the bushfire hazard for the part of the site in which development is proposed is 'low', no further assessment against this code is required. Note—A 'low' bushfire attack level must not be assumed for development in the Potential impact sub-category and in any areas subject to revegetation or regrowth vegetation even where the area is non-vegetated or vegetation is considered low threat in accordance with AS 3959-2009 Construction of buildings in bushfire-prone areas. The Bushfire planning scheme policy provides advice about the sources of information to be consulted to determine areas subject to revegetation or regrowth vegetation and the hazard classification of that vegetation in its mature state. Note—A bushfire management plan is to be prepared having regard to any bushfire hazard assessment undertaken to prepare a neighbourhood plan.	

Performance Outcomes	Acceptable Outcomes	Compliance
PO2 Development is sited, designed and maintained taking account of all relevant factors affecting the bushfire hazard on the site, including site topography, aspect, location and type and structure of vegetation to: (a) minimise the number of buildings and people working, living or visiting a site exposed to bushfire risk; (b) protect life during bushfire; (c) increase the survival of buildings and structures during a bushfire; (d) minimise bushfire risk from build-up of fuels around buildings and structures. Note—A bushfire management plan prepared in accordance with the Bushfire planning scheme policy can assist in demonstrating achievement of this performance outcome.	**AO2.1** Development other than an extension to an existing building is: (a) sited in a building protection zone where approved as part of ROL stage; or (b) sited in compliance with an approved bushfire management plan relevant to the full nature of the use; or (c) if there is no approved building protection zone and no approved bushfire management plan, where on a lot great than 10 hectares, located in the area of lowest risk from bushfire on the site; and (d) if there is no approved building protection zone and no approved bushfire management plan, where on a lot greater than 2,500m2: i. located away from ridgelines in compliance with Figure a; ii.located on land with a gradient less than 15%; i. preferably located on east- to south-facing slopes and avoiding north- to west- facing slopes unless the slope is clear of vegetation and is not located in the High hazard buffer area sub-category or the Medium hazard buffer area sub-category; ii. with setbacks to hazardous vegetation 1.5 times the predominant mature canopy height, or 20m whichever is greater so that vegetation does not overhang a building.	Buildings will be located in areas where BAL impact is < BAL 29. Complies Complies - Slope < 15% Southerly facing slope. Buildings will not be exposed to BAL greater than 29 kW/M2

Performance Outcomes	Acceptable Outcomes	Compliance
	AO2.2 Development other than an extension to an existing building is sited within a building protection zone extending a minimum of 20m from the outermost projection of the main building or any habitable structure or to the maximum extent possible on sites less than 2500m2 where a building protection zone would extend into neighbouring properties; and (a) clusters buildings and structures in the building protection zone; designs the inner 10m of the building protection zone to maintain a very low fuel state in the first 10m, and a fuel-reduced state to the extent of the building protection zone, in compliance with Figure b and Figure c.	
PO3 Development utilises fencing that: **(a)** does not contribute to spread of bushfire **(b)** in an urban area or in proximity to accommodation uses; contributes to reducing bushfire hazard to the building; **(c)** facilitates the safe movement of fauna	**AO3.1** Development for a fence within 20m of any building used for accommodation comprises non-combustible or fire-retardant materials. **AO3.2** Development for a fence: **(a)** incorporates gaps and spacing to allow the safe movement of fauna; or is designed to enable fauna to climb the fence.	Where required fences will be constructed of non - combustible materials

Performance Outcomes	Acceptable Outcomes	Compliance
PO4 Development ensures that the location, siting, and design of development and associated driveways and access routes: **(a)** avoid potential for entrapment during a bushfire; **(b)** facilitate safe and efficient emergency services to access and egress the site during a bushfire; (c) enables safe evacuation of the site during a bushfire for site occupants. Note—A bushfire management plan prepared in accordance with the Bushfire planning scheme policy can assist in demonstrating compliance with this performance outcome.	**AO4** Development ensures that: the length of driveways or access (a) routes does not exceed 70m between the most distant part of any occupied building and the nearest part of the public road; or (b) where the length of the driveway or access route exceeds 70m: i. the driveway or private access route design meets the requirements of emergency vehicles in compliance with Table 8.2.5.3.C; ii. the driveway or access route provides all weather access for two-wheel-drive vehicles; where relying on a private access route or driveway longer than 200m to reach a public road, a safe alternative access and egress route is provided.	Not Applicable
PO5 Development has adequate road access to the site for emergency vehicles and safe evacuation in a bushfire.	**AO5** Development has frontage to a constructed, all-weather public road capable of carrying emergency service vehicles.	Internal constructed roads meet council standards. The proposed road layout is located on moderate grade topography (< 5%)through areas of low bushfire hazard. The road configuration is considered acceptable, and no specific road design recommendations are required. Given the general low hazard of the adjoining vegetation, the proposed cul-de-sac road design is supported in this instance. Ingress and egress for residents and Emergency Services will be visa the internal roads to Cloverdale Road.

Performance Outcomes	Acceptable Outcomes	Compliance
PO6 Development makes adequate provision for fire-fighting requirements, including water supply	**AO6** Development ensures that: (a) a reliable reticulated water supply and water pressure is available for fire-fighting requirements with water supply and pressure, which is in compliance with the standards specified by the relevant utilities provider; or: (b) where sufficient reticulated water supply is not available for: (i) residential lots, there is a minimum water supply available and retained for fire-fighting purposes in compliance with Table 8.2.5.3.B, which may be in the form of a separate tank or a reserve section as part of a main water supply tank; or development other than for residential lots involving new premises or an existing premise with a gross floor area greater than 50m2, on-site water storage is provided which is appropriate to the use, according to the standards specified by the relevant emergency services agency and is not less than 5,000 litres.	Reticulated water will be provided to site to comply with statutory requirements. Fire hydrants are designed and installed in accordance with: *1. Fire Hydrant and Vehicle Access Guidelines for residential, commercial and industrial lots, Queensland Fire and Emergency Services, 2015, unless otherwise specified by the relevant water entity; and* *2. The Road Planning and Design Manual2nd edition, Department of Transport and* *Main Roads, 2013.*
PO7 Development ensures that the water supply provided for fire-fighting is safely located and freely accessible for fire-fighting purposes at all times.	**AO7** Development, for which sufficient reticulated water supply is not available, provides: (a) a water supply outlet located away from any potential fire hazards, such as gas bottles; (b) a hardstand area of 11m by 3.5m for fire-fighting vehicles within 2m of the water supply outlet;	Not Applicable

Performance Outcomes	Acceptable Outcomes	Compliance
	(c) tanks on the bushfire hazard side of the buildings with adequate shielding for the protection of fire fighters; (d) pumps which are shielded from bushfire hazard; (e) an outlet pipe which is 50mm in diameter and fitted with a 50mm male camlock (standard rural fire brigade fitting); (f) that any underground tank for fire-fighting purposes has an access hole of 200mm to allow a tanker to refill direct from the tank; (g) that any above-ground water tank is made of concrete or metal and its stand is protected from bushfire hazard; (h) that all above-ground water pipes external to the building are metal, including and up to any taps. Note—Plastic tanks are not to be used.	

Additional performance outcomes and acceptable outcomes for all development in the Biodiversity areas overlay if on a site larger than 2,500m2.

Performance Outcomes	Acceptable Outcomes	Compliance
PO8 Development through the siting, design, and construction of buildings, access routes and fire maintenance trails, and ongoing site management: **(a)** provides effective separation from sources of bushfire risk; **(a)** responds to the bushfire risk in that location; **(b)** maintains the safety and protection of people and property over time; (c) maximises the protection of vegetation in areas of high biodiversity value. Note—A bushfire management plan prepared in accordance with the Bushfire planning scheme policy can assist in demonstrating compliance with this performance outcome that ensures: · ongoing site management, such as the bushfire risk to buildings, does not increase beyond the standard to which they have been designed and constructed; appropriate design and maintenance of the site, and access routes and driveways.	**AO8** Development locates building protection zones as shown on Figure b and Figure c, driveways and access routes and any fire maintenance trails: (a) outside of the Biodiversity areas overlay; or (b) within the existing disturbed, degraded or cleared areas, using natural fire breaks to avoid vegetation clearing and to avoid or otherwise minimise fragmentation or incursions into a habitat area, fauna movement corridor or remnant vegetation.	The proposed development has been located, designed and shall be operated in accordance with this Bushfire Hazard Assessment.

Section B—If for assessable development other than ROL

Performance Outcomes	Acceptable Outcomes	Compliance
PO9 Development ensures that the following uses avoid being located in the bushfire overlay area and otherwise support safe and efficient evacuation and emergency services access to the site during a bushfire: **(a)** the introduction of significant worker or resident populations in a bushfire hazard area; **(a)** the location of vulnerable uses; **(b)** the introduction or expansion of difficult to evacuate uses; **(c)** the congregation of large numbers of people in a bushfire hazard area including assembly uses. Note—This includes consideration of appropriate alternative shelter for vulnerable uses, management of health and wellbeing requirements during evacuation, safe site operation, and access and egress arrangements in bushfire events. Note—A bushfire management plan prepared in accordance with the Bushfire planning scheme policy can assist in demonstrating compliance with this performance outcome.	**AO9.1** Development: (a) does not increase the number of people living, working on or visiting the site by more than 10%; or (b) increasing the number of people living, working on or visiting the site, or vulnerable, difficult to evacuate or assembly uses by more than 10%, implements the recommendations of an approved bushfire management plan, which identifies measures that address the identified bushfire risk relevant to the development. **AO9.2** Development provides alternative access routes that meet the road design requirements of items 1–7 in Table 8.2.5.3.C, for the following: (a) an extension to existing premises which increases the number of people living, working on or visiting the site by more than 10%; the introduction of vulnerable, difficult to evacuate or assembly uses.	This Bushfire Hazard Assessment and Management Plan has been prepared to maintain the safety of people and property from the adverse impacts of bushfire.

Additional performance outcomes and acceptable outcomes if involving storage or handling on site of hazardous chemicals in quantities that would be equivalent to or exceed the threshold quantities set out in Table 8.2.5.3.D.

Performance Outcomes	Acceptable Outcomes	Compliance
PO10 Development does not cause: **(a)** unacceptable risk to people, property and the environment due to the impact of bushfire on the storage or handling on site of hazardous chemicals; excessive danger or difficulty to emergency services for emergency response or evacuation.	**AO10** Development for storage or handling of hazardous chemicals: (a) is not located within the bushfire overlay; or (b) complies with an approved bushfire management plan prepared in accordance with the Bushfire planning scheme policy which identifies measures that ensure the development: (c) mitigates the bushfire risk relevant to the development; (d) does not pose an unacceptable risk to people, public health and safety or risk environmental harm; (e) does not present significant difficulties to emergency services for emergency response or evacuation. Note—Bushfire management plans and site-based risk assessments are prepared in accordance with the Bushfire planning scheme policy. Guidance on the preparation of a hazard and risk analysis is provided in the Industrial hazard and risk assessment planning scheme policy. Note—Any risk mitigation measures, including construction of underground tanks or fire-protected above-ground tanks or package stores, are in compliance with AS 1940-2004 The storage and handling of flammable and combustible liquids.	Not Applicable

Additional performance outcomes and acceptable outcomes for essential community infrastructure.

Performance Outcomes	Acceptable Outcomes	Compliance
PO11 Development for essential community infrastructure is located, designed and sited to: **(a)** protect the safety of people during a bushfire; **(b)** not create or increase the exposure of people to an unacceptable risk from a bushfire; **(c)** minimise the risk to vulnerable populations from a bushfire; **(d)** mitigate the impacts on the community and environment from the effects of a bushfire on the development.	**AO11** Development for essential community infrastructure: (a) is ancillary to and not relied on for the provision of the essential service during a bushfire; or (b) implements an approved bushfire management plan prepared in accordance with the Bushfire planning scheme policy which identifies measures that: i. ensure the development allows for safe and efficient emergency access and site evacuation during a bushfire; do not pose an unacceptable risk to people on a premises during a bushfire; ii. ensure the development is not at risk of failure during a bushfire which results in health or safety risks or adverse environmental impacts; enable people and property to be defended safely and effectively from a bushfire.	Not Applicable
PO12 Development for essential community infrastructure is able to function effectively during and immediately after bushfire events.	**AO12** Development for essential community infrastructure: (a) is ancillary to and not relied upon for the provision of the essential service during a bushfire; or	

Performance Outcomes	Acceptable Outcomes	Compliance
	(b) containing elements vital to the function of the essential service during a bushfire is not located in the Bushfire overlay area; or (c) implements an approved bushfire management plan prepared in accordance with the Bushfire planning scheme policy which identifies measures that ensure that: i. essential community infrastructure is able to function during bushfire events; ii. access necessary to maintain safety or function of the development is not compromised by a bushfire; iii. mitigation measures are not unduly reliant on human activation to respond to a bushfire; the safe storage of valuable records or items of cultural or historical significance, including storage of public records under the Public Records Act 2002, is able to be maintained during a bushfire event.	

Additional performance outcomes and acceptable outcomes if for landscaping or a park landscape plan is a requirement for development.

Performance Outcomes	Acceptable Outcomes	Compliance
PO13 Development provides landscaping that does not create an unacceptable risk to people or property and provides for ongoing management of risk to the development and people from a bushfire.	**AO13** Development is in compliance with a landscaping plan which: (a) is prepared in compliance with an approved bushfire management plan; (b) preserves the requirements of any building protection zone; (c) does not increase the exposure of a habitable building not located in a building protection zone to a bushfire hazard. Note—The requirements of a building protection zone are shown in Figure b and Figure c.	Landscaping will consist of Small Lot urban type Low Hazard vegetation.
PO14 Development for a park is designed so that the park: **(a)** is practical to maintain and requires minimal resources to be restored to its designed function and condition after a bushfire; **(b)** provides for safe and efficient site evacuation and efficient emergency services access avoiding potential for entrapment during a bushfire; **(c)** does not place unacceptable bushfire risk on an adjoining or nearby site, people and assets; **(d)** provides efficient access for fire fighting;	**AO14** Development provides a park landscape plan that complies with a bushfire management plan prepared in accordance with the Bushfire planning scheme policy.	Not Applicable

Performance Outcomes	Acceptable Outcomes	Compliance
(e) provides ongoing protection from bushfire for major park assets and buildings. Note—A bushfire management plan prepared in accordance with the Bushfire planning scheme policy can assist in demonstrating compliance with this performance outcome.		

Section C—If for ROL

Note—The following performance outcomes and acceptable outcomes only apply to the following categories of ROL:

- **Rural: ROL in a non-urban setting.**
- **Urban (7 or more lots): ROL in an urban or emerging community area which creates 7 or more lots, or involves the opening of a new road.**

Urban (fewer than 7 lots): ROL in urban areas which creates 6 or fewer new lots and does not involve the opening of a new road.

Performance Outcomes	Acceptable Outcomes	Compliance
PO15 Development addresses the bushfire hazard determined by a site-specific bushfire hazard assessment. Note—Bushfire hazard is generally assessed based on the vegetation existing on site, adjacent and nearby to the site at the time of application. However, the level of bushfire hazard posed by any areas subject to revegetation or regrowth vegetation is assessed as if that area had reached its mature state. The Bushfire planning scheme policy provides advice about the sources of information to be consulted to determine areas subject to revegetation or regrowth vegetation and the hazard classification of that vegetation in its mature state.	**AO15** Development addresses the level of bushfire hazard identified in a site-specific bushfire hazard assessment undertaken in accordance with the Bushfire planning scheme policy, which confirms the level of bushfire hazard for the part of the site in which development is proposed, and the location of hazardous vegetation posing a risk to the development in a bushfire. Note—Where a bushfire hazard assessment determines that the bushfire hazard for the part of the site in which development is proposed is 'low', no further assessment against this code is required. Note—A 'low' bushfire attack level must not be assumed for development in the Potential impact sub-category and in any areas subject to revegetation or regrowth vegetation even where the area is non-vegetated or vegetation is considered low threat in accordance with AS 3959-2009 Construction of buildings in bushfire-prone areas.	Bushfire Hazard Assessment confirms location and impact of retained vegetation.

Performance Outcomes	Acceptable Outcomes	Compliance
PO16 Development does not materially increase the number of premises exposed to unacceptable risk during bushfire events.	AO16 Development does not materially increase the number of people living or working in the Bushfire overlay area.	Not within bushfire overlay area
PO17 Development is designed to: **(a)** mitigate the risk of bushfire hazard to each lot; **(b)** limit the spread of bushfire within the reconfiguration; **(c)** achieve and maintain sufficient separation distance between development and hazardous vegetation to minimise bushfire hazard to future buildings during a bushfire; **(d)** allow for emergency services access; **(e)** locate buildings within a building protection zone Note—Lot size, location, configuration, dimensions and building measures are balanced to achieve an acceptable level of risk to future occupants. Note—A bushfire management plan prepared in accordance with the Bushfire planning scheme policy can assist in demonstrating compliance with this performance outcome.	**AO17.1** Development requires that lot number, size, shape and layout allow for the siting of future buildings within the lowest hazard locations on the site being located: (a) within a building protection zone in accordance with Figure b and Figure c; (b) to achieve separation distances between the development and hazardous vegetation of at least 1.5 times the predominant mature tree canopy height; (c) away from ridgelines and hilltop sites in compliance with Figure a; (d) on land with a gradient less than 15%; (e) preferably on east to south facing slopes and avoiding north to west facing slopes unless the slope is clear of vegetation and is not located in the High hazard buffers sub-category or Medium hazard sub-category.	Buildings sited in areas where BAL impacts are < 29 kW/m2 Slope l< 15% South facing slope

Performance Outcomes	Acceptable Outcomes	Compliance
	AO17.2 Development ensures that the bushfire attack level of the nominated development footprint plan does not exceed: (a) in a rural category, bushfire attack level 19 (calculated in accordance with AS 3959-2009 Construction of buildings in bushfire-prone areas); in an urban category, bushfire attack level 12.5 (calculated in accordance with AS 3959-2009 Construction of buildings in bushfire-prone areas).	
PO18 Development promotes safe site access, avoids creating a potential entrapment situation and supports accessibility and manoeuvring for fire fighting during bushfires. Note—This includes easements and boundary realignments. Note—A bushfire management plan prepared in accordance with the Bushfire planning scheme policy can assist in demonstrating compliance with this performance outcome.	**AO18** Development provides a lot layout which: provides direct road access and egress for new lots to public roads, rather than the creation of easements; (a) in an urban category, avoids creating a new lot less than or equal to 2,500m2 which directly adjoins hazardous vegetation; (b) in an urban category, locates a future building protection zone to avoid a driveway of longer than 70m from the road frontage to a habitable building; in a rural category, provides for an alternative access where the private access roads or driveways are longer than 200m to reach a public road.	

Performance Outcomes	Acceptable Outcomes	Compliance
PO19 Development ensures that the road layout and design provides: (a) emergency services access to sites and manoeuvring within the subdivision; (b) safe and efficient movement of residents, workers and visitors out of the subdivision and away from an approaching bushfire; (c) safe and efficient movement of emergency services into the subdivision; (d) alternative egress routes considering the most likely bushfire scenarios; (e) ongoing availability and maintenance of access and egress routes for the purposes of evacuation and emergency services access. Note—A bushfire management plan prepared in accordance with the Bushfire planning scheme policy can assist in demonstrating compliance with this performance outcome.	**AO19.1** Development involving a new road or fire maintenance trail is designed and constructed in compliance with: (a) Table 8.2.5.3.C; or (b) an approved bushfire management plan. AO19.2 Development has a road layout and design which: (a) provides for alternative access routes to the subdivision, by public roads that meet the requirements in Table 8.2.5.3.C and are able to access the arterial road network; (b) excludes cul-de-sacs, except where a perimeter road with a cleared width of 20m isolates the development from hazardous vegetation; (c) does not include dead-end roads or if a dead-end road is unavoidable, it is a maximum of 60m long, or 200m where located in the Environmental management zone, Conservation zone, Rural zone, or Rural residential zone, and an alternative emergency evacuation and egress route away from the most likely source of bushfire risk is provided for lots where multiple road access or exit points are not possible; (d) links road within the subdivision to, or provides for future links to roads in adjacent subdivisions.	

Performance Outcomes	Acceptable Outcomes	Compliance
PO20 Development involving new premises provides adequate infrastructure to support fire fighting.	**AO20.1** Development involving new premises ensures that: (a) lots have access to reticulated water supply and water pressure available for fire-fighting requirements with water supply and pressure that accord with the standards specified by the relevant utilities provider; or (b) where reticulated water supply is not available for: a. residential lots, there is a minimum water supply available and retained for fire-fighting purposes in compliance with Table 8.2.5.3.B, which may be in the form of a separate tank or a reserve section as part of a main water supply tank; development other than residential lots, onsite a. water storage is provided which is appropriate to the proposed future use according to the standards specified by the relevant emergency services agency and is not less than 5,000 litres. **AO20.2** Development provides fire hydrants in accordance with Central SEQ Distributor-Retailer Authority, Queensland Urban Utilities (incorporating Water Services Association of Australia) standards.	

Section D—If for accepted development subject to compliance with identified requirements (acceptable outcomes only) or assessable development where in Potential impact sub-category.

Performance Outcomes	Acceptable Outcomes	Compliance
PO21 Development is designed and constructed to reduce vulnerability to bushfire attack and addresses the bushfire hazard by a bushfire hazard assessment that: (a) utilises a fit for purpose methodology prepared in accordance with the State Planning Policy – State interest technical manual – Natural hazards, risk and resilience; (b) includes the following measures and inputs:i. potential fuel loads for vegetation in its mature state from areas subject to revegetation or regrowth vegetation; ii. a published vegetation hazard classification dataset from the relevant fire authority; iii. forest fire danger index of 54 (AEP 5%); iv. potential flame length; v. potential rate of fire spread. (b) is undertaken by a person suitably qualified and experienced with technical expertise in the field of bushfire hazard identification and mitigation, including protection of biodiversity values; (c) determines the relevant bushfire attack level for that part of the site in which development is proposed.	**A021.1** Development is designed and sited in compliance with an approved bushfire management plan relevant to the full nature of the uses, which identifies the level of future bushfire hazard and the location of future hazardous vegetation affecting the development. **AO21.2** Development other than ROL determines bushfire attack level using: (a) potential fuel loads for vegetation in its mature state from areas subject to revegetation or regrowth vegetation; (a) a published vegetation hazard classification dataset from the Relevant fire authority; (b) forest fire danger index of 54 (AEP 5%).	

QUEENSLAND BUSHFIRE PLANNING

Appendix 3

About the Report Author

This Report was prepared by Bushfire Specialist Bernard Trembath. Bernard has extensive practical knowledge and experience in bushfire planning and management and an intimate working knowledge of Queensland vegetation and climate, particularly in relation to fire prediction and behaviour.

Prior to establishing Queensland Bushfire Planning in 2014, Bernard was the Regional Manager Rural Operations, Brisbane Region, for Queensland Fire and Emergency Services (QFES). As Regional Manager, Bernard was responsible for bushfire mitigation within the Brisbane Region, working with Local Governments and many other organisations to help reduce the impacts of bushfires. Bernard was also the QFES bushfire planning specialist, providing specialist bushfire planning and management advice on behalf of QFES.
Since 2014, Bernard has provided his specialist bushfire planning knowledge to advise and assist a large number of individuals, companies and government agencies. His happy clients include: