REDLAND CITY COUNCIL
Approved Plan

01/08/2022

Application No. RAL21/0140

See Decision Notice for conditions of approval

Bushfire Hazard Assessment and Management Plan

39 Brendan Way, Victoria Point

Prepared for Brendan Way Project Pty Ltd

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Document Records - Quality

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FILED AS	PR22084_BHAMP_39 Brendan Way, Victoria Point

Revision	Date	Prepared by (name/title)	Reviewed by (name/ title)	Approved by (name/title)
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Table of Contents

1 Introduction 1
1.1 Background 1
1.2 Site Description 1
1.3 Scope of Work 2
1.4 Qualifications and Experience 2
2 Bushfire Regulatory Framework 4
2.1 State Planning Policy (SPP) 4
2.2 Redland City Plan 2018 5
2.3 AS3959:2018 Construction of Buildings in Bushfire Prone Areas 6
3 Bushfire Hazard Assessment 7
3.1 Hazard Assessment 7
3.1.1 Step 1 – Fire Weather Severity 8
3.1.2 Step 2 - Vegetation Hazard Classes and Potential Fuel Loads 8
3.1.2.1 Vegetation Hazard Classes 8
3.1.2.2 Potential Fuel Loads 12
3.1.3 Step 3 - Site and Effective Slope 15
3.1.4 Step 4 - Remodelling of Bushfire Hazard 15
3.2 Radiant Heat Exposure and Bushfire Attack Levels 17
4 Bushfire Management Plan 20
4.1 Agencies / Persons Responsible 20
4.2 Owner / Occupier Responsibilities 20
4.3 Reporting and Auditing 20
4.4 Siting of Buildings 21
4.5 Access Roads 21
4.6 Electricity Supply 21
4.7 Water Supply 21
4.8 Climate Change and Fire Weather – Projections for 2050 21
4.9 Emergency Response Procedures 21
5 Assessment Against the Bushfire Hazard Overlay Code 22
6 Conclusion 34
7 References 35

Appendix 1 Flamesol Method 2 Minimum Distance Calculations 36

FIGURES

Figure 1: Site location (Source: Queensland Globe) 1
Figure 2: Proposed development layout 3
Figure 3: Excerpt from DSDMIP SPP IMS – Bushfire prone area (Source: DSDMIP SPP IMS) 5
Figure 4: Excerpt from Redland City Plan 2018 – Bushfire hazard overlay (Source: Red-e-map, 2022) 6
Figure 5: State-mapped Vegetation hazard Classes (VHCs) 13
Figure 6: Ground-truthed Vegetation Hazard Classes (VHCs) 14
Figure 7: Bushfire Attack Levels 19

TABLES

Table 1: Potential fuel loads for classified vegetation within 150 m assessment area. 12
Table 2: Slope angles for assessable fire runs to the development site 15
Table 3: Potential fireline intensity ranges and bushfire hazard classes 16
Table 4: Potential fireline intensity for classified VHCs within 150 m assessment area 17
Table 5: Determination of Bushfire Attack Level (BAL) minimum separation distances for bushfire-prone vegetation. 18
Table 6: Assessment against the Redland City Plan 2018 (version 4) Bushfire Hazard Overlay Code. 23

PLATES

Plate 1: Vegetation Community 4 11
Plate 2: Vegetation Community 3 11
Plate 3: Vegetation Community 5 11
Plate 4: Vegetation Community 2 11

1 Introduction

1.1 Background

Green Tape Solutions was engaged by Brendan Way Project Pty Ltd to prepare a bushfire hazard assessment and management plan (BHAMP) for a site located at 39 Brendan Way, Victoria Point (formally described as Lot 2 on SP292896) (the 'site').

This report has been prepared for a development application for a Reconfiguration of lot (ROL) – for a 38-lot subdivision. The site currently supports existing dwelling houses and sheds which will be removed as part of the development except for the display unit which will be retained. Access shall be provided via internal streets from adjacent developments.

The proposed development layout is provided in **Figure 2**. No indicative building envelopes have been provided.

1.2 Site Description

The site comprises multiple lots equating to a total area of approximately 20,710 m^2 (2.07 ha) within the Redland City Council (RCC) local government area **(Figure 1)**. The site is bounded by low-density residential development to the north and east and large rural lots to the west and south.

The property has been historically cleared of native vegetation aside from paddock trees and minor landscaping. The landscape to the west of the site consists of remnant vegetation. A more detailed description of the vegetation communities within and surrounding the site is provided in **Section 3.1.2**

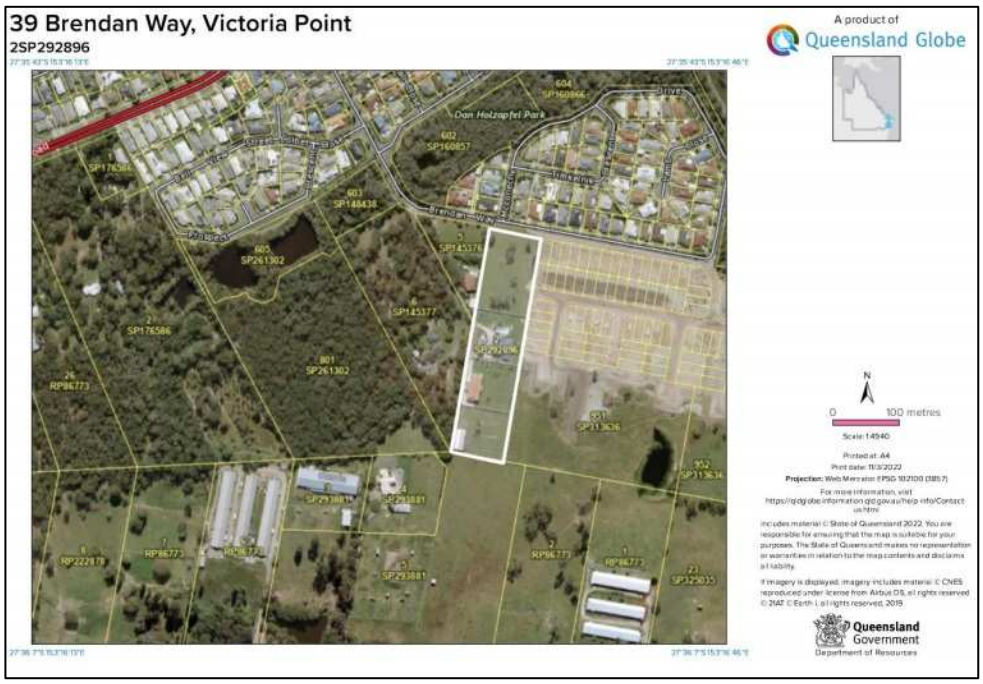


Figure 1: Site location (Source: Queensland Globe)

1.3 Scope of Work

The purpose of this BHAMP is to provide a site-specific assessment of bushfire hazard and to assess compliance of the proposed development with the outcomes sought by the Redland City Plan 2018 (version 6), in particular the assessment benchmarks outlined in the Bushfire hazard overlay code. The BHAMP also provides a plan for bushfire risk management including building construction requirements, asset protection zones, fuel management, access requirements and emergency responses measures. Recommendations are consistent with legislative requirements to reduce the risk to life and property.

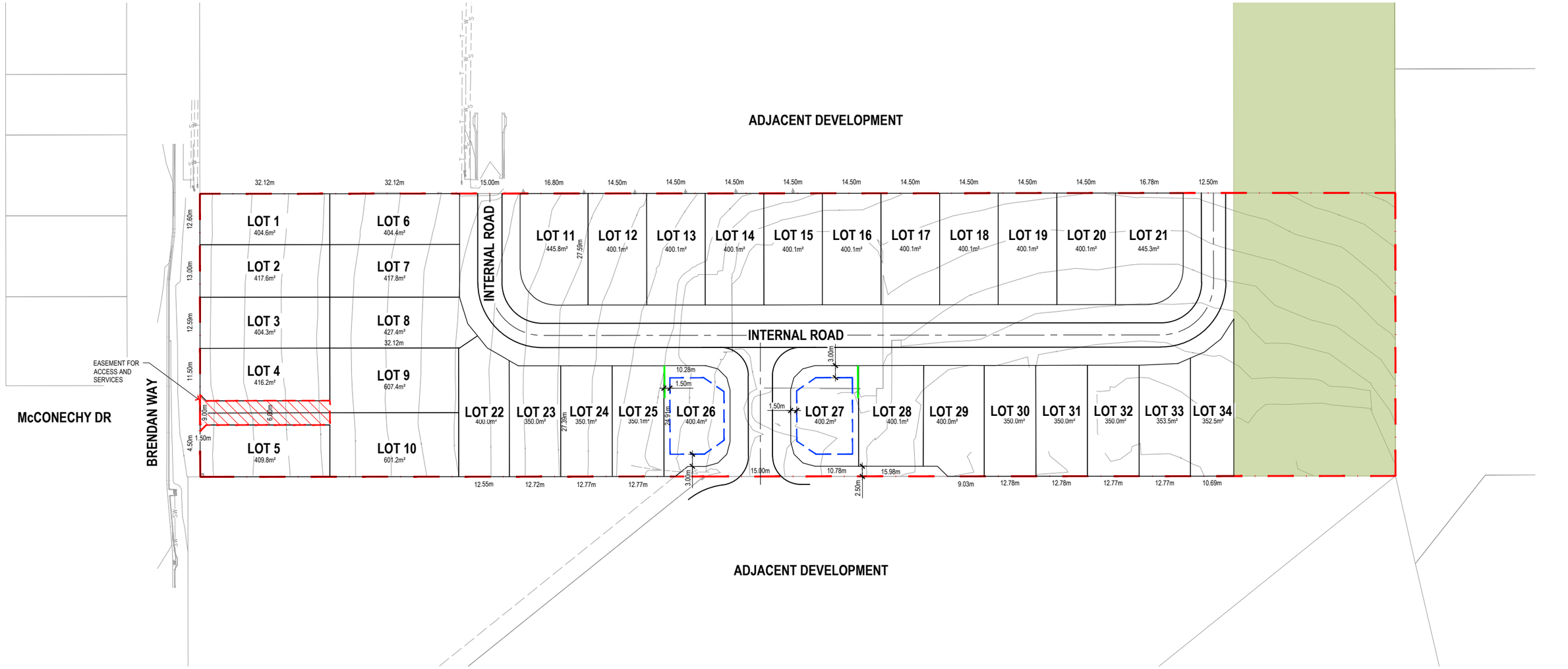
1.4 Qualifications and Experience

The Queensland Fire and Emergency Service (QFES) *Bushfire Resilient Communities Technical Reference Guide for the State Planning Policy State Interest 'Natural Hazards, Risk and resilience – Bushfire' October 2019* ('BRC Technical Guide') (QFES, 2019) provides guidance on suitably qualified people for assessments identified in the BRC Technical Guide. This guidance includes the following recommendations:

- Fine-scale assessment of vegetation communities in accordance with the 'Vegetation Hazard Class' assessment methodology be undertaken by a suitably qualified person with experience in botanical survey methods; and
- Applicant-initiated assessments and reports be prepared or peer-reviewed by suitably qualified and experienced people with degree (AQF Level 8) qualifications in environmental science, environmental management (or an equivalent discipline), demonstrated experienced in botanical surveys and spatial analysis methods, including use of geographic information systems (GIS) software); demonstrated experience in the assessment of bushfire hazard and risks or technical qualifications in environmental science, environmental management (or and equivalent discipline) and demonstrated relevant industry experience in the assessment of bushfire hazard and risks for a minimum of five years.

The author of this report meets QFES' criteria as follows:

- possesses knowledge and experience in applying relevant legislation, plans, policies, standards and guidelines relating to bushfire hazard and fire ecology relating to Queensland requirements and South-east Queensland conditions;
- has knowledge, experience in botanical survey methods and GIS analysis and at least 5 years' experience in undertaking bushfire hazard assessment and preparing bushfire management plans, including experience in undertaking fine-scale assessment of vegetation communities and application of the QFEs Bushfire Hazard Assessment methodology outlined in the BRC Technical Guide; and
- has qualifications and experience in the field of ecology, environmental management or similar to assess and protect site-based and strategic biodiversity values relating to South-east Queensland.



LEGEND

- LOT L2 SP292896 BOUNDARY (20,705m2)
- ECOLOGICAL CORRIDOR
- BLE
- OPTIONAL BUILT TO BOUNDARY WALL FOR GARAGE

NOTES

THIS PLAN WAS PREPARED AS A CONCEPTUAL LAYOUT ONLY. THE INFORMATION ON THIS PLAN IS NOT SUITABLE FOR ANY OTHER PURPOSE.

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SCALE 1:500 AT ORIGINAL SIZE

PRELIMINARY

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BRENDAN WAY PROJECT PTY LTD
39 BRENDAN WAY, VICTORIA POINT
L2 SP292896
SUBDIVISION LAYOUT PLAN

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2 Bushfire Regulatory Framework

Given that bushfire hazard can cause harm to people and social wellbeing, damage to property and impacts to the economy and environment, the management of bushfire hazard in Queensland is considered an integral component of land use planning and development decisions.

There are three regulatory mechanisms/instruments applicable to the site that regulate development to avoid and mitigate potential impacts associated with bushfire hazard:

- State Planning Policy (SPP) and associated guidelines (Department of Infrastructure, Local Govenment and Planning (DILGP), July 2017);
- Redland City Plan 2018 (version 6) (Redland City Council, 2022); and
- Australian Standard AS3959:2018 – Construction of Buildings in Bushfire-prone Areas (Standards Australia, 2018).

2.1 State Planning Policy (SPP)

The SPP identifies the Queensland Government's policies about matters of state interest in land use planning and development (Department of Infrastructure, Local Govenment and Planning (DILGP), July 2017). The SPP is a broad and comprehensive statutory planning instrument. It sits above regional plans, standard planning scheme provisions and local government planning schemes within the hierarchy of planning instruments outlined in the *Planning Act 2016*.

The SPP is supported by the following guidance material:

- The SPP state interest guidance material - Natural hazards, risk and resilience - Bushfire ('SPP guidance') (DSDMIP, 2019), which provides further context to the SPP and explains how the SPP policies can be applied, in particular for local government when making or amending local planning instruments. The SPP guidance is also intended to assist assessment managers and practitioners in applying the SPP assessment benchmarks when state interests have not been integrated into the local planning scheme (where applicable).
- The 'Bushfire Resilient Communities – Technical Reference Guide for the State Planning Policy State Interest - Natural Hazards, Risk and Resilience – Bushfire ('BRC Technical Guide') (QFES, 2019), which provides technical guidance and policy positions of the Queensland Fire and Emergency Services (QFES). It includes procedures for undertaking a bushfire hazard assessment (BHA), calculating asset protection zones and preparing a Bushfire Management Plan.

The SPP assessment benchmarks outlined in Part E of the SPP and Section 4.0 of the SPP guidance apply to development to the extent that the development is assessable against a planning scheme and only to the extent that the planning scheme is inconsistent with the SPP.

The SPP is also supported by a state-wide map of bushfire prone areas (BPA) (also referred to as 'bushfire hazard area') that was developed based on the CSIRO modelling of potential fireline intensity using the methodology described by Leonard *et al.* (2014). The BPA mapping identifies areas of Very

High (>40,000 kW/m), High (20,000 – 40, 000 kW/m) and Medium (4,000 – 20,000 kW/m) Potential Bushfire Intensity. The Potential Impact Buffer includes all land within 100 metres of any area with a potential fireline intensity greater than 4,000 kW/m (i.e. medium, high or very high bushfire hazard/potential bushfire intensity). This mapping triggers assessment against the State Planning Policy Assessment Benchmarks.

An excerpt from the SPP Assessment Benchmark – BPA mapping published on the SPP Interactive Mapping System (IMS) is provided in **Figure 3**. The site is mapped as containing areas of Potential Impact Buffer. In addition, land adjoining to the west is mapped as containing areas of Medium Potential Bushfire Intensity and Potential Impact Buffer.

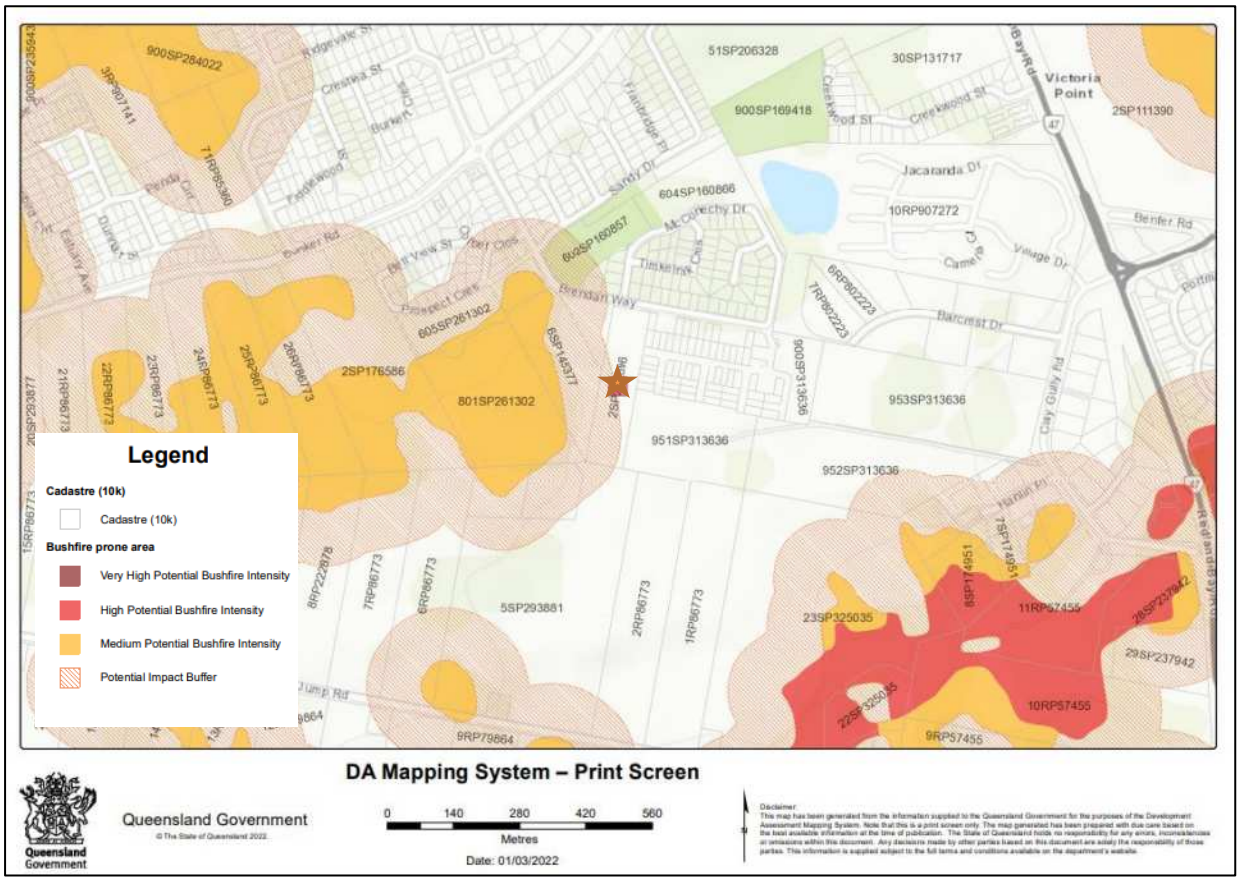

Figure 3: Excerpt from DSDMIP SPP IMS – Bushfire prone area (Source: DSDMIP SPP IMS)

2.2 Redland City Plan 2018

The site is located within the Redland City local government area and is subject to the provisions of the Redland City Plan 2018 (version 4). The planning scheme's Bushfire Hazard Overlay maps the site as being affected by the Potential Impact Buffer. An excerpt from the overlay map identifying the mapped bushfire hazard areas in relation to the proposed development site is shown in **Figure 4.**

Redland City Council's Bushfire hazard overlay mapping designates bushfire prone areas for the purposes of Section 12 of the *Building Regulation 2006*. The provisions of the Building Code of Australia (BCA) or Queensland Development Code (QDC) are applicable to any building assessment work in a designated bushfire prone area.

The Redland City Plan 2018 Bushfire overlay code notes that a site-based assessment may be used to ground-truth the extent of hazardous vegetation and the extent and nature of the bushfire hazard area (bushfire prone area), but does not specify acceptable methodologies.

The site-specific bushfire assessment provided in this plan has been undertaken in accordance with the BRC Technical Guide (Queensland Fire and Emergency Services (QFES), 2019).

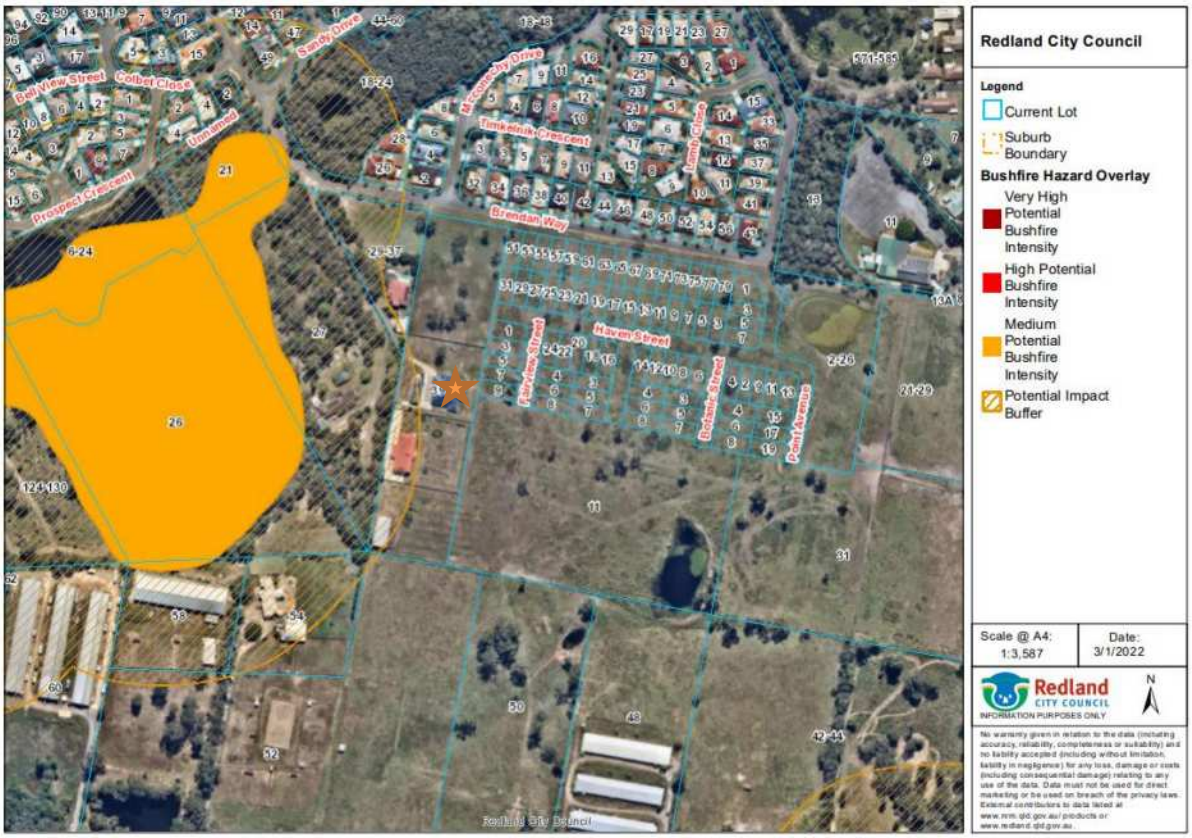

Figure 4: Excerpt from Redland City Plan 2018 – Bushfire hazard overlay (Source: Red-e-map, 2022)

2.3 AS3959:2018 Construction of Buildings in Bushfire Prone Areas

The Australian Standard *AS3959:2018 Construction of Buildings in Bushfire-Prone Areas* (Standards Australia, 2009) specifies the requirements for the construction of buildings in bushfire-prone areas in order to improve their resistance to bushfire attack. AS3959:2018 applies to those areas where a regulated map (i.e. a planning scheme overlay map) identifies an area as a bushfire prone area (or similar), requiring calculation of Bushfire Attack Level (BAL) in accordance with a methodology outlined in the standard.

AS3959:2018 thus prescribes the construction details for buildings depending on the calculated BAL. The detailed requirements relating to construction methods and materials are typically dealt with as part of building design and enabled via private certification in accordance with the Building Code of Australia.

3 Bushfire Hazard Assessment

A site-specific bushfire hazard assessment (BHA) for the site has been undertaken in accordance with the methodology outlined in the 'Bushfire Resilient Communities' (BRC) technical document (QFES, 2019). The methodology underpinning the BHA process consists of three stages:

1. An assessment to verify the reliability of existing BPA mapping over the site and land surrounding the site (the 'assessment area').
2. A hazard assessment involving field investigations to ground-truth the accuracy of the BPA mapping for the site, where required. The hazard assessment area must include the development area and all land within 150 metres of the development footprint.
3. Using the results of the site-specific assessment, the asset protection zone width needed to achieve the requisite radiant heat flux levels is calculated using the SPP Bushfire asset protection zone (APZ) width calculator or Method 2 of AS3959:2018.

Where the precision and/or accuracy of BPA mapping or map input datasets are insufficient (e.g. where there has been changes in land use and vegetation cover within the assessment area), the process enables applicants to create a local-scale BPA map based on the results of the site investigation and to apply modified input variables that reflect changes that have occurred over time. The BHA process adapts the method used to generate the state-wide BPA mapping, described in Leonard *et. al.* (2014) with further refinement to allow for the downgrade and/or filtering of small patches and narrow corridors where needed in accordance with contemporary mapping rules outlined in the BRC technical guide and Leonard and Opie (2017).

Where effective fuel loads have been reduced based on patch size and isolation in accordance with the patch and corridor filtering rules outlined in 4.2.6 of the QFES BRC technical guide, reduced effective fuel loads can be used as inputs into a Method 2 Bushfire Attack Level (BAL) assessment.

The assessment has been based on vegetation existing within, adjacent and nearby to the site including any areas subject to revegetation or regrowth, which have been assessed as if these areas have reached their mature state.

3.1 Hazard Assessment

The following steps have been undertaken to assess spatial factors that contribute to potential bushfire intensity for the site and surrounding land:

- **Step 1: Identification of Fire weather severity**

  Identification of all Forest Fire Danger Index (FFDI) values estimated at a 1:20 year (5%) Annual Exceedance Probability (AEP) using the Bushfire Hazard Area – Bushfire Prone Area – Inputs dataset from the Queensland Government data portal.

- **Step 2: Identification of Vegetation Hazard Classes**

  Assessment of vegetation communities to identify the relevant vegetation hazard classes (VHCs) using a combination of remnant and pre-clearing regional ecosystem maps, high-resolution aerial imagery and a ground-truthed assessment of vegetation present within the site and within the required 150 m assessment area.

- **Step 3: Slope assessment**

  Identification of site slope and effective slope, and determination of whether proposed buildings are upslope or downslope of hazardous vegetation using Bushfire Hazard Area – Bushfire Prone Area – Inputs dataset from the Queensland Government data portal and 1 m LiDAR-derived contour data.

- **Step 4: Remodeling of bushfire hazard and calculation of potential fireline intensity** - Where a change to the distribution, extent and/or classification of VHCs within the assessment area is proposed, remodeling of bushfire hazard is undertaken to determine how the changes to VHCs and associated fuel loads affect potential fireline intensity. Potential fireline intensity is to be calculated in accordance with the method outlined in Leonard *et. al.* (2014).

VHCs and associated potential fuel loads are in accordance with Leonard *et al.* (2017), as provided in the BRC Technical Guide and SPP Bushfire APZ width calculator published by the Queensland Fire and Emergency Services (QFES).

Relevant spatial datasets published by the QFES were accessed via the Queensland Spatial Catalogue (QSpatial) and the Catalyst Fire Management System (Queensland Fire and Emergency Services, 2020).

3.1.1 Step 1 – Fire Weather Severity

South-east Queensland has a subtropical climate with warm humid summers and mild winters and is subject to influence from monsoonal climate systems and easterly troughs. Seasonality is not pronounced; however, the 'wet' season generally occurs during the December – April period. The fire danger season usually occurs from spring to mid-summer (August/September to December) with the greatest danger after a dry winter and spring and when deep, low-pressure systems near Tasmania bring strong, hot and dry westerly winds to the coastal districts (Bureau of Meteorology, 2021). Severe bushfire weather is characterised by days with high temperatures over 35 degrees, low relative humidity and winds from the north to north-west.

Forest Fire Danger Index (FFDI) provides an index of fire weather severity. The relevant FFDI for the site was derived from the Fire Weather Severity (Forest Fire Danger Index) raster provided as part of the Bushfire Hazard Area – Bushfire Prone Area – Inputs dataset.

The FFDI for the site and surrounding land is 53.

3.1.2 Step 2 - Vegetation Hazard Classes and Potential Fuel Loads

3.1.2.1 Vegetation Hazard Classes

Different types of vegetation communities determine the rate at which dry fuel accumulates. Some vegetation communities protect fuel from drying out in all but extreme bushfire seasons and can then be susceptible to very destructive bushfires. Alternatively, vegetation communities may expose fuels to drying and therefore be frequently available for burning. Frequent bushfires can result in the development of bushfire-tolerant grassy woodlands or grasslands and less destructive bushfire behaviour.

Vegetation Hazard Classes (VHCs) provided within the Bushfire Prone Area – Vegetation hazard class – South east Queensland spatial dataset were reviewed for the site and surrounding land **(Figure 5).**

The following VHCs are mapped within the required 150 m assessment area:

- 22.1 - Melaleuca open forests on seasonally inundated lowland coastal swamps
- 22.2 – Melaleuca open woodland on seasonally inundated lowland coastal swamps
- 39.2 – Low to moderate tree cover in built-up areas;
- 40.4 – Continuous low grass or tree cover; and
- 42.6 – Nil to very low vegetation cover.

The reliability of State-mapped VHCs was assessed through:

- review of Vegetation Management remnant and pre-clearing regional ecosystem (RE) mapping published by the Department of Resources (DoR);
- review of the ecological assessment previously undertaken for the broader development (Byrns Larnder LA&E, 2016); and
- review of Arborist report undertaken on site (Independent Arboricultural Services, June 2021)
- an assessment of existing vegetation undertaken by Green Tape Solutions in March 2022 as part of site investigations to support preparation of a BHAMP.

DoR's remnant RE mapping shows that small patches of remnant vegetation are mapped within the assessment area. These patches are identified as containing the following REs (Figure 6):

- RE 12.9-10.4 - *Eucalyptus racemosa subsp. racemosa* woodland on sedimentary rocks.

The site assessment determined that vegetation within the 150 m assessment area consists of a mosaic of native vegetation, landscape vegetation (including streetscape vegetation) and areas of maintained grassland/lawn with low tree cover that is not accurately represented by State Mapping (**Figure 5** and **Figure 6**). The site has been predominantly cleared. Vegetation adjacent to and within proximity of the development consists of three (3) site-verified communities.

- **Vegetation community 1 – Managed turf and landscape vegetation**

  Much of the vegetation within the 150m assessment area consists primarily of exotic grassland and minor landscape vegetation. All of the landscape vegetation associated with the existing dwellings on the development site shall be removed as part of the development. Similar areas of landscape vegetation are associated with residential premises on adjoining lots.

  Landscape vegetation within the 150 m assessment area has been classified as **VHC 40.4** – Continuous low grass or tree cover.

- **Vegetation community 2 –Urban development areas**

  Most of the land to the east and north of the subject site is developed with low density residential lots, consisting mainly of roads, footpaths and dwellings/structures. Some of this development

is very recent. There is very little grass or vegetation within these areas. These areas can be classified as **VHC 42.6 -** Nil to very low vegetation cover.

- **Vegetation community 3 – Broad-leaved paperbark (*Melaleuca quinquenervia*) open forest**

  Remnant native vegetation associated with lots to the west of the site consists of broad-leaved paperbark (*Melaleuca quinquenervia*) open forest. The ground-truthed vegetation assessment determined that this vegetation is composed of mostly broad-leaved paperbark (*Melaleuca quinquenervia*) with few other canopy species present. Associated canopy species within this community include black she-oak (*Allocasuarina littoralis*), brush box (*Lophostemon confertus*), swamp box (*Lophostemon suaveolens*), Queensland blue gum (*Eucalyptus tereticornis)*, pink bloodwood (*Corymbia intermedia)* and grey ironbark (*Eucalyptus siderophloia)*.

  This community is mapped as Category B (remnant) vegetation containing the regional ecosystem (RE) 12.3.6. – *Melaleuca quinquenervia* +/- *Eucalyptus tereticornis*, *Lophostemon suaveolens*, *Corymbia intermedia* open forest on coastal alluvial plains. The ground-truthed vegetation assessment determined that this vegetation meets the criteria for remnant status and is generally consistent with RE 12.3.6.

  This vegetation forms part of a larger patch of *Melaleuca quinquenervia* open forest which extends from the watercourse located to the north-west of the site to remnant vegetation on the adjoining lot to the south of the site.

  The broad-leaved paperbark open forest community within the site and on adjoining land has been classified as **VHC 22.1** – Melaleuca open forest on seasonally inundated lowland coastal swamps.

- **Vegetation community 4 – Broad-leaved paperbark (*Melaleuca quinquenervia*) woodland**

  Remnant native vegetation associated with lots to the west of the site consists of broad-leaved paperbark (*Melaleuca quinquenervia*) woodland. The ground-truthed vegetation assessment determined that this vegetation is composed of mostly broad-leaved paperbark (*Melaleuca quinquenervia*) with few other canopy species present. Associated canopy species within this community include black she-oak (*Allocasuarina littoralis*), brush box (*Lophostemon confertus*), swamp box (*Lophostemon suaveolens*), Queensland blue gum (*Eucalyptus tereticornis)*, pink bloodwood (*Corymbia intermedia)* and grey ironbark (*Eucalyptus siderophloia)*.

  This community is mapped as Category B (remnant) vegetation containing the regional ecosystem (RE) 12.3.6. – *Melaleuca quinquenervia* +/- *Eucalyptus tereticornis*, *Lophostemon suaveolens*, *Corymbia intermedia* open forest on coastal alluvial plains. The ground-truthed vegetation assessment determined that this vegetation meets the criteria for remnant status and is generally consistent with RE 12.3.6.

  This vegetation forms part of a larger patch of *Melaleuca quinquenervia* open forest which extends far to the west of the site. The broad-leaved paperbark woodland community on adjoining land has been classified as **VHC 22.2** – Melaleuca woodland on seasonally inundated lowland coastal swamps.

- **Vegetation community 5 – managed wooded area**

  Vegetation on the adjacent property to the west consists of retained canopy trees (similar to community 1) with a managed understory. This vegetation is not considered to be hazardous due to the ongoing management and lack of ground fuel.

  This community has been classified as **VHC 39.2** – Low to moderate grass or tree cover in built-up areas.

Figure 6 depicts the location of ground-truthed VHCs within the 150 m assessment area.

Plate 1: Vegetation Community4

Plate 2: Vegetation Community 3

Plate 3: Vegetation Community 5

Plate 4: Vegetation Community 2

3.1.2.2 Potential Fuel Loads

Fuel loads have been allocated for each VHC to represent the long-unburnt condition that would be typically exhibited 10 years after fire. In accordance with the values provided in Figure 14 of the BRC Technical Guide (QFES, 2019a), the potential fuel load values for ground-truthed VHCs within and surrounding the site are as provided in **(Table 1).**

Table 1: Potential fuel loads for classified vegetation within 150 m assessment area.

VHC		Total potential surface fuel load (t/ha)	Total overall potential fuel load (t/ha)	Prone type [1]		Fuel continuity[2]	
22.1	Melaleuca open forests on seasonally inundated lowland coastal swamp	23.4	28.4	1	Bushfire-prone – Forest or shrub fires	1	Continuous
22.2	Melaleuca woodland on seasonally inundated lowland coastal swamp	17.7	19.7	1	Bushfire-prone – Forest or shrub fires	1	Continuous
39.2	Low to moderate tree cover in built-up areas	5.0	8.0	3	Non-bushfire prone – Low hazard	2	Discontinuous
40.4	Continuous low grass or tree cover	4.5	5.0	2	Non-bushfire prone – Grassland fire	1	Continuous
42.6	Nil to very low vegetation cover	2.0	2.0	3	Non-bushfire prone – Low hazard	2	Discontinuous

[1] Prone type taken from the VHC_Data sheet of the SPP Bushfire APZ Calculator.
[2] Fuel continuity type taken from Figure 14 of the QFES BRC Technical Guide.

Figure 5: State mapped VHC

Project: PR22084_39 Brendan Way
Victoria Point

State mapped VHC

- 22.1 Melaleuca open woodland on seasonally inundated lowland coastal swamps.
- 39.2 Low to moderate tree cover in built-up areas
- 41.4 Low grass or tree cover in built-up areas

Notes:
- Survey Data by Green Tape Solutions
-Site Infrastructure and Impact Areas from Client
-Base map Copyright (c) Esri and its data suppliers.
-Regional Ecosystems and QTopo Base map Copyright (c) State of Queensland (DNRME)

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Version: 1

0 25 50 m

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Figure 6: Ground truthed VHC

Project: PR22084_39 Brendan Way
Victoria Point

Property Boundary
Cadastral
Hazard vegetation

Ground Truthed VHC
22.1
22.2
39.2
40.4
42.6

Notes:
-Survey Data by Green Tape Solutions
-Site Infrastructure and Impact Areas from Client
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Version: 2

0 20 40 60 m

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3.1.3 Step 3 - Site and Effective Slope

Two slope input parameters are required for the estimation of fire behaviour and separation. Site slope is the slope of the ground between the edge of the proposed development (or site boundary) and the edge of hazardous vegetation. Effective slope refers to the slope of the land beneath hazardous vegetation. Effective slope is the more important parameter as it has a direct influence on the potential rate of fire spread, fuel consumption and thus, potential fireline intensity. For each vegetation hazard class, the effective slope is determined by assessing the slope beneath classified vegetation (in degrees) which most influences bushfire behaviour and the relative position of land supporting hazardous vegetation in relation to the development i.e. upslope or downslope. Where there is more than one slope beneath classified vegetation, each slope should be individually assessed, and the worst-case scenario adopted.

The topography of the site and surrounding land is largely flat aside from the waterway to the north-west. Slope measurements have calculated using LiDAR-derived 1 metre metre contour data published by the Department of Resources and verified by site measurement. The hazardous vegetation is all to the west and north-west of the site. This vegetation is predominantly downslope from the subject site. The site itself slopes gently upwards from the north-western corner to the south eastern corner. **Table 2** below shows the slopes used for the Method 2 BAL calculations.

Table 2: Slope angles for assessable fire runs to the development site

Slope location in relation to development area	Max effective slope (degrees)	Max site slope (degrees)	Fire run in relation to development	Fire run scale
West (VHC 22.1)	3.38	0	Downslope	Fully developed fire
West (VHC 22.2)	3.73	2.15	Downslope	Fully developed fire
North-west (VHC 22.1 in waterway)	1.07	2	Downslope	Fully developed fire

3.1.4 Step 4 - Remodelling of Bushfire Hazard

Given that site-specific assessment determined that VHCs provided within the BPA – VHC – South east Queensland spatial dataset do not entirely reflect the ground-truthed VHCs, remodelling of bushfire hazard has undertaken to determine how the changes to VHCs and associated fuel loads affect potential fireline intensity. Potential fireline intensity has been calculated in accordance with the method outlined in Leonard *et. al.* (2014).

Potential fireline intensity (PFI) is a standard measure of the rate at which an advancing fire would consume fuel energy per unit time per unit length of the fire front. This metric combines potential fuel load (PFL), maximum landscape slope (slope) and fire weather severity (FFDI) to provide a potential fireline intensity metric. The potential fireline intensity (PFI) is represented as the following equation:

PFI = 0.62 PFL^2 x FFDI exp (0.069 x slope)

Where: PFI = Potential fire line intensity (kW/m), PFL = Potential fuel load (tonnes / ha), FFDI = Potential severe fire weather (FFDI) and Slope = Max slope

Table 3 shows the potential fireline intensity ranges (in kilowatts per metre) and the corresponding potential bushfire hazard classes.

Table 3: Potential fireline intensity ranges and bushfire hazard classes

Potential Fireline Intensity (kW/m)	Potential Bushfire Hazard Class
40,000+ kW/m	Very high
20,000 – 40,000 kW/m	High
4,000–20,000 kW/m	Medium
0 – 4,000 kW/m	Low/Not bushfire prone

Section 4.2.6 of the QFES BRC technical guide provides a series of mapping rules ('patch and corridor filtering') for modifying the potential fireline intensity of bushfire-prone areas to reflect the likelihood of lower potential fireline intensities in smaller vegetation patches and narrow vegetated corridors. These rules are applied as follows:

1. Remove patches of continuous fuel < 1 ha in area that are surrounded by either no fuel or non-continuous fuel and are further than 100 m from any other continuous fuel greater than 2 ha;
2. Downgrade the effective fuel load of small patches of continuous fuel measuring a. 1 – 2 ha – downgrade by 66% and b. 2 – 3 ha – downgrade by 50 % if the patch is surrounded by either non-continuous fuel or a low-hazard vegetation or land-use type and if the patch is further than 100m from any other continuous -fuel vegetation patch greater than 2 ha; and
3. Remove narrow corridors and area of continuous fuel that are less than 50 m in width.

Based on the results of the site-specific assessment, vegetation within the assessment area does not meet any of the patch and corridor filtering rules outlined in QFES (2019).

The potential fireline intensity was calculated for bushfire-prone vegetation within 150 m of the site using the inputs from Steps 1 - 3. In accordance with Section 7.6 of the BRC Technical Guide, fireline intensity, radiant heat flux and bushfire attack level is not required to be calculated for non-bushfire prone (i.e. VHCs with a prone type of 2) or low hazard VHCs (i.e. VHCs with a prone-type of 3), therefore VHCs 39.2, 40.4 and 42.6 have been excluded from calculation of potential fireline intensity. Remodelled potential fireline intensity for bushfire-prone vegetation of the site is provided in **Table 4.**

Table 4: Potential fireline intensity for classified VHCs within 150 m assessment area

Location of classified vegetation in relative to development area	VHC	Status	Effective slope – average slope beneath bushfire-prone vegetation in relation to development (degrees)		Fire weather severity (FFDI)	Potential fireline intensity (PFI)	Potential bushfire hazard class
W	22.1	Remnant	3.38	Downslope	53	29,843 kW/m	High
W	22.2	Remnant	3.73	Downslope	53	14,640 kW/m	Medium
NW	22.1	Remnant	1.07	Downslope	53	33,581 kW/m	High

The results of the potential fireline intensity calculation for bushfire-prone vegetation within the assessment area show that vegetation associated with the watercourse and wetland area to the west and north-west (VHC 22.1) has a potential bushfire hazard class of 'high' and others areas to the west (VHC 22.2) have a potential bushfire hazard class have a of 'Medium'. All other vegetation within 150 m of the development site is not classified as bushfire-prone and therefore, calculation of radiant heat flux/bushfire attack level (BAL) is not applicable.

Section 5 outlines the requirements for management and mitigation of bushfire hazard for the bushfire-prone vegetation within the site.

3.2 Radiant Heat Exposure and Bushfire Attack Levels

Bushfire attack levels (BALs) are used to quantify the levels of attack (radiant heat exposures/flux) that built structures may experience during a fire event. The BAL is defined as 'a means of measuring the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact, using increments of radiant heat expressed in kilowatts per metre squared, and the basis for establishing the requirements for construction to improve protection of building elements from attack by bushfire' (Standards Australia, 2018).

AS3959:2018 adopts six BAL categories, which are based on the level of radiant heat flux to which buildings may be exposed to during a bushfire event. This level of heat flux generally relates to the type of vegetation, effective slope and how far a building is from hazardous vegetation. BALs apply to buildings and any attached or adjacent structure within 6 m of the building.

The BRC Technical Guide requires that radiant heat exposure/bushfire attack levels (BALs) are calculated using either the SPP Bushfire APZ calculator (QFES, 2019b), which is the preferred method or Method 2 of AS3959:2018. Where Method 2 is used, the following inputs are to be used:

- site-specific values for FFDI (Step 1)
- ground-truthed VHCs (Step 2) and their associated fuel loads (provided in Figure 14 of the BRC Technical Guide); and
- site and effective slopes (Step 3).

The Flamesol Method 2 Minimum Distance calculator has been used to calculate the minimum separation distance required between the development and bushfire-prone vegetation for each BAL. These results are provided in **Appendix 1** and **Figure 7** and summarised in **Table 5.**

Table 5: Determination of Bushfire Attack Level (BAL) minimum separation distances for bushfire-prone vegetation.

Bushfire attack level (BAL) →	BAL-Flame zone (FZ)	BAL-40	BAL-29	BAL-19	BAL-12.5
West (VHC 22.1)	0 - <15.8m	15.8- <21.2 m	21.2- < 30.14 m	30.1 - <41.3 m	41.3 - < 100m
West (VHC 22.2)	0 - <11.4m	11.4- <15.4 m	15.4- < 22.6m	22.6 - <32m	32 - < 100m
North-west	0 - <13.9m	13.9- <18.6 m	18.6- < 26.9m	26.9 - <37.5m	37.5 - < 100m

PO4 of the Redland City Plan Bushfire Hazard Overlay Code specifies that building envelopes on reconfigured lots less than 2000 m^2 are to be separated from hazardous vegetation such that they achieve a radiant heat flux level of 29 kW/m^2 (BAL-29) at the edge of the proposed lots. By using Method 2 radiant heat calculations (from AS3959: 2018), it has been determined that all proposed lots achieve a radiant heat flux of 29 kW/m^2 (BAL-29) or less, thereby complying with the Code. The hazardous vegetation to the north-west is over 60m from the site and therefore lots 4 and 5 sit within the BAL 12.5 radiant heat flux zone from this hazard. These lots are already rated as having BAL 12.5 exposure due to the effect of the hazardous vegetation to the west, and therefore the BAL contours from the north-western vegetation have not been shown on **Figure 7**.

Figure 7: Bushfire Attack Level map

Project: PR22084_39 Brendan Way Victoria Point

- Property Boundary
- Cadastral
- Asset Protection Zone
- Hazard vegetation

Bushfire Attack Level

- Flame Zone
- BAL 40
- BAL 29
- BAL 19
- BAL 12.5

Notes:
-BAL by Green Tape Solutions
-Site Infrastructure and Impact Areas from Client
-Base map Copyright (c) Nearmaps and its data suppliers.

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0 10 20 30 m

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4 Bushfire Management Plan

The SPP requires that where it is not possible to avoid a bushfire prone area, development mitigates bushfire risk to people and property to an acceptable or tolerable level. This can be achieved through development design and siting, hazard reduction practices and emergency mitigation measures for any buildings bordering potentially bushfire-susceptible vegetation. These practices and measures include fuel reduction and management, road infrastructure to provide safe access and egress, appropriate building design and construction standards, procedures for fighting bushfires and fire intensity reduction management measures.

The development does not seek to mitigate bushfire hazard through additional vegetation clearing beyond the development area boundary and shall contain all bushfire management and mitigation measures within the development area.

4.1 Agencies / Persons Responsible

The responsible fire authority is the Queensland Fire and Emergency Services (QFES). It is the responsibility of the proponent to ensure that the relevant measures required by this plan are in place prior to inspection by the Council and the building certifier, and to ensure that the measures are in place prior to enacting the approval. Furthermore, it is the responsibility of the proponent to ensure that a copy of this report is always on hand at the site.

4.2 Owner / Occupier Responsibilities

It is the responsibility of the relevant lot owner to maintain each lot in accordance with the conditions outlined in this report. The owner / occupier responsibilities include:

- All access routes are to remain clear of obstacles to enable effective emergency vehicle access and egress; and
- No burning is to be undertaken on-site without a Permit to Burn as issued by the local Fire Warden (and approval if required, in writing, from Council).
- The storage or handling of hazardous chemicals on the premises must not result in an unacceptable risk to people, property and the environment. Hazardous chemicals should not present a risk to or impose upon emergency services when responding to an emergency or evacuation.

4.3 Reporting and Auditing

This bushfire report is a controlled working document that is to be updated and revised to reflect adaptive management and constructive feedback. Some sections of the plan may be modified, new procedures may be implemented, and responsibilities altered, depending on feedback and application.

This bushfire report will only ever be modified with the agreement of QFES or Redland City Council. This agreement allows for changes to the plan scope, as determined through consultation and the acceptance of the proponent. That is, where further actions are deemed necessary or where actions can be reduced in scope.

4.4 Siting of Buildings

In accordance with the SPP 2017 (and associated guidance material) and the Redland City Plan 2018 (version 4), the proposed design has considered the key principles when siting development. The relevant clauses that have been considered are:

- Utilising land that is predominantly cleared to minimise ecological impacts to native vegetation;
- Maximising where practicable building frontage setbacks from any hazardous vegetation; and
- Siting of buildings so that elements of the development that are least susceptible to fire are situated closest to the bushfire hazard (e.g. driveways, parking areas and protective landscape treatments).

4.5 Access Roads

Access to the majority of the proposed lots will be provided via a new internal circulation road with two different connection points to existing residential areas to the east. This design allows for safe and efficient access for fire-fighting and other emergency vehicles and safe and efficient egress for residents away from the most likely direction of bushfire attack. The proposed internal road does not adjoin hazardous vegetation thereby avoiding the risk of entrapment.

Lots 1-5 and lots 9 & 10 have direct access to Brendan Way to the north, which also allows for safe and efficient access for fire-fighting and other emergency vehicles and safe and efficient egress for residents away from the most likely direction of bushfire attack.

4.6 Electricity Supply

The proposed development will have access to mains electricity supply.

4.7 Water Supply

The development will have access to the reticulated water supply at suitable pressure levels.

4.8 Climate Change and Fire Weather – Projections for 2050

Climate change can act in two ways to affect fire behaviour. First, it is likely to exacerbate the fire-weather risk on any given day, leading to increased frequency or intensity of extreme and very extreme fire-weather days particularly within the fire season. Secondly, an increase in the accumulated fire risk over a year might represent a longer fire season and a reduction in the number of days suitable for prescribed burning.

It is recommended to review this document and associated bushfire procedures at the site over the coming decades in response to any potential increases of bushfire risk from climate change.

4.9 Emergency Response Procedures

An onsite fire management and evacuation strategy should be developed and available to implement in the event of an emergency. In the event of a pending fire emergency, assistance is to be obtained by contacting dialling 000.

5 Assessment Against the Bushfire Hazard Overlay Code

The site is mapped with the Redland City Plan 2018 (version 4) Bushfire Hazard Overlay, which triggers a response to the Bushfire Hazard Overlay Code. An assessment against this code is provided in **Table 6**.

Table 6: Assessment against the Redland City Plan 2018 (version 4) Bushfire Hazard Overlay Code.

Performance Outcomes		Acceptable Outcomes		Compliance Assessment
For assessable development				
Compatible development				
PO1	Development involving the accommodation or congregation of vulnerable sectors of the community such as childcare centres, community care centres, educational establishments, detention facilities, hospitals, rooming accommodation, retirement facilities or residential care facilities, is not located on land subject to bushfire hazard, unless there is an overriding community need or the development is located in the specialised centre zone.	AO1.1	The following uses do not occur within bushfire hazard area (bushfire prone area): 1. childcare centres; 2. community care centres; 3. educational establishments; 4. detention facilities; 5. hospitals; 6. rooming accommodation; 7. retirement facilities; and 8. residential care facilities.	**Not applicable** The proposed development does not involve the accommodation or congregation of vulnerable sectors of the community.
PO2	Emergency services and uses providing community support services are able to function effectively during and immediately after a bushfire hazard event.		No acceptable outcome is nominated.	**NA - The development does not involve any uses providing emergency services or community support services.**

Performance Outcomes		Acceptable Outcomes		Compliance Assessment
PO3	Development involving hazardous materials manufactured or stored in bulk is not located on land subject to bushfire hazard.	AO3.1	The manufacture or storage of hazardous material in bulk does not occur within bushfire hazard area (bushfire prone area).	**Complies with PO3** The development is for a reconfiguration of lot to support the establishment of additional residential premises. No hazardous materials will be manufactured on site. Hazardous materials on the premises will not be stored or handled in bulk quantities. Hazardous materials will not present an unacceptable risk to people, property and the environment.
Development design and separation from bushfire hazard - reconfiguration of lots				
PO4	Where reconfiguration creates lots of 2,000m^2 or less, a separation distance from hazardous vegetation is provided to achieve a radiant heat flux level of 29kW/m^2 at the edge of the proposed lot(s). Editor's note—The radiant heat levels and separation distances are to be established in accordance with method 2 set out in AS3959-2009.	AO4.1.1 OR AO4.1.2	No new lots are created within the bushfire hazard area (bushfire prone area). Lots are separated from hazardous vegetation by a distance that achieves radiant heat flux level of 29kW/m^2 at all boundaries. Editor's note—Where a separation distance is proposed to be achieved by utilising existing cleared developed areas external to the site, certainty must be established (through tenure or other means) that the land will remain cleared of hazardous vegetation. Editor's note—For staged developments, temporary separation distances, perimeter roads or fire trails may be absorbed as part of subsequent stages.	**Complies with AO4.1.2** The reconfiguration shall result in the creation of lots less than 2,000m$^{2.}$ All new dwellings are separated from hazardous vegetation by a distance that achieves a radiant heat flux level of 29kW/m^2 or less at all lot boundaries.

Performance Outcomes		Acceptable Outcomes		Compliance Assessment
			Editor's note—The achievement of a cleared separation distance may not be achievable where other provisions within the planning scheme seek the protection of certain ecological, slope, visual or character features or functions.	
PO5	Where reconfiguration creates lots of more than 2,000m^2, a building envelope of reasonable dimensions is provided on each lot which is separated from hazardous vegetation such that it achieves radiant heat flux level of 29kW/m^2 at any point.		No acceptable outcome is nominated	**Not applicable** The reconfiguration shall not result in the creation of residential lots more than 2,000m2.
PO6	Where reconfiguration is undertaken in an urban area, a constructed perimeter road with reticulated water supply is established between the lots and the hazardous vegetation, and is readily accessible at all times for urban fire fighting vehicles. The access is available for both fire fighting and maintenance/defensive works. Editor's note—Applicants should also have regard to the relevant standards set out in the reconfiguration of a lot code and	AO6.1	Lot boundaries are separated from hazardous vegetation by a public road which: 1. has a two lane sealed carriageway; 2. contains a reticulated water supply; 3. is connected to other public roads at both ends and at intervals of no more than 500m; 4. accommodates geometry and turning radii in accordance with Qld Fire and Emergency Services' Fire Hydrant and Vehicle Access Guidelines; 5. has a minimum of 4.8m vertical clearance above the road;	**Complies with PO6** The subdivision design does not incorporate a perimeter road along the western boundary as required by PO6. However, this is not considered to be necessary for this site because it does not directly adjoin hazardous vegetation to the west. There are intervening areas on the adjoining properties that contain low-hazard vegetation which protect the development site from direct bushfire attack. These acreage properties have suitable access for emergency services personnel who may respond to a fire in the vegetation to the west of the site. Fire hydrants shall be designed and installed on the proposed new public road in accordance with AS2419.1

Performance Outcomes		Acceptable Outcomes		Compliance Assessment
	infrastructure works codes in this planning scheme.	AO6.2	6. is designed to ensure hydrants and water access points are not located within parking bay allocations; and 7. incorporates roll-over kerbing. Fire hydrants are designed and installed in accordance with AS2419.1 2005.	2005.
PO7	Outside an urban area, either a constructed perimeter road or a formed, all weather fire trail is established between the lots or building envelopes and the hazardous vegetation, and is readily accessible at all times for the type of fire fighting vehicles servicing the area. The access is available for both fire fighting and maintenance/hazard reduction works.	AO7.1	Lot boundaries are separated from hazardous vegetation by a public road or fire trail which has: 1. a reserve or easement width of at least 20m; 2. a minimum trafficable (cleared and formed) width of 4m capable of accommodating a 15 tonne vehicle and which is at least 6m clear of vegetation; 3. no cut or fill embankments or retaining walls adjacent to the 4m wide trafficable path; 4. a minimum of 4.8m vertical clearance; 5. turning areas for fire-fighting appliances in accordance with Qld Fire and Emergency Services' Fire Hydrant and Vehicle Access Guidelines; 6. a maximum gradient of 12.5%; 7. a crossfall of no greater than 10 degrees;	**Not applicable** The site is located within an urban area.

Performance Outcomes		Acceptable Outcomes		Compliance Assessment
			8. drainage and erosion control devices in accordance with the standards in Planning Scheme Policy 2 – Infrastructure works; 9. vehicular access at each end which is connected to the public road network at intervals of no more than 500m; 10. designated fire trail signage; 11. if used, has gates locked with a system authorised by Qld Fire and Emergency Services; and 12. if a fire trail, has an access easement that is granted in favour of council and Qld Fire and Emergency Services.	
PO8	The lot layout: minimises the length of the development perimeter exposed to, or adjoining hazardous vegetation; 1. avoids the creation of potential bottle-neck points in the movement network; 2. establishes direct access to a safe assembly/evacuation area in the event of an approaching bushfire; and		No acceptable outcome is nominated. Editor's note—In order to demonstrate compliance with the performance outcome, a bushfire management plan prepared by a suitably qualified person may be required. The bushfire management plan should be developed in accordance with the Public Safety Business Agency (PSBA) guideline entitled "Undertaking a Bushfire Protection Plan. Advice from the Queensland Fire and Emergency Services (QFES) should be sought as appropriate.	**Complies with PO8** This bushfire hazard assessment and management plan has been prepared in accordance with relevant guidelines under the State Planning Policy. It has been determined that all proposed lots achieve a radiant heat flux of 29 kW/m^2 (BAL-29) or less. Most lots are rated at BAL 12.5, with only 7 lots being exposed to a higher BAL rating. The maximum BAL construction level that any future dwelling should require is BAL 19. Access to the majority of the proposed lots will be provided via a new internal circulation road with two

Performance Outcomes		Acceptable Outcomes		Compliance Assessment
	3. ensures roads likely to be used in the event of a fire are designed to minimise traffic congestion. Editor's note—For example, developments should avoid finger-like or hour-glass subdivision patterns or substantive vegetated corridors between lots.			different connection points to existing residential areas to the east. This design allows for safe and efficient access for fire-fighting and other emergency vehicles and safe and efficient egress for residents away from the most likely direction of bushfire attack. The proposed internal road does not adjoin hazardous vegetation thereby avoiding the risk of entrapment. Lots 1-5 and lots 9 & 10 have direct access to Brendan Way to the north, which also allows for safe and efficient access for fire-fighting and other emergency vehicles and safe and efficient egress for residents away from the most likely direction of bushfire attack.
PO9	Critical or potentially hazardous infrastructure such as water supply, electricity, gas and telecommunications are located underground.		No acceptable outcome provided.	**Complies with PO9** The proposed development will have access to mains electricity supply and the reticulated water network. Electrical transmission lines, water supply, gas supply (if relevant) and telecommunications will be installed underground.
Development design and separation from bushfire hazard - material change of use				
PO10	Development is located and designed to ensure proposed buildings or building envelopes achieve the following radiant heat flux level at any point: 1. 10kW/m^2 where the use involves	AO10.1	Buildings or building envelopes are separated from hazardous vegetation by a distance that achieves a radiant heat flux level at any point on the building or envelope respectively, of 10kW/m^2 for a use	**Not applicable.** The proposed development involves a reconfiguration of a lot for residential purposes.

Performance Outcomes		Acceptable Outcomes		Compliance Assessment
	the accommodation or congregation of vulnerable sectors of the community such as childcare centres, community care centres, educational establishments, detention facilities, hospitals, rooming accommodation, retirement facilities or residential care facilities; or 2. 29kW/m^2 otherwise. Editor's note—The radiant heat levels and separation distances are to be established in accordance with method 2 set out in AS3959-2009.		mentioned in the performance outcome, or 29kW/m^2 otherwise. Editor's note—Where a separation distance is proposed to be achieved by utilising existing cleared developed areas external to the site, certainty must be established (through tenure or other means) that the land will remain cleared of hazardous vegetation. Editor's note—For staged developments, temporary separation distances, perimeter roads or fire trails may be absorbed as part of subsequent stages. Editor's note—The achievement of a cleared separation distance must be achieved in a way that ensures compliance with other provisions within the planning scheme seeking protection of certain ecological, slope, visual or character features or functions.	
PO11	Effective safety and evacuation procedures and measures are established.		No acceptable outcome is nominated.	**Not applicable** The proposed development involves a reconfiguration of lot.
PO12	A constructed perimeter road or a formed, all weather fire trail is provided between the hazardous vegetation and the site boundary or building envelope,	AO12.1	Development is separated from hazardous vegetation by a public road or fire trail which has: 1. a reserve or easement width of at least 20m;	**Not applicable** The proposed development involves a reconfiguration of lot.

Performance Outcomes		Acceptable Outcomes		Compliance Assessment
	and is readily accessible at all times for the type of fire fighting vehicles servicing the area. However, a fire trail will not be required where it would not serve a practical fire management purpose. Editor's note—Fire trails are unlikely to be required where a development site is less than 2.5ha.		2. a minimum trafficable (cleared and formed) width of 4m capable of accommodating a 15 tonne vehicle and which is at least 6m clear of vegetation; 3. no cut or fill embankments or retaining walls adjacent to the 4m wide trafficable path; 4. a minimum of 4.8m vertical clearance; 5. turning areas for fire-fighting appliances in accordance with Qld Fire and Emergency Services' Fire Hydrant and Vehicle Access Guidelines; 6. a maximum gradient of 12.5%; 7. a cross fall of no greater than 10 degrees; 8. drainage and erosion control devices in accordance with the standards in Planning Scheme Policy 2 – Infrastructure works; 9. vehicular access at each end which is connected to the public road network which is connected to the public road network at intervals of no more than 500m; 10. designated fire trail signage; 11. if used, has gates locked with a system authorised by Qld Fire and Emergency Services; and	

Performance Outcomes		Acceptable Outcomes		Compliance Assessment
			12. if a fire trail, has an access easement that is granted in favour of council and Qld Fire and Emergency Services.	
All development				
PO13	All premises are provided with vehicular access the enables safe evacuation for occupants and easy access by fire fighting appliances.	AO13.1	Private driveways: 1. do not exceed a length of 60m from the street to the building; 2. do not exceed a gradient of 12.5%; 3. have a minimum width of 3.5m; 4. have a minimum of 4.8m vertical clearance; 5. accommodate turning areas for fire-fighting appliances in accordance with Qld Fire and Emergency Services' Fire Hydrant and Vehicle Access Guidelines; and 6. serve no more than 3 dwellings or buildings.	**Complies with PO13** Direct access to the majority of lots will be provided via a new internal circulation road with two different connection points to existing residential area to the east. Seven of the proposed lots will get direct road access via Brendan Way. The new internal road will have a gradient less than 12.5% and will provide safe and effective access for emergency services and safe egress for occupants away from the most likely direction of bushfire attack. The proposed internal road does not adjoin hazardous vegetation thereby avoiding the risk of entrapment. Lots 1-5 and lots 9 & 10 have direct access to Brendan Way to the north, which also allows for safe and efficient access for fire-fighting and other emergency vehicles and safe and efficient egress for residents away from the most likely direction of bushfire attack. The new internal road is designed in accordance with the relevant guidelines provided in the Qld Fire and Emergency Service's Fire Hydrant and Vehicle

Performance Outcomes		Acceptable Outcomes		Compliance Assessment
				Access Guidelines.
PO14	Development outside reticulated water supply areas, includes a dedicated static supply that is available solely for fire fighting purposes and can be accessed by fire fighting appliances.	AO14.1	A water tank is provided within 10m of each building (other than a class 10 building) which: 1. is either below ground level or is constructed or screened by non combustible materials; Editor's note—Non-combustible is a defined in AS 3959:2009 and means: "not deemed combustible as determined by AS 1530.1 or not deemed combustible in accordance with the BCA." 2. 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: 1. 10,000 litres for residential buildings; 2. 45,000 litres for industrial buildings; and 3. 20,000 litres for other buildings; 3. includes a hardstand area allowing medium rigid vehicle (15 tonne fire appliance) access within 6m of the tank; 4. is provided with fire brigade tank fittings – 50mm ball valve and male camlock coupling and, if underground, an access hole of 200mm (minimum) to accommodate suction lines; and	**Not applicable** The development will have access to the reticulated water supply network.

Performance Outcomes		Acceptable Outcomes		Compliance Assessment
			5. is clearly identified by directional signage provided at the street frontage.	
PO15	Landscaping uses species that are not likely to exacerbate a bushfire event, and does not increase fuel loads within separation areas.	AO15.1	Low flammability plant species identified in Table 8.2.2.2 are used for any planted landscaping within 10m of a building or structure.	**Complies with PO15** Species selection for landscaping shall include consideration of the species identified in Table 8.2.2.2 for any landscaped areas within 10 m of a building or structure.
PO16	Bushfire risk mitigation treatments do not have a significant impact on the natural environment or landscape character of the locality.		No acceptable outcome is nominated.	**Complies with PO16** The development has been designed to primarily utilise existing cleared areas. No clearing is required for mitigation of bushfire risk. Given the existing urban character of the surrounding area, landscaping treatments will not have a significant impact on the landscape character of the locality.

6 Conclusion

This report has been prepared to provide a site-specific bushfire hazard assessment and management plan for a proposed development at 39 Brendan Way, Victoria Point.

The results of the assessment show that vegetation associated with the broad-leaved paperbark open forest and woodland to the west of the site has a potential bushfire hazard class of 'high' and 'medium' respectively. PO4 of the Redland City Plan Bushfire Hazard Overlay Code specifies that building envelopes on reconfigured lots less than 2000 m^2 are to be separated from hazardous vegetation such that they achieve a radiant heat flux level of 29 kW/m^2 (BAL-29) at the edge of the proposed lots. By using Method 2 radiant heat calculations (from AS3959: 2018), it has been determined that all proposed lots achieve a radiant heat flux of 29 kW/m^2 (BAL-29) or less, thereby complying with the Code.

Bushfire management and mitigation measures to ensure safe premises have been outlined as part of this report for the site. Access to the majority of the proposed lots will be provided via a new internal circulation road with two different connection points to existing residential areas to the east. This design allows for safe and efficient access for fire-fighting and other emergency vehicles and safe and efficient egress for residents away from the most likely direction of bushfire attack. The proposed internal road does not adjoin hazardous vegetation thereby avoiding the risk of entrapment.

Lots 1-5 and lots 9 & 10 have direct access to Brendan Way to the north, which also allows for safe and efficient access for fire-fighting and other emergency vehicles and safe and efficient egress for residents away from the most likely direction of bushfire attack.

The proposed development complies with the relevant provisions of the *Redlands City Plan 2018* (version 4) Bushfire Hazard Overlay Code.

7 References

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Appendix 1

Flamesol Method 2 Minimum Distance Calculations

Calculated March 24, 2022, 1:39 pm (MDc v.4.9)

West 22.1

Minimum Distance Calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Fire Danger Index	53	Rate of spread	2.28 km/h
Vegetation classification	Forest	Flame length	19.43 m
Understorey fuel load	28.4 t/ha	Flame angle	52 °, 61 °, 69 °, 73 °, 74 ° & 81 °
Total fuel load	38.4 t/ha	Elevation of receiver	7.65 m, 8.49 m, 9.07 m, 9.289999999999999 m, 9.33 m & 9.59 m
Vegetation height	n/a	Fire intensity	45,248 kW/m
Effective slope	3.38 °	Transmissivity	0.864, 0.841, 0.8129999999999999, 0.787, 0.774 & 0.717
Site slope	0 °	Viewfactor	0.6086, 0.4512, 0.3065, 0.2085, 0.1693 & 0.0458
Flame width	100 m	Minimum distance to < 40 kW/m²	15.8 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	21.2 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	30.1 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	41.3 m
		Minimum distance to < 10 kW/m²	48.3 m

Rate of Spread - Mcarthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

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Calculated March 24, 2022, 1:40 pm (MDc v.4.9)

West 22.2

Minimum Distance Calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Fire Danger Index	53	Rate of spread	1.62 km/h
Vegetation classification	Woodland	Flame length	14.09 m
Understorey fuel load	19.7 t/ha	Flame angle	54.15 °, 64.15000000000001 °, 73.15000000000001 °, 77.15000000000001 °, 79.15000000000001 ° & 84.15000000000001 °
Total fuel load	29.7 t/ha	Elevation of receiver	5.28 m, 5.76 m, 5.89 m, 5.67 m, 5.5 m & 3.57 m
Vegetation height	n/a	Fire intensity	24,869 kW/m
Effective slope	3.73 °	Transmissivity	0.873, 0.855, 0.829, 0.803, 0.79 & 0.728
Site slope	2.15 °	Viewfactor	0.601, 0.445, 0.3007, 0.2039, 0.1662 & 0.0451
Flame width	100 m	Minimum distance to < 40 kW/m²	11.4 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	15.4 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	22.6 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	32 m
		Minimum distance to < 10 kW/m²	37.9 m

Rate of Spread - Mcarthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

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Calculated March 24, 2022, 2:29 pm (MDc v.4.9)

North west 22.1

Minimum Distance Calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Fire Danger Index	53	Rate of spread	1.94 km/h
Vegetation classification	Forest	Flame length	17.24 m
Understorey fuel load	28.4 t/ha	Flame angle	54 °, 64 °, 71 °, 76 °, 77 ° & 84 °
Total fuel load	38.4 t/ha	Elevation of receiver	6.48 m, 7.09 m, 7.21 m, 7.05 m, 6.86 m & 4.99 m
Vegetation height	n/a	Fire intensity	38,581 kW/m
Effective slope	1.07 °	Transmissivity	0.867, 0.846, 0.819, 0.793, 0.78 & 0.721
Site slope	2 °	Viewfactor	0.604, 0.4496, 0.3048, 0.2066, 0.1684 & 0.0455
Flame width	100 m	Minimum distance to < 40 kW/m²	13.9 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	18.6 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	26.9 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	37.5 m
		Minimum distance to < 10 kW/m²	44 m

Rate of Spread - Mcarthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005