BLACKASH
BUSHFIRE CONSULTING

Bushfire Hazard Assessment

Residential Subdivision

39 Rifle Range Road, Mudgee

Prepared for

Arcstone Developments

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Version V1.0

Document Tracking

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[redacted]

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Contents

1. Introduction

Blackash Bushfire Consulting has been engaged by Arcstone Developments to assess the proposed residential subdivision of land known as 39 Rifle Range Road, Mudgee, legally described as Lot 68 DP735127 (see Figure 1).

The site has a northerly street frontage to Rifle Range Road and an approximate site area of 4.04 hectares. The site falls gently from the rear (southern) boundary to the street. There is scattered vegetation throughout the site.

2. Proposed Development

The proposed development is subdivision of one (1) lot into seventeen (17) lots plus associated civil works. An existing easement is to be realigned to maintain access through the site while creating lots of a regular shape and size. (Figure 1).

3. Legislative Framework

Development on land that is identified as being bushfire prone must comply with the NSW RFS document *Planning for Bushfire Protection* (PBP 2019) under s.4.46 of the *Environmental Planning and Assessment Act, 1997* (EPA Act).

A residential subdivision development is categorised as Integrated Development, under s.4.46 of the EPA Act. Integrated development requires development consent from Council and General Terms of Approval from the NSW RFS. Any development applications for such a purpose must obtain a Bush Fire Safety Authority (BFSA) from the Commissioner of the NSW RFS in accordance with Section 100B of the RF Act.

A BFSA authorises development to the extent that it complies with PBP 2019 including standards regarding setbacks, provision of water supply and other measures in combination considered by the Commissioner necessary to protect persons, property or the environment from danger that may arise from a bushfire.

As a new residential subdivision, the application needs to be able to justify that the proposal can achieve a worst-case Bushfire Attack Level (BAL) of a maximum of BAL-29. This can be achieved.

Figure 1: Site Location

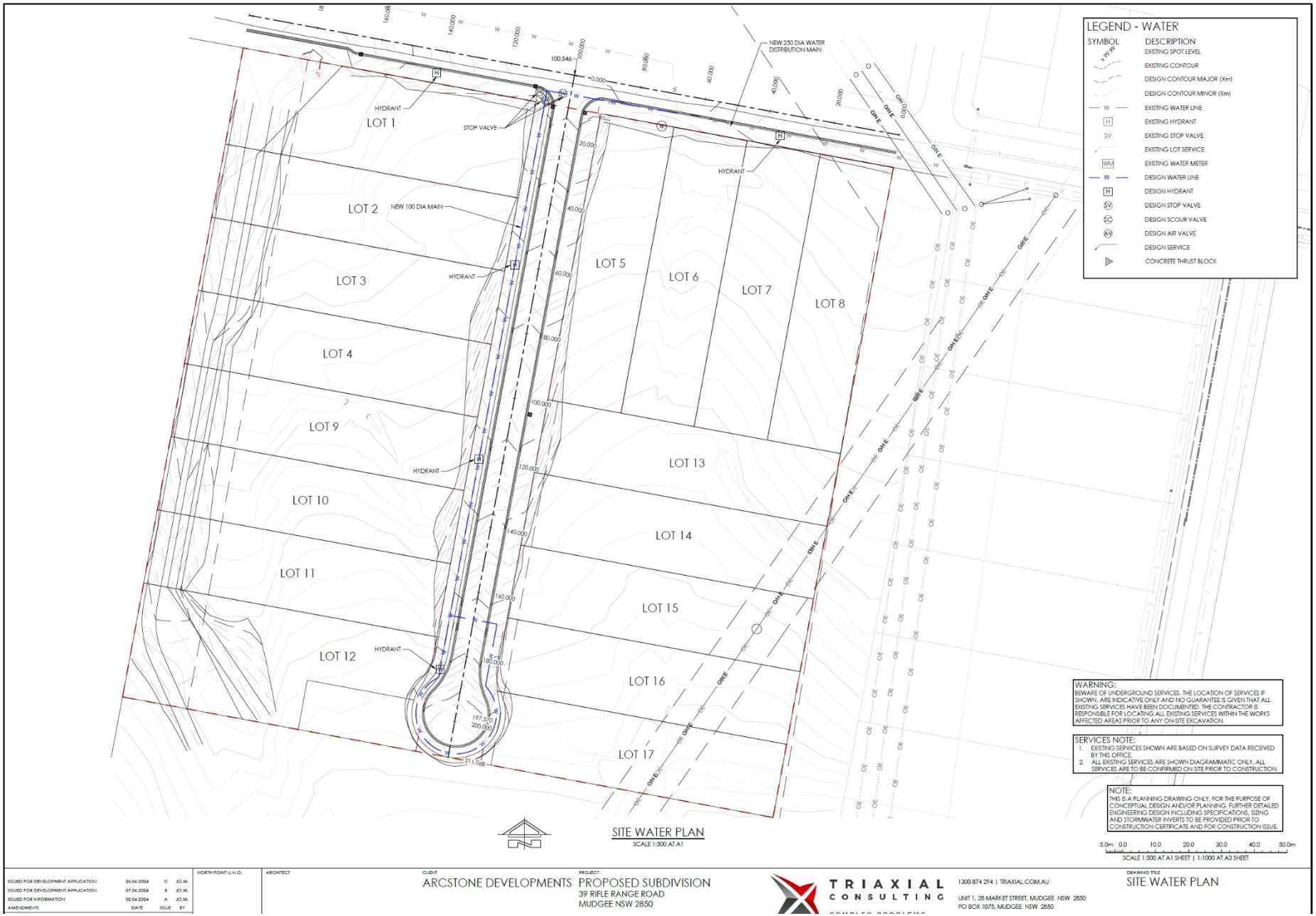

Figure 2: Proposed development site

4. Bushfire Threat Assessment

4.1. Methodology

PBP 2019 provides a methodology to determine the bushfire threat and commensurate size of any asset protection zone (APZ) that may be required to offset possible bushfire attack. These elements include the potential hazardous landscape that may affect the site and the effective slope within that hazardous vegetation. For new residential subdivision, APZ requirements are based on keeping radiant heat levels at new buildings below 29kW/m^2.

The following assessment is prepared in accordance with Section 100B of the RF Act, Clause 44 of the RF Reg and PBP 2019. This assessment is based on the following resources:

- Planning for Bush Fire Protection (NSW RFS, 2019);
- Mid-Western Bushfire Prone Land Map;
- Aerial mapping; and
- Detailed GIS and Site analysis.

The methodology used in this assessment is in accordance with PBP 2019 and is outlined in the following sections.

4.2. Bushfire Prone Land Mapping

The site is identified as 'bush fire prone land' (see Figure 3) for the purposes of Section 10.3 of the EPA Act and the legislative requirements for building on bush fire prone lands are applicable.

Bush fire prone land maps provide a trigger for the development assessment provisions and consideration of sites that are bushfire prone. Bush Fire prone land (BFPL) is land that has been identified by council, which can support a bushfire or is subject to bushfire attack. Bush fire prone land maps are prepared by local council and certified by the Commissioner of the NSW RFS.

4.3. Fire Danger District

The Mid-Western City Council has a FFDI set at 80.

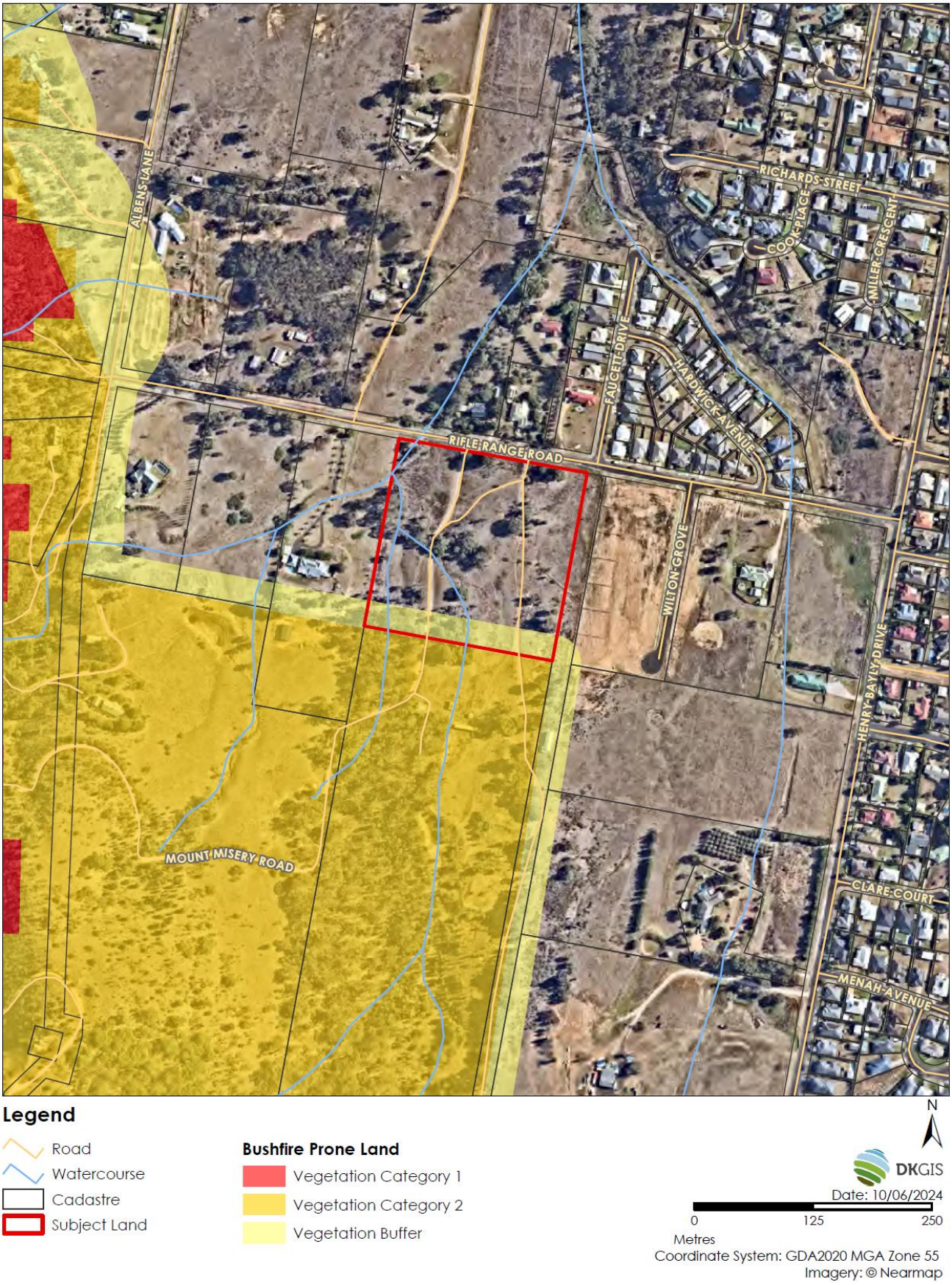

Figure 3: Bush Fire Prone Land Map.

4.4. Vegetation Assessment

The RF Regulation requires a classification of the vegetation on and surrounding the property (out to 140 metres from the boundaries of the property) in accordance with the system for classification of vegetation contained in PBP 2019.

Predominant Vegetation is classified by structure or formation using the system adopted by Keith (2004) and by the general description using PBP 2019.

The site and general surrounds is, in the most part, managed land and new development, however there are areas of Grassland and pockets of forest adjoin to the south and northwest of the site.

See Figure 4.

4.5. Slopes Influencing Bushfire Behavior

The RF Reg requires an assessment of the slope of the land on and surrounding the property (out to 100 metres from the boundaries of the property or from the proposed development footprint.

The effective slope' influencing fire behaviour approaching the sites has been assessed in accordance with the methodology specified within PBP 2019. The effective slope is the slope of the ground under the hazard (vegetation). It is not the slope between the vegetation and the building (slope located between the asset and vegetation is the site slope).

The land within and surrounding the site is relatively flat, with slopes ranging from 1.1 degrees downslope to 3.4 degrees upslope. See Figure 4.

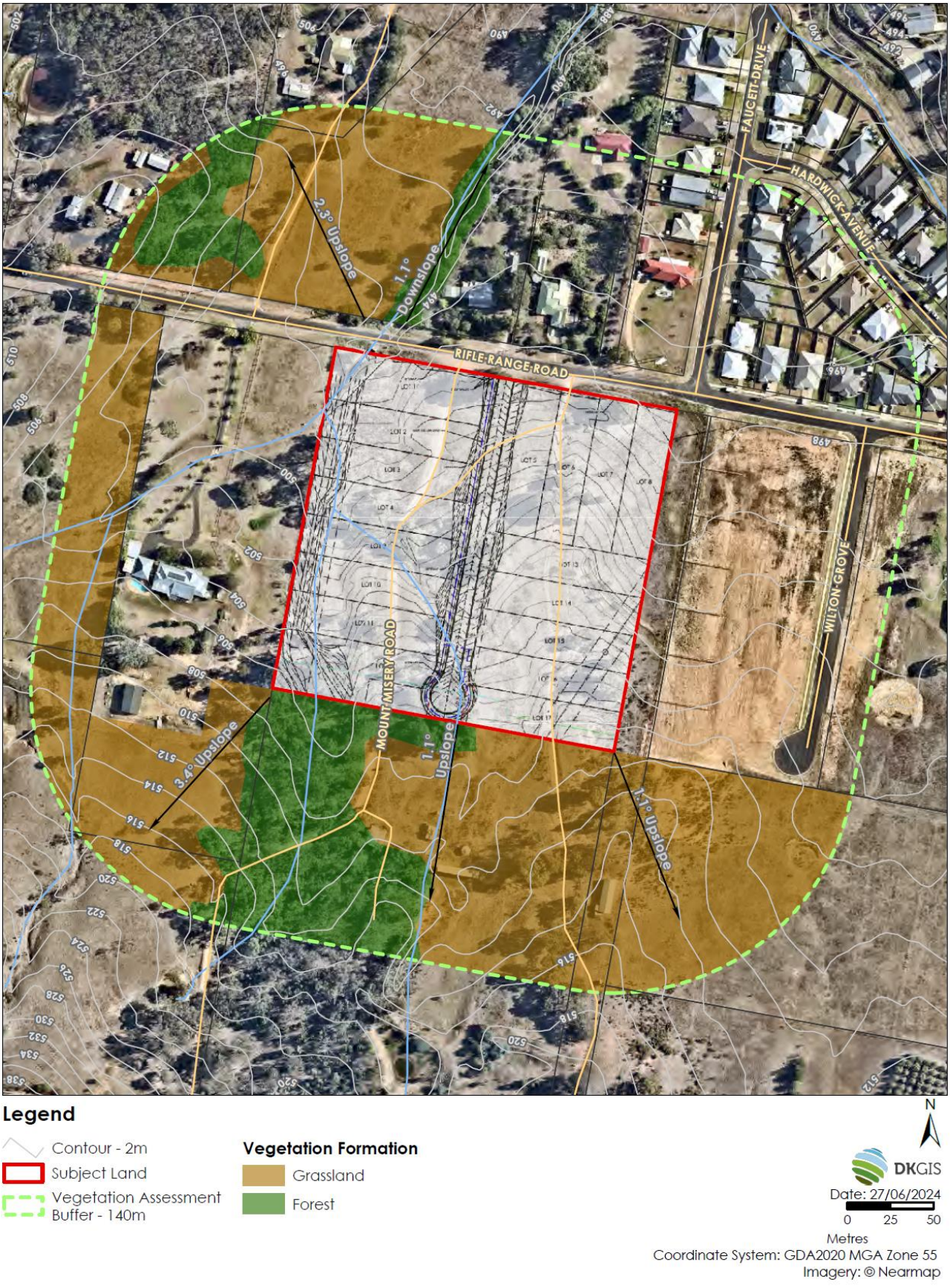

Figure 4: Vegetation and slope map.

5. Bushfire Protection Measures

PBP 2019 recognises the unique attributes of residential development and promotes detailed site analysis and the application of a combination of bushfire protection measures (BPMs) to achieve an acceptable outcome.

The BPMs work in combination to provide a suite of measures that meet the aim and objective and Section 6 of PBP 2019. The BPMs are shown in Figure 5.

Appropriate combinations depend upon geographic location and site circumstances.

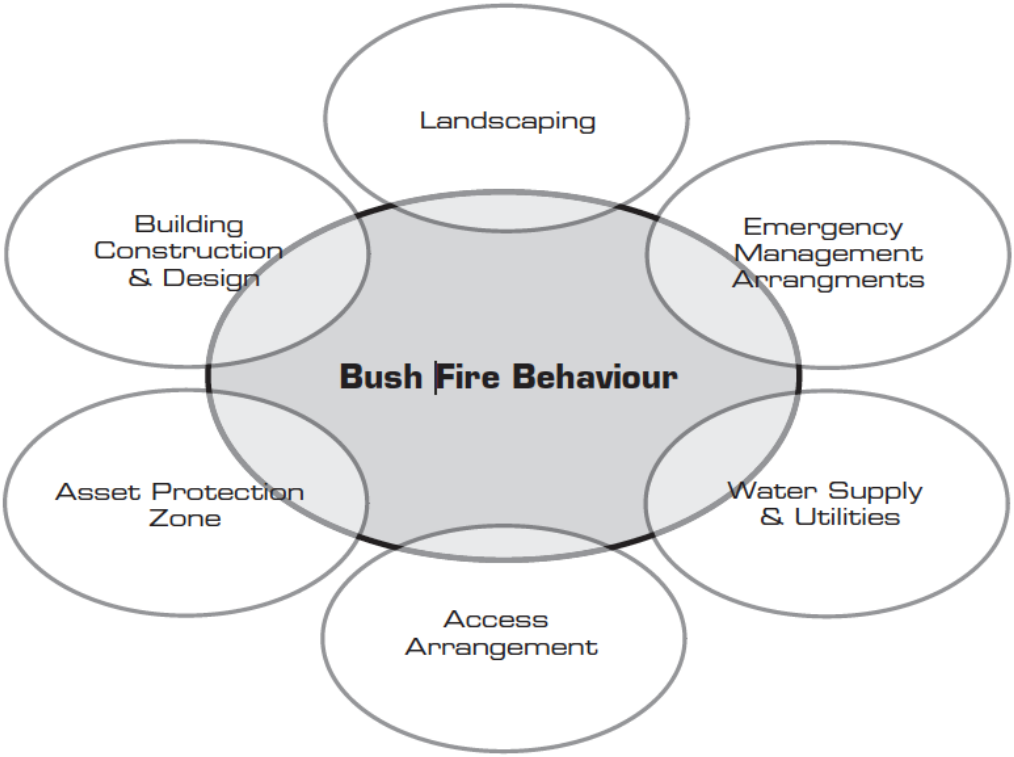

Figure 5: Bushfire Protection Measures in Combination (source PBP 2019 p. 26).

5.1. Asset Protection Zones

For proposed new residential subdivision, PBP 2019 requires that a minimum separation is provided in the form of Asset Protection Zones (APZ). The APZ is a fuel-reduced, physical separation between buildings and bushfire hazards. For residential developments, APZ requirements are based on keeping radiant heat levels at buildings below 29kW/m^2 as the maximum exposure on all sides of the building.

The site is generally adjoined by existing managed lands and new development, with only a small area in the west along the southern boundary is adjoined by hazard vegetation.

Table 1 is a summary of the APZ requirements and Figure 6 depicts the minimum APZ for the proposed development.

Table 1: APZ Assessment

Direction	Slope	Vegetation	Min Required APZ	APZ provided
North	NA	Managed Land	Nil	NA
East	NA	Managed Land	Nil	NA
Southeast	1.1° Upslope	Grassland	9 metres*	9 metres
South	1.1° Upslope	Grassland	9 metres*	9 metres
Southwest	3.4° Upslope	Forest	17 metres*	17 metres
West	NA	Managed Land	Nil	NA
Northwest	1.1° Downslope	Grassland / Forest	22 metres*	>25 metres

**Note: Based on detailed Radiant Heat modelling (see section 5.2.1).*

5.2. Bushfire Attack Levels

The Bushfire Attack Levels (BAL) is a means of measuring the ability of a building to withstand attack from bushfire. The form of bushfire attack and the severity will vary according to the conditions (FDI, vegetation, slope and setback) on the site.

The BAL assesses 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 square metre, which is the basis for establishing the requirements for construction to improve protection of a building from potential attack by a bushfire, as defined in *Australian Standard AS 3959-2009 Construction of buildings in bushfire-prone areas* (AS 3959-2018).

The BAL ratings are used as the basis for establishing the requirements for construction to improve protection of a proposed building from potential bushfire attack. Detailed BAL determination will be undertaken as part of the individual building DAs, but all lots can achieve BAL-29 or less.

Figure 7 depicts the BALs across the site.

5.2.1. Radiant Heat Modelling

Detailed radiant heat modelling has been undertaken for the site due to the unique site-specific inputs. Table 2 below is a summary of the key inputs, while the detailed outputs for each BAL on each scenario can be found in Appendix 2 -4.

The radiant heat modelling has considered the following scenarios which presents as the likely worst case bushfire scenario from the southeast, southwest and northwest.

Southeast Fire Scenario – The reasonable worst-case scenario is a fire run from the south / southeast which burns through the grassland area directly towards the site. The effective slope in this area is 1.1 degrees upslope.

Southwest Fire Scenario – The reasonable worst-case scenario is a fire run from the southwest which burns through the small patch of Southern Tablelands Dry Sclerophyll Forest directly towards the site. The effective slope in this area is 3.4 degrees upslope but has been rounded down to 3 degrees for the purposes of the modelling.

Northwest Fire Scenario – The reasonable worst-case scenario is a fire run from the northwest which burns through the narrow finger of Southern Tablelands Dry Sclerophyll Forest directly towards the site. The effective slope in this area is 1.1 degrees downslope but has been rounded up to 2 degrees for the purposes of the modelling.

Table 2 (below) is a summary of the key inputs used for the Radiant Heat modelling. Full results for the southeast aspect are provided in Appendix 2, southwest in Appendix 3 and northwest in Appendix 4.

Table 2: SFR Key inputs and outputs – showing the 29kW/m^2 threshold for each scenario.

Direction	Slope	Vegetation	Separation	Receiver	SFR	Radiant Heat
Southeast	1° Upslope	Grassland	9 metres	3.47 metres	NA	28.26kW/m^2
Southwest	3° Upslope	Southern Tablelands DSF	17 metres	6.9 metres	NA	28.53kW/m^2
Northwest	2° Downslope	Southern Tablelands DSF	22 metres	8 metres	NA	28.21kW/m^2

Figure 6: Minimum APZ requirements.

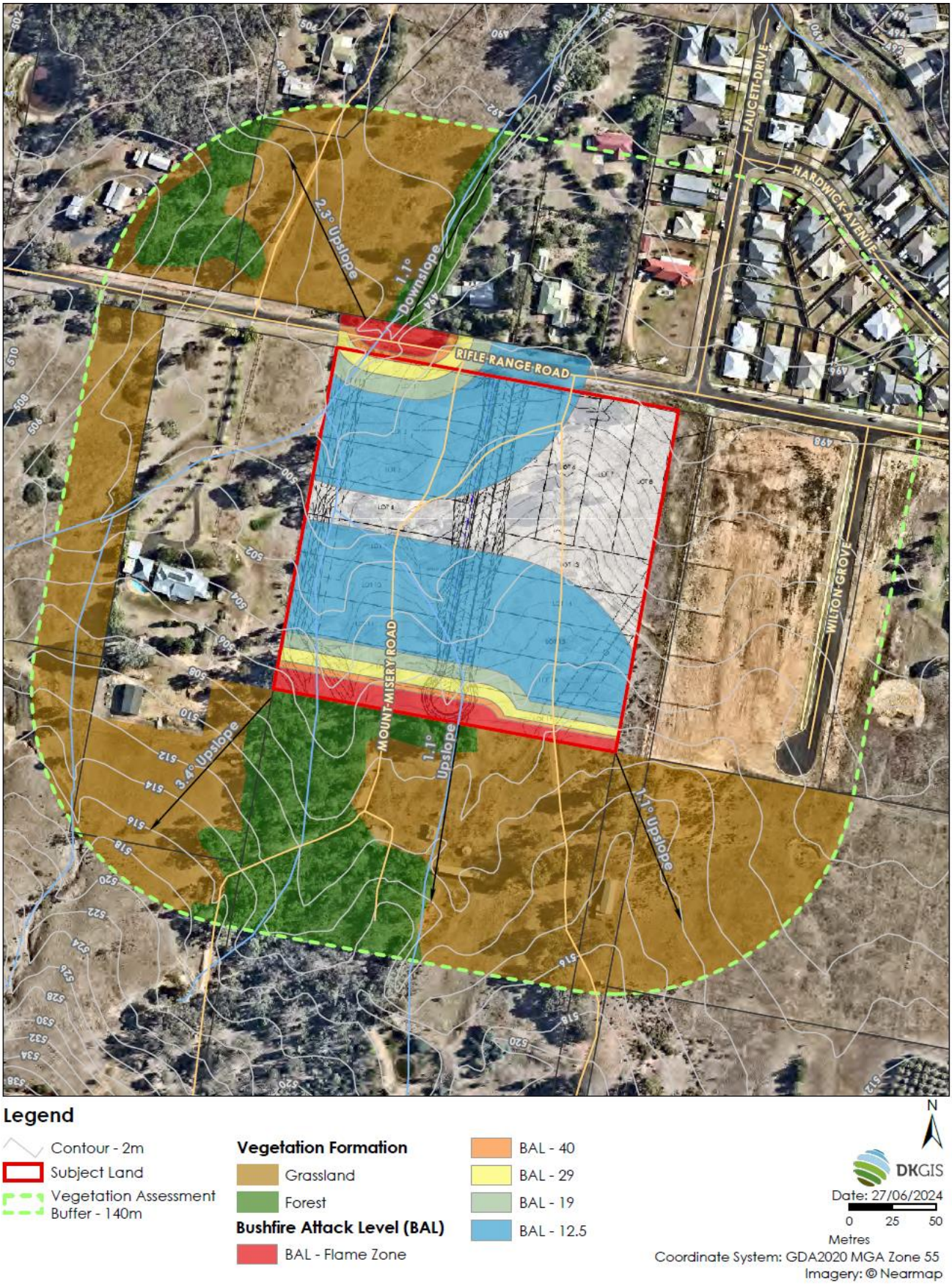

Figure 7: Bushfire Attack Levels.

5.3. Water Supplies

The Site will be adequately serviced by a reticulated water supply, with hydrants located at regular intervals along the proposed public road and Rifle Range Road which comply with AS2419 and PBP 2019.

This complies with PBP 2019.

5.4. Gas and electrical supplies

Electricity supply to the area is underground and any gas services are to be installed and maintained in accordance with *Australian Standard AS/NZS 1596 'The storage and handling of LP Gas'* (Standards Australia 2008).

This complies with PBP 2019.

5.5. Access

All proposed lots have direct access to either Rifle Range Road for the proposed public road within the site. The proposed public road is a dead-end road approximately 200 metres in length and designed to comply with all requirements for non-perimeter roads in PBP 2019, including the following key features:

- 9 metre wide carriageway width;
- Does not traverse areas of unmanaged bushland; and
- Residents leaving are travelling away from the likely bushfire threat.

Given its location, design and length, proposed internal road is considered appropriate and satisfies the relevant Performance Criteria, ensuring firefighting vehicles are provided with safe, all-weather access to structures.

While the design does not include more than one way in and out of the development or a perimeter road, given the adjoining developments, managed land and nature of the bushfire hazard (primarily grassland), a secondary egress is not considered necessary.

Therefore, while the proposed development isn't provided with secondary access or perimeter road as prescribed by the Acceptable Solutions, the design is considered to appropriately satisfy the relevant Performance Criteria by ensuring firefighting vehicles are provided with safe, all-weather access to the structures.

This complies with PBP 2019.

6. Recommendations

The following recommendation has been made within this report to ensure the proposed development is compliant with Section 100B of the *Rural Fires Act 1997* and *Planning for Bush Fire Protection 2019*:

Recommendation 1: The entire site shall be managed as an Inner Protection Area in accordance with the NSW RFS *Standards for Asset Protection Zones* and *Planning for Bush Fire Protection 2019*.

Recommendation 2: Future dwellings are to be constructed to comply with the National Construction Code (2019), Australian Standard AS 3959:2018, *Construction of buildings in bush fire-prone areas* and/or NASH Standard (1.7.14 updated), *National Standard Steel Framed Construction in Bushfire Areas* – 2014, and Section 7.5 of *Planning for Bush Fire Protection 2019* on a prescriptive (deemed to satisfy and/or acceptable solution) basis and/or performance basis to the extent identified in Figure 7.

Recommendation 3: Water, electricity and gas supplies through the proposed development must comply with section 5.3.3 of PBP 2019.

Recommendation 4: The proposed access road is to be constructed in accordance with the design requirements of section 5.3.2 of *Planning for Bush Fire Protection 2019*.

7. Conclusion

This assessment has demonstrated that the proposed subdivision can comply with *Planning for Bush Fire Protection 2019*. The proposed lots and existing dwellings are provided the minimum APZ requirements for 29kW/m^2.

In the authors professional opinion, the bushfire protection measures demonstrated in this report comply with the aim and objectives of *Planning for Bush Fire Protection 2019* and allow for the issue of a Bush Fire Safety Authority under Section 100B of the *Rural Fires Act 1997*.

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BPAD Bushfire Planning & Design Accredited Practitioner Level 3

Appendix 1: References

Councils of Standards Australia AS3959 (2009) – *Australian Standard Construction of buildings in bushfire-prone areas*

Councils of Standards Australia AS2419 (200) – *Fire Hydrant Installations*

Keith, David (2004) – *Ocean Shores to Desert Dunes – The Native Vegetation of New South Wales and the ACT*. The Department of Environment and Climate Change

NSW Rural Fire Service (2015) *Guide for Bushfire Prone Land Mapping*

NSW Rural Fire Service (2019). *Planning for Bushfire Protection: A Guide for Councils, Planners, Fire Authorities, Developers and Home Owners.* Draft for Public Exhibition

NSW Government (1979) *Environmental Planning and Assessment Act 1979*. NSW Government Printer.

Appendix 2: Radiant Heat Modelling Outputs - Southeast

NBC Bushfire Attack Assessment Report V4.1

AS3959 (2018) Appendix B - Detailed Method 2

Print Date: 12/06/2024 **Assessment Date:** 2/02/2024

Site Street Address:	39 Rifle Range Road, Mudgee
Assessor:	Corey Shackleton; Blackash Bushfire Consulting
Local Government Area:	Mid-western Regional
Alpine Area:	No

Equations Used

Transmissivity: Fuss and Hammins, 2002
Flame Length: RFS PBP, 2001/Vesta/Catchpole
Rate of Fire Spread: Noble et al., 1980
Radiant Heat: Drysdale, 1985; Sullivan et al., 2003; Tan et al., 2005
Peak Elevation of Receiver: Tan et al., 2005
Peak Flame Angle: Tan et al., 2005

Run Description: Southeast

Vegetation Information

Vegetation Type:	Grassland		
Vegetation Group:	Grassland		
Vegetation Slope:	1 Degrees	**Vegetation Slope Type:**	Upslope
Surface Fuel Load(t/ha):	6	**Overall Fuel Load(t/ha):**	6
Vegetation Height(m):	0	Only Applicable to Shrub/Scrub and Vesta	

Site Information

Site Slope:	0 Degrees	**Site Slope Type:**	Level
Elevation of Receiver(m):	3.47	**APZ/Separation(m):**	9

Fire Inputs

Veg./Flame Width(m):	100	**Flame Temp(K):**	1090

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg)	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	110

Program Outputs

Level of Construction:	BAL 29	**Peak Elevation of Receiver(m):**	3.47
Radiant Heat(kW/m2):	28.26	**Flame Angle (degrees):**	65
Flame Length(m):	7.67	**Maximum View Factor:**	0.425
Rate Of Spread (km/h):	13.35	**Inner Protection Area(m):**	9
Transmissivity:	0.874	**Outer Protection Area(m):**	0
Fire Intensity(kW/m):	41374		

BAL Thresholds

	BAL-40:	BAL-29:	BAL-19:	BAL-12.5:	10 kw/m2:	Elevation of Receiver:
Asset Protection Zone(m):	7	9	14	20	33	3

Appendix 3: Radiant Heat Modelling Outputs - Southwest

NBC Bushfire Attack Assessment Report V4.1

AS3959 (2018) Appendix B - Detailed Method 2

Print Date: 12/06/2024 **Assessment Date:** 2/02/2024

Site Street Address: 39 Rifle Range Road, Mudgee

Assessor: Corey Shackleton; Blackash Bushfire Consulting

Local Government Area: Mid-western Regional **Alpine Area:** No

Equations Used

Transmissivity: Fuss and Hammins, 2002
Flame Length: RFS PBP, 2001/Vesta/Catchpole
Rate of Fire Spread: Noble et al., 1980
Radiant Heat: Drysdale, 1985; Sullivan et al., 2003; Tan et al., 2005
Peak Elevation of Receiver: Tan et al., 2005
Peak Flame Angle: Tan et al., 2005

Run Description: Southwest

Vegetation Information

Vegetation Type:	Southern Tablelands DSF		
Vegetation Group:	Dry Sclerophyll Forests (Shrubby)		
Vegetation Slope:	3 Degrees	**Vegetation Slope Type:**	Upslope
Surface Fuel Load(t/ha):	22.5	**Overall Fuel Load(t/ha):**	30.85
Vegetation Height(m):	1.4	Only Applicable to Shrub/Scrub and Vesta	

Site Information

Site Slope:	0 Degrees	**Site Slope Type:**	Level
Elevation of Receiver(m):	6.9	**APZ/Separation(m):**	17

Fire Inputs

Veg./Flame Width(m):	100	**Flame Temp(K):**	1090

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg)	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	80

Program Outputs

Level of Construction:	BAL 29	**Peak Elevation of Receiver(m):**	6.73
Radiant Heat(kW/m2):	28.53	**Flame Angle (degrees):**	63
Flame Length(m):	15.12	**Maximum View Factor:**	0.441
Rate Of Spread (km/h):	1.76	**Inner Protection Area(m):**	7
Transmissivity:	0.851	**Outer Protection Area(m):**	10
Fire Intensity(kW/m):	27991		

BAL Thresholds

	BAL-40:	BAL-29:	BAL-19:	BAL-12.5:	10 kw/m2:	Elevation of Receiver:
Asset Protection Zone(m):	13	17	25	34	53	6

Appendix 4: Radiant Heat Modelling Outputs - Northwest

NBC Bushfire Attack Assessment Report V4.1

AS3959 (2018) Appendix B - Detailed Method 2

Print Date: 12/06/2024 **Assessment Date:** 2/02/2024

Site Street Address:	39 Rifle Range Road, Mudgee
Assessor:	Corey Shackleton; Blackash Bushfire Consulting
Local Government Area:	Mid-western Regional
Alpine Area:	No

Equations Used

Transmissivity: Fuss and Hammins, 2002
Flame Length: RFS PBP, 2001/Vesta/Catchpole
Rate of Fire Spread: Noble et al., 1980
Radiant Heat: Drysdale, 1985; Sullivan et al., 2003; Tan et al., 2005
Peak Elevation of Receiver: Tan et al., 2005
Peak Flame Angle: Tan et al., 2005

Run Description: Northwest

Vegetation Information

Vegetation Type:	Southern Tablelands DSF		
Vegetation Group:	Dry Sclerophyll Forests (Shrubby)		
Vegetation Slope:	2 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	22.5	**Overall Fuel Load(t/ha):**	30.85
Vegetation Height(m):	1.4	Only Applicable to Shrub/Scrub and Vesta	

Site Information

Site Slope:	0 Degrees	**Site Slope Type:**	Level
Elevation of Receiver(m):	8	**APZ/Separation(m):**	22

Fire Inputs

Veg./Flame Width(m):	100	**Flame Temp(K):**	1090

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg)	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	80

Program Outputs

Level of Construction:	BAL 29	**Peak Elevation of Receiver(m):**	8.75
Radiant Heat(kW/m2):	28.21	**Flame Angle (degrees):**	61
Flame Length(m):	19.82	**Maximum View Factor:**	0.442
Rate Of Spread (km/h):	2.48	**Inner Protection Area(m):**	10
Transmissivity:	0.84	**Outer Protection Area(m):**	12
Fire Intensity(kW/m):	39523		

BAL Thresholds

	BAL-40:	BAL-29:	BAL-19:	BAL-12.5:	10 kw/m2:	Elevation of Receiver:
Asset Protection Zone(m):	17	22	31	42	63	6