



Bushfire Attack Level (BAL) Assessment Report

for the construction of
6 dwellings at
18 Twenty First Street, Eildon VIC 3713

Report prepared for
Murrindindi Shire Council

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Cover image: Looking into the site from Twenty First Street.

Accountability

Stage	Date completed	Name	Title
Site assessment	2025-05-24	Jon Boura	Managing Director
Analysis & report preparation	2025-05-26	Jon Boura Mark Garvey	Managing Director Senior Analyst
Peer review	2025-05-26	Hamish Allan	Manager, Bushfire Planning and Design

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1.0	2025-05-27	BAL Report to client	Jon Boura

Terramatrix Pty. Ltd.

ACN 129 163 373

ABN 44 129 163 373

PO Box 1391

Collingwood VIC 3066

P: 03 9417 2626

www.terramatrix.com.au

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1 Introduction

This Bushfire Attack Level (BAL) assessment and report has been prepared for Murrindindi Shire Council, for the construction of 6 dwellings at 18 Twenty First Street, Eildon VIC 3713. The site is in a designated Bushfire Prone Area (BPA). BPAs are those areas subject to or likely to be subject to bushfires, as determined by the Minister for Planning.

In a BPA, the Building Act 1993 and associated Building Regulations 2018, through application of the National Construction Code 2022 (NCC), require specific design and construction standards for Class 1, 2 and 3¹ buildings, certain Class 9 and 4 buildings², and Class 10A buildings³ or decks adjacent to, or connected with, these classes of buildings.

For Class 1 buildings (dwellings) and associated Class 10A buildings or decks, the applicable performance requirement in the NCC is:

'A Class 1 building or a Class 10a building or deck associated with a Class 1 building that is constructed in a designated bushfire prone area must be designed and constructed to—

- (a) reduce the risk of ignition from a design bushfire with an annual exceedance probability not more than 1:50 years; and*
- (b) take account of the assessed duration and intensity of the fire actions of the design bushfire; and*
- (c) be designed to prevent internal ignition of the building and its contents; and*
- (d) maintain the structural integrity of the building for the duration of the design bushfire (ABCB, 2022).*

The performance requirement for Class 1, 2 and 3 buildings and associated Class 10a buildings and decks, is deemed to be satisfied by design and construction in accordance with AS 3959-2018 *Construction of buildings in bushfire prone areas* and, for Class 1 buildings and associated decks, the NASH Standard – *Steel Framed Construction in Bushfire Areas* (NASH, 2021).

In Victoria, applicable buildings in the BPA must be constructed to a minimum Bushfire Attack Level (BAL)-12.5, or higher as determined by a site assessment, or specified in a planning scheme or planning permit.

A BAL is a means of measuring the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact. There are six BALs defined in AS 3959:2018, ranging from BAL-LOW, which has no specific bushfire construction requirements, to BAL-FZ (Flame Zone), where flame contact with a building is expected (see Appendix 1).

¹ Class 1, 2 and 3 buildings are defined in the NCC and are generally those used for residential accommodation, including houses and other dwellings, apartments, hotels and other buildings with a similar function or use.

² Applicable Class 9 buildings are Class 9a health-care buildings, Class 9b early childhood centres, primary and secondary schools, Class 9c residential care buildings, and any Class 4 parts of a building associated with these Class 9 buildings.

³ Class 10a buildings are defined in the NCC as non-habitable buildings including sheds, carports, and private garages.

This report uses the simplified procedure (Method 1) of AS 3959:2018 to determine the BAL construction standard to be applied to the renovations to the accommodation buildings.

2 Method 1 BAL determination

The following steps have been used to determine the BAL in accordance with Clause 2.2 of AS 3959:2018.

2.1 Forest Fire Danger Index (FDI)

As the site is in a non-alpine area of Victoria, the applicable FFDI is 100.

2.2 Vegetation classification

Vegetation within the 100 m assessment zone around the buildings has been classified in accordance with the AS 3959 methodology. Classified vegetation is vegetation that is deemed hazardous from a bushfire perspective.

The classification system is not directly analogous to Ecological Vegetation Classes (EVCs) but uses a generalised description of vegetation based on the AUSLIG (Australian Natural Resources Atlas: No. 7 - Native Vegetation) classification system. The classification is based on the mature state of the vegetation and the likely fire behaviour that it will generate.

2.2.1 Forest

Treed vegetation along the Skyline Road reserve and in the paddock to the west (see Map 1, Figure 1, Figure 2 and Figure 3) best accords with the Forest group of AS 3959:2018. Forest vegetation comprises areas with trees to 30 m high or taller at maturity, typically dominated by eucalypts, with 30% to more than 70% foliage cover (may include understorey ranging from rainforest species and tree ferns to sclerophyllous low trees or shrubs). Includes pine and eucalypt plantations (Standards Australia, 2020).

The vegetation on the road reserve of Skyline Road and along the edge of the adjacent paddock has some characteristics of Forest, Woodland and Scrub, and we have applied the highest hazard classification as a precaution. This is discussed further at Section 3 below.

2.2.2 Grassland

Vegetation in the paddocks to the north (see Map 1 and Figure 4) and west (see Figure 5) of the site matches the AS 3959:2018 classification of Grassland, which is defined as all forms of vegetation (except Tussock Moorlands) including situations with shrubs and trees, if overstorey foliage cover is less than 10%. Includes pasture and cropland (Standards Australia, 2020).

Grassland vegetation is considered hazardous, and therefore classifiable, when it is not managed in a minimal fuel condition. Minimal fuel condition means there is insufficient fuel available to

significantly increase the severity of the bushfire attack (e.g. short-cropped grass, to a nominal height of 100 mm) (Standards Australia, 2020). Grassland areas are assumed to be unmanaged and classifiable unless there is 'reasonable assurance' that they will be managed in perpetuity, in a low threat state, no more than 100 mm high.



Figure 1 – Forest along the Skyline Road reserve, west of the site, with the site visible beyond.



Figure 2 – Dense *Leptospermum sp.* understorey along the Skyline Road reserve and on the adjacent property, west of the site.



Figure 3 – Forest along the Skyline Road reserve and on the adjacent property, north-west of the site.



Figure 4 – Grassland in the paddock at the northern extremity of the site assessment zone.



Figure 5 – Grassland on the property west of Skyline Road.

2.2.3 Excluded vegetation and non-vegetated areas

Areas of low threat vegetation and non-vegetated areas can be excluded from classification in accordance with Section 2.2.3.2 of AS 3959:2018, if they meet one or more of the following criteria:

- (a) *'Vegetation of any type that is more than 100 m from the site.*
- (b) *Single areas of vegetation less than 1 ha in area and not within 100 m of other areas of vegetation being classified vegetation.*
- (c) *Multiple areas of vegetation less than 0.25 ha in area and not within 20 m of the site, or each other, or of other areas of vegetation being classified vegetation.*
- (d) *Strips of vegetation less than 20 m in width (measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20 m of the site or each other, or other areas of vegetation being classified vegetation.*
- (e) *Non-vegetated areas, that is, areas permanently cleared of vegetation, including waterways, exposed beaches, roads, footpaths, buildings and rocky outcrops.*
- (f) *Vegetation regarded as low threat due to factors such as flammability, moisture content or fuel load. This includes grassland managed in a minimal fuel condition, mangroves and other saline wetlands, maintained lawns, golf courses (such as playing areas and fairways), maintained public reserves and parklands, sporting fields, vineyards, orchards, banana plantations, market gardens (and other non-curing crops), cultivated gardens, commercial nurseries, nature strips and windbreaks' (Standards Australia, 2020).*

Low-threat areas include the cultivated gardens on residential properties to the north, east and south of the site, and the mown nature strips of Twenty First Street, excluded from classification pursuant to Section 2.2.3.2 (f). Non-vegetated areas include the roads, driveways, parking areas and structures within the 100 m site assessment zone, excluded from classification pursuant to Section 2.2.3.2 (e) (see Map 1).



Figure 6 – Looking across the site into low threat residential properties south of Twenty First Street.



Figure 7 – Low threat cultivated garden of property immediately north of the site.



Figure 8 – Non-vegetated area of the storage facility, north of the site.



2.3 Distance of the site from classified vegetation

The distance from the nearest classified vegetation, is measured horizontally, to the nearest part of an external wall of the building (or the site in the absence of a detailed building design). For those parts of the building that do not have external walls (including carports, verandas, decks, landings, steps and ramps), the distance is measured to the supporting posts or columns (Standards Australia, 2020).

The following parts of the building are excluded when determining the distance:

- (a) Eaves and roof overhangs.
- (b) Rainwater and domestic fuel tanks.
- (c) Chimneys, pipes, cooling or heating appliances or other services.
- (d) Unroofed pergolas.
- (e) Sun blinds.

The nearest classified vegetation influencing the BAL for the development (see Map 1) is the Forest west of Skyline Road that is:

- 26 m from Building 1.
- 39 m from Building 2.
- 51 m from Building 3.
- 64 m from Building 4.
- 75 m from Building 5.
- 82 m from Building 6.

2.4 Effective slope under the classified vegetation

The AS 3959 methodology requires that the 'effective slope' be identified. This is the slope of the land under the classified vegetation⁴ that will most significantly influence the bushfire attack on a building. Two broad types apply:

- Flat and/or Upslope - land that is flat or on which a bushfire will be burning downhill in relation to the development. Fires burning downhill (i.e. on an upslope) will generally be moving more slowly with a reduced intensity.
- Downslope - land under the classified vegetation on which a bushfire will be burning uphill in relation to the development. As the rate of spread of a bushfire burning on a downslope (i.e. burning uphill towards a development) is significantly influenced by increases in slope, downslopes are grouped into five classes in 5° increments from 0° up to 20°.

The applicable effective slope class is 'All upslopes and flat land' under the Forest to the west.

⁴ The slope of the land between the classified vegetation and the building is called the site slope, which in the Method 1 procedure is assumed to be the same as the effective slope.



Map 2 - BAL assessment map.

2.5 BAL construction standard

Building 1

Based on the 26 m setback from the Forest to the west, and the 'All upslopes and flat land' slope class, Building 1 must be designed and constructed to a minimum **BAL-29** standard.

Building 2

Based on the 39 m setback from the Forest to the west, and the 'All upslopes and flat land' slope class, Building 2 must be designed and constructed to a minimum **BAL-19** standard.

Building 3

Based on the 51 m setback from the Forest to the west, and the 'All upslopes and flat land' slope class, Building 3 must be designed and constructed to a minimum **BAL-12.5** standard.

Building 4

Based on the 64 m setback from the Forest to the west, and the 'All upslopes and flat land' slope class, Building 4 must be designed and constructed to a minimum **BAL-12.5** standard.

Building 5

Based on the 75 m setback from the Forest to the west, and the 'All upslopes and flat land' slope class, Building 5 must be designed and constructed to a minimum **BAL-12.5** standard.

Building 6

Based on the 82 m setback from the Forest to the west, and the 'All upslopes and flat land' slope class, Building 6 must be designed and constructed to a minimum **BAL-12.5** standard.

3 Further considerations

3.1 Reducing BAL of Buildings 1 & 2 via Method 2 assessment

The vegetation on the road reserve of Skyline Road and along the edge of the adjacent paddock has characteristics of Forest, Woodland and Scrub. In this BAL report we have applied the more conservative Forest classification.

The DEECA NatureKit online mapper identifies the vegetation as EVC 47 Valley Grassy Forest (DEECA, 2025), which has a benchmark canopy tree cover of 20% with a sparse shrub layer, and the understorey dominated by herbs, lilies, grasses and sedges (DSE, 2004). At benchmark conditions this EVC would be classified as Woodland.

The vegetation in question, however, is not at EVC benchmark conditions and the dominant fuel layer is the tall shrubs (believed to be *Leptospermum sp.*). If on their own, the shrubs would be consistent with a classification as Scrub, but there is also a eucalypt overstorey. Dense, tall shrubs beneath a eucalypt canopy best aligns with classification as Forest.

Classification of Forest, however, overstates the actual level of bushfire attack as the strip of vegetation in question is narrow. There may be opportunities to reduce the BAL rating through more detailed fire behaviour modelling using Method 2 of AS 3959. This could be explored as additional work outside the scope of this report if it is desired to reduce the BAL rating of Buildings 1 and 2⁵.

3.2 Re-siting Building 1 to reduce BAL

To lower the BAL rating of Building 1 to BAL-19, without undertaking the Method 2 assessment described above, the building could be moved approx. 9 m eastwards to provide a 35 m setback from the Forest to the west. An alternative, but presumably less possible option, would be to remove most of the scrub vegetation under the trees to achieve at least a 35 m setback.

4 Conclusion

This BAL assessment has used the simplified procedure (Method 1) of AS 3959:2018 to determine the BAL construction standard to be applied to the 6 dwellings buildings at 18 Twenty First Street, Eildon VIC 3713.

The dwellings are exposed to Forest to the west on a slope in the 'All upslopes and flat land' slope class. Based on the current setback of the dwellings from the Forest, Building 1 must be designed and constructed to a minimum BAL-29 standard, Building 2 to BAL-19 and Buildings 3-6 to BAL-12.5.

The Forest classification is precautionary and conservative, and it may be possible to reduce the BAL rating of Buildings 1 and 2 through detailed Method 2 modelling or by re-siting the buildings to increase the separation distance from the Forest to the west.

5 References

ABCB (2022) *National Construction Code, Volume 1*. Australian Building Codes Board (ABCB). Available at <<https://ncc.abcb.gov.au/>>.

DEECA (2025) *NatureKit online mapper*. Department of Energy, Environment and Climate Action, Melbourne. Available at <<https://maps2.biodiversity.vic.gov.au/Html5viewer/index.html?viewer=NatureKit>>.

DSE (2004) *EVC/Bioregion Benchmark for Vegetation Quality Assessment – Central Victorian Uplands bioregion*. Department of Sustainability and Environment, Melbourne. Available at <https://www.environment.vic.gov.au/__data/assets/pdf_file/0030/48558/CVU_EVCs_combined.pdf>.

⁵ Note BAL-12.5 is the minimum BAL permissible in a BPA in Victoria, so the BAL rating of Buildings 3-6 cannot be reduced.

NASH (2021) *NS 300 NASH Standard – Steel Framed Construction in Bushfire Areas 2021*. National Association of Steel-framed Housing Inc, Hartwell, Victoria.

Standards Australia (2020) *AS 3959:2018 Construction of buildings in bushfire-prone areas*. Incorporating amendment no. 2, Standards Australia, North Sydney, New South Wales.

6 Appendix - BALs explained

Bushfire Attack Level (BAL)	Risk Level	Construction elements are expected to be exposed to...	Comment
BAL-Low	VERY LOW: There is insufficient risk to warrant any specific construction requirements but there is still some risk.	No specification.	At 4k W/m ² pain to humans after 10 to 20 seconds exposure. Critical conditions at 10kW/m ² and pain to humans after 3 seconds. Considered to be life threatening within 1 minute exposure in protective equipment.
BAL-12.5	LOW: There is risk of ember attack.	A radiant heat flux not greater than 12.5 kW/m ² .	At 12.5 kW/m ² standard float glass could fail and some timbers can ignite with prolonged exposure and piloted ignition.
BAL-19	MODERATE: There is a risk of ember attack and burning debris ignited by windborne embers and a likelihood of exposure to radiant heat.	A radiant heat flux not greater than 19 kW/m ² .	At 19 kW/m ² screened float glass could fail.
BAL-29	HIGH: There is an increased risk of ember attack and burning debris ignited by windborne embers and a likelihood of exposure to an increased level of radiant heat.	A radiant heat flux not greater than 29 kW/m ² .	At 29 kW/m ² ignition of most timbers without piloted ignition after 3 minutes exposure. Toughened glass could fail.
BAL-40	VERY HIGH: There is a much increased risk of ember attack and burning debris ignited by windborne embers, a likelihood of exposure to a high level of radiant heat and some likelihood of direct exposure to flames from the fire front.	A radiant heat flux not greater than 40 kW/m ² .	At 42 kW/m ² ignition of cotton fabric after 5 seconds exposure (without piloted ignition).
BAL- FZ (i.e. Flame Zone)	EXTREME: There is an extremely high risk of ember attack and a likelihood of exposure to an extreme level of radiant heat and direct exposure to flames from the fire front.	A radiant heat flux greater than 40 kW/m ² .	At 45 kW/m ² ignition of timber in 20 seconds (without piloted ignition).

Source: derived from AS 3959:2018 (Standards Australia, 2020).