# APPENDIX E

## Bushfire Hazard Assessment

Prepared by:

E2M

# Bushfire Hazard Assessment and Management Plan

## Trussmaster Pty Ltd
## 28-34 Ellerslie Road, Meadowbrook

Unit 1 / Studio 4
304 Montague Road
WEST END QLD 4101

Issue Date: 21 September 2018
mail@e2mconsulting.com.au
www.e2mconsulting.com.au

# Document Management

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# Definitions

| Term | Definition |
|---|---|
| Development footprint | 'Site plan' developed by Multi Span Australia Group (drawing no. SK-AR-3001, rev. D dated 06/09/18) and extent of earthworks identified within the '13470 – Dev Extent' file provided by RMA Engineers |
| The site | 28-34 Ellerslie Road, Meadowbrook (Lot 20 on RP91039 and Lot 21 on RP91039) |
| Survey area | Development footprint plus 150 m assessment buffer |

# Abbreviations

| Abbreviation | Description |
|---|---|
| AS 3959-2009 | Australian Standard: Construction of buildings in bushfire prone areas |
| BAL | Bushfire Attack Level |
| BCA | National Construction Code 2016: Building Code of Australia |
| BHAMP | Bushfire Hazard Assessment and Management Plan |
| DA | Development application |
| DEE | Federal Government Department of the Environment and Energy |
| DEHP | Department of Environment and Heritage Protection |
| DILGP | Department of Infrastructure, Local Government and Planning |
| DNRM | Department of Natural Resources and Mines |
| DSITI | Department of Science, Information Technology and Innovation |
| E2M | E2M Pty Ltd |

| Abbreviation | Description |
|---|---|
| EA | Ecological Assessment |
| GIS | Geographic Information Systems |
| GPS | Global Positioning System |
| LCC | Logan City Council |
| MCU | Material change of use |
| Planning Act | *Planning Act 2016* |
| Planning Regulation | *Planning Regulation 2017* |
| SPP | State Planning Policy (July 2017) |
| VC | Vegetation community |
| VHC | Vegetation Hazard Class |
| VM Act | *Vegetation Management Act 1999* |
| NC Act | *Nature Conservation Act 1992* |
| RE | Regional Ecosystem |

# 1 Introduction

## 1.1 Project background

On behalf of Trussmaster Pty Ltd (Trussmaster), BH Contracting Pty Ltd (BH Contracting) is seeking to lodge a Development Application (DA) for the construction of an industrial building at 28-34 Ellerslie Road, Meadowbrook (formally described as Lots 20-21 on RP91039) (herein referred to as 'the site'). The site is located within the Logan City Council (LCC) Local Government Area (LGA) and is subject to split zoning under the Logan Planning Scheme 2015 (v5.1) (Logan PS), including 'Rural Residential' (Park Living) (Lot 20 on RP91039) and 'Medium Impact Industry' (Lot 21 on RP91039).

The site is subject to both State and Local bushfire prone area mapping, as such, the proposed development is required to be informed by a site-specific bushfire hazard assessment. This Bushfire Hazard Assessment and Management Plan (BHAMP) has been based on the 'Site plan' developed by Multi Span Australia Group (drawing no. SK-AR-3001, rev. D dated 06/09/18) and extent of earthworks identified within the '13470 – Dev Extent' file provided by RMA Engineers (herein referred to as the 'development footprint').

## 1.2 Scope and objectives

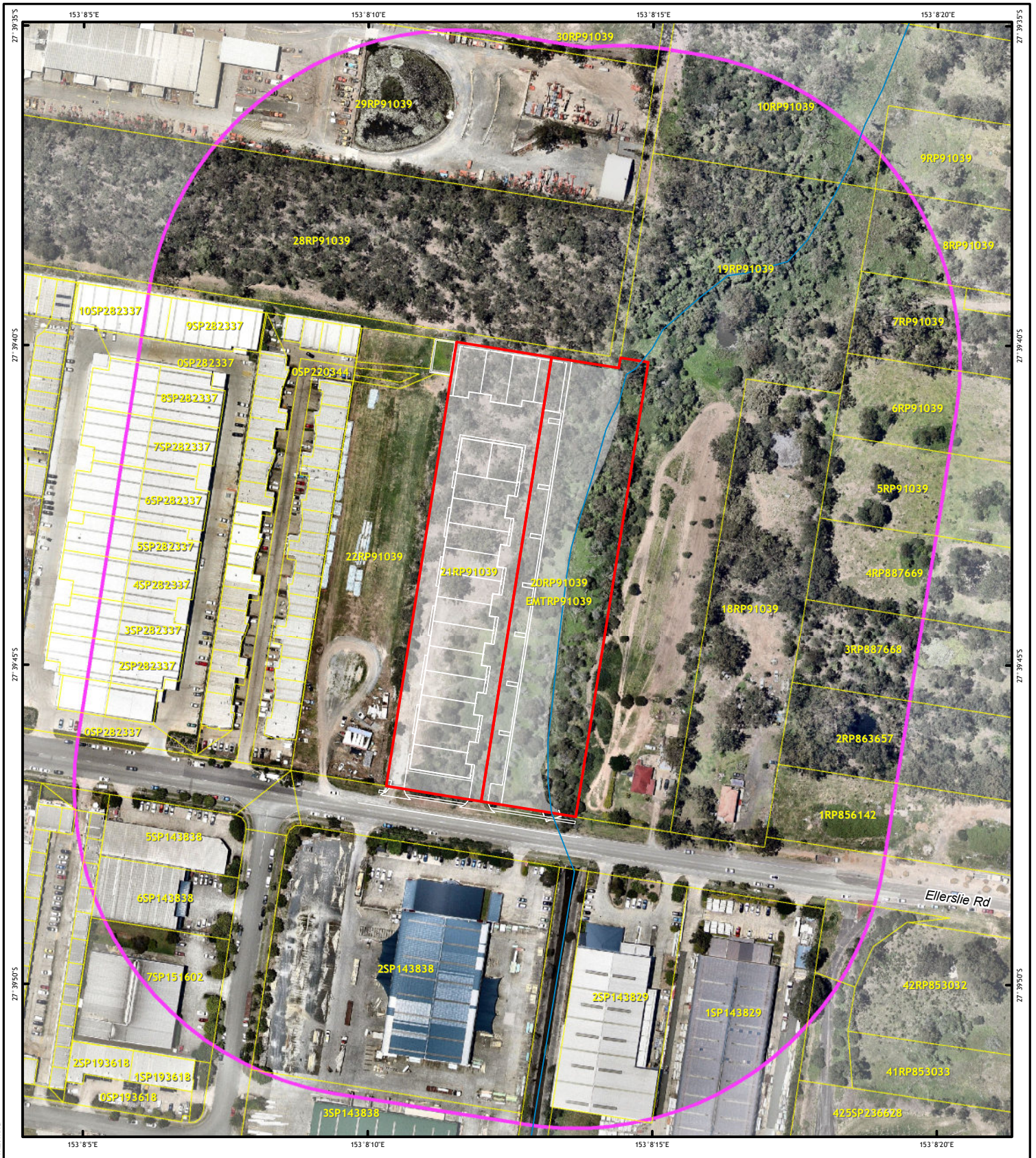
E2M Pty Ltd (E2M) has been engaged by Trussmaster to undertake a bushfire hazard assessment to accompany a DA for the site. The objectives of this assessment are to:

- identify bushfire related risk factors associated with the placement of the development footprint, including likely direction of bushfire attack, hazard scores associated with existing and proposed (where relevant) vegetation on and surrounding the site, and planning separation from potential hazards; and
- recommend appropriate measures of protection to mitigate the risk posed by the assessed Bushfire Attack Level (BAL) in accordance with the State Planning Policy (SPP), Australian Standard (AS) 3959-2009 (Standards Australia Committee FP-020 2011) and Bushfire Hazard Overlay Code (Logan PS).

In addition to the above, this BHAMP has been developed in conjunction with the Ecological Assessment (EA) prepared by E2M (2018). The identification of ecological features within and adjacent to the site allows for the recommendation of appropriate mitigation management measures which meet both the biodiversity and bushfire hazard requirements of the Logan PS.

This BHAMP addresses relevant State and Local regulatory requirements and has been undertaken in accordance with the requirements of the Bushfire Hazard Overlay Code and Planning Scheme Policy 6 – Management of bushfire hazard (PSP 6) (Logan PS), with consideration given to the desired outcomes of the SPP (July 2017) and associated guideline[1].

[1] *State Planning Policy – State Interest Guideline: Natural Hazards, risks and resilience* (April 2016). The updated guideline is yet to be released.




## Legend

- Watercourse
- Proposed Layout
- Proposed Disturbance Area
- Site
- Cadastre
- Bushfire Buffer (150m)

N

Scale 1:2,500 (A4)

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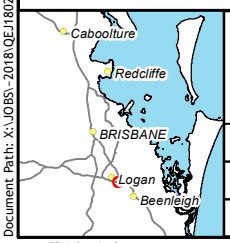
Metres

Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator

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# FIGURE 1: SITE LOCALITY

Bushfire Hazard Assessment and Management Plan
28-34 Ellerslie Road, Meadowbrook

| Map Number | Job Number | Rev |
|---|---|---|
| 1 of 1 | QEJ18021 | 0 |

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## 1.3 Site description

The site comprises ~2 ha of undeveloped land, with shed present along the eastern boundary of Lot 21 on RP91039. Ellerslie Road bounds the site to the south, with residential and industrial development to the east and west respectively. A section of undeveloped land connects to the site via the northern boundary.

## 1.4 Proposed development

The proposed development consists of an industrial facility (refer to Figure 1). Specifically, a Material Change of Use (MCU) for a proposed Medium Impact Industry and Warehouse is being sought from Logan City Council (LCC).

## 1.5 Legislative context

### 1.5.1 State Planning Policy (July 2017)

Supporting the *Planning Act 2016* (Planning Act) (Qld), the purpose of the SPP is to guide State and Local government in land-use planning and development by defining the Queensland Government's polices about matters of state interest, to which there are 17 arranged under five themes:

- liveable communities
- mining and extractive resources
- water quality
- natural hazards, risk and resilience; and
- strategic airports and aviation facilities.

Local governments must consider the state interest and reflect appropriately when amending local planning schemes and in some cases, assessing development applications.

Under the safety and resilience to hazards theme, the state's interest is to ensure that natural hazards are properly considered in all levels of the planning system. This includes the avoidance of natural hazard areas or the mitigation of risks to an acceptable or tolerable level. The SPP is supported by the *SPP – State interest guideline – Natural hazards, risk and resilience* (April 2016) and *Technical manual – Evaluation report: Bushfire Hazards* (April 2016) which identify the outcomes sought by the State and application when planning development within a *bushfire hazard area (bushfire prone area)*[2]. Furthermore, the SPP Interactive Mapping System includes bushfire hazard area (bushfire prone area) mapping which is based on the methodologies outlined in Leonard *et al*. 2014.

### 1.5.2 National Construction Code 2016: Building Code of Australia

The *National Construction Code 2016: Building Code of Australia* (BCA) details technical provisions pertaining to the design and construction of buildings and other structures throughout Australia (The Australian Building Codes Board). Ten primary building classes, including several sub-classes, are defined within the BCA. Part G5 of the BCA identifies that where a building is going to be constructed within a

[2] *is land that is potentially affected by significant bushfires, including: vegetation likely to support a significant bushfire; and adjacent land that could be subject to impacts from a significant bushfire (i.e. potential impact buffer)* (Part G, SPP).

designated bushfire prone area, it must *be designed and constructed to reduce the risk of ignition from a bushfire*. This, however, is only applicable to:

- Class 1[3], Class 2[4] or Class 3[5] buildings; or
- a Class 10a[6] building or deck associated with Class 1-3 buildings.

Beyond these classes, there are some instances where the BCA identifies provisions for special use buildings such as public transport buildings, farm buildings and farm sheds.

### 1.5.3 Australian Standard: Construction of buildings in bushfire-prone areas (AS 3959-2009)

Where development is proposed within bushfire prone areas, AS 3959-2009 specifies construction requirements to improve resistance to bushfire attack. Construction specifications are based on heat flux exposure thresholds which have been categorised into six Bushfire Attack Levels[7] (BAL):

- BAL-LOW
- BAL-12.5
- BAL-19
- BAL-29
- BAL-40; and
- BAL-Flame Zone (FZ).

These categories are expressed in kW/m$^2$, as such, the lower the category value the lower the radiant heat. The highest level of bushfire attack is BAL-FZ, which indicates direct exposure to flames. Determining a BAL rating for a proposed development can be ascertained using either Method 1 (Clause 2.2, AS 3959-2009) or Method 2 (Appendix B, AS 3959-2009). Method 1 is a simplified procedure, whereas Method 2 is more detailed and is utilised when a more specific result is required.

As identified within Section 1.5.2, construction requirements identified within AS 3959-2009 are only applicable to Class 1, Class 2 or Class 3 buildings, or a Class 10a building or deck associated with Class 1-3 buildings.

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[3] *A single dwelling being a detached house, or one or more attached dwellings, each being a building, separated by a fire-resisting wall, including a row house, terrace house, town house or villa unit; A boarding house, guest house, hostel or the like with a total area of all floors not exceeding 300m2, and where not more than 12 reside, and is not located above or below another dwelling or another Class of building other than a private garage* (Queensland Building and Construction Commission).

[4] *A building containing two or more sole-occupancy units each being a separate dwelling* (Queensland Building and Construction Commission).

[5] *A residential building, other than a Class 1 or 2 building, which is a common place of long term or transient living for a number of unrelated persons* (Queensland Building and Construction Commission).

[6] *A private garage, carport, shed or the like* (Queensland Building and Construction Commission).

[7] *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* (AS 3959-2009).

### 1.5.4 Logan Planning Scheme 2015 (v5.1)

The purpose of the Bushfire Hazard Overlay map OM – 03.01, under the Logan PS (LCC), is to reflect SPP State and Local level interests by identifying designated bushfire prone areas. Where assessable development is proposed on land mapped as containing bushfire prone areas, a site-specific bushfire hazard assessment prepared in accordance with the Bushfire Hazard Overlay Code and Planning scheme policy 6 – Management of bushfire hazard (PSP 6) (Logan PS) is required.

Part 2 of the Logan PS identifies that the Natural hazards, risk and resilience state interest has been integrated, however, this is based on a superseded version of the SPP (July 2014). As PSP 6 requires confirmation of bushfire prone areas to be undertaken in accordance with Leonard *et al*. (2014), it has been assumed that the Bushfire Hazard Overlay map OM – 03.00 has been developed using that same methodology. In any case, SPP mapping was updated on 3 July 2017 in conjunction with the release of the Planning Act and SPP (July 2017). This results in a variation between bushfire prone area (bushfire hazard) sub-category extents.

The SPP – state interest guidance material for Natural hazards, risk and resilience: Bushfire, which supports the current SPP (July 2017) bushfire prone area mapping, is yet to be released. As such, verification of the presence, or otherwise, of bushfire prone areas in this BHAMP has been undertaken in accordance with available SPP (April 2016) guidance material, specifically the *Technical Manual: A 'fit for purpose' approach in undertaking natural hazard studies and risk assessments* (technical manual) (April 2016) which incorporates Leonard *et al*. (2014).

# 2 Methods

## 2.1 Desktop assessment and legislative review

A desktop assessment and legislative review was undertaken to identify overlay mapping and code requirements under the SPP and Logan PS. The review included:

- *Planning Act 2016* (Planning Act) (Qld)
  - *Planning Regulation 2017* (Planning Regulation) (Qld)
  - State Planning Policy (SPP) (July 2017)
  - State Planning Policy Interactive Mapping System (Department of State Development, Manufacturing, Infrastructure and Planning)
- Logan Planning Scheme 2015 (v5.1) (Logan PS)
  - Bushfire Hazard Overlay Code
  - Planning Scheme Policy 6 – Management of bushfire hazard
  - Logan Planning Scheme Interactive Mapping
- *National Construction Code 2016: Building Code of Australia* (BCA)
- *Australian Standard: Construction of buildings in bushfire-prone areas* (AS 3959-2009)

## 2.2 Field assessment

A field survey of the site was conducted by E2M Fire Protection Association Australia - Bushfire Planning and Design Level 1 Accredited Bushfire Practitioner, Nicole Nesvadba, on 28 February 2018. The survey included:

- recording the floristic structure, composition and condition of vegetation communities located within and adjacent to the site (i.e. 150 m assessment buffer)
- assessment of slope under classified vegetation
- determination of the aspect of the site; and
- identification of waterway and wetland features within the site (if applicable).

A Trimble Nomad Global Positioning System (GPS) device was utilised to delineate the extent of vegetation communities and record local attributes within and adjacent to the site. Captured data was validated, mapped and assessed using a geographical information system, whereby the development footprint and observed features and extents were overlaid on the relevant regulatory mapping (GDA94/MGA zone 56).

## 2.3 Bushfire hazard assessment

Utilising the recorded outcomes of the field assessment, a Bushfire Hazard Assessment (BHA) and subsequent BAL review was carried out in accordance with the Bushfire Hazard Overlay Code, PSP 6, SPP and associated technical manual[8].

## 2.4 Bushfire Attack Level

Determination of the BAL associated with the development footprint and classified vegetation was undertaken in accordance with AS 3959-2009, specifically Method 1 (Clause 2.2). This includes identification of the following input values:

- relevant Fire Danger Index (FDI)
- vegetation classification
- distance of the development footprint from classified vegetation; and
- effective slope of land under classified vegetation.

AS 3959-2009 defines BAL as *being 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*. As such, the outcomes of the assessment and associated BAL construction requirements are only applicable to proposed buildings and/or assets; not the entire development footprint.

In this instance, the assets associated with the proposed development include 'proposed building 1' and 'proposed building 2' indicated on the 'Site plan' developed by Multi Span Australia Group (drawing no. SK-AR-3001, rev. D dated 06/09/18).

[8] *Technical Manual: A 'fit for purpose' approach in undertaking natural hazard studies and risk assessments* (April 2016)

# 3 Results

## 3.1 Desktop assessment and legislative review

### 3.1.1 State Planning Policy (July 2017)

The SPP Interactive Mapping System mapping indicated that the site contains the following sub-categories of bushfire hazard area (bushfire prone area):

- Medium potential bushfire intensity; and
- Potential impact buffer.

The SPP mapping has been indicated in Figure 2.

### 3.1.2 Logan Planning Scheme 2015 (v5.1)

The Logan Planning Scheme Interactive Mapping tool identified that sections of the site contain the following Bushfire Hazard Overlay sub-category areas (Bushfire Hazard Overlay map OM – 03.00):

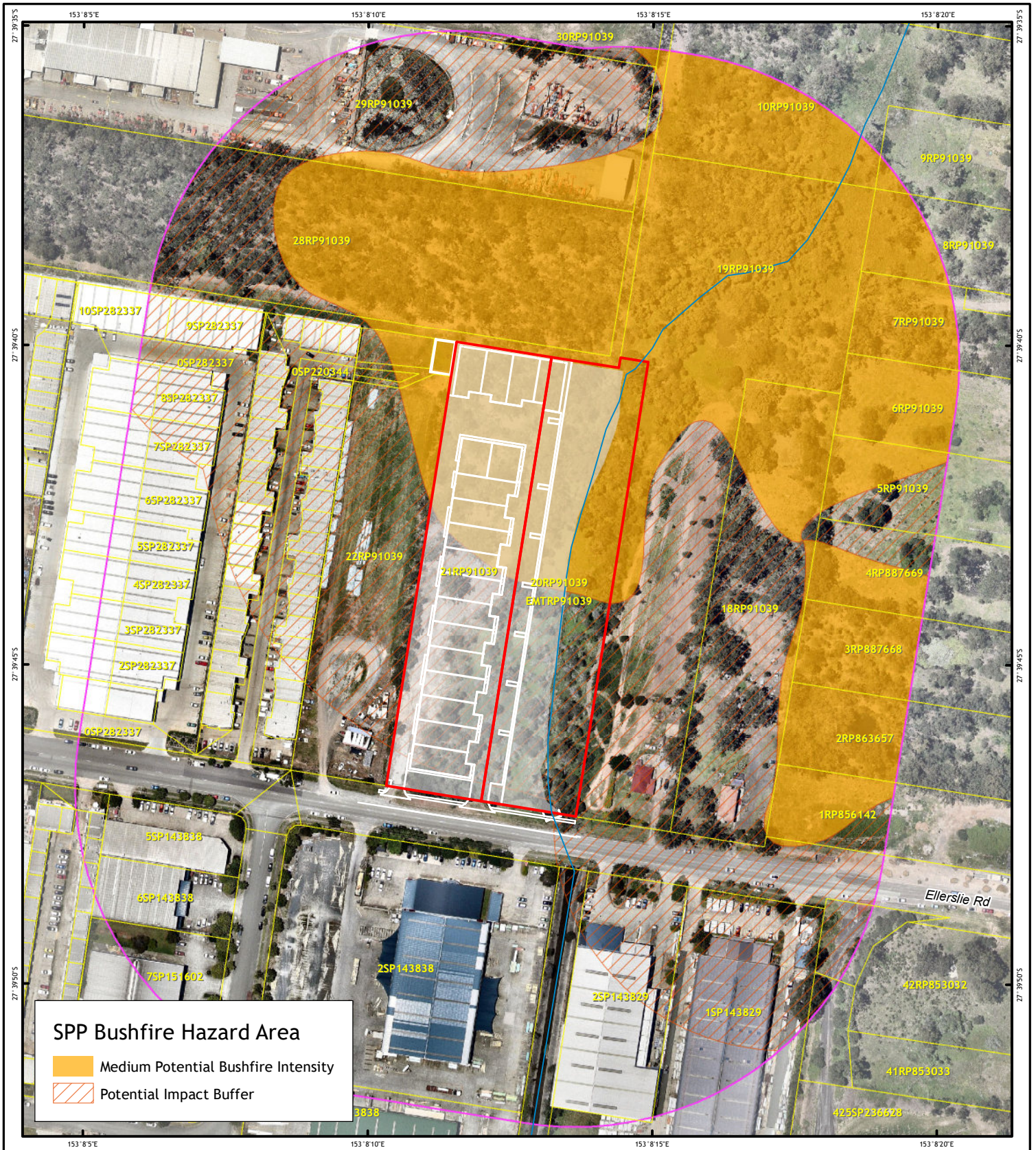
- Bushfire hazard – medium potential; and
- Bushfire hazard – potential impact buffer.

The Bushfire Hazard Overlay mapping has been indicated in Figure 3.

In addition to the Bushfire Hazard Overlay mapping, the Logan Planning Scheme Interactive Mapping tool identified that sections of the site contain the following environmentally relevant sub-category areas:

- Primary vegetation management area, Matters of State and Local significance and Matters of Local environmental significance (Biodiversity Areas Overlay map OM - 02.00); and
- Minor waterway, Major wetland and Wetland buffer (Waterway Corridors and Wetlands Overlay map OM – 13.00).

Refer to the EA prepared by E2M (2018) for an assessment of environmental values across the site.




## Legend

- Watercourse
- Proposed Layout
- Proposed Disturbance Area
- Site
- Cadastre
- Bushfire Buffer (150m)

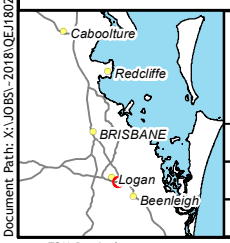
N

Scale 1:2,500 (A4)

0 25 50 75 100

Metres

Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator

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# FIGURE 2: SPP BUSHFIRE HAZARD AREA (BUSHFIRE PRONE AREA)

Bushfire Hazard Assessment and Management Plan
28-34 Ellerslie Road, Meadowbrook

| Map Number | Job Number | Rev |
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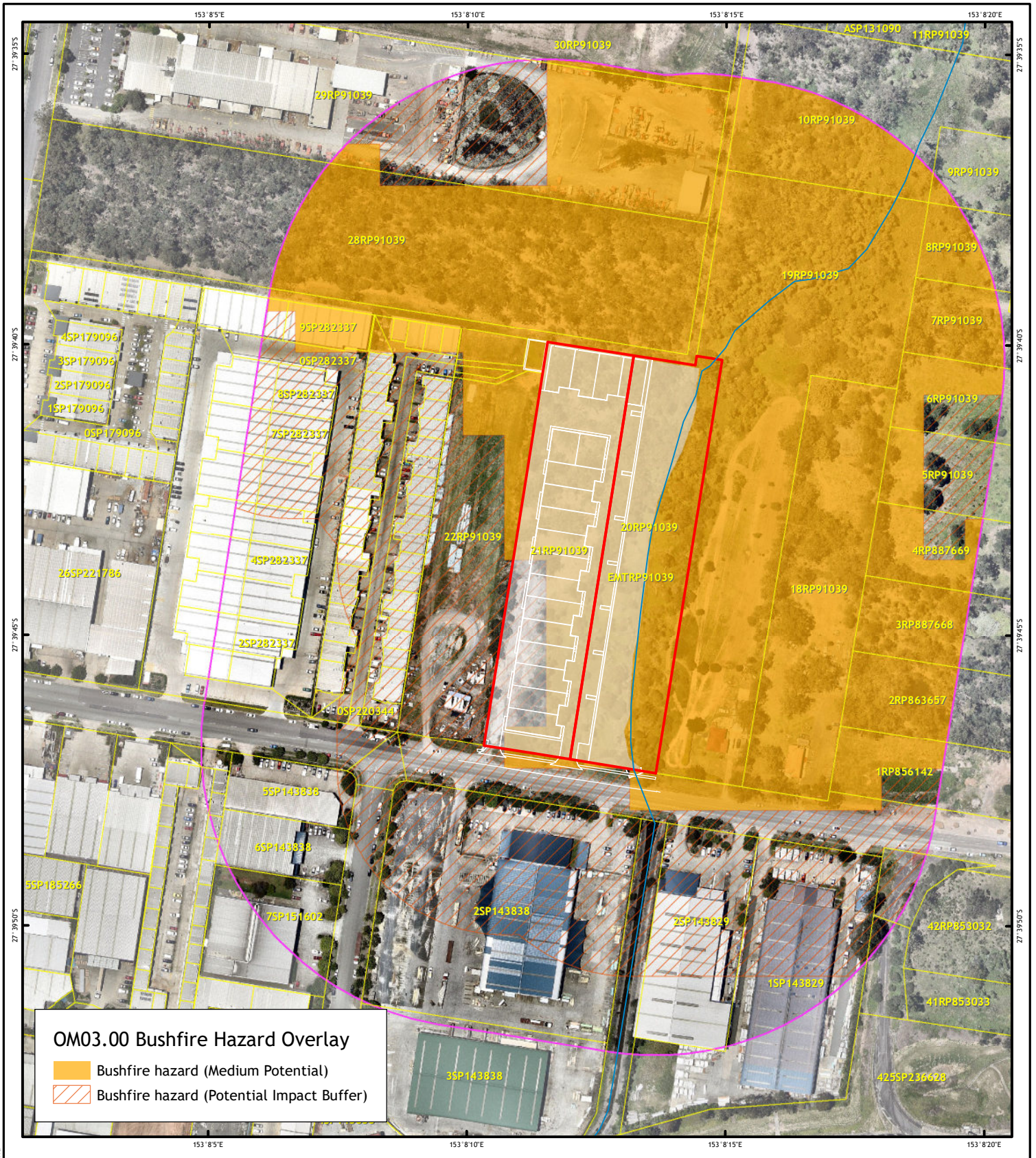


## Legend

- Watercourse
- Proposed Layout
- Proposed Disturbance Area
- Site
- Cadastre
- Bushfire Buffer (150m)

N

Scale 1:2,750 (A4)

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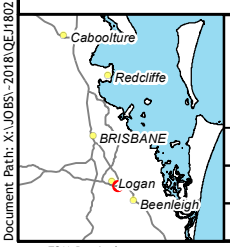
Metres

Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator

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# FIGURE 3: BUSHFIRE HAZARD OVERLAY (LOGAN PS)

Bushfire Hazard Assessment and Management Plan
28-34 Ellerslie Road, Meadowbrook

| Map Number | Job Number | Rev |
|---|---|---|
| 1 of 1 | QEJ18021 | 0 |

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## 3.2 Field assessment

### 3.2.1 Vegetation communities

The outcomes of the field survey identified three areas of differing vegetation composition and structure (refer to Figure 4 for extents). To align with the descriptions provided within the technical manual and AS 3959-2009, the three vegetation communities (VCs) have been further sub-categorised. This allows for subsequent BHA and BAL assessment.

Areas impacted by the development footprint have been excluded from the assessment, as it is assumed the vegetation in these areas will be removed or maintained in a low threat condition.

#### 3.2.1.1 VC 1

Vegetation community 1 was characterised by areas supporting nil to very low vegetation cover or sparsely vegetated areas associated with VC 2 or VC 3 (refer to Photo Plate 1).

The vegetation associated with VC 1 has been sub-categorised into the following three categories:

- VC 1A: built-up areas supporting nil to very low vegetation (e.g. warehouses, roads etc.) (i.e. Vegetation Hazard Class (VHC) 42.6, exclusion 2.2.3.2(e), AS 3959-2009; VHC 41.1, exclusion 2.2.3.2(f), AS 3959-2009).
- VC 1B: sparsely vegetated areas with a maintained understorey (lawns). Vegetation within these areas is considered to be low threat (i.e. VHC 16.6, exclusion 2.2.3.2(f), AS 3959-2009).
- VC 1C: disturbed areas consisting of overgrown exotic grass species such as *Megathyrsus maximus**, *Chloris gayana**, *Urochloa decumbens** and *Melinis repens** (VHC 16.6, vegetation classification G, AS 3959-2009)

Photo Plate 1 – VC 1 (top row, examples of VC 1B; bottom row, examples of VC 1C)

#### 3.2.1.2 VC 2

Vegetation community 2 was comprised of a *Eucalyptus moluccana* and *Corymbia citriodora* canopy (to 26 m) with associated *E. siderophloia* and *E. tereticornis* on Quaternary alluvials. The sparse shrub layer comprised *Melaleuca linariifolia*, *Acacia disparrima*, *Lantana camara** and juvenile eucalypts. Understorey vegetation included a mix of native and exotic grasses and forbs including *Themeda triandra*, *Cymbopogon refractus*, *Imperata cylindrica*, *Urochloa decumbens** and *Fimbristylis dichotoma* (refer to Photo Plate 2).

To align with the technical manual and AS 3959-2009, VC 2 has been sub-categorised due to forest versus woodland structural differences[9]:

- VC 2A: remnant Regional Ecosystem (RE) 12.3.3d forest areas (i.e. VHC 16.1, vegetation classification A, AS 3959-2009).
- VC 2B: non-remnant woodland areas associated with RE 12.3.3d (i.e. VHC 16.2, vegetation classification B, AS 3959-2009).

[9] Affects modelled fuel loads

Photo Plate 2 – VC 2 - (top row, examples of VC 2A; bottom row, examples of VC 2B)

#### 3.2.1.3 VC 3

*Eucalyptus tereticornis* canopy (to 27 m) with associated *E. propinqua*, *Angophora leiocarpa* and *Corymbia citriodora* on Quaternary alluvials. A sub-canopy of *Lophostemon suaveolens*, *Melaleuca quinquenervia* and juvenile eucalypts was also present. The moderately dense shrub layer consisted of *Lophostemon suaveolens*, *Senna pendula**, *Lantana camara**, *Schinus terebinthifolius**, *Glochidion ferdinandi* and *Schefflera actinophylla**. The dense ground layer was dominated by exotic forbs and grasses including *Sphagneticola trilobata**, *Urochloa decumbens** and *Megathyrsus maximus** (refer to Photo Plate 3).

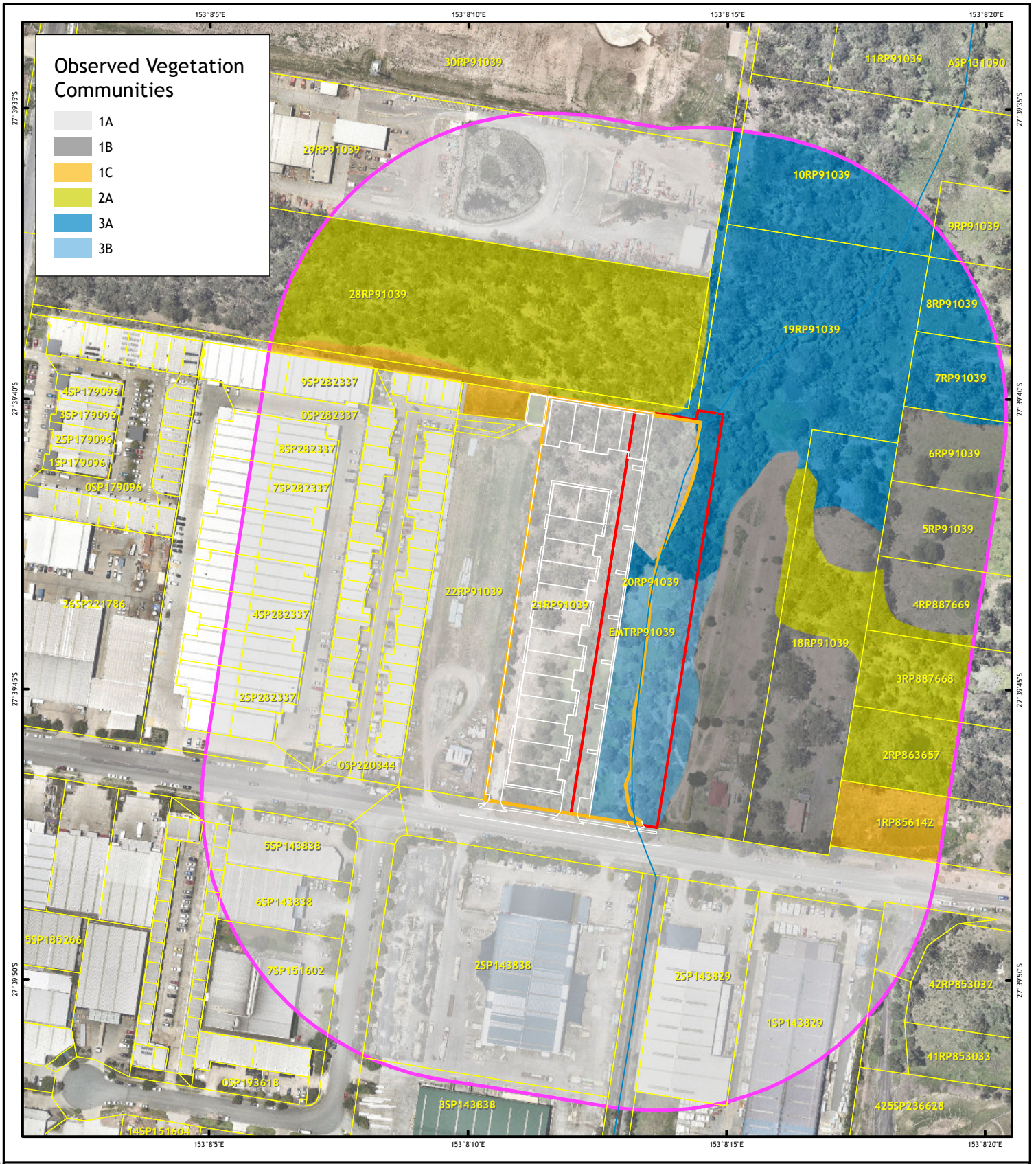
To align with the technical manual and AS 3959-2009, VC 2 has been sub-categorised due to forest versus woodland structural differences:

- VC 3A: remnant RE 12.3.11 forest areas (i.e. VHC 16.1, vegetation classification A, AS 3959-2009).
- VC 3B: non-remnant woodland regrowth areas, including scattered canopy trees such as, *Eucalyptus siderophloia*, *E. tereticornis* and *Corymbia citriodora* (to 12 m). A sparse shrub layer was present consisting of *Acacia disparrima*, *A. leiocalyx*, *Leucaena leucocephala**, *Lantana camara** and juvenile eucalypts (i.e. VHC 16.2, vegetation classification B, AS 3959-2009).

Photo Plate 3 – VC 3 - (top row, examples of VC 3A; bottom row, examples of VC 3B)

### 3.2.2 Slope and aspect

The landform of the site consists of undulating rises, having a very low relief (~7 m north-eastern section of Lot 20 to ~10 m within the southern portion and along the western boundary of Lot 21) with a gently inclined slope (4-10%) (Speight 2009). Aspect across the site is mostly eastern facing, being influenced by the watercourse that intersects Lot 20.




## Legend

- Watercourse
- Proposed Layout
- Proposed Disturbance Area
- Site
- Cadastre
- Bushfire Buffer (150m)

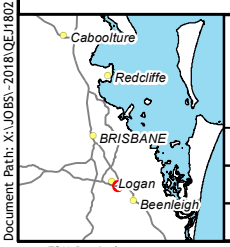
N

Scale 1:2,750 (A4)

0 25 50 75 100 125

Metres

Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator




Notes:
Aerial Imagery: © Nearmap 2018
Cadastre: © DNRME 2018
Watercourse: © Geoscience Australia 2017
Road: © PSMA 2014

| Rev | Description | Drawn | Approved | Date |
|---|---|---|---|---|
| 0 | Issued for Use | CO | CB | 21/09/2018 |
| A | Issued for Review | NN | CB | 15/06/2018 |

# FIGURE 4: OBSERVED VEGETATION COMMUNITIES

Bushfire Hazard Assessment and Management Plan
28-34 Ellerslie Road, Meadowbrook

| Map Number | Job Number | Rev |
|---|---|---|
| 1 of 1 | QEJ18021 | 0 |

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## 3.3 Bushfire hazard assessment

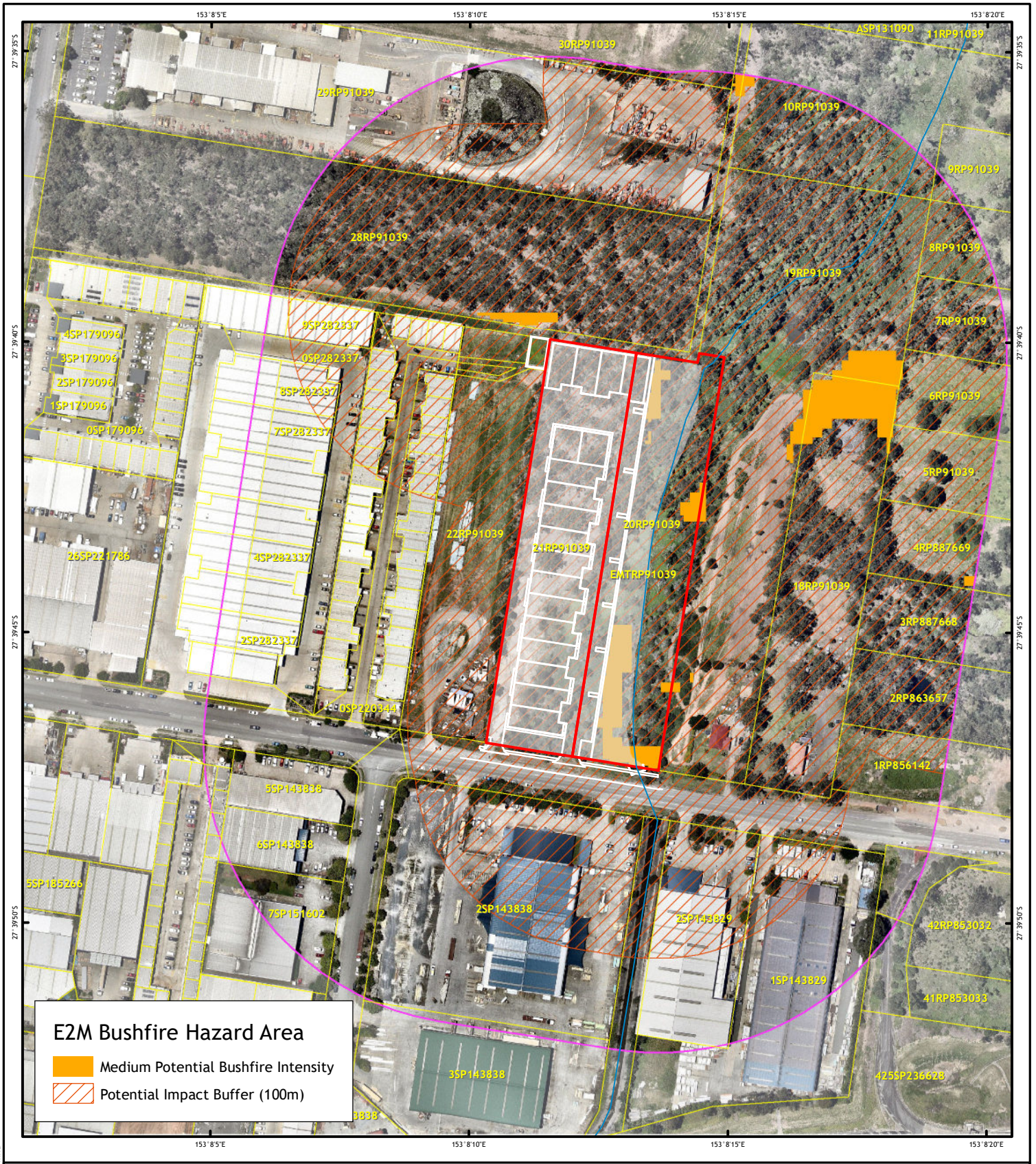
### 3.3.1 Pre-development scenario

A 'pre-development scenario' BHA was undertaken to determine the existing bushfire prone (i.e. bushfire hazard) areas within the site and confirm, or otherwise, SPP mapping. The outcomes of the assessment identified that the site contains classified vegetation, including Medium potential bushfire intensity and Potential impact buffer areas. This result is generally in accordance with SPP mapping.

### 3.3.2 Post-development scenario

As the 'pre-development' scenario BHA identified Medium potential bushfire intensity and Potential impact buffer areas within and adjacent to the site, a 'post-development' BHA was undertaken to determine the level of bushfire risk to the proposed development footprint. This assessment was based on the assumptions that vegetation will be cleared or managed in a low-fuel state where impacted by the siting of the development footprint and land will be generally levelled through associated earthworks.

The outcomes of the 'post-development' scenario identified that sections of the development footprint are located within the potential impact buffer area (refer to Figure 5). As such, the development footprint and buildings located within will require consideration regarding construction requirements, set-backs, Asset Protection Zones and bushfire hazard mitigation requirements.




## Legend

- Watercourse
- Proposed Layout
- Proposed Disturbance Area
- Site
- Cadastre
- Bushfire Buffer (150m)

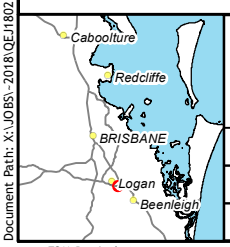
N

Scale 1:2,750 (A4)

0 25 50 75 100 125

Metres

Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator




**Notes:**
Aerial Imagery: © Nearmap 2018
Cadastre: © DNRME 2018
Watercourse: © Geoscience Australia 2017
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| Rev | Description | Drawn | Approved | Date |
|---|---|---|---|---|
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| A | Issued for Review | NN | CB | 15/06/2018 |

# FIGURE 5: 'POST-DEVELOPMENT' BHA

Bushfire Hazard Assessment and Management Plan
28-34 Ellerslie Road, Meadowbrook

| Map Number | Job Number | Rev |
|---|---|---|
| 1 of 1 | QEJ18021 | 0 |

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## 3.4 Bushfire Attack Level ('post-development')

Acceptable Outcome (AO) 2 of the Bushfire Hazard Overlay code (Part 8.2.3, Logan PS) identifies that development is to ensure that the BAL of the nominated development footprint does not exceed BAL-29 (calculated in accordance with AS 3959-2009).

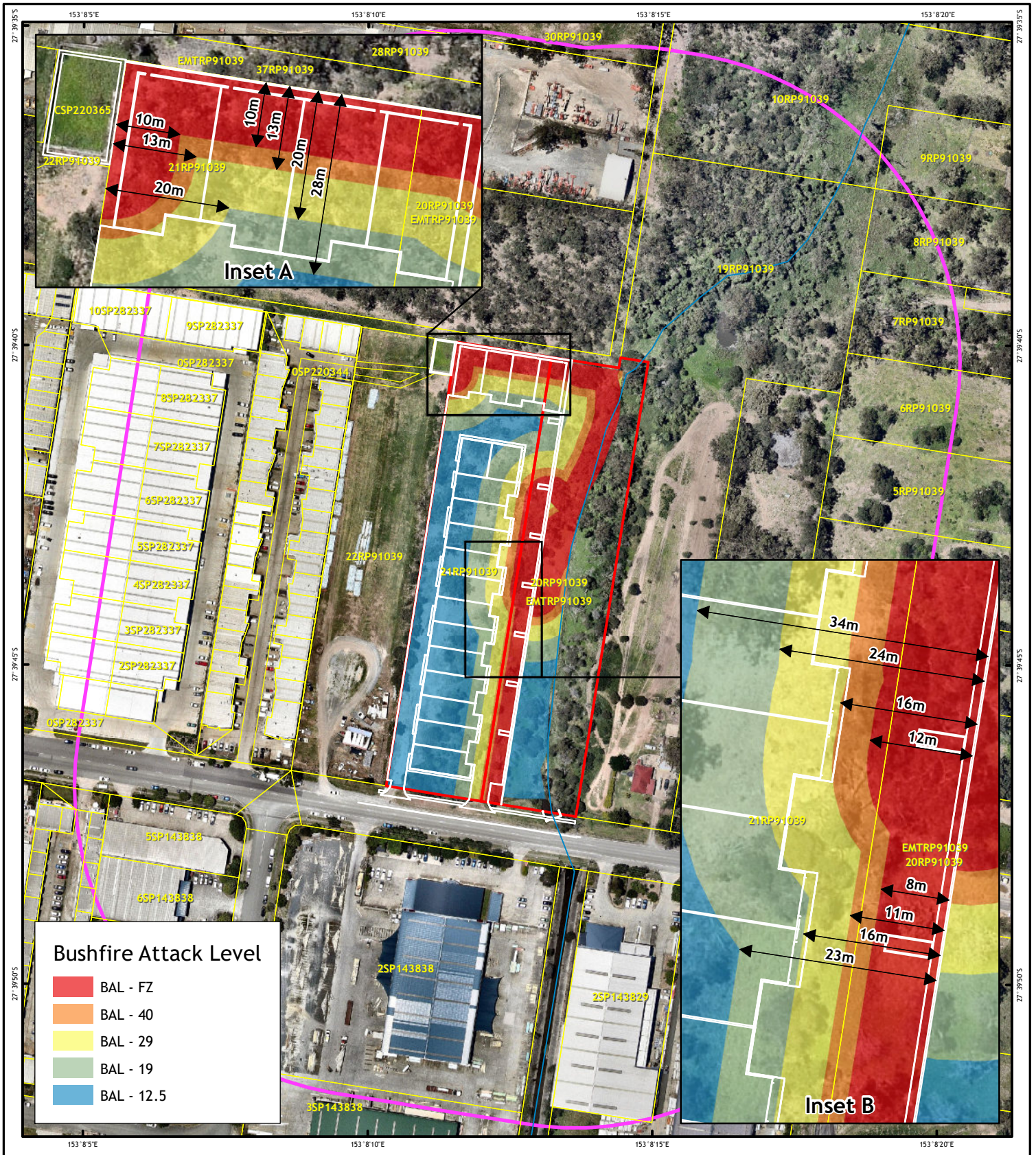
The BAL assessment, which was undertaken in accordance with AS 3959-2009, identified that various setbacks are required to achieve BAL-29 (refer to Table 1). The length of the setback is dependent on the VC and additional factors such as effective slope.

**Table 1: BAL assessment (AS 3959-2009)**

| Obs. VC | Fire Danger Index (Qld) | Vegetation Classification | Effective Slope (°) | Setback from hazard (m) | BAL |
|---|---|---|---|---|---|
| VC 1A - 1B | 40 | Exclusion 2.2.3.2 (e)<br>*Non-vegetated areas, including waterways, roads, footpaths, buildings and rocky outcrops.*<br>OR<br>Exclusion 2.2.3.2 (f)<br>*Low threat vegetation, including grassland managed in a minimal fuel condition, maintained lawns, maintained public reserves and parklands, cultivated gardens, nature strips and windbreaks.*<br>NOTE: Minimal fuel condition means there is insufficient fuel available to significantly increase the severity of the bushfire attack (recognizable as short-cropped grass for example, to a nominal height of 100 mm). | N/A | N/A | BAL-LOW |
| VC 1C | 40 | Class G - Grassland | Flat (0) | 8-<12 | BAL-19 |
| | | | | 5-<8 | BAL-29 |
| | | | | 4-<5 | BAL-40 |
| VC 2A | 40 | Class A - Forest | Flat (0) | 20-<28 | BAL-19 |
| | | | | 13-<20 | BAL-29 |
| | | | | 10-<13 | BAL-40 |
| VC 2B | 40 | Class B - Woodland | Downslope (>0 - 5) | 16-<23 | BAL-19 |
| | | | | 11-<16 | BAL-29 |
| | | | | 8-<11 | BAL-40 |
| VC 3A | 40 | Class A - Forest | Downslope (>0 - 5) | 24-<34 | BAL-19 |
| | | | | 16-<24 | BAL-29 |
| | | | | 12-<16 | BAL-40 |
| VC 3B | 40 | Class B - Woodland | Downslope (>0 - 5) | 16-<23 | BAL-19 |
| | | | | 11-<16 | BAL-29 |
| | | | | 8-<11 | BAL-40 |

The various BAL categories associated with the hazardous VCs have been illustrated in Figure 6. The outcomes of the BAL assessment identified that the northern, eastern, western perimeters of proposed building 2 are exposed to the BAL-FZ threshold. The remainder of the proposed development footprint is sited within the recommended BAL-29 or lower (i.e. BAL-19 or BAL-12.5) threshold areas. Building 2 is exposed to BAL-FZ. Nevertheless, strategies to mitigate and manage identified bushfire hazards have been included in Section 4.

Note: In this instance, as the assets are classified as Class 7b buildings under the BCA, the construction requirements of AS 3959-2009 do not apply (refer to Section 4.2).




## Legend

- Watercourse
- Bushfire Buffer (150m)
- Proposed Layout
- Site
- Cadastre

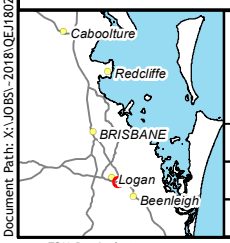
N

Scale 1:2,500 (A4)

0 25 50 75 100

Metres

Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator

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Watercourse: © Geoscience Australia 2017
Road: © PSMA 2014

| Rev | Description | Drawn | Approved | Date |
|---|---|---|---|---|
| 0 | Issued for Use | CO | CB | 21/09/2018 |
| A | Issued for Review | NN | CB | 15/06/2018 |

# FIGURE 6: BUSHFIRE ATTACK LEVEL ASSESSMENT

Bushfire Hazard Assessment and Management Plan
28-34 Ellerslie Road, Meadowbrook

| Map Number | Job Number | Rev |
|---|---|---|
| 1 of 1 | QEJ18021 | 0 |

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# 4 Management and mitigation strategies

As it has been identified that the proposed development is subject to bushfire hazards, the following management and mitigation measures have been included to ensure that the risk is reduced to an acceptable or tolerable level. These have been described in accordance with the Bushfire Hazard Overlay Code, PSP 6 (Logan PS) and AS 3959-2009. Bushfire protection measures have also been adapted from *Planning for bushfire protection: a guide for councils, planners, fire authorities and developers* developed by the Rural Fire Service (2017a).

## 4.1 Separation from bushfire hazard areas

It is important to note that wildfires can break out at any time, however within Queensland, weather supporting critical fire hazard periods occur from late winter to early summer (Department of National Parks, Sport and Racing). As such, it is important to undertake management measures to reduce the risk of fire to assets such as buildings. The Asset Protection Zone (APZ) is an area surrounding a building that is managed to reduce bushfire hazard to an acceptable or tolerable level to mitigate the risk of life and property. The APZ can be separated into two management zones:

- Inner 10 m - Fuel Free Inner Zone (FFIZ); and
- Fuel Reduced Outer Zone (FROZ) (refer to Figure 7).

For the development to achieve BAL-29 (refer to Section 3.4), the edge of any proposed assets must be setback from hazardous vegetation. The inner 10 m and residual distance of the corresponding BAL buffers respectively form the FFIZ and FROZ of the APZ (refer to Figure 7 and Figure 8). Both to be retained and planted vegetation within the APZ is required to be sparse to very sparse[10] to ensure that the canopy is discontinuous. Furthermore, if possible, design features such as paths or lawns should be incorporated to reduce the potential continuity (i.e. spread) of a fire.

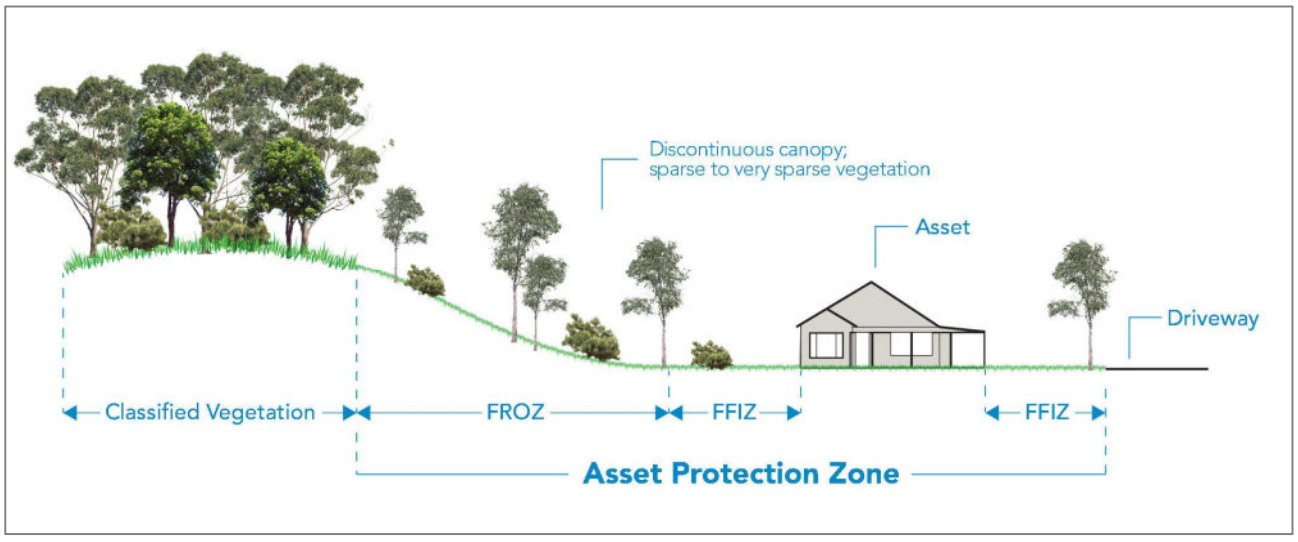


**Figure 7: Asset Protection Zone**

[10] As defined by Hnatuik *et al.* 2009. Foliage cover for sparse to very sparse is 10-30% and 0.2-10% respectively.

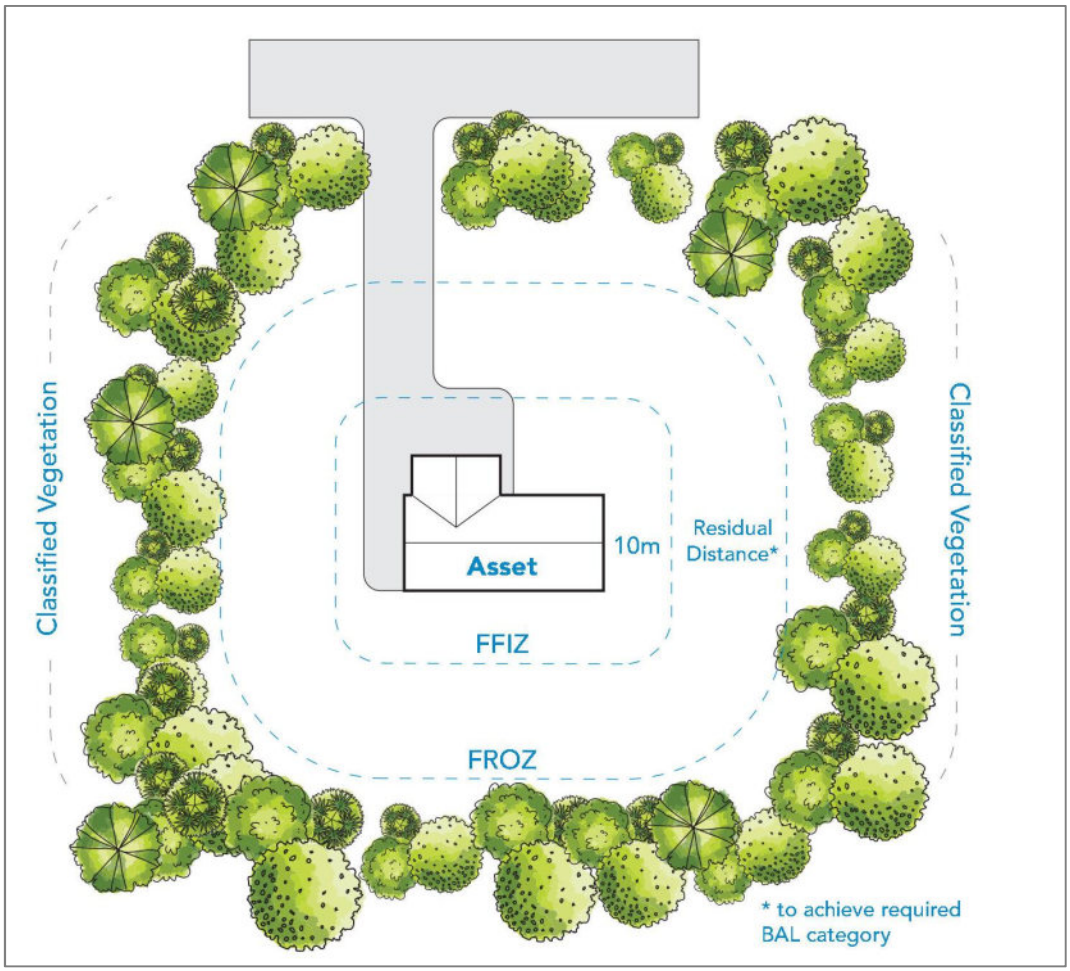


Figure 8: Requirements for Asset Protection Zones

### 4.1.1 Fuel Free Inner Zone

The FFIZ is known as the defendable space, which serves as an area immediately surrounding an asset where vegetation is modified and maintained to ensure a low fuel state. This reduces the effects of direct flame contact, fuel continuity and radiant heat associated with a bushfire. The area should be free of combustible items and obstructions.

The FFIZ should be regularly maintained to prevent the build-up of fuels. Examples of fuel control include:

- Raking or manual removal of leaf litter and bark (i.e. fine fuels).
- Mowing or slashing grass (including removal of cuttings).
- Removal or pruning of trees, shrubs and the understorey to ensure that:
  - vegetation is not located in front of vulnerable sections of the asset(s) such as window features; and
  - canopies do not overhang the asset(s).

### 4.1.2 Fuel Reduced Outer Zone

Similarly to the FFIZ, the FROZ is to be regularly maintained to ensure a reduced fuel state. The purpose of this area is to reduce the intensity of a bushfire, shield buildings from radiant heat and reduce ember

attack. Tree retention or planting is beneficial within the FROZ as selectively retained vegetation can absorb radiant heat, filter embers and reduce wind speed (Country Fire Authority 2011), however, it must be ensured that the trees and shrubs do not form a continuous canopy. Consequently, tree branches within two metres from the ground should be removed and shrubs retention at the base of trees should be minimised so to prevent the transfer of flames from ground fuels to the canopy.

The storage of flammable and combustible material within this area is to be managed to reduce the risk of providing additional fuel to a fire. Some examples of hazardous materials include woodpiles, garden mulch/ grass clipping stockpiles, flammable building materials and wooden sheds. If possible, these items should be stored in a cleared location away from any classified vegetation.

## 4.2 Construction standards

The outcomes of the BAL assessment identified that proposed building 2 is exposed to a BAL-FZ threshold, with proposed building 1 sited within BAL-29 or lower (i.e. BAL-19 or BAL-12.5). In this instance, as the assets are classified as Class 7b buildings under the BCA, the construction requirements of AS 3959-2009 do not apply.

In addition, it should be ensured that gas and electricity utilities do not contribute to fire hazard risk or impede upon fire-fighting efforts. That is, the location or design of these services should not result in the potential ignition of vegetation or buildings (catalyst to combustion). Where practicable, electrical transmission and gas lines are to be located underground and metal piping should exclusively be used. If the use of reticulated or bottled gas is proposed, these should be installed and maintained in accordance with Australian / New Zealand Standard (AS/NZS) 1596:2014, shielded from any classified vegetation, kept clear of flammable materials and the safety valves should be directed away from the building.

## 4.3 Access roads

Access roads are to be developed in accordance with the Bushfire Hazard Overlay Code (Logan PS) and any other relevant development codes to allow for the safe and efficient access and egress of emergency services and evacuating residents. The maintenance and availability of the proposed access roads must be ongoing. For example, overhanging vegetation should be trimmed back, gate access should be unrestricted, the capacity of road surfaces need to be sufficient to support firefighting vehicles, roads are to be all-weather graded and two-wheel drive accessible (Rural Fire Service 2017b).

## 4.4 Fire-fighting requirements

In addition to the abovementioned access and egress requirements, adequate infrastructure to support fire-fighting must be provided. This includes the provision of an adequate water supply and fire hydrants as specified within the Bushfire Hazard Overlay Code (Logan PS). Examples of fire-fighting requirements include:

- Unhindered access to a fire-fighting water supply which must be located away from classified vegetation and hazardous materials (e.g. gas bottles). Further, a suitable hardstand area must be located next to the water supply.
- Underground and above-ground tanks need to incorporate relevant access holes and outlet pipes which meet standard rural fire brigade fitting requirements.
- Above-ground tanks must be manufactured using either concrete or metal and metal piping should exclusively be used.

- Fire hydrant design, spacing, sizing, flow and pressure is to be in accordance with the requirements of AS 2419.1:2005 and Queensland Urban Utilities standards.
- Fire hydrants must be located clear of parking areas / bay allocations / road carriageways.

## 4.5 Storage or handling of hazardous chemicals

The storage or handling of hazardous chemicals within the site must not result in an unacceptable risk to people, property and/or the environment. Furthermore, hazardous chemicals should not impose upon emergency services when responding to an emergency or evacuation. Where hazardous chemicals are proposed to be stored within a site, a Quantitative Risk Assessment to establish and assess the risk profiles (individual fatality and societal) should be undertaken by a qualified practitioner.

## 4.6 Landscaping

Landscaping is to be guided by the requirements of this BHAMP, with particular regard to Section 4.1 which requires the incorporation of two vegetation management zones surrounding the asset(s) (i.e. FFIZ and FROZ). Appropriately managed, retained and planted vegetation, can provide many benefits in bushfire prone areas including a reduction in fire intensity, wind speed, deflection and filtering of embers and sheltering from radiant heat. Conversely, improper management or landscaping could increase the risk of asset damage or loss from a bushfire event.

In addition to the fuel management examples listed in Section 4.1, the following fuel management strategies should be considered when developing a landscape plan:

- Avoidance of plants that are combustible or produce fine fuels (e.g. trees with fibrous or paper bark, produce ribbon bark, leaves with a high oil content, plants with fine foliage or branches (thickness ~1-2 mm) etc.)
- Ensure that vegetation placement is not located directly against an asset or near vulnerable sections such as window features, doors or decks.
- Ensure that vegetation is discontinuous vertically and horizontally. For example:
  - Vegetation should be planted/ retained in groups or islands which are to be broken up by design features such as paths or maintained lawns.
  - Minimise the retention or planting of shrubs beneath trees so to restrict the laddering of fire from ground fuels to the canopy.
- All materials against and around the asset(s) should be non-combustible.
- Ground covers should incorporate the use of succulents or herbaceous plants that are shade- or drought-tolerant perennials which maintain a high moisture content and have a low-growing habit.
- Use of shade-tolerant evergreen shrubs that have a moderately dense habit and retain little dead leaves or branches.
- Ensure that environmental or noxious weeds are actively managed and removed from the site.
- Development of a maintenance schedule which incorporates maintenance periods prior to and during the fire season (i.e. late winter to early summer).

# 5 Conclusions

The outcomes of the bushfire hazard assessment identified that the development footprint is located adjacent to classified vegetation categorised as having Medium potential bushfire intensity in accordance with the *Technical manual – A 'fit for purpose' approach in undertaking natural hazard studies and risk assessments* (April 2016) (DILGP). As sections of the proposed development footprint were identified as being within Potential impact buffer areas, a BAL assessment was undertaken to identify which heat flux exposure thresholds, if any, the assets contained within the proposed development footprint would be exposed to.

The outcomes of the BAL assessment identified that the northern, eastern, western perimeters of proposed building 2 are exposed to a BAL-FZ threshold. In accordance with AS 3959-2009, the risk associated with BAL-FZ is considered to be extreme. The remainder of the proposed development footprint is sited within the recommended BAL-29 or lower (i.e. BAL-19 or BAL-12.5) threshold areas. Table 1 identifies the minimum set-back distances for the proposed development footprint, specifically proposed building 2, to achieve the recommended BAL-29 exposure level. Mitigation and management strategies have been provided in the instance that siting within BAL-FZ is accepted.

**Assumptions and Limitations**

The following assumptions and limitations have been made in compiling this assessment:

- All recommendations are in reference to the 'Site plan' developed by Multi Span Australia Group (drawing no. SK-AR-3001, rev. D dated 06/09/18) and extent of earthworks identified within the '13470 – Dev Extent' file provided by RMA Engineers
- Areas of vegetation assumed to be cleared or managed in a low-fuel state must be treated in this way in perpetuity; and
- Vegetation Management Plans, Rehabilitation Management Plans and proposed landscaping treatments are to adhere to requirements of the BHAMP.

This assessment has been made based on bushfire hazards within and adjacent to the site as the time of the assessment (February 2018).

The recommendations provided within this BHAMP incorporate appropriate actions to reduce the potential risk to life and risk of damage and/or harm to property in the event of a bushfire on or near the proposed development, however, these recommendations do not and cannot guarantee that the area will not be affected by bushfire.

# 6 References


Country Fire Authority. (2011) *Landscaping for Bushfire: Garden Design and Plant Selection*. Country Fire Authority, Victoria.

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Standards Australia Committee FP-020. (2011) *Australian Standard: Construction of Buildings in Bushfire-Prone Areas, AS 3959-2009 ed.3.0*. Standards Australia Limited, Sydney.