

21 February 2018

Marshall Gray  
Assistant Development Manager  
Impact Group Aus Pty Ltd  
By Email: [marshall@impactgroupaus.com.au](mailto:marshall@impactgroupaus.com.au)

Dear Marshall

**RE: REVISED BUSHFIRE ANALYSIS FOR 105 GARDINER ROAD, HOLMVIEW – METHOD 2**

**1.0 INTRODUCTION**

Thank you for the opportunity to advise in regard to the aforementioned matter. I understand that you require us to undertake a detailed Method 2 bushfire hazard analysis of the approved development at 105 Gardiner Road, Holmview with regard to approved clearing extents on the adjoining property to the north and existing vegetation to the east. We have worked closely with Rob Janssen to review botanical structure and form on the adjoining properties to develop a detailed Method 2 bushfire hazard analysis. A copy of this this detailed analysis can be found in **Attachment 1**.

**2.0 SUMMARY OF FINDINGS**

The detailed method 2 Bushfire Attack Level (BAL) analysis was perform over adjoining vegetation to the north and east of the Site. This included appropriate fire flame widths based on short run fire lengths and input in the Fire Protection Association Australia *BAL calculator version 4.7* to model the method 2 analysis. The detailed results of these inputs are shown in Appendix B of **Attachment 1**. A summary of these results and how they impact relevant allotments is shown in **Table 1 & 2** respectfully.

**Table 1: Setbacks required to achieve BAL ratings for construction under AS 3959-2009**

Elevation or vegetation direction	Distance of building envelope to unmanaged vegetation (m)				
	BAL 40	BAL 29	BAL 19	BAL 12.5	BAL-LOW
<b>North</b>	9 - < 12	12 - < 16	16 - < 21	21 - < 100	100+
<b>East</b>	12 - < 15	15 - < 19	19 - < 24	24 - < 100	100+

**Table 2: BAL assessments for approved allotments (shown in Figure 1 of Attachment 1)**

BAL Rating	Allotments impacted and location of impact
<b>BAL 29</b>	lots 56-59 on the east elevation of the buildings; the north, south and west elevation of the buildings are shielded from bushfire hazard, and the BAL rating on the shielded elevations can be reduced by one level to BAL-19
<b>BAL 19</b>	lot 60 on the east elevation of the building; the north, south and west elevation of the buildings are shielded from bushfire hazard, and the BAL rating on the shielded elevations can be reduced by one level to BAL-12.5
<b>BAL 12.5</b>	lots 6-8, 12-37, 42-55 and 61 on all elevations of the buildings
<b>BAL - LOW</b>	lots 1-5, 9-11 and 38-41

If you have any further questions in regard to this matter, please give me a call.

Regards



Mitch Taylor  
Senior Environmental Consultant, 28 South Environmental  
E: [Mitch@28south.com.au](mailto:Mitch@28south.com.au)  
P: 0488 204 523



**Attachment 1 – Method 2 Detailed Analysis**

20 February 2018

Land and Environment Consultants  
13 Pedwell Place Birkdale QLD 4159  
P: 0466 714 833  
E: [info@landiconsultants.com.au](mailto:info@landiconsultants.com.au)  
ABN: 35 209 590 760

Marshall Gray  
Impact Group Aus  
C/- Mitch Taylor  
Senior Environmental Consultant  
28 South Environmental  
[mitch@28south.com.au](mailto:mitch@28south.com.au)

**Subject: Bushfire attack level assessment for proposed development at 105 Gardiner Road, Holmview, Queensland**

## 1 Introduction

Land and Environment Consultants (LEC) was engaged to undertake a 'method 2' bushfire attack level (BAL) assessment under the *Australian Standard for the Construction of Buildings in Bushfire Prone Areas* (AS 3959-2009) for the north and east boundaries of the approved development at 105 Gardiner Road, Holmview (the site), properly described as 28/RP96004.

The building envelope plan for the approved development is shown at Appendix 1.

The site is affected by the Logan Planning Scheme 2015 *Bushfire hazard overlay* (Bushfire overlay) map for high and medium potential bushfire hazard areas. As a result, the site is defined as a 'bushfire prone area' under section 12 of the Queensland Building Regulation 2006 and the future development of *National Construction Code* (NCC) class 1-3 buildings, ie residential buildings, and associated class 10 buildings, ie non-habitable buildings and structures, on the site must be assessed against, and comply with BAL construction requirements in the AS 3959-2009.

This report documents a 'method 2' BAL assessment for the north and east boundaries of the approved development and identifies the setbacks required to achieve BAL ratings on the new lots. LEC was advised that a 20 m wide vegetation buffer would be established on 27/RP192147 along the north boundary of the site. Although not cleared of vegetation at the time of the site assessment, this 20 m wide buffer was considered in the BAL assessment discussed in this report.

This report will be used by building certifiers in the building certification process.

## 2 Method

Prior to the site assessment, the Queensland Fire and Emergency Services (QFES) online mapping system (redi-portal) was accessed to review the Queensland Regional Ecosystem (RE) map (version 10), vegetation hazard class (VHC) map and severe fire weather map. Aerial imagery of the site was also accessed on Google Earth.

A site assessment of land within 100 m of the north and east boundaries of the site was performed by LEC on 13 February 2018. During the site assessment observations were made about vegetation structure, topography, current vegetation management practices, vehicle access tracks and proximity of adjacent development.

Google Earth was used to validate measurements and observations made during the site assessment.

The Fire Protection Association Australia *BAL calculator version 4.7* (BAL calculator) was used to model the 'method 2' BAL assessment procedure from Appendix B of AS 3959-2009.

The New South Wales Rural Fire Service guideline, *Methodology for assessing bushfire risk for low risk vegetation* (July 2017) was used to calculate the flame width of the 'short-run fire' bushfire attack scenarios on the north and east boundaries of the site

### 3 Site observations

The site assessment confirmed that vegetation adjoining the north and part of the east boundaries of the site was generally consistent with RE 12.11.5 *Corymbia citriodora* subsp. *variegata* woodland to open forest +/- *Eucalyptus siderophloia*/*E. crebra*, *E. carnea*, *E. acmenoides*, *E. propinqua* on metamorphics +/- interbedded volcanics. The southern part of the east boundary of the site is adjacent urban development. Vegetated land adjacent the north and east boundaries of the site is shown in Photograph 1 and Photograph 2.



Photograph 1 Land adjacent the north boundary



Photograph 2 Land adjacent the east boundary

The redi-portal indicates RE 12.11.5 best correlates with VHC 10.1 Spotted gum dominated open forests and has a potential overall forest fuel load of 20.8 tonnes(t)/hectare (ha) and a surface fuel load of 16.3 t/ha.

A drainage line occurs adjacent the north and east boundaries of the site. Land between the north boundary and the drainage line is downslope 5 degrees and between the east boundary and the drainage line is downslope 10 degrees.

The redi-portal severe fire weather map indicates the 5% annual exceedance probability forest fire danger index (FDI) for the locality is 53. We have used this FDI value in the BAL assessment because it is considered to more accurately reflect severe fire weather conditions at the location than the FDI specified for Queensland in AS 3959-2009 which is 40.

### 4 Flame width calculations

AS 3959-2009 recommends a standard flame width input of 100 m in the BAL assessment procedure. However, AS 3959-2009 allows for the flame width value to be reduced where the width of vegetation and/or the relative orientation between vegetation and the development area justify the use of a lesser value.

A lesser value for flame width is justified along the north and east boundaries of the site because the width of bushfire hazard vegetation adjacent these boundaries is constrained by residential development and the bushfire attack scenarios on these boundaries would be 'short-run fires' of about 150 m and 125 m on the north and east boundaries, respectively.

Bushfire hazard vegetation adjacent the north and east elevations of the proposed lots is less likely to ignite due to its disconnection with broader areas of bushfire hazard vegetation that can carry a running fire front. However, if these areas were ignited by either point or line ignition they would have limited flame head width and hence limited fire line intensity. Therefore, it was considered relevant to use the New South Wales Rural Fire Service guideline, *Methodology for assessing bushfire risk for low risk vegetation* (July 2017) to calculate the flame width of the 'short-run fire' bushfire attack scenarios. The flame width results are as follows:

- north boundary - 28 m flame width based on short-run fire of 150 m; and
- east boundary - 23 m flame width based on short-run fire of 125 m.

## 5 Bushfire attack level assessment

The AS 3959-2009 sets out the requirements for the construction of buildings in bushfire prone areas to improve their safety when they are subjected to burning debris, radiant heat or flame contact generated from a bushfire.

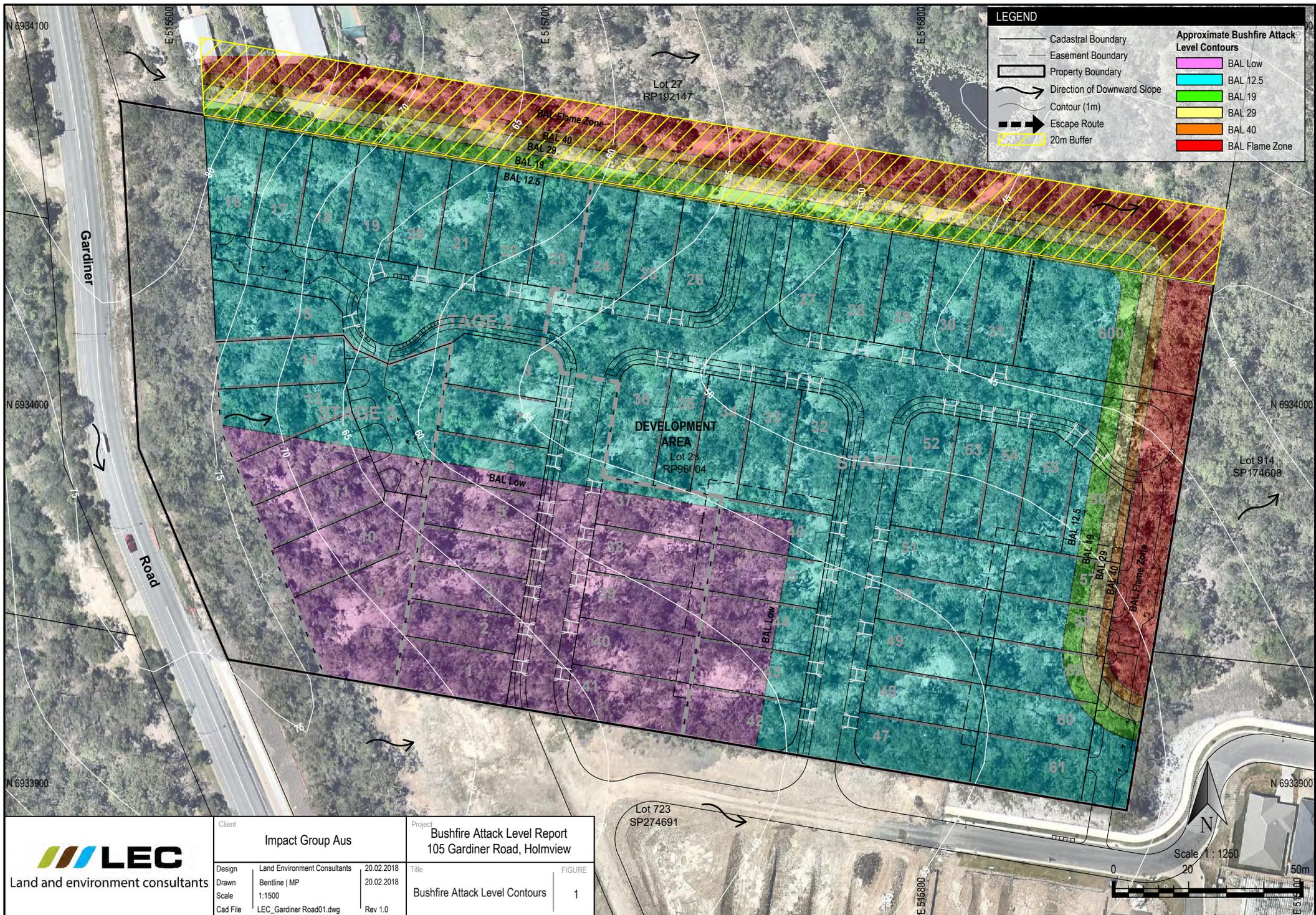
BALs are a means of measuring the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact, using increments of radiant heat expressed in kilowatts (kW)/m<sup>2</sup>, and are the basis for establishing the requirements for construction to improve protection of building elements to attack by bushfire. Further explanation of BALs is provided at Appendix 2.

A 'method 2' BAL assessment was performed on the north and east boundaries of the site. The inputs used in the BAL assessment and the outputs of the BAL calculator are provided at Appendix 3. A summary of the setbacks required to achieve BALs is provided in Table 1.

**Table 1 Setbacks required to achieve BAL ratings**

Elevation	Distance of building envelope to unmanaged vegetation (m)				
	BAL-40	BAL-29	BAL-19	BAL-12.5	BAL-LOW
North	9-<12	12-<16	16-<21	21-<100	100+
East	12-<15	15-<19	19-<24	24-<100	100+

The setbacks required to achieve BAL ratings are shown on Figure 1.



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## 6 Building design and construction requirements

When the building envelope on the site is chosen the distance of the building to vegetation is taken from the external wall of the building, or for parts of the building that do not have external walls (including carports, verandas, decks, landings, steps and ramps), to the supporting posts or columns. The following parts of the building are excluded when determining the distance of the building to vegetation:

- eaves and roof overhangs;
- rainwater and domestic fuel tanks;
- chimneys, pipes, cooling or heating appliances or other services;
- unroofed pergolas;
- sun blinds; and
- landings, terraces, steps and ramps, not more than 1 m in height.

The construction requirements for the next lower BAL rating that is determined for the building envelope may be applied to an elevation of the building where the elevation is not exposed to the source of bushfire attack.

Based on the building envelope plan shown on Figure 1, buildings will be subject to the following BAL ratings:

- BAL-29 – lots 56-59 on the east elevation of the buildings; the north, south and west elevation of the buildings are shielded from bushfire hazard, and the BAL rating on the shielded elevations can be reduced by one level to BAL-19;
- BAL-19 – lot 60 on the east elevation of the building; the north, south and west elevation of the buildings are shielded from bushfire hazard, and the BAL rating on the shielded elevations can be reduced by one level to BAL-12.5;
- BAL-12.5 – lots 6-8, 12-37, 42-55 and 61 on all elevations of the buildings; and
- BAL-LOW – lots 1-5, 9-11 and 38-41.

If the building envelope plan is changed, ie location or dimensions, the setbacks in Table 1 and AS 3959-2009 considerations stated above should be used to review the BAL rating of the building.

AS 3959-2009 construction specifications for BAL-LOW to BAL-29 are provided in Table 2.

**Table 2 Construction requirements**

<b>BAL</b>	<b>Heat flux exposure thresholds</b>	<b>Description of predicted bushfire attack and levels of exposure</b>	<b>AS 3959-2009 construction requirements</b>
BAL-LOW	< 12.5 kW/m <sup>2</sup>	There is insufficient risk to warrant specific construction requirements	Refer to sections 4
BAL-12.5	> 12.5 kW/m <sup>2</sup> and < 19 kW/m <sup>2</sup>	Ember attack	Refer to sections 3 and 5 of AS 3959-2009
BAL-19	> 12.5 kW/m <sup>2</sup> and < 19 kW/m <sup>2</sup>	Increasing levels of ember attack and burning debris ignited by windborne embers	Refer to sections 3 and 6 of AS 3959-2009
BAL-29	> 19 kW/m <sup>2</sup> and < 29 kW/m <sup>2</sup>	Increasing levels of ember attack and burning debris ignited by windborne embers	Refer to sections 3 and 7 of AS 3959-2009

## 7 Conclusion

The 'method 2' BAL assessment was used to determine the BAL rating of building envelopes on the site and the building design and construction requirements under AS 3959-2009.

This report provides the BAL rating of buildings based on the building envelope plan shown on Figure 1. The BAL ratings assume a 20 m wide vegetation buffer is constructed and maintained along the north boundary of the site in the adjoining property.

Yours sincerely,



Robert Janssen  
Principal consultant  
Land and Environment Consultants  
0466 714 833  
[rjanssen@landiconsultants.com.au](mailto:rjanssen@landiconsultants.com.au)

### *Disclaimer*

Notwithstanding the precautions adopted in this report, it should always be remembered that bushfires burn under a range of conditions. An element of risk, no matter how small always remains, and although AS 3959-2009 is designed to improve the performance of such buildings, there can be no guarantee, because of the variable nature of bushfires, that any one building will withstand bushfire attack on every occasion.

It should be noted that upon lodgement of a development application, council and/or the fire service may recommend additional construction requirements.

Although every care has been taken in the preparation of this report, Land and Environment Consultants accept no responsibility resulting from the use of the information in this report.

Appendix 1 Building envelope plan



Notes

Notes regarding lot boundaries, easements, and common property. Includes details about shared driveways and bin pads.

lots within a community title scheme. Shared driveway to form common property.

Development Controls

Development Controls section detailing applicable codes and standards. Includes a legend for building setbacks and nominated built-to-boundary wall locations.

All other Acceptable Solutions of the relevant Queensland Development Code and the Logan Planning Scheme 2015 apply to the Lots.

- Building Setbacks
- Nominated Built to Boundary Wall location to be in accordance with QDC requirements.



Appendix 2 Bushfire attack levels explained

Bushfire attack levels (BAL) are explained in AS3959-2009 as follows:

**BAL-LOW** the risk is considered to be **very low**

- There is insufficient risk to warrant any specific construction requirements but there is still some risk.

**BAL-12.5** the risk is considered to be **low**

- There is a risk of ember attack.
- The construction elements are expected to be exposed to a heat flux not greater than 12.5 kW/m<sup>2</sup>.

**BAL-19** the risk is considered to be **moderate**

- There is a risk of ember attack and burning debris ignited by wind borne embers and a likelihood of exposure to radiant heat.
- The construction elements are expected to be exposed to a heat flux not greater than 19 kW/m<sup>2</sup>.

**BAL-29** the risk is considered to be **high**

- There is an increased risk of ember attack and burning debris ignited by wind borne embers and a likelihood of exposure to an increased level of radiant heat.
- The construction elements are expected to be exposed to a heat flux not greater than 29 kW/m<sup>2</sup>.

**BAL-40** the risk is considered to be **very high**

- There is a much increased risk of ember attack and burning debris ignited by wind borne embers, a likelihood of exposure to a high level of radiant heat and some likelihood of direct exposure to flames from the fire front.
- The construction elements are expected to be exposed to a heat flux not greater than 40 kW/m<sup>2</sup>.

**BAL-Flame Zone (FZ)** the risk is considered to be **extreme**

- There is an extremely high risk of ember attack and burning debris ignited by wind borne embers, a likelihood of exposure to an extreme level of radiant heat and direct exposure to flames from the fire front.
- The construction elements are expected to be exposed to a heat flux greater than 40 kW/m<sup>2</sup>.

Appendix 3 Bushfire attack level assessment

## North

- Forest fire danger index - 53
- Vegetation – VHC 10.1 Spotted gum dominated open forests
- Overall fuel load – 20.8 t/ha
- Surface fuel load – 16.3 t/ha
- Slope – 5 degrees downslope
- Site slope – 5 degrees upslope
- Flame width – 28 m (based on short-run fire of 150 m)



Calculated February 19, 2018, 6:58 pm (MDC v.4.7)

### 103 Gardiner Rd (N)

#### Minimum Distance Calculator - AS3959-2009 (Method 2)

Inputs		Outputs	
Fire Danger Index	53	Rate of spread	1.46 km/h
Vegetation classification	Forest	Flame length	12.01 m
Surface fuel load	16.3 t/ha	Flame angle	52 °, 59 °, 65 °, 69 °, 71 ° & 82 °
Overall fuel load	20.8 t/ha	Elevation of receiver	3.9 m, 4.08 m, 4.02 m, 3.77 m, 3.59 m & 1.66 m
Vegetation height	n/a	Fire intensity	15,730 kW/m
Effective slope	5 °	Transmissivity	0.88, 0.867, 0.851, 0.834, 0.825 & 0.77
Site slope	5 °	Viewfactor	0.5937, 0.4372, 0.2923, 0.1966, 0.1583 & 0.0425
Flame width	28 m	Minimum distance to < 40 kW/m <sup>2</sup>	9.4 m
Windspeed	n/a	Minimum distance to < 29 kW/m <sup>2</sup>	12.1 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m <sup>2</sup>	16.2 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m <sup>2</sup>	20.9 m
		Minimum distance to < 10 kW/m <sup>2</sup>	23.8 m

## East

- Forest fire danger index - 53
- Vegetation – VHC 10.1 Spotted gum dominated open forests
- Overall fuel load – 20.8 t/ha
- Surface fuel load – 16.3 t/ha
- Slope – 10 degrees downslope
- Site slope – flat
- Flame width – 23 m (based on short-run fire of 125 m)



Calculated February 19, 2018, 6:59 pm (MDC v.4.7)

103 Gardiner Rd (N)

Minimum Distance Calculator - AS3959-2009 (Method 2)			
Inputs		Outputs	
Fire Danger Index	53	Rate of spread	2.06 km/h
Vegetation classification	Forest	Flame length	15.93 m
Surface fuel load	16.3 t/ha	Flame angle	43 °, 48 °, 54 °, 58 °, 61 ° & 73 °
Overall fuel load	20.8 t/ha	Elevation of receiver	5.43 m, 5.91 m, 6.44 m, 6.75 m, 6.96 m & 7.61 m
Vegetation height	n/a	Fire intensity	22,211 kW/m
Effective slope	10 °	Transmissivity	0.877, 0.864, 0.848, 0.831, 0.822 & 0.768
Site slope	0 °	Viewfactor	0.5932, 0.4369, 0.2942, 0.1969, 0.1595 & 0.0426
Flame width	23 m	Minimum distance to < 40 kW/m <sup>2</sup>	12.4 m
Windspeed	n/a	Minimum distance to < 29 kW/m <sup>2</sup>	15.2 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m <sup>2</sup>	19.2 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m <sup>2</sup>	23.9 m
		Minimum distance to < 10 kW/m <sup>2</sup>	26.7 m

Rate of Spread: 2.06 km/h; Weather: 10770; 10/10/2018; 10:00