Land and environment consultants

Bushfire management plan

Proposed redevelopment of Trinder Park Rest Home | 10 Laurel Street | Woodridge | Queensland
Prepared for Lutheran Services | 18 October2017

Land and environment consultants
13 Pedwell Place
Birkdale Queensland 4159
T: 0466 714 833
E: info@landeconsultants.com.au

Bushfire assessment

Draft

Report 17062 | Prepared for Lutheran Services | 18 October 2017

Prepared by	Robert Janssen
Position	Principal consultant
Signature	
Date	18 October 2017

This report has been prepared in accordance with the brief provided by the client and has relied upon the information collected at or under the times and conditions specified in the report. All findings, conclusions or recommendations contained in the report are based on the aforementioned circumstances. The report is for the use of the client and no responsibility will be taken for its use by other parties. The client may, at its discretion, use the report to inform regulators and the public.

© Reproduction of this report for educational or other non-commercial purposes is authorised without prior written permission from LEC provided the source is fully acknowledged. Reproduction of this report for resale or other commercial purposes is prohibited without LEC's prior written permission.

Document control

Version	Date	Prepared by	Reviewed by
Draft	18 October 2017	R. Janssen	RPS PM

LEC
Land and environment consultants

T: 0466 714 833 | E: info@landeconsultants.com.au | http://www.landeconsultants.com.au/

13 Pedwell Place | Birkdale | Queensland | 4159 | Australia

Table of contents

Contents

Table of contents i

1 Introduction 1

1.1 Method 1

1.2 Suitably qualified person 2

2 Description of the site and the proposed development 3

2.1 Site description 3

2.2 Proposed development 3

2.3 Bushfire hazard overlay 3

3 Bushfire hazard assessment 6

3.1 Site assessment 6

3.2 Potential bushfire intensity calculations 8

3.3 Bushfire hazard areas 8

4 Bushfire hazards associated with the site 10

4.1 Fire danger season 10

4.2 Fire history 10

4.3 Likely directions of bushfire attack 10

4.4 Potential hazard from surrounding land uses 10

5 Bushfire hazards associated with the proposed development 11

5.1 Site activities and usage patterns 11

5.2 Population increases 11

5.3 Hazardous materials 11

5.4 Proposed clearing and landscaping 11

5.5 Access and egress 11

5.6 Emergency procedures 12

5.7 Warning and evacuation requirements 12

5.8 Fire-fighter water supply 12

5.9 Building design and construction requirements 12

5.10 Bushfire protection zones 12

6 Mitigation measures 14

6.1 Bushfire protection zones 14

6.2 Building design and construction 14

6.3 Evacuation points 14
6.4 Emergency procedures manual 14
6.5 Access roads 15
6.6 Fire maintenance trails 15
6.7 Services – water, gas and electricity 15
6.8 Wayfinding 16
6.9 Hazardous materials 16
7 Bushfire risk assessment 18
7.1 Likelihood 18
7.2 Consequences 18
7.3 Bushfire risk 19
8 Conclusion 20

Figures

Figure 2.1 Bushfire hazard overlay 5
Figure 6.1 Bushfire mitigation plan 17

Tables

Table 4.1 Site observations 6
Table 4.2 Potential bushfire intensity 8
Table 5.1 Bushfire protection zones required to achieve BALs 13
Table 7.1 Consequence ratings for human settlement assets 18
Table 7.2 Determining the risk rating 19

Photographs

Photograph 4.1 A view south 7
Photograph 4.2 B view south 7
Photograph 4.3 B view west 7
Photograph 4.4 C view west 7
Photograph 4.5 D view north 7
Photograph 4.6 D view west 7
Photograph 4.7 E view north 8
Photograph 4.8 F view south 8

Appendix

Appendix 1 Concept site layout plan

Appendix 2 Bushfire attack levels explained

Appendix 3 Bushfire protection zone assessment

Appendix 4 Bushfire hazard overlay code assessment

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.

1 Introduction

Land and Environment Consultants (LEC) was engaged to undertake a bushfire hazard assessment and prepare a bushfire management plan for the proposed redevelopment of Trinder Park Rest Home (proposed development) at 10 Laurel Street, Woodridge (the site), properly described as 3/RP852745.

The site is within the Logan City Council (Council) local government area and triggers the Logan Planning Scheme 2015 Version 3.0 (Logan planning scheme) *Bushfire hazard overlay map* (OM-03.00) (Bushfire hazard overlay map) for high and medium bushfire hazard areas and impact buffer area. Therefore, under the Logan planning scheme *Bushfire hazard overlay code* (Bushfire hazard overlay code), a bushfire hazard assessment and bushfire management plan are required to ensure the risk of bushfire hazards associated with the site and the proposed development are identified and mitigated to a tolerable level.

This bushfire management plan was prepared in general accordance with the guidelines in the Logan planning scheme policy 6 *Management of bushfire hazard* (Bushfire planning scheme policy). It documents the bushfire hazard assessment for the site and identifies strategies that the proposed development is to implement for mitigating the potential impacts of bushfire on life, property and the environment. It includes:

- an introduction (this section) and description of methods and information resources used for the bushfire assessment;
- description of the site and the proposed development;
- bushfire hazard assessment;
- identification of bushfire hazards associated with the site and the proposed development;
- bushfire attack level (BAL) assessment and corresponding construction standards under the *Australian Standard for the Construction of Buildings in Bushfire Prone Areas* (AS 3959-2009);
- a plan for mitigating the risk of bushfire hazards; and
- assessment of the proposed development against the development requirements in the Bushfire hazard overlay code.

1.1 Method

To address the requirements of the Bushfire planning scheme policy the following steps were performed:

- desktop review of Queensland Fire and Emergency Services (QFES) online mapping system (redi-portal) regarding Queensland regional ecosystem (RE) mapping, fire weather severity mapping, forest fuel load mapping, and bushfire hazard area mapping;
- assessment of the site was performed on 8 February 2017 and included:
    - assessment of vegetation, slope and aspect within the site;
    - taking photographs of assessment points; and
    - making general site observations.
- consultation with Trinder Park Rest Home maintenance personnel;
- site-specific bushfire hazard assessment using the QFES *Potential Bushfire Intensity Calculator* (version November 2014);
- bushfire attack level (BAL) assessment in accordance with the 'method 2' procedure in AS 3959-2009; and
- bushfire risk assessment in accordance with the bushfire risk assessment process in the West Australia Department of Fire and Emergency Services' *Guidelines for Preparing a Bushfire Risk Management Plan* (DFES 2015) which is based on AS/NZS ISO 31000:2009, *Risk management – principles and guidelines*.

Aerial imagery of the site was accessed online from Google Earth to assist in validating observations and measurements made during the site assessment.

1.2 Suitably qualified person

This report was prepared by Robert Janssen who is a suitably qualified and experienced bushfire management consultant.

Robert is the managing principal at LEC and has over 20 years of experience in bushfire planning and operations. He has prepared bushfire management plans for residential, commercial and industrial property developments, utilities, government facilities and conservation estates.

Robert's university qualifications as an environmental scientist and consulting experience are coupled with 10 years of experience as a nationally accredited fire-fighter with the national parks and wildlife service in New South Wales and Queensland.

2 Description of the site and the proposed development

2.1 Site description

The location of the site is shown on Figure 2.1 and adjoins Karawatha Forest to the north, south and west and urban residential development to the east. The north, south and west boundary of the site also represents the boundary between Logan and Brisbane local government areas.

The site consists of one irregular shaped parcel of land of 21.25 hectares (ha) which is partially improved by the Trinder Park Rest Home and contains scattered mature vegetation and short cut grass which forms part of the site landscaping. Site access/egress is from Laurel Street and Patricia Avenue. Both access/egress routes connect with Railway Parade which is a local arterial road.

Remnant vegetation occurs across the balance of the site and is mapped as medium and high bushfire hazard area by the Bushfire overlay map. We have used the Queensland State Planning Policy bushfire hazard area map to show bushfire hazard areas on Figure 2.1 because it is more refined than the Bushfire overlay map.

There are several vehicle access tracks through the remnant vegetation on the site. These vehicle access tracks provide access to Karawatha Forest via gates on the north and west boundaries of the site.

The site has access to mains water which will be used as supply for fire-fighting water services. There is also a large dam on the site which is accessible to the local rural fire brigade.

2.2 Proposed development

The scope of the proposed development will be performed in three stages and includes:

- stage 1:
    - demolition of existing portion of residential aged care (RAC) building and existing entry road;
    - construct RAC facility (112 beds);
    - construct new RAC plaza with activity zone;
    - construct new internal roads and new access to Acacia Road;
    - refurbish existing nursing home to accommodate 50 RAC beds;
    - construct associated carparking and back of house link;
- stage 2:
    - independent living unit development across the site;
    - development of community led forest activities; and
    - expansion of dam into wetlands;
- stage 3:
    - child care facility.

The conceptual site layout plan for the proposed development (BVN 2017) is provided at Appendix 1. The current application for development approval is for stage 1. Stages 2 and 3 will be subject to separate applications.

2.3 Bushfire hazard overlay

The proposed development is affected by the Bushfire hazard overlay map for high and medium bushfire hazard areas and impact buffer area which is shown in Figure 2.1.

To address Council's requirements identified in the prelodgement meeting minutes (LCC 2017), the proposed development needs to comply with the Bushfire hazard overlay code. The proposed development is defined as community infrastructure under the Logan planning scheme and as such, the bushfire management plan must thoroughly address performance outcome 06 in the Bushfire hazard overlay code.

Figure 2.1 Bushfire hazard overlay

3 Bushfire hazard assessment

3.1 Site assessment

The site assessment was performed on the 8 February 2017. Land within the existing Trinder Park Rest Home development area is improved with roads, footpaths, buildings, maintained lawns and landscaped gardens and is mapped as impact buffer area by the Bushfire overlay map. Therefore, the site assessment focused on remnant vegetation at assessment points A-F which are shown on Figure 2.1. Observation were made to the north, south, east and west of each assessment point.

A summary of site observations from assessment points is provided in Table 3.1. Remnant vegetation is various sub-categories of regional ecosystem 12.9-10.17 which is described as *Eucalyptus acmenoides, E. major E. siderophloia +/- Corymbia citriodora subspecies variegate woodland on sedimentary rocks*. The assessment sites are shown in photographs (Photograph 3.1 to Photograph 3.8). The photographs shown are in the direction of Karawatha Forest which is the likely direction of bushfire attack on the site.

The site drains to the north and south and the topography is best described as undulating.

Charring was visible on standing trees at all assessment points on the site, except F which is adjacent developed land to the north, east and west. Consultation with site maintenance personnel indicated the site burnt about 4 year ago, from a fire which originated in Karawatha Forest.

There are several vehicle access tracks through the remnant vegetation on the site which are about 3 m wide. These vehicle access tracks provide access to Karawatha Forest via gates on the north and west boundaries. Karawatha Forest has a boundary vehicle access tracks which runs along the south and west boundaries of the site.

A large dam exists on the north-east corner of the site and is a potential source of firefighting water supply for rural fire brigades. Vehicle access is possible to the south edge of the dam for pumping water.

Table 3.1 Site observations

Assessment point	Regional ecosystem[1]	Vegetation hazard class[2]	Maximum slope (°)	Potential fuel load (t/ha)[2]
A	12.9-10.17c	Moist to dry eucalypt open forest	6	24.1
B	12.9-10.17c	Moist to dry eucalypt open forest	5	24.1
C	12.9-10.17d	Moist to dry eucalypt open forest	6	24.1
D	12.9-10.17d	Moist to dry eucalypt open forest	3	24.1
E	12.9-10.17d	Moist to dry eucalypt open forest	3	24.1
F	12.9-10.17b	Spotted gum dominated open forest	6	20.8

Notes 1 Regional ecosystem description from Queensland Government Vegetation management supporting map which was accessed from the Queensland Globe (last updated 2 March 2016)
2 Vegetation hazard class and potential fuel load (QFES 2016)



Photograph 3.1 A view south



Photograph 3.2 B view south



Photograph 3.3 B view west



Photograph 3.4 C view west



Photograph 3.5 D view north



Photograph 3.6 D view west



Photograph 3.7 E view north



Photograph 3.8 F view south

3.2 Potential bushfire intensity calculations

The potential bushfire intensity (or bushfire hazard) of land adjacent assessment points A-F was verified using the site assessment observations discussed in Section 3.1 and the Queensland Fire and Emergency Service *Potential Bushfire Intensity Calculator* (November 2014).

A forest fire danger index value (FDI) of 54 was used in the calculations to reflect expected climate in 2050 and comes from the severe fire weather map which was access from the QFES redi-portal. The FDI value represents the chance of a fire starting, its rate of spread, its intensity and the difficulty of its suppression, according to various combinations of air temperature, relative humidity, wind speed and both the long and short-term drought effects.

The results are based on the dominate combination of vegetation and slope (as presented in Table 3.1) that will influence fire behaviour in the bushfire hazard vegetation and is summarised in Table 3.2.

Table 3.2 Potential bushfire intensity

Assessment point	Vegetation hazard class[1]	Maximum slope (^{0})	Potential bushfire intensity (kW/m)	Bushfire hazard rating
A	Moist to dry eucalypt open forest	6	29,418	High
B	Moist to dry eucalypt open forest	5	27,457	High
C	Moist to dry eucalypt open forest	6	29,418	High
D	Moist to dry eucalypt open forest	3	23,918	High
E	Moist to dry eucalypt open forest	3	23,918	High
F	Spotted gum dominated open forest	6	21,913	High

Notes 1 Vegetation hazard class (QFES 2016)

3.3 Bushfire hazard areas

The results of the potential bushfire intensity calculations indicate that high bushfire hazard areas occur within the site and adjacent the proposed development. Therefore, it is concluded that the proposed development is affected by bushfire hazard areas and is subject to demonstrating compliance with the outcomes sought under the Bushfire hazard overlay code.

In addition, under Section 12 of the Queensland Building Regulation 2006, the site is defined as a 'bushfire prone area' and proposed development of *National Construction Code* (NCC) class 2 buildings, ie apartment

buildings, class 3 buildings, ie ‘care-type facilities’, and associated class 10a buildings, ie carports and decks, are subject to complying with building design and construction specifications in AS 3959-2009.

4 Bushfire hazards associated with the site

This chapter identifies potential bushfire risks associated with the site.

4.1 Fire danger season

The fire danger season in South-east Queensland starts in August, peaks in September and begins to fall in November, but will remain elevated until consistent summer rainfall occurs. Typically, the worst fire weather conditions will be experienced during the fire danger season when the wind direction is from the north.

4.2 Fire history

Charring was visible on standing trees throughout the site and site maintenance personnel indicated the site burnt about 4 year ago, from a fire which originated in Karawatha Forest. It is possible the site could be subject to a fire in the future, particularly along the boundaries adjoining Karawatha Forest.

4.3 Likely directions of bushfire attack

The most likely direction of bushfire attack on the proposed development is from the south and west where natural areas occur. Bushfire attack along the north boundary of the site is also possible, but is less likely than the south and west boundaries, due to current land management practices on the adjacent property, ie clearing and management of grass. These bushfire attack scenarios are further assessed in Section 5.10.

Most of the east boundary of the site adjoins existing residential development and would not be exposed to bushfire attack.

4.4 Potential hazard from surrounding land uses

Land adjacent the site consists of urban residential development and Karawatha Forest.

Urban residential development does not present a potential bushfire hazard to the proposed development. However, fire in Karawatha Forest, both unplanned and planned, are a potential hazard to the proposed development as embers could cause an ignition in natural vegetation on the site. The ongoing maintenance of vehicle access tracks, gates and fire-fighter water supply is important for the management of this potential hazard on the proposed development.

5 Bushfire hazards associated with the proposed development

This chapter identifies potential bushfire risk factors associated with the proposed development.

5.1 Site activities and usage patterns

An aged care facility requires special consideration for bushfire management purposes because the occupants may require assistance to respond adequately to a bushfire threat and may present organisational difficulties for evacuation and or management, ie the occupants may be more vulnerable to bushfire attack.

5.2 Population increases

The proposed development is a redevelopment of the site and is on the fringe of an existing urban residential area. In this context, the increase in population associated with the proposed development will not materially increase the number of people exposed to bushfire hazard. In addition, with the implementation of mitigation measures in this report, the risk of bushfire hazards will be reduced to a tolerable level.

5.3 Hazardous materials

Hazardous materials will be stored in locations shielded from the bushfire hazard associated with natural areas.

The bulk storage of hazardous materials on the site, as defined under the Queensland *Work Health and Safety Act 2011*, will require a risk assessment to ensure that it does not pose an unacceptable risk to public safety or the environment.

5.4 Proposed clearing and landscaping

The landscaping plan for the site will incorporate bushfire protection zones around buildings adjacent natural areas.

Bushfire protection zones will consist of an inner and outer protection zone and will be sufficient to achieve BAL-12.5 building envelopes adjacent natural areas. The inner protection zone is the area closest to buildings and incorporates a defendable space for managing heat intensities at the building surface. The outer protection zone is for reducing the potential length of flames by slowing the rate of spread, filtering embers and suppressing crown fire.

Landscaping around buildings will consist of walkways, retaining walls, cultivated gardens and lawn.

Any proposal for vegetation restoration in natural areas on the site will be designed to ensure that plantings do not exacerbate bushfire hazard on buildings when they reach a mature state.

5.5 Access and egress

There will be multiple points of access and egress to the proposed development including the existing Laurel Street and Patricia Avenue routes and the new road connecting the site to Acacia Road.

The design of internal roads and the connection to Acacia Road will provide adequate access for fire-fighting and emergency vehicles and for the evacuation of residents during a bushfire event (if required).

New buildings associated with the proposed development are designed so building evacuation points are shielded from bushfire hazard vegetation and/or will not be exposed to radiant heat flux greater than 10 kW/m^2.

5.6 Emergency procedures

The general manager of Trinder Park Rest Home will update the existing emergency procedures manual to address the proposed development on the site.

5.7 Warning and evacuation requirements

Queensland emergency services use a range of methods to warn the community about bushfire, severe weather and other emergencies that require preparation and action at the property level. Future residents of the proposed development will be subject to advice and warnings provided by the Queensland emergency services via radio, online media, and local community safety announcements.

5.8 Fire-fighter water supply

The proposed development will be connected to the reticulated water supply and will have a reticulated hydrant system. Hydrants will be in positions that enable fire services to access water safely, effectively and efficiently. They will be identified so that fire services can locate them at all hours.

During the detailed design phase of the proposed development, water supply and pressure will be tested (and if required augmented) to ensure that it has sufficient flow and pressure characteristics for fire-fighting purposes always.

5.9 Building design and construction requirements

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.

Bushfire attack levels (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 kW/m^2, and 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.

AS 3959-2009 is applicable to the proposed development because under Section 12 of the Queensland Building Regulation 2006, the site is defined as a 'bushfire prone area'. Therefore, the proposed development of NCC class 2 buildings, class 3 buildings and associated class 10a buildings will comply with building design and construction specifications in AS 3959-2009.

5.10 Bushfire protection zones

As discussed in Section 4.3, the likely direction of bushfire attack on the proposed development is from the south and west where large intact areas of natural vegetation occur and to lessor degree from the north.

A BAL assessment was performed on relevant north, south and west elevations of assessment points using the 'method 2' procedure in AS 3959-2009 and *Flamesol BAL calculator version 4* software. The BAL assessment was performed to calculate the extent of bushfire protection zones which are required to achieve BAL-12.5 building envelopes adjacent natural areas and to confirm building evacuation points will be exposed to radiant heat flux exposure less than 10 kW/m^2. The BAL models inputs and calculations are provided in Appendix 3.

A summary of bushfire protection zones required to achieve BALs in AS 3959-2009 is presented in Table 5.1. The results indicate building envelopes adjacent natural areas can achieve BAL-12.5 and evacuation points can achieve radiant heat flux exposure less than 10 kW/m^2 with the inclusion of bushfire protection zones measuring 25-35 m.

Table 5.1 Bushfire protection zones required to achieve BALs

Assessment point	Elevation	Distance of building envelope to vegetation (m)				
		BAL-40	**BAL-29**	**BAL-19**	**BAL-12.5**	**BAL-LOW**
A	South	12-<17	17-<24	24-<34	**34**-<100	100+
B	South	12-<16	16-<23	23-<33	**33**-<100	100+
	West	10-<13	13-<19	19-<27	**27**-<100	100+
C	West	9-<17	12-<17	17-<25	**25**-<100	100+
D	North	11-<15	15-<21	21-<30	**30**-<100	100+
	West	9-<12	12-<17	17-<25	**25**-<100	100+
E	North	11-<15	15-<21	21-<30	**30**-<100	100+

6 Mitigation measures

This chapter identifies mitigation measures that will be implemented for the proposed development to reduce the risk of bushfire hazards to a tolerable level and to comply with required outcomes in the Bushfire hazard overlay code as demonstrated at Appendix 4.

6.1 Bushfire protection zones

Bushfire protection zones will be established between building envelopes and natural areas. The location and dimensions of the bushfire protection zones is shown on **Error! Reference source not found.**.

Bushfire protection zones will consist of an inner protection zone and outer protection zone and will be maintained in low fuel condition:

- The inner protection zone will be established from the outer wall of buildings and/or the nearest supporting post or column. The area will be 10 m wide and will provide access and a defendable space for fire-fighters to manage heat intensity and ember attack at the building surface. This zone will consist of roads, walkways, retaining walls, cultivated gardens and lawn. Cultivated gardens will be designed so that they do not exacerbate bushfire hazard, ie they will consist of lower flammability species and will cover less than 20% of the inner protection zone.
- The outer protection zone will be the balance of the bushfire protection zone, ie 15-25 m wide. This area will resemble a parkland with native specimen trees and low-cut grass. Trees will be selectively removed as required to ensure the canopy of trees are not interconnected. Small patches of native shrubs and groundcovers can be retained in less than 20% of the outer protection zone.

Any proposal for vegetation restoration in natural areas on the site will be designed to ensure that plantings do not exacerbate bushfire hazard on buildings when they reach a mature state.

6.2 Building design and construction

With the implementation of bushfire protection zones discussed in Section 6.1, building envelopes within 100 m of natural areas could be exposed to radiant heat flux up to 12.5 kW/m^2 and ember attack. Therefore, NCC class 2 buildings, class 3 buildings and associated class 10a buildings will comply with BAL-12.5 design and construction specifications in Sections 3 and 5 of AS 3959-2009.

Fencing and retaining walls will be constructed of non-flammable materials. Gates on fences will be designed to provide access to fire-fighters at all times.

6.3 Evacuation points

Building evacuation points will not be exposed to radiant heat flux greater than 10 kW/m^2. The location of building evacuation points in relation to bushfire protection zones are shown on **Error! Reference source not found.**.

6.4 Emergency procedures manual

The general manager of Trinder Park Rest Home will update the existing emergency procedures manual to address the proposed development.

The emergency procedures manual must comply with the *Australian Standard for Planning for Emergencies for Health Care Facilities* (AS 4083-1997).

An emergency planning committee is to be established to consult with residents (and their families in the case of aged care accommodation) and staff in developing and implementing the updated emergency procedures manual.

Detailed plans of all emergency assembly areas including 'onsite' and 'offsite' arrangements as stated in the *Australian Standard for Emergency Control Organisation and Procedures for Buildings, Structures and Workplaces for Residential Accommodation* (AS 3745-2002) will be clearly displayed, and an annual trial emergency evacuation will be conducted.

6.5 Access roads

Access roads will connect to the external public road network at more than one point, ie there will be three ways to access/egress the site.

Internal road widths and design will enable safe access for fire-fighting crews, allow crews to work with equipment about vehicles and facilitate the evacuation of residents from the site. Internal roads will meet the following design criteria:

- sealed, all weather roads;
- two traffic lane widths (carriageway 8 m minimum kerb to kerb) and shoulders on each side, allowing traffic to pass in opposite directions;
- dead end roads will incorporate a minimum 12 m outer radius turning circle – other solutions using T or Y heads of specified dimensions are also appropriate;
- traffic management devices will be constructed to facilitate access by fire-fighting vehicles;
- a minimum vertical clearance of 4 m to any overhanging obstructions, including tree branches and 5 m to overhanging powerlines;
- roads are clearly sign-posted;
- the road surfaces and bridges/culverts have capacity to carry fully-loaded fire-fighting vehicles, ie 15 tonnes; and
- hydrants are located outside of parking bays.

6.6 Fire maintenance trails

Fire maintenance trails will provide suitable access for fire management purposes in natural areas on the site. Existing vehicle access tracks which connect with gates on the south and west boundaries on the site are to be upgraded to fire maintenance trail standard as follows:

- minimum carriageway width of 4 m with an additional 1 m wide strip on each side of the trail cleared of vegetation;
- minimum vertical height clearance of 4 m to any overhanging obstruction such as tree branches;
- capacity to pass or turnaround every 200 m by way of passing bays (20 m long by 3 m wide) or reversing bays (8 m deep by 6 m wide);
- appropriate drainage and erosion controls are to be provided;
- connection to internal access roads are provided; and
- gates for fire trails are provided and locked with a key/lock system agreed in consultation with Brisbane City Council (Karawatha Forest) and the local rural fire brigade.

6.7 Services – water, gas and electricity

Water supply for fire-fighting will come from mains water supply. A reticulated hydrant system will be installed and will have minimum water flow rate and pressure of 10 litres/second (L/s) at 10 kilopascals (Kpa) in accordance with the *Australian Standard for Fire Hydrant Installations-System design, installation and commissioning* (AS 2419.1-2005) or the water utility provider's specifications where it exceeds AS 2419.1-2005.

Electrical transmission lines will be installed underground.

Reticulated or bottled gas will be installed and maintained in accordance with the *Australian Standard for the Storage and Handling of LP Gas* (AS 1596-2002). All fixed liquid petroleum gas tanks will be kept in a position shielded from bushfire hazard vegetation.

6.8 Wayfinding

Roads, parking areas, buildings, hydrants and fire maintenance trails will be clearly sign-posted.

Hydrant markers will be installed in accordance with *Fire Hydrants and Vehicle Access Guidelines for Residential, Commercial and Industrial Lots* (QFES 2015). Blue 'cats eyes' are preferred for sealed roads. Marker posts should be used to identify hydrants where there is an unsealed road as road (HR) or path (HP) hydrants.

6.9 Hazardous materials

Public safety and the environment will not be adversely affected by the adverse impact of bushfire on hazardous materials stored in bulk on the site (if any).

Hazardous materials will be stored in a position shielded from bushfire hazard vegetation and in compliance with the *Australian Standard for the Storage and Handling of Flammable and Combustible Liquids* (AS 1940-2004).

The bulk storage of hazardous materials on the site, as defined under the Queensland *Work Health and Safety Act 2011*, will be advised by a risk assessment to ensure that it does not pose an unacceptable risk to public safety or the environment.

Figure 6.1 Bushfire mitigation plan

7 Bushfire risk assessment

Exposure of the proposed development to bushfire risk has been determined using the bushfire risk assessment process in *Guidelines for Preparing a Bushfire Risk Management Plan* (DFES 2015) which is based on AS/NZS ISO 31000:2009, *Risk management – principles and guidelines* (AS/NZS ISO 31000:2009).

Under the *Guidelines for Preparing a Bushfire Risk Management Plan* (DFES 2015), the proposed development is defined as a 'human settlement asset – special risk and critical facilities'.

The bushfire risk assessment in this chapter is based on the premise that the total of the recommendations in Chapter **Error! Reference source not found.** are implemented.

The bushfire risk assessment process requires consultation to ensure relevant stakeholders understand and accept the level of bushfire risk associated with the proposed development. Consultation with relevant stakeholders regarding this bushfire management plan will occur during the planning assessment and detailed design stages of the proposed development.

7.1 Likelihood

Likelihood is described as the chance of a bushfire igniting, spreading and reaching buildings and occupants associated with the proposed development, eg unlikely, possible, likely and almost certain. Evidence of a recent fire was observed on the site as discussed in Section 4.23.1, but it did not reach buildings or occupants of the site. Given there is a boundary fence track in Karawatha Forest and the proposed development will include appropriate bushfire protection zones, fire-fighter access, hydrants and way-finding, it is considered 'unlikely' that a bushfire will impact buildings and occupants of the site.

7.2 Consequences

The consequence rating for the proposed development is a product of threat and vulnerability and is determined using Table 7.1.

Table 7.1 Consequence ratings for human settlement assets

Threat / Vulnerability	Low	Medium	High	Very High
High Vulnerability	Moderate	Major	Catastrophic	Catastrophic
Moderate Vulnerability	Minor	Moderate	Major	Catastrophic
Low vulnerability	Minor	Minor	Moderate	Major

With the implementation of bushfire protection zones recommended in Section 6.1, NCC class 2, class 3 and associated class 10a buildings and will be BAL-12.5 which is defined as a low level of bushfire threat in Appendix G of AS 3959-2009. Therefore, the threat of bushfire attack on the proposed development is considered 'low'.

The proposed development is a 'special risk and critical facility' where occupants are a combination of able and non-able-bodied persons and where there is independent living (both with and without the requirement for outside assistance or special needs). Regardless of the recommendations in this bushfire hazard assessment some occupants will be susceptible to the impact of smoke and/or will be completely reliant upon outside assistance in a bushfire situation. Therefore, a precautionary approach has been taken for this bushfire risk assessment and the vulnerability of the proposed development was determined as 'high'.

When threat and vulnerability are analysed together using Table 7.1, ie low threat and high vulnerability, the consequences rating for the proposed development is 'moderate'.

7.3 Bushfire risk

The bushfire risk rating for the proposed development is a product of likelihood and consequences. Table 7.2 demonstrates how likelihood and consequences are combined to determine the bushfire risk rating.

Table 7.2 Determining the risk rating

Consequence / Likelihood	Minor	Moderate	Major	Catastrophic
Almost certain	High	Very High	Extreme	Extreme
Likely	Medium	High	Very High	Extreme
Possible	Low	Medium	High	Very High
Unlikely	Low	Low	Medium	High

It can be concluded from the analysis of likelihood and consequence using Table 7.2, that with the implementation of recommendations in this report, the chance of a bushfire igniting, spreading and causing damage to the proposed development or its occupants is 'low'.

8 Conclusion

This report has been prepared in general accordance with the Bushfire planning scheme policy.

A bushfire hazard assessment determined the site is in a bushfire hazard area and is subject to compliance with required outcomes in the Bushfire hazard overlay code and BAL construction specifications under AS 3959-2009.

Mitigation measures for bushfire hazards associated with the site and the proposed development are provided in this report. A bushfire risk assessment was performed on the proposed development and determined that with the implementation of mitigation measures, the risk of bushfire on the proposed development and its occupants is low. Nevertheless, failure to implement all mitigation measures in their entirety could result in an increased level of exposure to bushfire risk.

With the implementation of bushfire mitigation measures, the proposed development meets the required outcomes in the Bushfire hazard overlay code.

References

Australian Building Codes Board (ABCB) 2012, *National Construction Code Series, Building Code of Australia Class 2 to Class 9 Buildings, Volume 1,2 and 3*, Australian Government and States and Territories of Australia 2012

BVN 2017, *Trinder Park proposed master plan*, 9 August 2017

Government of Western Australia, Department of Fire and Emergency Services, Office of Bushfire Risk Management (DFES) 2015, *Guidelines for Preparing a Bushfire Risk Management Plan*, November 2015

Logan City Council (LCC) 2017, *Prelodgement meeting minutes*, 5 October 2017

Lutheran Community Care (LCC) 2016, *LCC Synod Report 2016*, Section 22, 2016 Convention of Synod

Queensland Fire and Emergency Service (QFES) 2015, *Fire Hydrant and Vehicle Access Guidelines for Residential, Commercial and Industrial Lots*, November 2015

Queensland Fire and Emergency Service (QFES) 2016, *Guidance on conducting reliability assessment of state bushfire prone area mapping – Draft – not government policy*, October 2016

Standards Australia Limited (Standards Australia) 2009, *Australian Standard 3959-2009 Construction of buildings in bushfire prone areas*, Incorporating amendments 1, 2 and 3, 10 March 2009

Appendix 1 Concept site layout plan

<<insert concept site layout plan>>

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^2.

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^2.

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^2.

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^2.

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^2.

Appendix 3 Bushfire protection zone assessment

Land and environment consultants

Calculated February 17, 2017, 4:27 pm (MDc v.4.7)

10 Laurel St (A South)

Minimum Distance Calculator - AS3959-2009 (Method 2)			
Inputs		Outputs	
Fire Danger Index	54	Rate of spread	1.96 km/h
Vegetation classification	Forest	Flame length	15.63 m
Surface fuel load	20 t/ha	Flame angle	57 °, 67 °, 76 ° & 80 °
Overall fuel load	24.1 t/ha	Elevation of receiver	5.25 m, 5.44 m, 5.03 m & 4.09 m
Vegetation height	n/a	Fire intensity	24,413 kW/m
Effective slope	6 °	Transmissivity	0.87, 0.851, 0.824 & 0.798
Site slope	6 °	Viewfactor	0.5988, 0.446, 0.303 & 0.2057
Flame width	100 m	Minimum distance to < 40 kW/m²	12.4 m
Windspeed	45 km/h	Minimum distance to < 29 kW/m²	16.7 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	24.3 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	34.3 m

Land and environment consultants

Calculated February 17, 2017, 4:29 pm (MDc v.4.7)

10 Laurel St (B South)

Minimum Distance Calculator - AS3959-2009 (Method 2)			
Inputs		Outputs	
Fire Danger Index	54	Rate of spread	1.82 km/h
Vegetation classification	Forest	Flame length	14.78 m
Surface fuel load	20 t/ha	Flame angle	56 °, 67 °, 75 ° & 80 °
Overall fuel load	24.1 t/ha	Elevation of receiver	5.09 m, 5.41 m, 5.1 m & 4.4 m
Vegetation height	n/a	Fire intensity	22,785 kW/m
Effective slope	5 °	Transmissivity	0.872, 0.853, 0.827 & 0.801
Site slope	5 °	Viewfactor	0.6001, 0.4463, 0.3012 & 0.205
Flame width	100 m	Minimum distance to < 40 kW/m²	11.8 m
Windspeed	45 km/h	Minimum distance to < 29 kW/m²	15.9 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	23.3 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	32.9 m

Land and environment consultants

Calculated February 17, 2017, 4:32 pm (MDc v.4.7)

10 Laurel St (B West)

Minimum Distance Calculator - AS3959-2009 (Method 2)			
Inputs		Outputs	
Fire Danger Index	54	Rate of spread	1.29 km/h
Vegetation classification	Forest	Flame length	11.31 m
Surface fuel load	20 t/ha	Flame angle	53 °, 63 °, 72 ° & 76 °
Overall fuel load	24.1 t/ha	Elevation of receiver	4.51 m, 5.04 m, 5.38 m & 5.48 m
Vegetation height	n/a	Fire intensity	16,137 kW/m
Effective slope	0 °	Transmissivity	0.878, 0.863, 0.839 & 0.815
Site slope	0 °	Viewfactor	0.595, 0.4402, 0.2963 & 0.201
Flame width	100 m	Minimum distance to < 40 kW/m²	9.5 m
Windspeed	45 km/h	Minimum distance to < 29 kW/m²	12.8 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	18.8 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	26.9 m

Land and environment consultants

Calculated February 17, 2017, 4:34 pm (MDc v.4.7)

10 Laurel St (C West)

Minimum Distance Calculator - AS3959-2009 (Method 2)			
Inputs		Outputs	
Fire Danger Index	54	Rate of spread	1.12 km/h
Vegetation classification	Forest	Flame length	10.23 m
Surface fuel load	20 t/ha	Flame angle	52 °, 62 °, 70 ° & 75 °
Overall fuel load	24.1 t/ha	Elevation of receiver	4.33 m, 4.92 m, 5.41 m & 5.81 m
Vegetation height	n/a	Fire intensity	14,057 kW/m
Effective slope	-2 °	Transmissivity	0.88, 0.866, 0.844 & 0.82
Site slope	-2 °	Viewfactor	0.5906, 0.4383, 0.2951 & 0.1995
Flame width	100 m	Minimum distance to < 40 kW/m²	8.8 m
Windspeed	45 km/h	Minimum distance to < 29 kW/m²	11.8 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	17.3 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	24.9 m

Land and environment consultants

Calculated February 17, 2017, 4:36 pm (MDc v.4.7)

10 Laurel St (D North)

Minimum Distance Calculator - AS3959-2009 (Method 2)			
Inputs		Outputs	
Fire Danger Index	54	Rate of spread	1.59 km/h
Vegetation classification	Forest	Flame length	13.25 m
Surface fuel load	20 t/ha	Flame angle	55 °, 66 °, 74 ° & 78 °
Overall fuel load	24.1 t/ha	Elevation of receiver	4.86 m, 5.28 m, 5.25 m & 4.89 m
Vegetation height	n/a	Fire intensity	19,848 kW/m
Effective slope	3 °	Transmissivity	0.875, 0.857, 0.832 & 0.807
Site slope	3 °	Viewfactor	0.5976, 0.4421, 0.2998 & 0.2035
Flame width	100 m	Minimum distance to < 40 kW/m²	10.8 m
Windspeed	45 km/h	Minimum distance to < 29 kW/m²	14.6 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	21.3 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	30.3 m

Land and environment consultants

Calculated February 17, 2017, 4:38 pm (MDc v.4.7)

10 Laurel St (D West)

Minimum Distance Calculator - AS3959-2009 (Method 2)			
Inputs		Outputs	
Fire Danger Index	54	Rate of spread	1.12 km/h
Vegetation classification	Forest	Flame length	10.23 m
Surface fuel load	20 t/ha	Flame angle	52 °, 62 °, 70 ° & 75 °
Overall fuel load	24.1 t/ha	Elevation of receiver	4.33 m, 4.92 m, 5.41 m & 5.81 m
Vegetation height	n/a	Fire intensity	14,057 kW/m
Effective slope	-2 °	Transmissivity	0.88, 0.866, 0.844 & 0.82
Site slope	-2 °	Viewfactor	0.5906, 0.4383, 0.2951 & 0.1995
Flame width	100 m	Minimum distance to < 40 kW/m²	8.8 m
Windspeed	45 km/h	Minimum distance to < 29 kW/m²	11.8 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	17.3 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	24.9 m

Land and environment consultants

Calculated February 17, 2017, 4:40 pm (MDc v.4.7)

10 Laurel St (E North)

Minimum Distance Calculator - AS3959-2009 (Method 2)			
Inputs		Outputs	
Fire Danger Index	54	Rate of spread	1.59 km/h
Vegetation classification	Forest	Flame length	13.25 m
Surface fuel load	20 t/ha	Flame angle	55 °, 66 °, 74 ° & 78 °
Overall fuel load	24.1 t/ha	Elevation of receiver	4.86 m, 5.28 m, 5.25 m & 4.89 m
Vegetation height	n/a	Fire intensity	19,848 kW/m
Effective slope	3 °	Transmissivity	0.875, 0.857, 0.832 & 0.807
Site slope	3 °	Viewfactor	0.5976, 0.4421, 0.2998 & 0.2035
Flame width	100 m	Minimum distance to < 40 kW/m²	10.8 m
Windspeed	45 km/h	Minimum distance to < 29 kW/m²	14.6 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	21.3 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	30.3 m

Appendix 4 Bushfire hazard overlay code assessment

Part A–Criteria for self-assessable and assessable development

Table 8.2.3.3.1–Bushfire hazard overlay code: self-assessable and assessable development

Performance outcomes	Acceptable outcomes	Comments
For self-assessable and assessable development		
Location, design and siting of development		
PO1 Development is designed to: (a) minimise risk of bushfire hazard; (b) provide safe premises; (c) create efficient emergency access for fire-fighting and other emergency vehicles. Note—Planning scheme policy 6–Management of bushfire hazard provides guidelines on how to achieve this outcome.	AO1 Development: (a) does not increase the number of persons living in, or lots in, the Bushfire hazard area identified on Bushfire hazard overlay map–OM–03.00; or (b) is on a site that a bushfire hazard assessment prepared in accordance with the methodology in planning scheme policy 6–Management of bushfire hazard determines is of low bushfire hazard.	The bushfire risk assessment confirmed that with the implementation of mitigation measures the proposed development and its occupants will be exposed to a 'low' level of bushfire risk. Therefore, this bushfire management plan demonstrates PO1 is achieved.
PO2 Development is sited and constructed to minimise the bushfire hazard and maximise the protection of life and property from bushfire.	AO2 Development is located and constructed: (a) where there is no bushfire management plan approved by an existing development approval: (i) such that the bushfire attack level is less than or equal to BAL–29; (ii) away from the most likely direction of a fire front; (iii) so that elements of the development least susceptible to fire are sited closest to the bushfire hazard; (iv) such that asset protection zones are sited on land with a slope less than 18 degrees; (v) such that asset protection zones are entirely within the boundaries of the private property of the development site; or (b) where an approved bushfire management plan directs development to be located. Note—BAL = Bushfire attack level is the radiant heat flux a building will experience during a bushfire and is a measure of heat energy impacting on a	The proposed development includes bushfire protection zones on land with slope less than 18 degrees. The bushfire protection zones will achieve BAL-12.5 building envelopes and building evacuation points will be exposed to less than 10 kW/m^2. A bushfire risk assessment confirmed that with the implementation of mitigation measures the proposed development and its occupants will be exposed to a 'low' level of bushfire risk. Therefore, this bushfire management plan demonstrates PO2 is achieved.

Performance outcomes	Acceptable outcomes	Comments
	surface expressed as kW/m^2. BAL is calculated from the following factors; vegetation type, fuel loads, distance to vegetation, Forest Fire danger Index (FDI), flame length, fire behaviour/intensity and slope. BAL is used to determine the required construction level of a building and the size of asset protection zones (inner and outer radiation zones). Further information on calculating the BAL can be obtained from AS3959–2009. Editor's note—Asset protection zones are not located on slopes greater than 18 degrees to ensure maintenance is practical, soil stability is not compromised and the potential for crown/canopy fires is reduced. Editor's note—Planning scheme policy 6–Management of bushfire hazard contains guidance on the preparation of bushfire management plans.	
PO3 Reconfiguring a lot ensures that lots are designed to minimise bushfire hazard and provide safe sites for people, property and buildings.	AO3 Lots: (a) are suitable for people, property and buildings by: (i) having a bushfire attack level less than or equal to BAL–29; or (ii) containing a development envelope area that has a bushfire attack level less than or equal to BAL–29; (b) provide asset protection zones that: (i) are located on land with a slope less than 18 degrees; (ii) are located on the same lot.	N/A The proposed development does not include the reconfiguration of a lot.
Vehicular access and fire maintenance trails		
PO4 Access for fire management and evacuation is provided by access that: (a) separates premises from adjoining vegetation; (b) is safely accessible by fire fighting vehicles; (c) has regular vehicular access points for bushfire management, response and evacuation; (d) has regular vehicle passing and turning areas for bushfire management, response and evacuation;	AO4 Access for fire management and evacuation is provided by vehicular access in the form of a perimeter road: (a) with a minimum reserve width of 20 metres; (b) located between the premises and adjoining vegetation; (c) with a maximum gradient of 12.5 percent; (d) constructed to otherwise comply with section 3.4–Movement infrastructure standards of planning scheme policy 5–Infrastructure;	There will be three ways to access/egress the site. The design specifications for access roads in Section 6.5 will provide safe access for fire-fighting crews and facilitate evacuation of residents from the site and generally comply with the Queensland Fire and Emergency Services guideline, *Fire Hydrant and Vehicle Access Guidelines for Residential, Commercial and Industrial Lots 2015* for road width and height, road construction, road grades and turning areas.

Performance outcomes	Acceptable outcomes	Comments
(e) allows access at all times for fire fighting vehicles; (f) allows for maintenance, burning off and bushfire response; (g) has vehicular links to an alternative through road; (h) is readily maintained. Editor's note—Planning scheme policy 6– Management of bushfire hazard provides details on alternative solutions for providing fire management access and evacuation	(e) that has a layout that does not include a cul-de-sac.	Vehicle access tracks which are to be retained on the site will be upgraded to fire maintenance trail standard and will meet the fire trail design specifications in Section 6.6. Therefore, this bushfire management plan demonstrates relevant criteria in PO4 are achieved.
Water supply		
PO5 Development has access to adequate water supply for fire fighting purposes.	AO5 Development: (a) is connected to a reticulated water supply scheme that has sufficient flow and pressure characteristics for fire fighting purposes at all times with a minimum pressure and flow of 10 litres per second at 200kPa; or (b) has an on-site water storage in accordance with Table 8.2.3.3.2, dedicated or retained for fire fighting purposes that is made of fire resistant materials and is: (i) a separate tank; or (ii) a reserve section in the bottom part of the main water supply tank. Editor's note—The requirement in AO5 is: – in addition to the requirement for potable water supply/storage in AO2 in Table 9.4.3.3.2– Infrastructure code: self-assessable and assessable development.; – reflected in AO5 in Table 9.4.3.3.2–Infrastructure code: self-assessable and assessable development.	The proposed development will be connected to reticulated water supply. Fire-fighter water supply and hydrants will be provided in accordance with in accordance with the *Australian Standard for Fire Hydrant Installations-System design, installation and commissioning* (AS 2419.1-2005) or the water utility provider's specifications where it exceeds AS 2419.1-2005. Therefore, this bushfire management plan demonstrates PO5 is achieved.

Performance outcomes	Acceptable outcomes	Comments
For assessable development		
Community infrastructure		
PO6 Community infrastructure is not located in a bushfire hazard area or is able to function effectively during and immediately after a bushfire event.	AO6 Community infrastructure is: (a) not located in a Bushfire hazard area identified on Bushfire hazard overlay map—OM—03.00; or (b) located to ensure that: (i) the core services provided by the community infrastructure is able to function effectively during bushfire events; (ii) access to the community infrastructure is not compromised by bushfire events; (iii) the safe storage of valuable records, public records and items of cultural or historic significance is able to be maintained during a bushfire event.	The proposed development includes bushfire protection zones which will achieve BAL-12.5 building envelopes and building evacuation points which will be exposed to less than 10 kW/m^2. Compliance with BAL-12.5 construction requirements will improve the buildings resilience to bushfire attack and will protect contents and enable functionality in a bushfire event under most fire weather conditions experienced at the locality. Adequate water services will be provided for the protection of buildings during and after the passage of a bushfire, and gas and electricity will be located to not contribute to the risk of fire to buildings. There are multiple points of access/egress to the site which are not exposed to the likely direction of bushfire attack, ie the Karawatha Forest. The existing emergency procedures manual will be updated to address the proposed development and will comply with the *Australian Standard for Planning for Emergencies for Health Care Facilities* (AS 4083-1997). Detailed plans of all emergency assembly areas including 'onsite' and 'offsite' arrangements as stated in the *Australian Standard for Emergency Control Organisation and Procedures for Buildings, Structures and Workplaces for Residential Accommodation* (AS 3745-2002) will be clearly displayed, and an annual trial emergency evacuation will be conducted. Therefore, this bushfire management plan demonstrates PO6 is achieved.
Hazardous materials		
PO7	AO7 Hazardous materials:	Hazardous materials will be stored in a position shielded from bushfire hazard

Performance outcomes	Acceptable outcomes	Comments
Public safety and the environment are not adversely affected by the adverse impacts of bushfire on hazardous materials including fuels, explosives and flammable chemicals manufactured or stored in bulk on premises.	(a) storage is in compliance with AS1940—The storage and handling of flammable and combustible liquids; (b) manufacturing does not occur in a Bushfire hazard area on Bushfire hazard overlay map–OM–03.00.	vegetation and in compliance with the *Australian Standard for the Storage and Handling of Flammable and Combustible Liquids* (AS 1940-2004). If there is to be the bulk storage of hazardous materials on the site, it will be advised by a risk assessment to ensure that it does not pose an unacceptable risk to public safety or the environment. Therefore, this bushfire management plan demonstrates PO7 is achieved.

Table 8.2.3.3.2–Water storage for fire fighting

Column 1 Lot size / use type	Column 2 Water requirement
For each residential lot:	
(a) less than 1000m^2	5000 litres
(b) between 1000m^2 and less than 1 hectare	10,000 litres
(c) greater than 1 hectare	20,000 litres
Multiple dwelling	5000 litres per dwelling up to a maximum of 20,000 litres
A use other than Multiple dwelling	5000 litres or the prevailing rural fire brigade standard