Land and environment consultants

Bushfire management plan

Residential aged care facility | 53 Seventeen Mile Rocks Road | Oxley | Queensland
Prepared for Rockpool Pty Ltd | 31 March 2021

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Bushfire management plan

Final

Report 21015 | Rockpool Pty Ltd | 31 March 2021

Prepared by Robert Janssen

Position Managing principal

Signature 

Date 31 March 2021

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.

Document control

Version	Date	Prepared by	Reviewed by
Draft	17 March 2021	R. Janssen	McNab
Final	31 March 2021	R. Janssen	LEC

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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 3959-2018 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 Pty Ltd accept no responsibility resulting from the use of the information in this report.

1 Introduction

Land and Environment Consultants Pty Ltd (**LEC**) was engaged to undertake a bushfire hazard assessment and prepare a bushfire management plan for the proposed residential aged care facility (**proposed development**) at 53 Seventeen Mile Rocks Road, Oxley (**the site**), properly described as part of lot 600/SP236626.

An application for a development permit will be made for the proposed development under the *Oxley Priority Development Area Development Scheme* (DSDMIP 2019.)

The site is identified as a bushfire hazard area by the Queensland State Planning Policy (**SPP**) *Bushfire prone area map* (**SPP bushfire prone area map**). Therefore, the application for a development permit will be assessed for compliance with bushfire outcomes of the SPP *Bushfire prone area code* (**SPP bushfire prone area code**) in the *Natural Hazards, Risk and Resilience – State Planning Policy State Interest guidance material* (DSDMIP 2019) (**SPP 2017 guidance material**).

This bushfire management plan has been prepared in accordance with *Bushfire Resilient Communities Technical Reference Guide for the State Planning Policy State Interest 'Natural Hazards, Risk and Resilience – Bushfire'* (QFES 2019) (**Bushfire resilient communities**) which was prepared by the Queensland Fire and Emergency Services (**QFES**) to provide technical guidance for the implementation of the SPP 2017 guidance material. It documents the site-specific bushfire hazard assessment for the site and identifies strategies that will be implemented to achieve compliance with outcomes of the SPP bushfire prone area code. It includes:

- an introduction (this section) and description of methods and information resources used for the preparation of this bushfire management plan;
- description of the site and the proposed development;
- site-specific bushfire hazard assessment;
- identification of bushfire hazards associated with the site and the proposed development;
- radiant heat exposure assessment;
- a plan for mitigating bushfire hazards; and
- assessment of the proposed development against the SPP bushfire prone area code.

1.1 Method

To meet the requirements of Bushfire resilient communities the following steps were undertaken:

- review of the SPP bushfire prone area map on the Queensland Governments Development Assessment mapping system and the Queensland regional ecosystem map, vegetation hazard class (**VHC**) map, severe fire weather map and fire history map on the QFES mapping system (**Catalyst**);
- a walk over the site and assessment of land within 100 metres (**m**) of the development area for vegetation characteristics, current land management practices, slope, and evidence of previous fires;
- site-specific bushfire hazard assessment in accordance with the method in Bushfire resilient communities;
- radiant heat exposure assessment using the Fire Protection Association of Australia *BAL calculator V4.8* (**BAL calculator**) which models the 'method 2' bushfire attack level (**BAL**) assessment procedure in the *Australian Standard for Construction of Buildings in Bushfire Prone Areas* (**AS 3959-2018**); and
- assessment of the proposed development against the SPP bushfire prone area code.

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 bushfire management plan 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 formal 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

This chapter provides a description of the site and the proposed development.

2.1 Site description

The location of the site and proposed development are shown on Figure 2.1. It is 1.6 hectares (although only the southern part of the site is subject to the development permit application) and is located in Stage 1 of the Oxley Priority Development Area (**PDA**) which was granted preliminary approval on 9 December 2020 (DEV2020/1099).

The preliminary approval for the material change of use for the master plan for Oxley PDA (DEV2020/1099) also identifies lot 102 within precinct b – lifestyle and care. A residential care facility is identified as a suitable/preferred land use within precinct 3b: lifestyle and care.

The preliminary approval for Stage 1 of the Oxley PDA will result in the development of a residential subdivision to the south-east of the site, public recreation parks to the north-east of the site and drainage reserve to the north, west and south of the site. Stage 2 of the Oxley PDA will seek to preserve an area of forest to the west of the drainage reserve.

The site has access to mains water and a public road network which is capable of accommodating emergency vehicles.

2.2 Proposed development

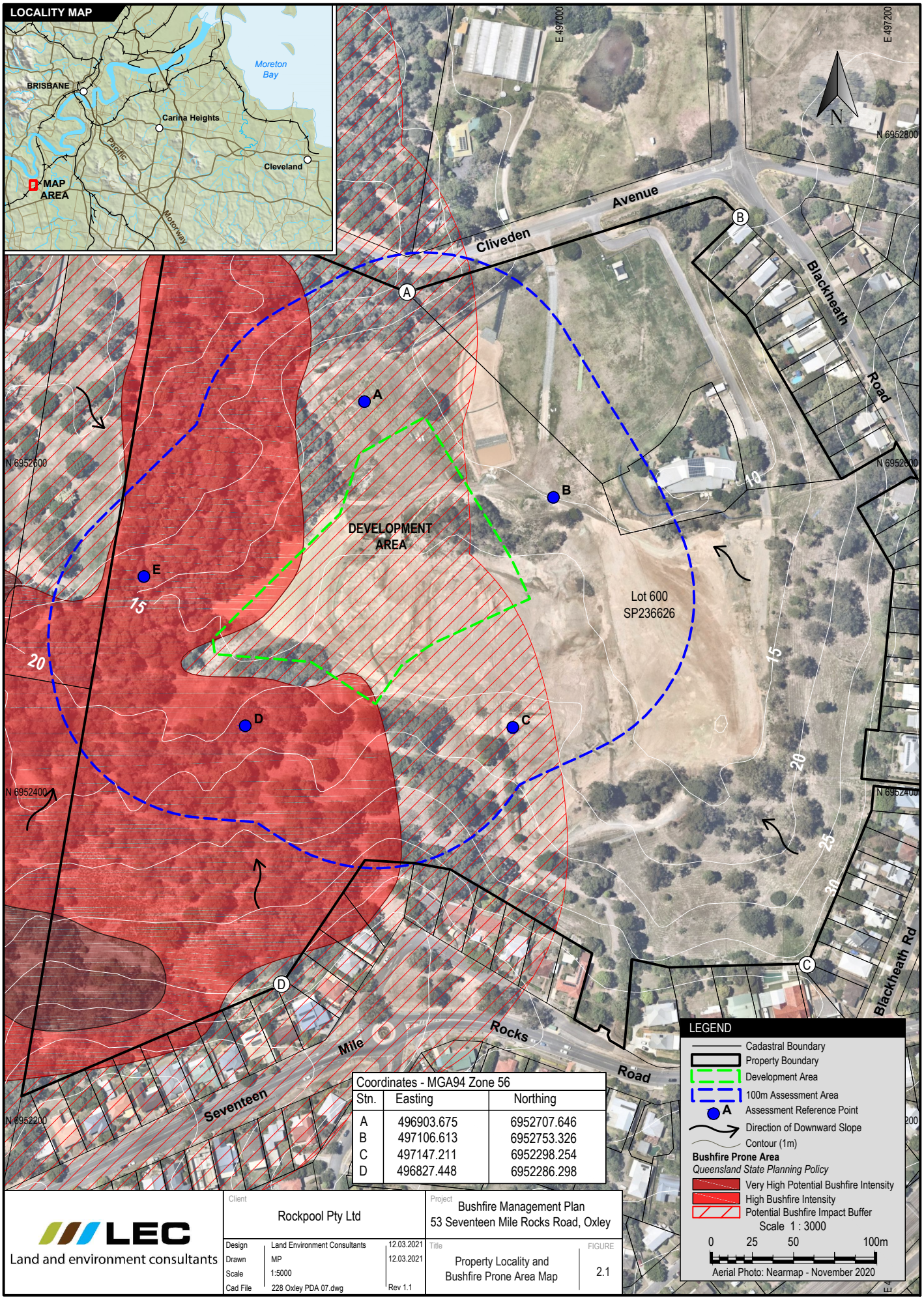
The proposed development involves establishing a residential aged care facility in Stage 1 of the Oxley PDA. The preliminary approval for the material change of use for the master plan for Oxley PDA (DEV2020/1099) also identifies lot 102 within precinct b – lifestyle and care. A residential care facility is identified as a suitable/preferred land use within precinct 3b: lifestyle and care.

The site plan for the proposed development is provided at Appendix 1. It shows that carparks and driveways have been used to separate the proposed residential aged care building from the drainage reserve and forest area to the west of the drainage reserve.

The proposed development will be connected to mains water and will have a reticulated hydrant system. Site access and egress will be via Seventeen Mile Rocks Road with secondary emergency access and egress via the public recreation paths to Cliveden Avenue.

2.3 SPP bushfire prone area map

The SPP bushfire prone area map for the site is shown on Figure 2.1. The site-specific bushfire hazard assessment in Section 3.4 provides verification of the bushfire hazard areas shown on the SPP bushfire prone area map.



Coordinates - MGA94 Zone 56

Stn.	Easting	Northing
A	496903.675	6952707.646
B	497106.613	6952753.326
C	497147.211	6952298.254
D	496827.448	6952286.298

LEC Land and environment consultants

Client: Rockpool Pty Ltd

Project: Bushfire Management Plan
53 Seventeen Mile Rocks Road, Oxley

Design	Land Environment Consultants	12.03.2021
Drawn	MP	12.03.2021
Scale	1:5000	
Cad File	228 Oxley PDA 07.dwg	Rev 1.1

Title: Property Locality and Bushfire Prone Area Map

FIGURE: 2.1

3 Bushfire assessment

This chapter provides details of the desktop review, site assessment and site-specific bushfire hazard assessment.

3.1 Severe fire weather

The severe fire weather map in Catalyst indicates the 5 % annual exceedance probability forest fire danger index (**FFDI**) for the site is 55.

This FFDI value has been used for the site-specific bushfire hazard assessment in Section 3.4 and the radiant heat exposure assessment in Section 5.7.

3.2 Fire history

Fire history data in Catalyst indicates no fires have occurred within 1 kilometre (**km**) of the site during the past 10 years.

3.3 Site assessment

LEC inspected the site on 15 May 2018 for Stage 1 of the Oxley PDA (LEC 2020). Observations were recorded about current land use and management, vegetation characteristics, slope of land and evidence of previous fires.

The locations of site assessment reference points are shown on Figure 2.1. Table 3.1 provides a summary of observations associated with site assessment reference points and forest vegetation in Stage 2 of the Oxley PDA is shown in Photograph 3.1.

Table 3.1 Site observations

Assessment Reference Point	Catalyst VHC	Ground truthed VHC	Notes
A	VHC 39.2 *Low to moderate tree cover in built-up areas* (**VHC 39.2**)	VHC 40.4 *Low grass or tree cover in rural areas* (**VHC 40.4**)	This land will be part of the drainage reserve under DEV2020/1099. It will be rehabilitated with bioretention grass species and a sparse density of tree species.
B	VHC 39.2	VHC 41.4 *Low grass or tree cover in a built-up area* (**VHC 41.4**)	This land will be part of the public recreation park under DEV2020/1099. It will be maintained as low cut grass.
C	VHC 41.4	VHC 42.6 *Nil to very low vegetation cover* (**VHC 42.6**)	This land will be subject to residential subdivision under DEV2020/1099 and will be nil to very low vegetation cover.
D	VHC 9.1 *Moist to dry eucalypt open forests* (**VHC 9.1**)	VHC 41.4	This land will be part of the drainage reserve under DEV2020/1099. It will consist of a pedestrian pathway and maintained as low cut grass along the south boundary of the site.
E	VHC 9.1	VHC 9.1	This land is Stage 2 of the Oxley PDA which will seek to preserve the forest vegetation within an environmental protection zone.

Photograph 3.1 VHC 9.1 at E

3.4 Bushfire hazard assessment

The potential bushfire intensity of assessment reference points was determined using the Queensland Public Safety Business Agency *Potential Bushfire Intensity Calculator* (version November 2014) which is an Excel spreadsheet calculator that models the site-specific bushfire hazard assessment method in Bushfire resilient communities.

Part B of the SPP *Natural Hazards, Risk and Resilience Technical Manual* – A *'fit-for-purpose' approach in undertaking natural hazard studies and risk assessments* (DILGP 2016) defines bushfire hazard classes as follows:

- very high – potential bushfire intensity > 40,000 kilowatts/m (**kW/m**);
- high – potential bushfire intensity 20,000-40,000 kW/m;
- medium – potential bushfire intensity 4,000-20,000 kW/m; and
- non bushfire hazard – potential bushfire intensity < 4,000 kW/m.

Results of potential bushfire intensity calculations which determine the bushfire hazard class of assessment reference points shown on Figure 2.1 are presented in Table 3.2.

Table 3.2 Potential bushfire intensity

Assessment reference point	Ground truthed VHC	Potential fuel load (t/ha)[1]	Slope (°)[2]	Potential bushfire intensity (kW/m)	Bushfire hazard class
A	VHC 40.4	5	0	853	Non-bushfire hazard class
B	VHC 41.4	3	0	307	Non-bushfire hazard class
C	VHC 42.6	2	0	136	Non-bushfire hazard class
D	VHC 41.4	3	0	307	Non-bushfire hazard class
E	VHC 9.1	24.2	0	19,806	Medium

Notes 1 potential fuel load taken from Bushfire resilient communities
2 slope default to 0° for VHC's with discontinuous fuels, ie VHC 41.4 and VHC 42.6

3.5 Bushfire hazard areas

Results of potential bushfire intensity calculations determined that the development footprint within the site is within the 100 m wide potential impact buffer from the medium potential bushfire intensity area associated with VHC 9.1 at assessment reference point E. Therefore, the development footprint

is in a bushfire hazard area and the proposed development must be designed to achieve compliance with outcomes of the SPP bushfire prone area code.

4 Bushfire hazards associated with the site

This chapter identifies bushfire hazards 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 or west.

Fire danger ratings (**FDR**) provide advice about the level of bushfire threat on a day. An FFDI of 55 is commensurate with a 'severe' FDR and will be associated with hot, dry and windy conditions. If a bushfire starts and takes hold during a severe FDR, it will be difficult to control and fast moving in large areas of forest vegetation.

4.2 Fire history

As discussed in Section 3.2, fire history data indicates no fires have occurred within 1 km of the site during the past 10 years.

4.3 Potential direction of bushfire attack

The potential direction of bushfire attack on the site is from the west, ie assessment reference point E, where a medium potential bushfire intensity area occurs. This bushfire attack scenario is further assessed in Section 5.7.

4.4 Potential bushfire hazard from adjacent land use

Based on fire history data discussed in Section 3.2, residential development surrounding the Oxley PDA is not a bushfire hazard to the proposed development.

4.5 Water and access

The proposed development has access to mains water and a public road network which is capable of accommodating emergency vehicles.

5 Bushfire hazards associated with the proposed development

This chapter identifies potential bushfire hazards associated with the proposed development.

5.1 Vulnerable use

The proposed development is a 'vulnerable use' residential aged care facility as defined under Table 7 of the SPP 2017 guidance material. As mention in Section 2.1, the preliminary approval for the material change of use for the master plan for Oxley PDA (DEV2020/1099) also identifies lot 102 within precinct b – lifestyle and care. A residential care facility is identified as a suitable/preferred land use within precinct 3b: lifestyle and care.

Vulnerable use developments are often more difficult to evacuate than other types of development because occupants may not be able to support themselves during a fire event. Therefore, mitigation measures for vulnerable use developments are focused on providing a safe working environment for emergency services who may be required to operate around a vulnerable use building for a longer period of time during an evacuation.

Bushfire resilient communities permits vulnerable use development in bushfire hazard areas where site planning can appropriately support disaster management capacity and capability, ie access for emergency services, vegetation management areas which provide opportunities for bushfire management operations and an appropriately designed reticulated hydrant system for fire-fighting purposes.

5.2 Essential community infrastructure

The proposed development does not involve community infrastructure for essential services as defined under Table 7 of the SPP 2017 guidance material.

5.3 Hazardous material storage in bulk

The proposed development will include a bulk liquified petroleum gas (**LPG**) storage area. The location of the LPG storage area will be appropriately separated from bushfire hazard areas.

5.4 Landscaping

Landscaping within the site will be designed to limit the potential for it to catch fire and compromise buildings and evacuation routes from the building.

5.5 Emergency access and evacuation

Efficient access for emergency services and the evacuation of the site will be provided via an appropriately designed driveway which includes manoeuvring areas. Primary access to the proposed development will be from Seventeen Mile Rocks Road.

Upon completion of stage 1 of the Oxley PDA, secondary access for emergency vehicles will be provided from Clivenden Avenue via a 4 m wide path (through the stage 1B development area).

5.6 Walkway along south boundary of the site

As shown by the approved design plan for the drainage reserve shown at Appendix 2, the south boundary of the site will be separated from forest vegetation by a turf area which incorporates a concrete walkway.

This area of landscaping will be maintained as low cut grass in perpetuity and can be included in the bushfire management setback to the forest area that will be retained in Stage 2 of the Oxley PDA. The landscaping also supports disaster management capacity and capability by providing access to the forest area for bushfire management activities.

5.7 Fire-fighter water supply

The proposed development will be connected to mains water and will have access to an appropriately designed reticulated hydrant system that will be constructed as part of Stage 1 of the Oxley PDA.

5.8 Radiant heat exposure

Bushfire resilient communities requires vulnerable use development to be setback from hazardous vegetation by a distance which achieves a radiant heat flux level ≤ 10 kW/m^2 at the development footprint.

As discussed in Section 4.3, the potential direction of bushfire attack on the proposed development is from assessment reference point E, as shown on Figure 2.1, where a medium potential bushfire intensity area occurs. Notwithstanding, bushfire attack is also possible through parts of the drainage reserve where rehabilitation involves bioretention grass species, ie VHC 40.4.

The radiant heat profile of these bushfire attack scenarios were assessed using the BAL calculator. The inputs used in the BAL calculator and the results from the BAL calculator are provided at Appendix 3. These calculations and results are consistent with the approved bushfire management plan (LEC 2020a) for Stage 1 of the Oxley PDA.

Results indicate that the development footprint within the site achieves a radiant heat flux level of ≤ 10 kW/m^2 with a 39 m wide setback from the forest area that will be retained in Stage 2 of the Oxley PDA and 19.1 m from the drainage reserve where it is planted out with bioretention grass species.

6 Bushfire mitigation plan

This chapter identifies mitigation measures that will be implemented as part of the proposed development to mitigate the risk of bushfire hazards to a tolerable level by way of compliance with outcomes of the SPP bushfire prone area code.

It is the combination of mitigation measures in this chapter what will reduce the risk of bushfire hazard to a tolerable level.

6.1 Bushfire protection zone

A bushfire protection zone will be established and maintained along the west boundary of the site as shown on Figure 6.1. The bushfire protection zone shown on Figure 6.1 is the same as shown in the approved addendum to the bushfire management plan (LEC 2020b) for Stage 1 of the Oxley PDA.

No part of the proposed residential aged care building will be located in the bushfire protection zone.

The bulk LPG storage area will not be located in the bushfire protection zone.

Landscaping within the bushfire protection zone and the balance of the site will designed in accordance with Section 6.2 and will result in a low fuel hazard area with discontinuous fuels.

6.2 Landscaping

Landscaping within the bushfire protection zone and the balance of the site will be designed in accordance with principles in *Bushfire Resilient Building Guidance for Queensland Homes* (QRA 2020) which is publicly available online.

Design principles that will be observed include:

- gardens will not be planted under or adjacent to vulnerable parts of the building such as ground floor windows and doors;
- garden plantings will be located so that they do not touch walls or other elements of the building when they reach maturity;
- shrubs should not be planted around the base of trees;
- ground cover plantings should be used to fill spaces between shrubs;
- use lawn, hardened pathways and water features; and
- use less-flammable mulch, eg gravel, scoria (pumice), pebbles, shells, crushed brick, etc.

Some plants have characteristics that reduce the likelihood of ignition. Plant selection will favour species with the following characteristics:

- well suited to local growing conditions;
- high moisture content;
- open and loose branching with sparse leaves;
- course texture;
- wide, flat and thick leaves;
- smooth bark; and
- low levels of oils, waxes and resins.

Over time plants may become diseased, stressed or die and become more flammable as moisture content decreases. Therefore, regular maintenance will be carried out, including:

- removing dead plants and fallen branches;

- clearing ground fuel from underneath plants;
- replacing plants that die or become diseased;
- keeping plants well hydrated through watering and use of non-flammable mulch;
- removing any fine or dead material that may accumulate in plants; and
- removing weeds.

6.3 Vehicle access

The driveway and cross over will be designed and constructed in accordance with *Fire Hydrant and Vehicle Access Guidelines for Residential, Commercial and Industrial Lots* (QFES 2015) (**Fire hydrant and vehicle access guidelines**) for load bearing capacity, geometry and turning radii and will provide efficient access/egress for emergency services.

Please note, Fire hydrant and vehicle access guidelines defers to the *Road Planning and Design Manual – 2nd Edition* (DTMR 2013).

The driveway will incorporate manoeuvring areas which enable emergency vehicles to turnaround within the site.

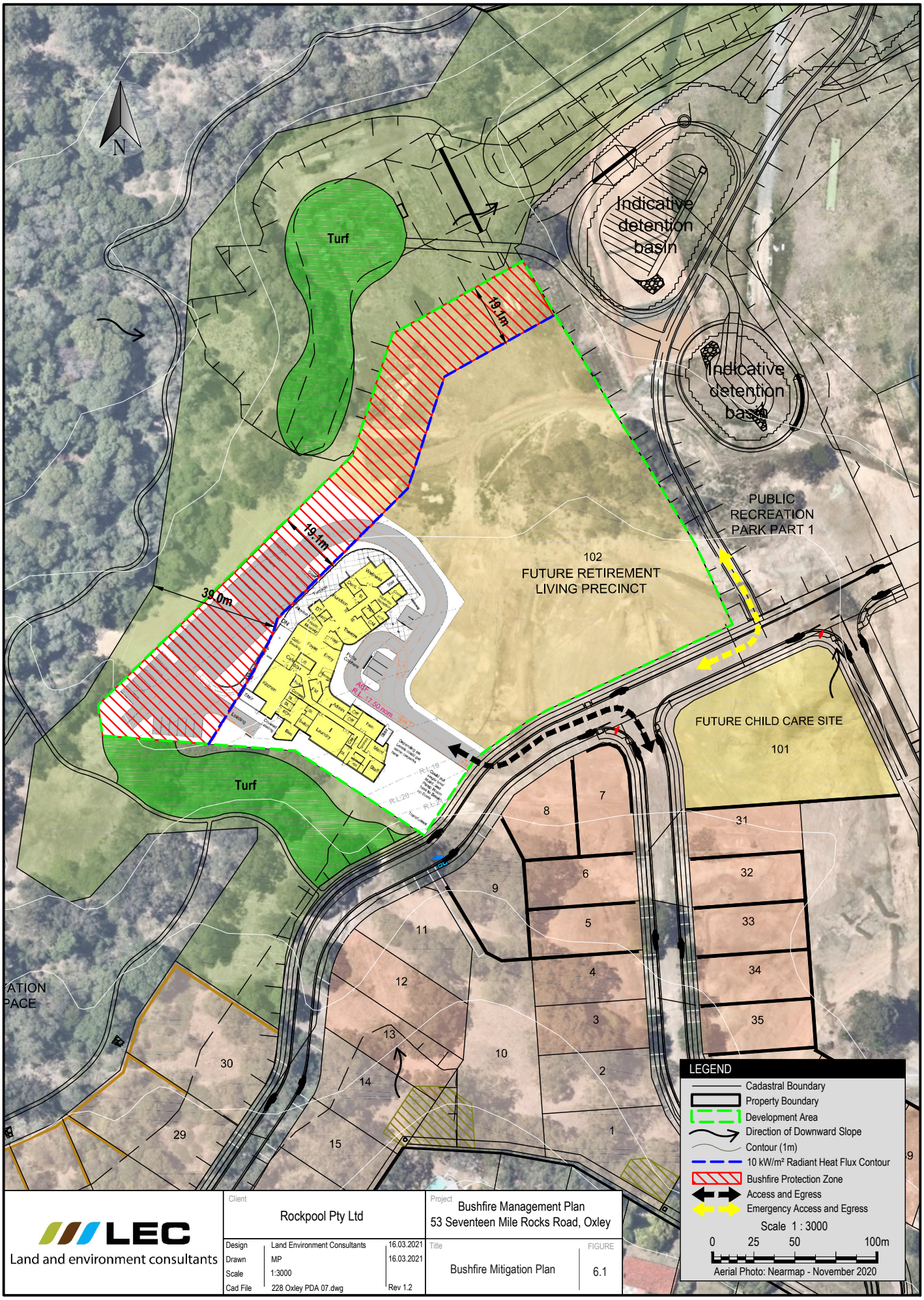
Site access and egress is shown on Figure 6.1.

6.4 Fire-fighting water supply

The proposed development will be connected to mains water and will have access to an appropriately designed reticulated hydrant system that will be constructed as part of Stage 1 of the Oxley PDA.

6.5 Utilities

Services, ie water, electricity, and gas, will be installed underground.



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Client	Rockpool Pty Ltd	
Project	Bushfire Management Plan 53 Seventeen Mile Rocks Road, Oxley	
Design	Land Environment Consultants	16.03.2021
Drawn	MP	16.03.2021
Scale	1:3000	
Cad File	228 Oxley PDA 07.dwg	Rev 1.2
Title	Bushfire Mitigation Plan	FIGURE 6.1

7 Conclusion

This bushfire management plan has been prepared by a suitably qualified person and in general accordance with Bushfire resilient communities.

A site-specific bushfire hazard assessment confirmed that the site is affected by bushfire hazard and the proposed development is subject to compliance with outcomes of the SPP bushfire prone area code.

The preliminary approval for the material change of use for the master plan for Oxley PDA (DEV2020/1099) also identifies lot 102 within precinct b – lifestyle and care. A residential care facility is identified as a suitable/preferred land use within precinct 3b: lifestyle and care.

Mitigation measures that will be implemented as part of the proposed development are specified in Chapter 6. With the implementation of these mitigation measures, the proposed development complies with the preliminary approval for the material change of use for the master plan for Oxley PDA (DEV2020/1099) and outcomes of the SPP bushfire prone area code as demonstrated at Appendix 4.

References

Australian Building Codes Board (ABCB) 2019, *National Construction Code Series, Building Code of Australia Class 2 to Class 9 Buildings, Volume 1,* Australian Government and States and Territories of Australia, February 2019

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Queensland Fire and Emergency Service (QFES) 2019, *Bushfire Resilient Communities Technical Reference Guide for the State Planning Policy State Interest 'Natural Hazards, Risk and Resilience – Bushfire',* October 2019

Queensland Reconstruction Authority (QRA) 2020, *Bushfire Resilient Building Guidance for Queensland Homes*, July 2020

Standards Australia Limited (Standards Australia) 2017, *Australian Standard 2419.1-2017 – Fire hydrant installation, System design, installation and commissioning,* November 2017

Standards Australia Limited (Standards Australia) 2018, *Australian Standard 3959-2018 Construction of buildings in bushfire prone areas*, Fourth edition, November 2018

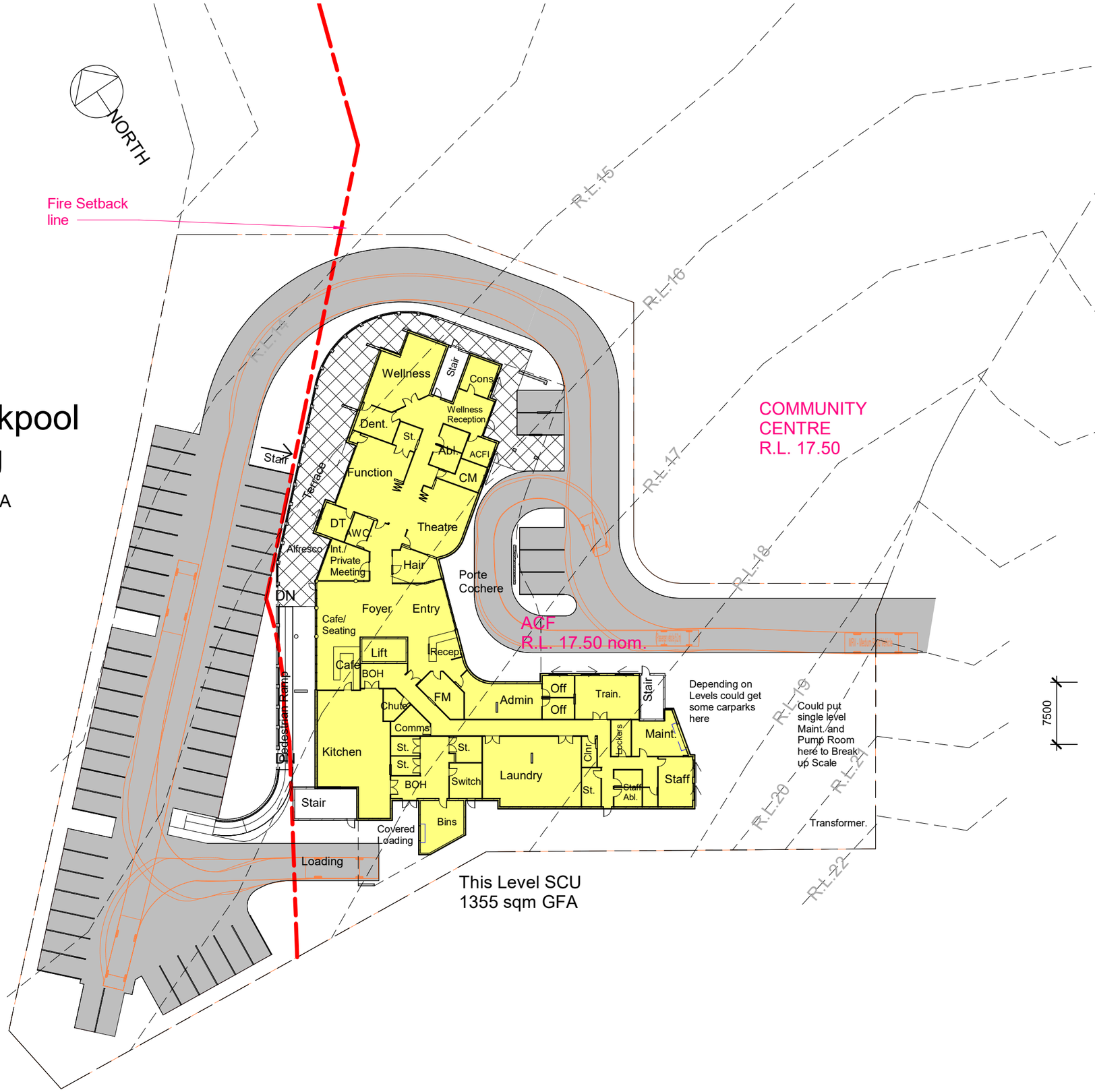
Appendix 1 Proposed site plan

Proposed Rockpool RACF Building

Approximately 8270 sqm GFA

6 Levels - 150 Residents

53 Car Parks - ACF



This Level SCU
1355 sqm GFA

GJG Architects

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Project
Carseldine CUV- Scheme 23

Client
Rockpool

Issue	Date	Amendment
5	14.01.21	Modelling and Planning Advanced
4	09.09.20	Fire Setback Increased
3	28.05.20	Added fire setback note & units alt.
2	22.05.20	Planning update + modelling
1	08.05.20	Prelim Issue 1

Drawing Title
Ground Floor

Scale 1 : 500 @ A3 original

Drawing Number
20-15- SCM-10-03

Appendix 2 Approved landscape plan for assessment reference point D


102
RETIREMENT LIVING
PRECINCT
ROAD 2
ROAD 3
01E
01D
01C
01B
03E
03D
03C
03B
04A
XXX
XXX
XXX
XXX
FUT
CA

Appendix 3 Radiant heat exposure calculations

Retirement living precinct

The retirement living precinct adjoins the waterway corridor open space, ie VHC 40.4, but is within 100 m of bushland vegetation in the western part of the site, ie VHC 9.1. Therefore, the 10 kW/m^2 radiant heat flux contour in the retirement living precinct was determined by overlaying the 10 kW/m^2 radiant heat flux contours from bushfire attack scenarios through the bushland vegetation in the western part of the site, ie VHC 9.1, and the waterway corridor open space, ie VHC 40.4, and tracing the worst case scenario.

VHC 9.1 in the bushland vegetation in western part of the site

- Forest fire danger index - 55
- Vegetation – VHC 9.1 *Moist to dry eucalypt open forest on coastal lowlands and ranges*
- Overall fuel load – 34.2 t/ha
- Surface fuel load – 24.2 t/ha
- Slope – 0° slope
- Site slope – 0° slope
- Flame width – 100 m

FPA AUSTRALIA | FLAMESOL

Calculated February 7, 2020, 12:35 pm (MDc v.4.8)

J19061 (BB VHC9.1)

Minimum Distance Calculator - AS3959-2009 (Method 2)			
Inputs		Outputs	
Fire Danger Index	55	Rate of spread	1.59 km/h
Vegetation classification	Forest	Flame length	14.48 m
Surface fuel load	24.2 t/ha	Flame angle	53 °, 63 °, 71 °, 75 °, 77 ° & 82 °
Overall fuel load	34.2 t/ha	Elevation of receiver	5.78 m, 6.45 m, 6.84 m, 6.99 m, 7.05 m & 7.17 m
Vegetation height	n/a	Fire intensity	28,222 kW/m
Effective slope	0 °	Transmissivity	0.872, 0.853, 0.828, 0.802, 0.789 & 0.727
Site slope	0 °	Viewfactor	0.6024, 0.4465, 0.301, 0.2046, 0.1661 & 0.0451
Flame width	100 m	Minimum distance to < 40 kW/m²	11.99999999999997 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	16.09999999999996 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	23.40000000000006 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	32.9000000000002 m
		Minimum distance to < 10 kW/m²	39.00000000000028 m

Rate of Spread - Mcarthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

VHC 40.4 in the waterway corridor open space

- Grassland fire danger index – 78 (approximate equivalence to FFDI 55)
- Vegetation - VHC 40.4 *Low tree or grass cover in built up areas*
- Overall fuel load – 5 t/ha
- Surface fuel load – 5 t/ha
- Slope – 0° slope
- Site slope – 0° slope
- Flame width – 100 m

Minimum Distance Calculator - AS3959-2009 (Method 2)			
Inputs		Outputs	
Grassland Fire Danger Index	78	Rate of spread	10.14 km/h
Vegetation classification	Grassland	Flame length	6.1 m
Surface fuel load	5 t/ha	Flame angle	54 °, 64 °, 73 °, 78 °, 80 ° & 85 °
Overall fuel load	5 t/ha	Elevation of receiver	2.46 m, 2.74 m, 2.91 m, 2.98 m, 3 m & 3.03 m
Vegetation height	n/a	Fire intensity	26,195 kW/m
Effective slope	0 °	Transmissivity	0.889, 0.88, 0.865, 0.846, 0.835 & 0.76
Site slope	0 °	Viewfactor	0.5865, 0.4293, 0.2868, 0.1934, 0.1566 & 0.0431
Flame width	100 m	Minimum distance to < 40 kW/m²	5.199999999999998 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	7.099999999999991 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	10.59999999999998 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	15.59999999999996 m
		Minimum distance to < 10 kW/m²	19.1 m

Rate of Spread - Noble et al. 1980

Flame length - Purton, 1982

Elevation of receiver - Douglas & Tan, 2005

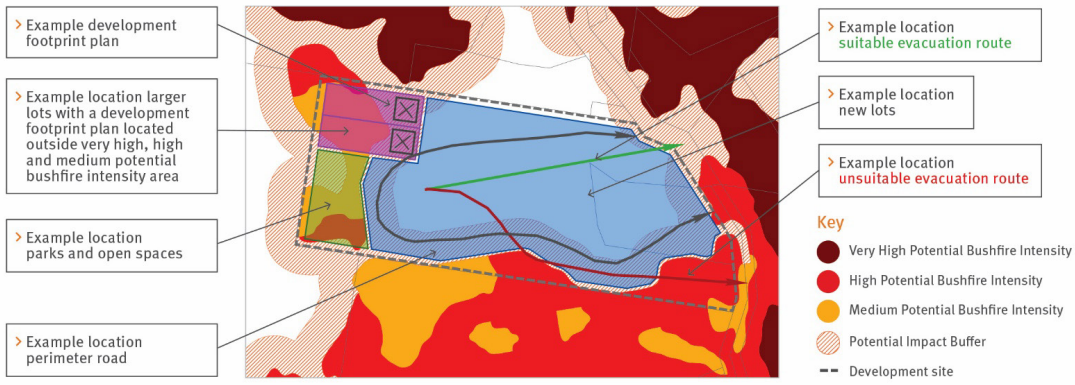
Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Appendix 4 SPP bushfire prone area code assessment

Performance outcomes	Acceptable outcomes	Compliance assessment
Section A **Reconfiguring a lot (RaL) – where creating lots of more than 2,000 square metres**		
PO1 The subdivision layout: (a) enables future buildings to be located away from slopes and land forms that expose people or property to an intolerable risk to life or property; and (b) facilitates emergency access and operational space for firefighters in a reduced fuel area between future buildings and structures and hazardous vegetation, that reduce risk to an acceptable or tolerable level. Note – An applicant may seek to undertake a site-level verification of the location and nature of hazardous vegetation and resulting potential bushfire intensity levels, for example where changes in foliage have occurred (e.g. as a consequence of adjoining permanent urban development) or where an applicant seeks to verify the regional ecosystem map inputs. This verification should form part of a bushfire hazard assessment in accordance with the methodology in the QFES *Bushfire resilient communities* document. The outcomes of this assessment can demonstrate how an alternate solution to the acceptable outcome can deliver an acceptable or tolerable level of risk.	**AO1.1** A development footprint plan is identified for each lot that avoids ridgelines, saddles and crests where slopes exceed 15 per cent. **AO1.2** A development footprint plan is identified for each lot that is separated from the closest edge to the adjacent mapped medium, high or very high potential bushfire intensity area by: (a) a distance that is no closer than the distances specified in Table 5 at all development footprint plan boundaries; or (b) a distance that achieves a radiant heat flux level of 29 kW/m2 or less at all development footprint plan boundaries. Note – This separation area is often termed an asset protection zone. Note – The radiant heat flux levels can be established by undertaking a bushfire hazard assessment in accordance with the methodology in the QFES Bushfire resilient communities document.	**Not applicable** The proposed development does not involve the reconfiguring a lot.
PO2 The subdivision layout enables: (a) future buildings to be located as close as possible to property entrances to facilitate safe evacuation during a bushfire event; and (b) future site access to be located and designed to allow safe evacuation of the site by occupants and maintain access by emergency services under critical event conditions.	**AO2** A development footprint plan is identified for each lot that: (a) is located within 60 metres of the street frontage; and (b) sited to enable a route between the development footprint plan and the street frontage with a gradient that does not exceed of 12.5 per cent.	**Not applicable** The proposed development does not involve the reconfiguring a lot.

Performance outcomes	Acceptable outcomes	Compliance assessment
Section B		
Reconfiguring a lot (RaL) – where creating lots of 2,000 square metres or less		
PO3 The subdivision layout: (a) avoids creating lots on slopes and land forms that expose people or property to an intolerable risk to life or property; and (b) facilitates emergency access and operational space for firefighters in a reduced fuel area between future buildings and structures and hazardous vegetation, that reduce risk to an acceptable or tolerable level. Note – An applicant may seek to undertake a site-level verification of the location and nature of hazardous vegetation and resulting potential bushfire intensity levels, for example where changes in foliage have occurred (e.g. as a consequence of adjoining permanent urban development) or where an applicant seeks to verify the regional ecosystem map inputs. This verification should form part of a bushfire hazard assessment, in accordance with the methodology in the QFES *Bushfire resilient communities* document. The outcomes of this assessment can demonstrate how an alternate solution to the acceptable outcome can deliver an acceptable or tolerable level of risk.	**AO3.1** The subdivision layout results in lots that are sited so that they are separated from the closest edge to the adjacent mapped medium, high or very high potential bushfire intensity area by: (a) a distance that is no closer than the distances specified in Table 5 at all lot boundaries; or : (b) a distance that achieves a radiant heat flux level of 29 kW/m^2 or less: (i) at the building envelope, if identified at RaL stage; or (ii) where a building envelope is not identified, at all lot boundaries. Note – This separation area is often termed an asset protection zone. Note – The radiant heat flux levels can be established by undertaking a bushfire hazard assessment in accordance with the methodology in the QFES *Bushfire resilient communities* document. Note – For staged developments, temporary separation areas may be absorbed as part of subsequent stages. Note - Existing cleared areas external to the site may only be used in calculating necessary separation where tenure ensures that the land will remain cleared of hazardous vegetation (for example the land is a road, watercourse or highly managed park in public ownership). **AO3.2** The subdivision layout does not create lots that are within bushfire prone areas and on ridgelines, saddles and crests where slopes exceed 15 per cent (roads and parks may be located in these areas)	**Not applicable** The proposed development does not involve the reconfiguring a lot.

Performance outcomes	Acceptable outcomes	Compliance assessment
Section C		
Reconfiguring a lot (RaL) – where creating more than 20 lots		
PO4 The subdivision layout is designed to minimise the length of the development perimeter and number of lots exposed to hazardous vegetation. Note – For example, avoid finger-like subdivision patterns or substantive vegetated corridors between lots.	**AO4** No acceptable outcome is prescribed	**Not applicable** The proposed development does not involve the reconfiguring a lot.
PO5 The subdivision layout provides for adequate access and egress and safe evacuation routes, to achieve an acceptable or tolerable risk to people.	**AO5.1** The subdivision layout: (a) avoids the creation of bottle-neck points in the movement network within the development (for example, avoids hourglass patterns); and (b) ensures the road network has sufficient capacity for the evacuating population. **AO5.2** The subdivision layout ensures evacuation routes: (a) direct occupants away from rather than towards or through areas with a greater potential bushfire intensity; and (b) minimise the length of route through bushfire prone areas.	**Not applicable** The proposed development does not involve the reconfiguring a lot.
		

Performance outcomes	Acceptable outcomes	Compliance assessment
Figure 5 – Subdivision layout and evacuation routes		
PO6 The subdivision layout provides adequate buffers between hazardous vegetation and development. Note – An applicant may seek to undertake a site-level verification of the location and nature of hazardous vegetation and resulting potential bushfire intensity levels, for example where changes in foliage have occurred (e.g. as a consequence of adjoining permanent urban development) or where an applicant seeks to verify the regional ecosystem map inputs. This verification should form part of a bushfire hazard assessment, in accordance with the methodology in the QFES *Bushfire resilient communities* document. The outcomes of this assessment can demonstrate how an alternate solution to the acceptable outcome can deliver an acceptable or tolerable level of risk.	**AO6.1** The subdivision layout results in an asset protection zone being located to create a separation area from adjacent mapped medium, high or very high potential bushfire intensity areas. **AO6.2** The asset protection zone is comprised of: (a) parks and open spaces; and/or (b) lots greater than 2000 square metres; and/or (c) public roads (termed perimeter roads). Note – Parks and open space may be located within the mapped medium, high and very high potential bushfire intensity areas to create a separation between the development and the balance of the bushfire prone area. Note – Portions of lots greater than 2000 square metres may be located within the mapped medium, high and very high potential bushfire intensity areas. Refer Figure 5. **AO6.3** Where the asset protection zone includes lots greater than 2000 square metres a development footprint plan is identified for each lot that is located in accordance with AO1.2.	**Not applicable** The proposed development does not involve the reconfiguring a lot.
PO7 Parks or open space provided as part of the asset protection zone do not create additional bushfire prone areas. Note –The undertaking of a bushfire hazard assessment, in accordance with the methodology in the QFES *Bushfire resilient communities* document may assist in demonstrating compliance with this performance outcome.	**AO7** Where the asset protection zone includes parks or open spaces, they: (a) comprise only low threat vegetation, including grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves and parklands, cultivated gardens and nature strips; or (b) are designed to ensure a	**Not applicable** The proposed development does not involve the reconfiguring a lot.

Performance outcomes	Acceptable outcomes	Compliance assessment
	potential available fuel load is maintained at less than eight tonnes/hectare in aggregate and with a fuel structure that remains discontinuous. Note – Minimal fuel condition means there is insufficient fuel available to significantly increase the severity of the bushfire attack, for example short-cropped grass to a nominal height of 10 centimetres.	
PO8 Perimeter roads are accessible for fire-fighting vehicles, to facilitate emergency access and operational space for fire- fighting, maintenance works and hazard reduction activities.	**AO8.1** Where the asset protection zone includes a perimeter road it: (a) has a two-lane sealed carriageway clear of hazardous vegetation; and (b) is connected to the wider public road network at both ends and at intervals of no more than 200 metres; and (c) does not include design elements that may impede access for fire-fighting and maintenance for fire- fighting purposes (for example traffic calming involving chicanes). **AO8.2** Where the subdivision contains a reticulated water supply, the road network and fire hydrants are designed and installed in accordance with: (a) *Fire Hydrant and Vehicle Access Guidelines for residential, commercial and industrial lots*, Queensland Fire and Emergency Services, 2015, unless otherwise specified by the relevant water entity; and (b) the *Road Planning and Design Manual 2nd edition*, Department of Transport and Main Roads, 2013	**Not applicable** The proposed development does not involve the reconfiguring a lot.
Section D		
Reconfiguring a lot (RaL) – where creating additional lots for the purpose of residential development and a reticulated water supply is not provided.		

Performance outcomes	Acceptable outcomes	Compliance assessment
PO9 The subdivision layout provides for perimeter roads or fire trail and working areas that are accessible by the type of fire-fighting vehicles servicing the area, to facilitate emergency access and operational space for fire-fighting, maintenance works and hazard reduction activities.	**AO9.1** The subdivision layout includes: (a) a fire trail and working area designed and constructed in accordance with the design parameters in Table 6 that separates the residential lot or development footprint plan from adjacent mapped medium, high or very high potential bushfire intensity areas; or (b) a perimeter road designed and constructed in accordance with AO8.1.	**Not applicable** The proposed development does not involve the reconfiguring a lot.

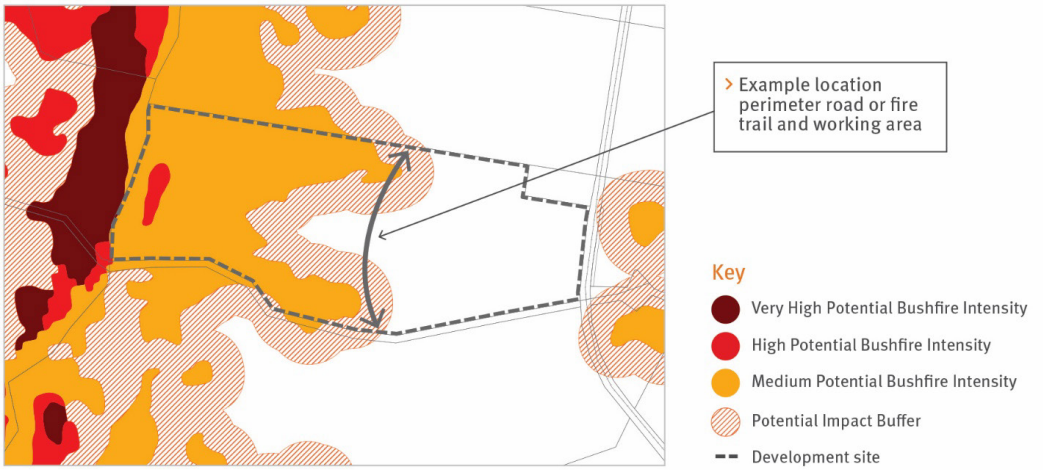



Figure 6 – Siting of fire trail and working area		
Section E		
Material change of use		
PO10 Site layout achieve an acceptable or tolerable risk to people. Landscape or open space provided as part of the development: (a) acts as a buffer between hazardous vegetation and development; and	**AO10.1** Site layout places the landscape and open spaces within the site between premises and adjacent mapped medium, high or very high potential bushfire intensity areas. Refer Figure 7.	✓ **Complies with AO10.1 and AO10.2** The approved design plan for the waterway corridor open space at Appendix 2 of the bushfire management plan shows the south boundary of the site will be separated from the forest area in Stage 2 of the Oxley PDA by a turf

Performance outcomes	Acceptable outcomes	Compliance assessment
(b) does not create additional bushfire prone areas. Note – An applicant may seek to undertake a site-level verification of the location and nature of hazardous vegetation and resulting potential bushfire intensity levels, for example where changes in foliage have occurred (e.g. as a consequence of adjoining permanent urban development) or where an applicant seeks to verify the regional ecosystem map inputs. This verification should form part of a bushfire hazard assessment in accordance with the methodology in the QFES *Bushfire resilient communities* document. The outcomes of this assessment can demonstrate how an alternate solution to the acceptable outcome can deliver an acceptable or tolerable level of risk.	**AO10.2** This landscaping and open space comprises protective landscape treatments that: (a) comprise only low threat vegetation, including grassland managed in a minimal fuel condition, maintained lawns, golf courses and cultivated gardens; or (b) are designed to ensure a potential available fuel load is maintained at less than 8 tonnes/hectare in aggregate and that fuel structure remains discontinuous. Note – Minimal fuel condition means there is insufficient fuel available to significantly increase the severity of the bushfire attack, for example short-cropped grass to a nominal height of 10 centimetres.	area which incorporates a concrete walkway. This area of landscaping will be maintained as low cut grass in perpetuity and can be included in the bushfire management setback along the south boundary of the site. The landscaping also supports disaster management capacity and capability by providing access to the forest area for bushfire management activities Landscaping within the bushfire protection zone and the balance of the site will be designed in accordance with principles in *Bushfire Resilient Building Guidance for Queensland Homes* (QRA 2020). These design principles will minimise the potential for landscaping to catch fire and compromise the proposed residential aged care building. Specifications for landscaping are provided in Section 6.2 of the bushfire management plan.

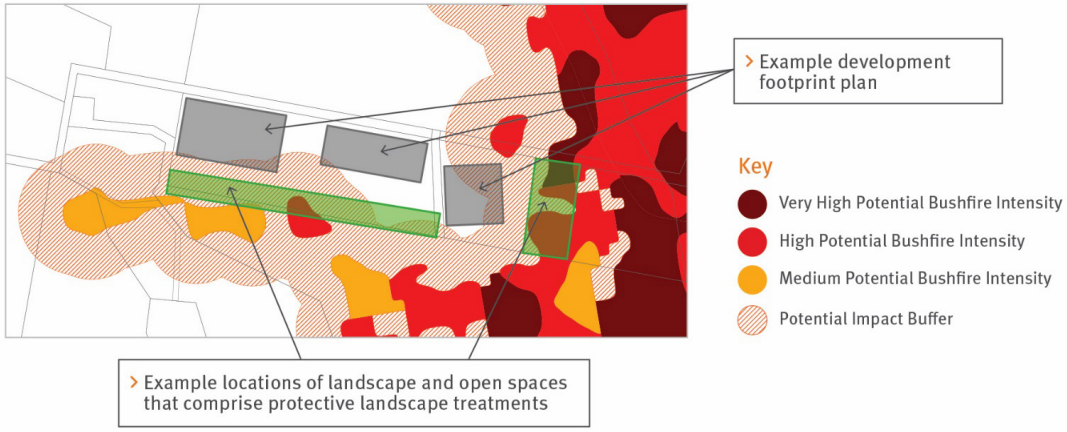


Figure 7 – Siting of protective landscape treatments

PO11 The development establishes evacuation areas, to achieve an acceptable or tolerable risk to people	**AO11** If in an isolated location, development establishes direct access to a safe assembly/evacuation area.	✓ **complies with PO11** The proposed development is in suburban Brisbane and not an isolated location.

Performance outcomes	Acceptable outcomes	Compliance assessment
	Note – Guidance on identifying safe evacuation areas is contained in the QFES *Bushfire resilient communities* document.	
PO12 If on a lot of over 2,000 m^2, where involving a new premises or an existing premises with an increase in development footprint, development: (a) locates occupied areas as close as possible to property entrances to facilitate safe evacuation during a bushfire event; and (b) ensures vehicular access is located and designed to allow safe evacuation of the site by occupants and maintain access by emergency services under critical event conditions	**AO12** No acceptable outcome is prescribed.	✓ **complies with PO12** The driveway and crossover will be designed to provide sufficient width and height clearance and turning geometrics for urban fire-fighter appliances, ie in accordance with *Fire Hydrant and Vehicle Access Guidelines for Residential, Commercial and Industrial Lots* (QFES 2015). The driveway will incorporate manoeuvring areas which enable emergency vehicles to turnaround within the site.
PO13 Development is located within a reticulated water supply area or includes a dedicated static water supply that is available solely for fire-fighting purposes and can be accessed by fire-fighting vehicles. Note – Swimming pools, farm ponds and dams are not considered reliable sources of static water supply in Queensland due to regular drought events. [Note for Local Government – Information on how to provide an appropriate static water supply, may form a condition of a development approval. For further information on preferred solutions refer to the QFES *Bushfire resilient communities* document.]	**AO13** No acceptable outcome is prescribed	✓ **complies with PO13** The proposed development will be connected to mains water and will have access to a reticulated hydrant system in the adjoining road reserve.
PO14 Vulnerable uses listed in Table 7 are not established or intensified within a bushfire prone area unless: (a) there is an overriding need in the public interest for the new or expanded service the	**AO14.1** No acceptable outcome is prescribed.	**An alternate solution is proposed** The proposed residential aged care building will achieve a radiant heat flux level ≤ 10 $kW/m^{2.}$ The preliminary approval for the material change of use for the master plan for Oxley PDA

Performance outcomes	Acceptable outcomes	Compliance assessment
development provides; and (b) there are no other suitable alternative locations within the required catchment; and (c) site planning can appropriately mitigate the risk (for example, siting ovals for an educational establishment between the hazardous vegetation and structures. Note – The preparation of a bushfire management plan in accordance with the methodology in the QFES *Bushfire resilient communities* document may assist in demonstrating compliance with this performance outcome		(DEV2020/1099) also identifies lot 102 within precinct b – lifestyle and care. A residential care facility is identified as a suitable/preferred land use within precinct 3b: lifestyle and care. The combination of mitigation measures in the bushfire management plan appropriately supports disaster management capacity and capability, ie access for emergency services, vegetation management areas which provide opportunities for prescribed burning or backburning operations and appropriately design reticulated hydrant system for fire-fighting purposes.
PO15 Community infrastructure providing essential services listed in Table 7 are not established within a bushfire prone area unless: (a) there is an overriding need in the public interest for the new or expanded service the development provides (for example, there are no other suitable alternative locations that can deliver the required level of service or meet emergency service response times during and immediately after a bushfire event); and (b) the infrastructure can function effectively during and immediately after a bushfire event. Note – The preparation of a bushfire management plan in accordance with the methodology in the QFES *Bushfire resilient communities* document may assist in demonstrating compliance with this performance outcome	**AO15** No acceptable outcome is prescribed. (i)	**Not applicable** The proposed development does not involve community infrastructure.
PO16 Development avoids or mitigates the risks to public safety and the environment from the manufacture or storage of materials listed in Table 7 that are hazardous in the context of	**AO16** No acceptable outcome is prescribed.	✓ **complies with PO16** The bulk LPG storage area will not be located in the bushfire protection zone.

Performance outcomes	Acceptable outcomes	Compliance assessment
bushfire to an acceptable or tolerable level. Note – The preparation of a bushfire management plan in accordance with the methodology in the QFES *Bushfire resilient communities* document may assist in demonstrating compliance with this acceptable outcome. Editor's note – In addition to the requirements of this code the *Work Health and Safety Act 2011* and associated Regulation and Guidelines, the *Environmental Protection Act 1994* and the relevant building assessment provisions under the *Building Act 1975* contain requirements for the manufacture and storage of hazardous substances. Information is provided by Business Queensland on the requirements for storing and transporting hazardous chemicals, available at: www.business.qld.gov.au/running-business/protecting-business/risk-management/hazardous-chemicals/storing-transporting.		
Section F		
Where involving an asset protection zone		
PO17 Asset protection zones are designed and managed to ensure they do not increase the potential for bushfire hazard. Note – The preparation of a landscape management plan undertaken in accordance with the methodology in the QFES *Bushfire resilient communities* document may assist in demonstrating compliance with this performance outcome.	**AO17.1** Landscaping treatments within any asset protection zone comprise only low threat vegetation, including grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves and parklands, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and windbreaks. Note – Minimal fuel condition means there is insufficient fuel available to significantly increase the severity of the bushfire attack, for example short-cropped grass to a nominal height of 10 centimetres. OR **AO17.2** Landscaping management within any asset protection zone maintains a: (a) potential available fuel load which is less than eight tonnes/hectare in aggregate; and (b) fuel structure which is discontinuous.	**Not applicable** A bushfire protection zone will be established and maintained along the west boundary of the site to ensure the proposed residential aged care building achieves a radiant heat flux level $\leq$ 10 kW/m^2.

Performance outcomes	Acceptable outcomes	Compliance assessment
	Note – The preparation of a landscape management plan undertaken in accordance with the methodology in the QFES *Bushfire resilient communities* document may assist in demonstrating compliance with this acceptable outcome.	
Section G		
Where planning provisions or conditions of approval require revegetation or rehabilitation		
PO18 Revegetation or rehabilitation areas are designed and managed to ensure they do not result in an unacceptable level of risk or an increase in bushfire intensity level. Note – The undertaking of a bushfire hazard assessment in accordance with the methodology in the QFES *Bushfire resilient communities* document may assist in demonstrating compliance with this performance outcome.	**AO18.1** Required revegetation or rehabilitation: (a) is located outside of any asset protection zone; or (b) maintains a potential available fuel load which is less than eight tonnes/hectare in aggregate and fuel structure which is discontinuous. Note – The preparation of a landscape management plan undertaken in accordance with the methodology in the QFES *Bushfire resilient communities* document may assist in demonstrating compliance with acceptable outcome (b). **AO18.2** Revegetation or rehabilitation of areas located within mapped medium, high or very high potential bushfire intensity areas, revegetate and rehabilitate in a manner that maintains or reduces the existing fuel load. OR Revegetation or rehabilitation of areas located within the mapped potential impact buffer area, revegetate and rehabilitate in a manner that maintains or reduces the existing fuel load. Note – The preparation of a vegetation management plan undertaken in accordance with the methodology in the QFES *Bushfire resilient communities* document may assist in demonstrating compliance with this acceptable outcome.	**Not applicable** The proposed development does not involve any areas of bushland vegetation restoration.

Parameter	Provisions
Width	Contains a width of at least 20 metres including: 1. A **trafficable area** (cleared and formed); a. with a minimum width of 4 metres that can accommodate a rural firefighting vehicle b. with no less than 4.8 metres vertical clearance from canopy vegetation c. with no adjacent inhibiting embankments or retaining walls 2. A **working area** each side of the trafficable area: a. with a minimum width of 3 metres each side b. cleared of all flammable vegetation greater than 10 centimetres in height 3. The **balance** (i.e. 10 metre width) managed vegetation area: a. sited to separate the trafficable area from adjacent mapped medium, high or very high potential bushfire intensity areas managed vegetation b. comprising managed vegetation clear of major surface hazards.
Access	Access is granted in favour of the local government and Queensland Fire and Emergency Services Note-This access is commonly granted in the form of an easement that is to be maintained by the grantor.
Egress	Contains trafficable vehicle routes in to low hazard areas, every 200 metres

Table 6 – Fire trail and working area design parameters

Group	Uses
Vulnerable uses	childcare centre, community care centre, detention facility, education establishment, hospital, nature-based tourism, relocatable home park, rooming accommodation, residential care facility, resort complex, retirement facility, tourist park
Community infrastructure for essential services	educational establishment, emergency services, hospital
Hazardous materials in the context of bushfire hazard	Hazardous chemicals that are present at levels or in the quantities that would constitute the use being a hazardous chemical facility Hazardous materials that are present in the quantities in the Work Health and Safety Regulation, schedule 15

Table 7 – Vulnerable uses, community infrastructure for essential services and materials that are hazardous in the context of bushfire hazard