QUEENSLAND BUSHFIRE PLANNING

BUSHFIRE ATTACK LEVEL (BAL) ASSESSMENT

Property

Flagstone School Site

Lot 30015

PEET

October 2022

+ Bushfire assessments
+ Property vegetation assessments
+ Site planning for bushfire
+ Property management for bushfire
+ Bushfire management plans

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Disclaimer

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INTRODUCTION

This report has been prepared to determine the Bushfire Attack Level (BAL), in accordance with Australian Standard AS 3959-2018, *Construction of Buildings in Bushfire Prone Areas* for PEET for Flagstone School Site. AS 3959-2018 is the national building construction specifications for land within designated bushfire prone areas. Please note, due to copyright laws Queensland Bushfire Planning is unable to reproduce sections of Australian Standard AS 3959-2018.

The aim of this report is to assist the building certifier through the Building Application process by clearly demonstrating how the BAL has been calculated. The client will have a clear understanding of the construction requirements associated with AS 3959-2018 and recommendations on how to achieve a reduced BAL for the site if necessary. This report is not intended to be included as part of a development application but is specifically for the proposed works.

SITE LOCATION AND DETAILS

Site Details

Site Address	**Flagstone School Site**
Local Government	Logan City Council
Real Property Description	Lot 30015
Zoning	Priority Development Area
Area of Site (square metres)	7,000
Applicant	PEET

The site is located at Flagstone School Site and is described as Lot 30015 within Logan City Council (Figure 1).

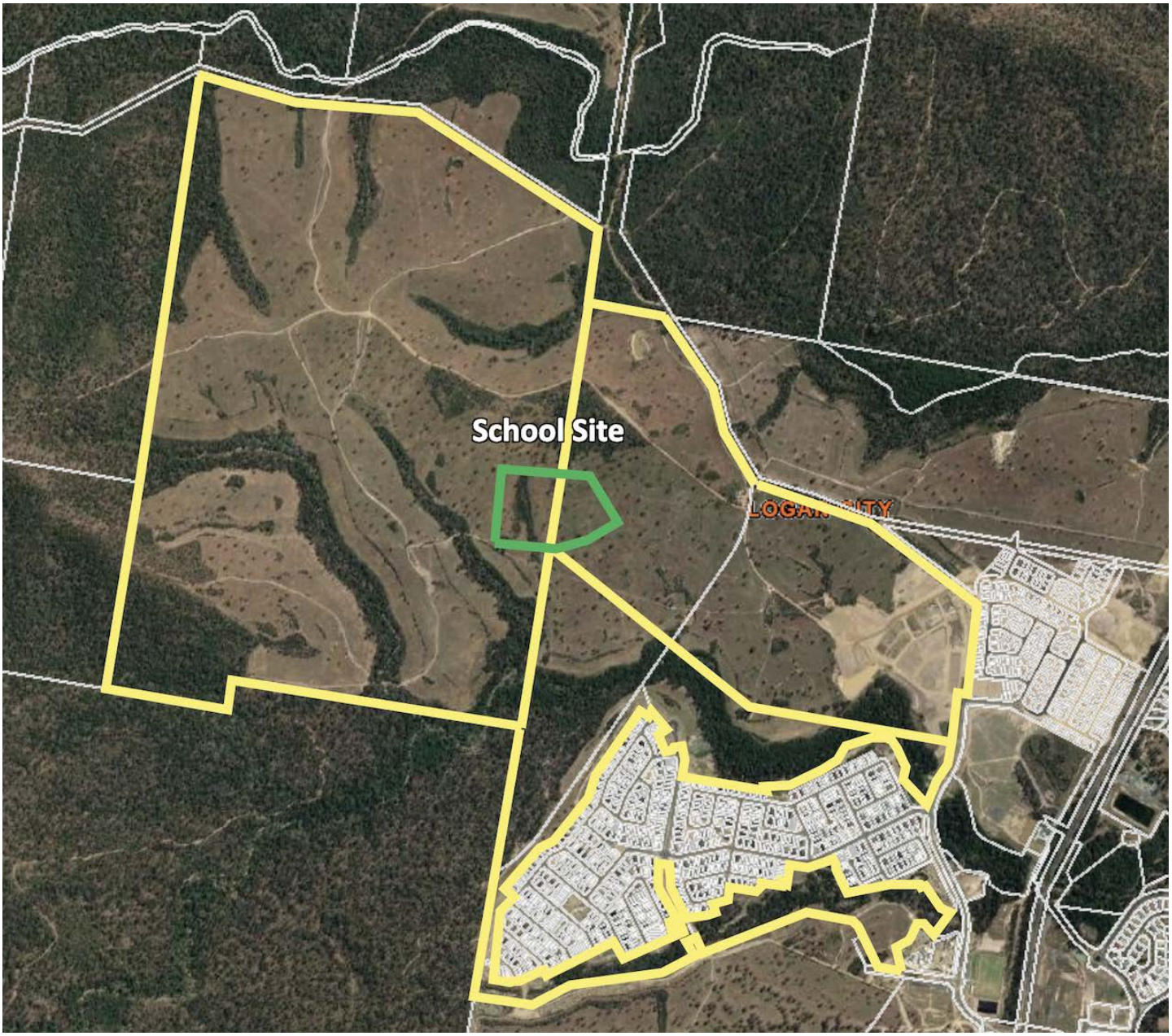

Figure 1

Lot 30015 has an area of 7,000 square metres and is aligned east-west with a south-easterly aspect. Lot 30015 is currently zoned Priority Development Area (Figure 2).

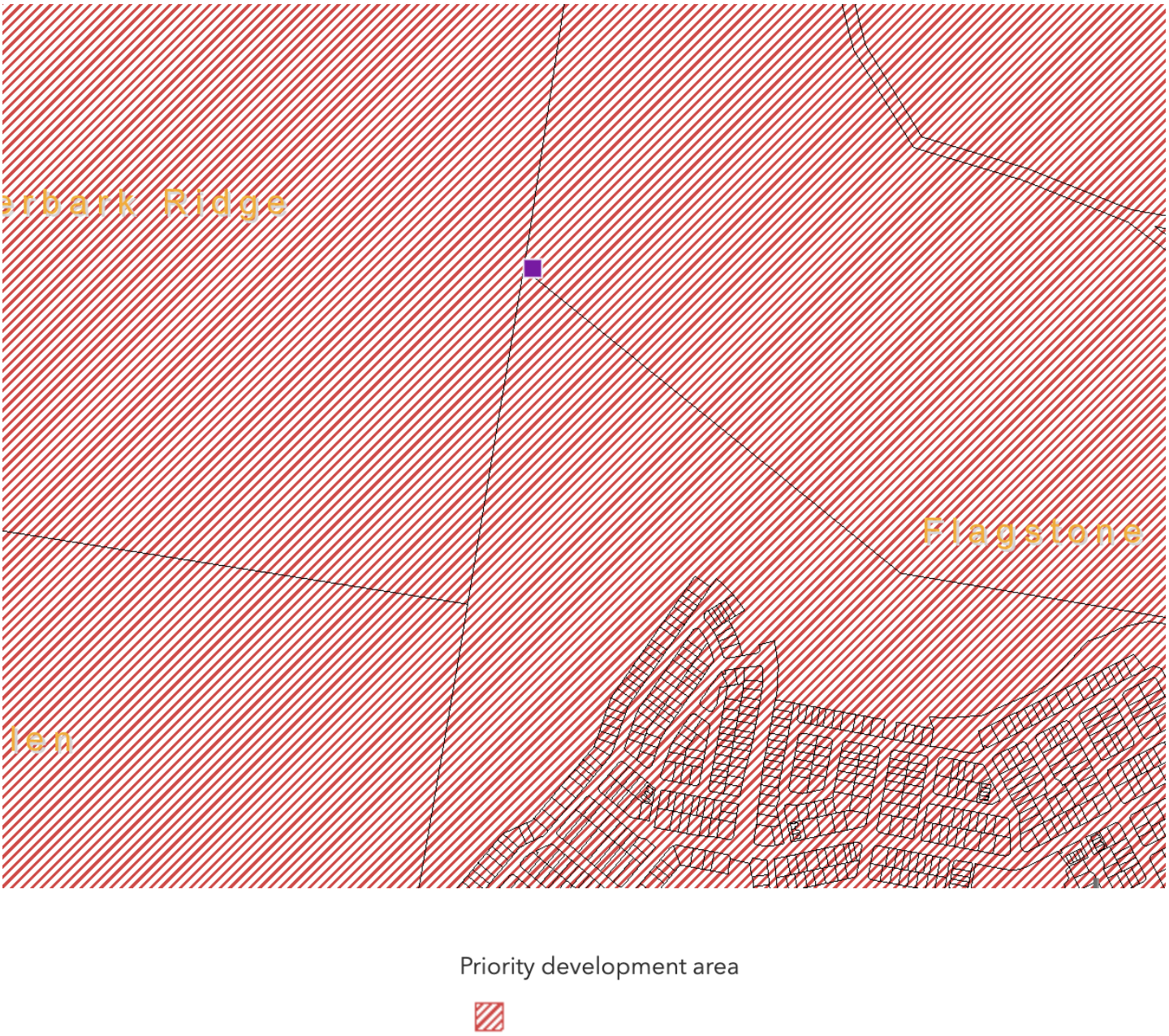

Figure 2

UNDERSTANDING BUSHFIRE HAZARD

Bushfires are an intrinsic part of Australia's environment. Natural ecosystems have evolved with fire and the landscape, along with its biological diversity, has been shaped by both historic and recent fires. Many of Australia's native plants are fire prone and very combustible, while numerous species depend on fire to regenerate. Indigenous Australians have long used fire as a land management tool and it continues to be used to clear land for agricultural purposes and to protect properties from intense, uncontrolled fires. Historically, bushfires have caused loss of life and significant damage to property. While naturally occurring bushfires cannot be averted, their consequences can be minimised by implementing mitigation strategies and reducing the potential impact to areas which are most vulnerable.

Bushfire Attack

Bushfire attack refers to the various methods in which bushfire may impact upon life and property and principally encompass:

- Direct flame contact;
- Ember and firebrand attack;
- Radiant heat; and
- Fire-driven wind (Figure 3).

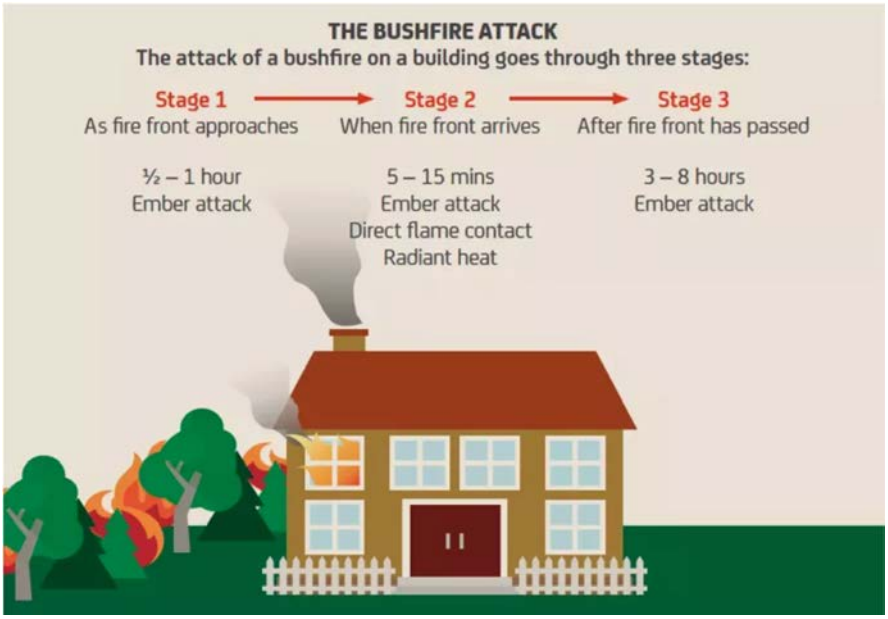

Figure 3

Direct Flame Contact

Direct flame attack refers to flame contact from the main fire front, the flame that engulfs burning vegetation is the same flame that contacts the building. It is estimated that only 10 to 20 per cent of buildings lost to bushfire occur as a direct result of flame attack.

Ember and Firebrand Attack

CSIRO research has shown that ember attack is the cause of up to 80% of house loss in Australia. The convective forces of bushfire raise burning embers into the atmosphere on prevailing winds and deposit them to the ground ahead of the fire front. Typically, ember attack occurs approximately 30 minutes prior to the arrival of the fire front and continues during the impact of the fire front and for several hours afterwards. Building loss via ember attack relates largely to the vulnerabilities and peculiarities of each building, its distance from the classifiable vegetation and whether someone is present to actively defend the building.

Radiant Heat

Measured in kilowatts per m2, radiant heat is the heat energy released from the fire front which radiates to the surrounding environment, deteriorating rapidly over distance. In terms of impacts on buildings, radiant heat can pre-heat materials making them more susceptible to ignition. Radiant heat can also damage building materials such as window glazing, allowing openings into a building through which embers may enter.

Fire Driven Wind

The convective forces of a bushfire typically result in strong fire-driven winds, which can lead to building damage. The typical effects of fire driven wind include conveyance of embers, damage from branches and debris hitting the building, as well as direct damage to vulnerable building components, such as lifting roofs and the breakage of windows.

Vegetation

The Australian bush varies greatly around the country. There are regions of open woodlands, grassland savannas, dense rainforest. Different types of vegetation burn differently. Generally, fuel is classified as being fine (grasses and twigs that are less than 6 millimetres in diameter) or heavy (branches, logs or stumps). Finer fuels burn more easily, increasing the spread of the fire. Another key factor is fuel moisture content, or how dry the fuel is. The drier the fuel, the more easily it will burn. The dryness of the fuel depends on seasonal rainfall and temperatures.

Topography

Fires burn faster uphill. This is due to the radiation and convection a fire creates preheating the fuel. A 10-degree increase in slope results in a doubling of the speed of the fire. Fire will spread up a 10-degree slope two times as fast as it will along flat ground (Figure 4). The aspect of a slope (direction that a sloping piece of land is facing) influences a fire's behaviour. Northern and western aspects receive more direct heat from the sun, drying both the soil and the vegetation more than on southern or eastern slopes. The fuels on northern and western aspects are often drier and less dense than fuels on slopes with a different aspect.

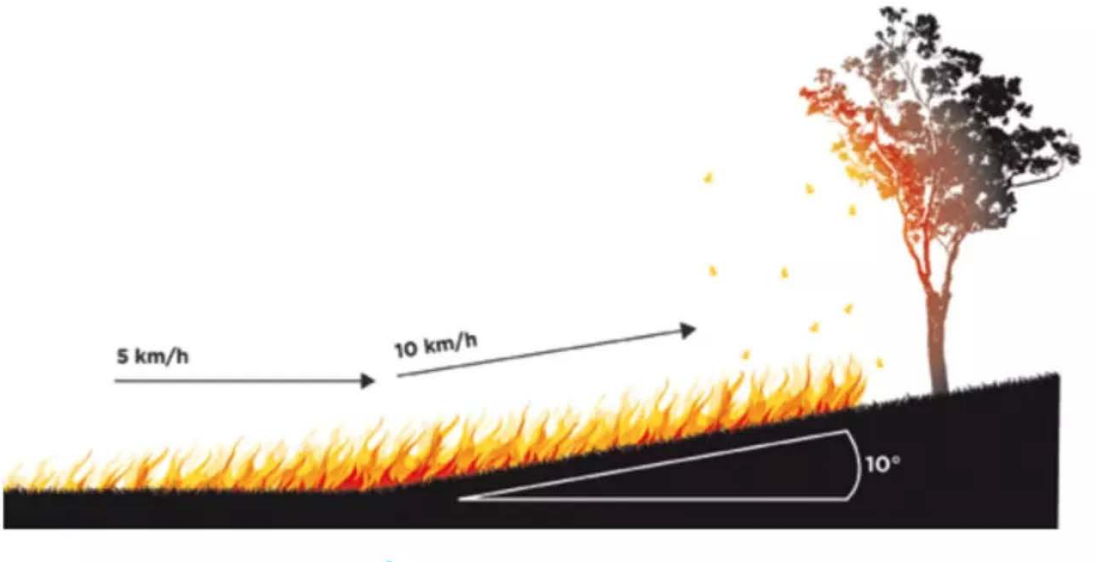

Figure 4

Fire Weather

Fire weather affects bushfire risk levels on a daily, weekly or seasonal basis. The South-east Queensland weather pattern is dominated by a maritime effect. The most common winds are southeast and northeast, the latter being very common during the summer months as an afternoon sea breeze. The most severe fire weather in the area is associated with a northwest wind generated on the back of a high pressure system moving slowly from west to east or from a situation where there is intense low pressure activity in the southeast of Australia extending a trough into southern Queensland (Just, 1978). However, the frequency of these situations in the region is low, being generally of the order of one to two days or fewer per year. The exception can occur in bad fire seasons when fuel conditions are very dry as a result of prolonged dry periods. In Queensland, these bad fire seasons occur about once a decade and are infrequent when compared with the fire situation that prevails frequently in southern Australia.

Whilst an assessment of vegetation types, fuel loads, effective slope and other factors can be readily undertaken, fire weather can fluctuate across days, weeks and seasons and can have a significant impact on the potential for bushfire threat, as well as influence bushfire behaviour and intensity. The Forest Fire Danger Index (FFDI) is a commonly used method to readily advise the community of the likely ability of fire suppression based on fire weather, which is used to inform the Fire Danger Rating (FDR) System (Figure 5). It is important to maintain awareness as to the level of local fire danger during the fire season.

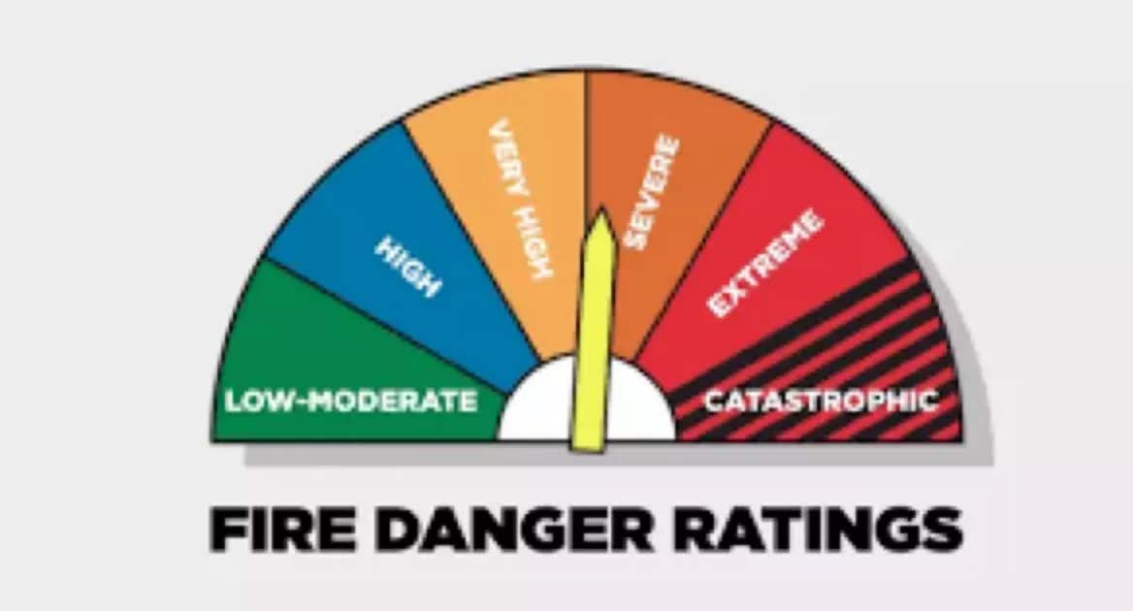

Figure 5

BUSHFIRE HAZARD MAPPING

The Queensland Government - Public Safety Business Agency (PSBA) *State-Wide Bushfire Hazard (Bushfire Prone Area)* mapping shows Lot 30015 is located in an area of potential bushfire impact (Figure 6).

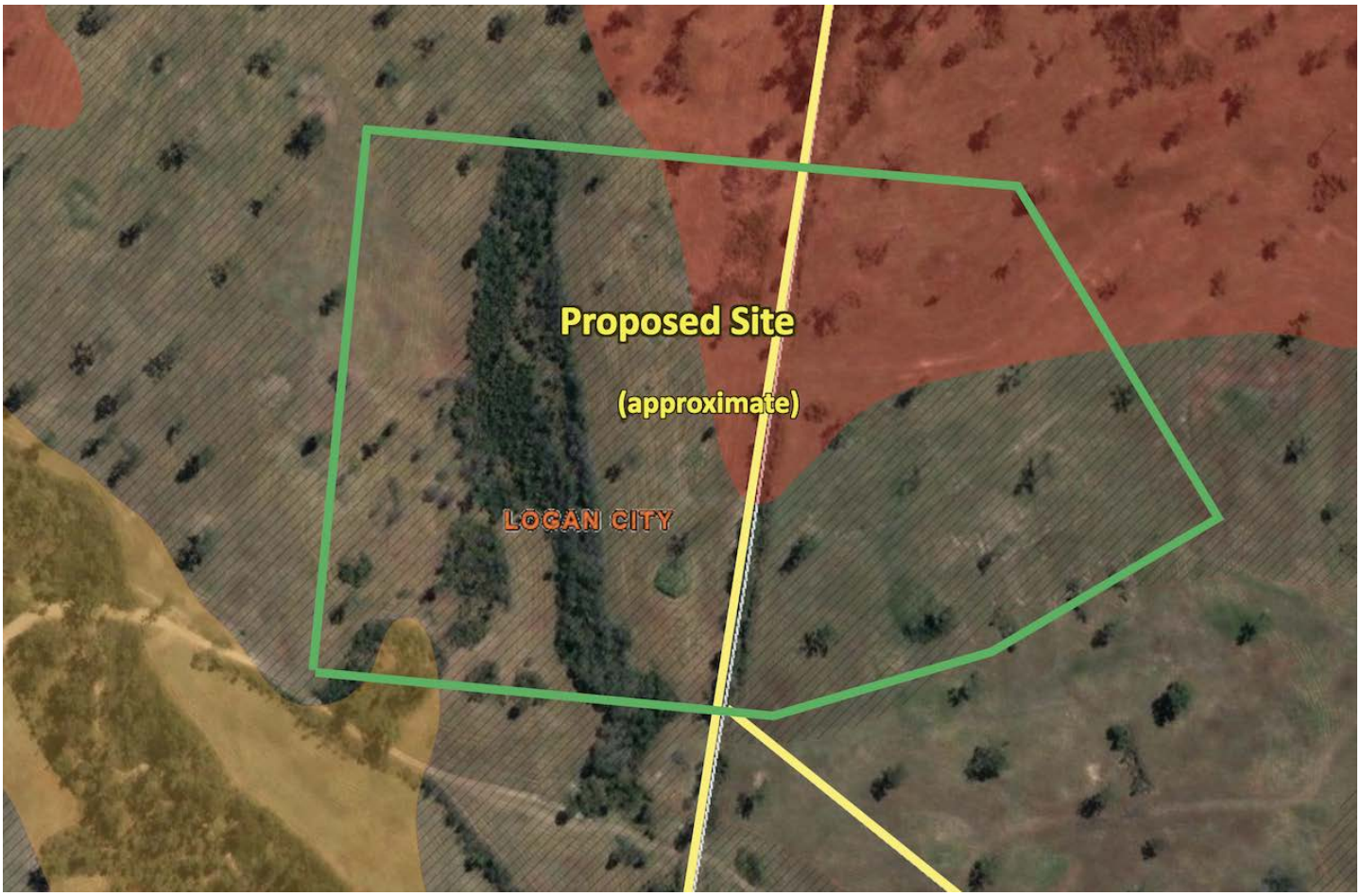

Figure 6

VEGETATION

A site assessment was conducted at Lot 30015. The assessment was undertaken to determine the Bushfire Attack Level (BAL) in accordance with the requirements of the Australian Standard - Construction of Buildings in Bushfire Prone Areas (AS 3959-2018) for the proposed works .

Original Vegetation

The *Public Safety Business Agency (PSBA) State-wide Bushfire Hazard (Bushfire Prone Area)* mapping identifies the original vegetation on and about this site as Regional Ecosystem (RE) 12.9 - 10.2 .Corymbia citriodora subsp. variegata Â± Eucalyptus crebra open forest on sedimentary rocks. Vegetation Hazard Class 10.2(Photo 1).

Photo 1

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Classified Vegetation

The *Australian Standard: Construction of Buildings in Bushfire Prone Areas (AS 3959–2018)* requires that any classified vegetation within 100 metres of the proposed works must be assessed. The vegetation on Lot 30015 and surrounding properties is now a patchwork of remnant and Low Hazard as a result of the intended development impacts (Photo 2).

Photo 2

The removal of the native vegetation from Lot 30015, Flagstone School Site, the fragmentation of the wider landscape by public and private infrastructure and the reduction in ground fuels has reduced the immediate bushfire threat to people and property. . There is no evidence of recent fire activity and the removal and modification of the original vegetation has removed the hazard previously mapped by the (*PSBA) State-wide Bushfire Hazard (Bushfire Prone Area)*

Assessable vegetation is measured as a horizontal distance from the proposed works and is not restricted to the Lot on which the works will be carried out. Where the assessable vegetation is on adjoining lands the distance is measured to the nearest classified vegetation. A area disturbed vegetation fringing an unnamed drainage line to the southwest can be discounted due to the narrow linear configuration being less than 50 metres in width. The vegetation to the North will be removed as part of the ongoing development of the larger site.

The distance to any classified vegetation likely to impact the proposed school site has been measured at a distance greater than 100 metres (Figure 7).

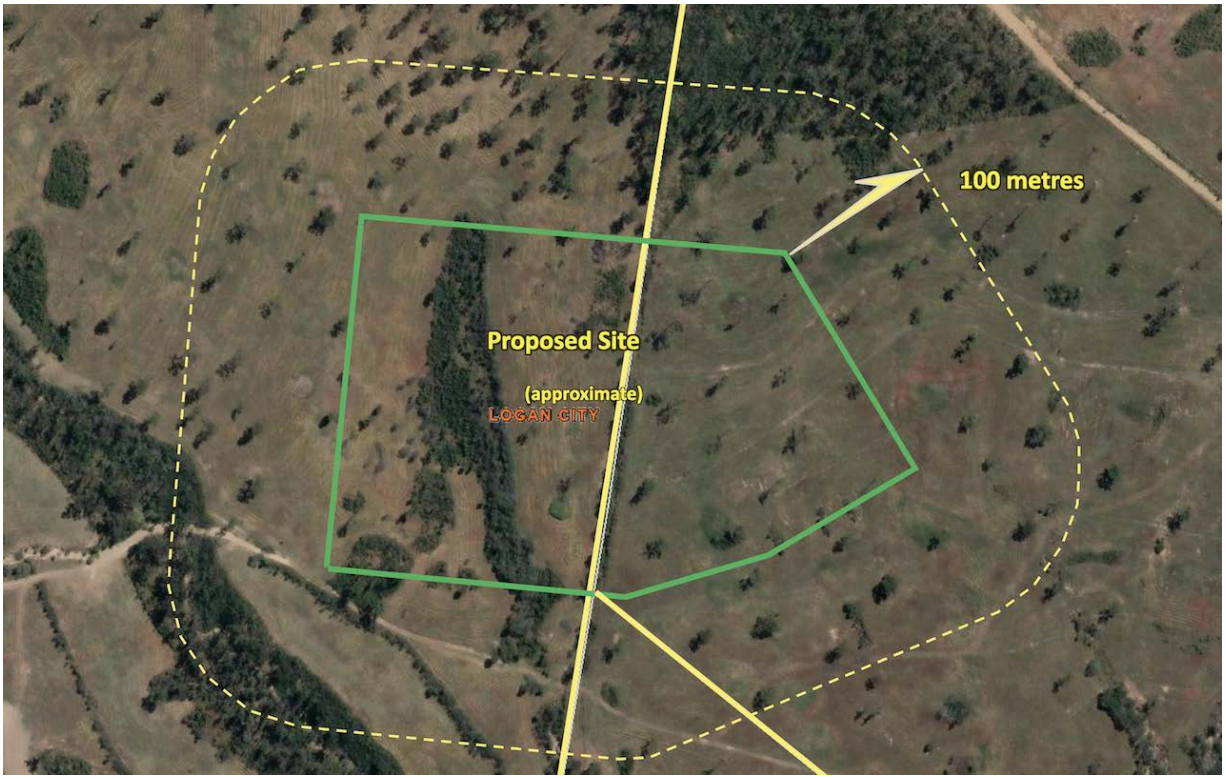

Figure 7 (Indicative Only)

The vegetation is classified as downslope with an average slope of 0 degrees. The available fuel load within this vegetation 18 tonnes/Ha has been derived from Queensland Government – Public Safety Business Agency (PSBA) *State-wide Bushfire Hazard (Bushfire Prone Area)* mapping.

NOTE: As fire travels slower down a hill, all classified vegetation that is upslope will assume a value of 0 degrees (i.e. flat land) *(AS3959:2018)*.

POTENTIAL BUSHFIRE ATTACK LEVEL

The Australian Standard, Construction of Buildings in Bushfire Prone Areas (AS 3959-2018) provides a suitable methodology for identifying assessable vegetation and determining the requirements for the construction of buildings in order to improve their resistance to bushfire attack from burning embers, radiant heat, flame contact and a combination of the three attack forms.

Method for Determination of BAL

The BAL was determined in accordance with Appendix B of *AS 3959-2018, Detailed Method for Determining the Bushfire Attack Level (BAL) – Method 2 (Normative):*

Step 1: Determine the relevant FDI.

Step 2: Determine the vegetation classification, fuel loads.

Step 3: Determine the effective slope in degrees under the classified vegetation.

Step 4: Determine the slope in degrees of the land between the site and the classified vegetation.

Step 5: Determine the distance of the site from classified vegetation.

Step 6: Calculations.

Determination of BAL

Step 1. Relevant Fire Danger Index

The PSBA bushfire hazard mapping identifies the FFDI as 56.

Step 2. Vegetation Classification - Fuel Loads

The vegetation type was classified as spotted gum dominated open forests. Available fuel weights were derived from *PSBA State – Wide Bushfire Hazard (Bushfire Prone Area) Mapping. Fuel weight was determined as: 18 tonne/hectare.*

Fuel weights were determined as:

- 14.0 tonne/hectare surface fuels
- 3.0 tonne/hectare near surface fuels
- 1.0 tonne/hectare elevated fuels
- 0.0 tonne/hectare bark fuels
- Total fuel weight = *18 tonne/hectare.*

Step 3. Determine the effective slope in degrees under the classified vegetation

The classified vegetation is downslope at 0 degrees.

Step 4. Determine the slope in degrees of the land between the site and the classified vegetation

The slope between the site and the classified vegetation is with an average slope of 0 degrees.

Step 5. Determine the distance of the site from classified vegetation

Distance is calculated from the closest edge of the classified vegetation. Classified vegetation under AS 3959-2018 does not include low threat vegetation. The distance to any identified classified vegetation was calculated at a distance greater than 100 metres.

Step 6. Calculations

Effective slope (°) - 0

Site slope (°) - 0

Distance (m) - a distance greater than 100

Vegetation classification — spotted gum dominated open forests

Forest Fire Danger Index (FFDI) – 56

Surface fuel load (t/ha) – 14.0

Overall fuel load (t/ha) – *18*

Heat of combustion (kj/kg) – 18 600

Flame temperature (K) – 1 090

Outcomes

Intensity (kW/m2) – 11 978

Radiant heat flux (kW/m2) – LOW

Bushfire Attack Level (BAL) - LOW

Conclusion and Recommendations

Bushfire Attack Level (BAL) - LOW

The assessment of the potential Bushfire Attack Level (BAL) for Lot 30015, Flagstone School Site has been determined as BAL **LOW** as per *AS 3959- 2018 Appendix B: Method for Determining The Bushfire Attack Level (BAL) – Method 2 (Normative)*.

According to Table 3.1 of AS 3959-2018 it is predicted that the proposed building in the context of the existing environment would be subject to there is insufficient risk to warrant specific bushfire construction requirements. The AS 3959 - 2018 does not provide construction requirements for buildings assessed in bushfire prone areas in accordance with Section2 as being BAL LOW .

It should be noted that the measures contained in AS 3959–2018 cannot guarantee that a building will survive a bushfire event on every occasion. This is substantially due to the unpredictable nature and behaviour of fire and extreme weather conditions.

Bernard Trembath, GC App Mgmt, FRAFAQ
Director, Specialist Bushfire Consultant

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Appendices

Appendix 1

About the Report Author

This Report was prepared by Bushfire Specialist Bernard Trembath. Bernard has extensive practical knowledge and experience in bushfire planning and management and an intimate working knowledge of Queensland vegetation and climate, particularly in relation to fire prediction and behaviour.

Prior to establishing Queensland Bushfire Planning in 2014, Bernard was the Regional Manager Rural Operations, Brisbane Region, for Queensland Fire and Emergency Services (QFES). As Regional Manager, Bernard was responsible for bushfire mitigation within the Brisbane Region, working with Local Governments and many other organisations to help reduce the impacts of bushfires. Bernard was also the QFES bushfire planning specialist, providing specialist bushfire planning and management advice on behalf of QFES.
Since 2014, Bernard has provided his specialist bushfire planning knowledge to advise and assist a large number of individuals, companies and government agencies. His happy clients include: