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Bushfire Hazard Assessment

Flood Recovery Blakebrook Public School

Special Fire Protection Purpose Development

Prepared for

School Infrastructure NSW

28 November 2023 | Version 1.2

BPAD Bushfire Planning & Design Accredited Practitioner Level 3

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1. Abbreviations

APZ	Asset protection zone
AS2419	*Australian Standard – Fire hydrant installations*
AS3745	*Australian Standard – Planning for emergencies in facilities*
AS3959	*Australian Standard – Construction of buildings in bushfire-prone areas 2018*
BAL	Bushfire Attack Level
NCC	*National Construction Code*
BFSA	Bush Fire safety authority
EP&A Act	*Environmental Planning & Assessment Act 1979*
EPA Reg	*Environmental Planning and Assessment Regulation 2000*
GTA	General terms of approval
PBP	*Planning for Bush Fire Protection 2019*
RF Act	*Rural Fires Act 1997*
RFS	NSW Rural Fire Service
RFR	*Rural Fires Regulation* 2013
SFPP	Special fire protection purpose

2. Glossary

AS3959	Australian Standard AS 3959 Construction of buildings in bushfire-prone areas, Standards Australia, 2018, that outlines construction standards applicable to residential developments in bush fire prone areas
Bushfire Prone Area	An area of land that can support a bush fire or is likely to be subject to bush fire attack.
Bush fire safety authority	An approval of the Commissioner of the RFS required for a subdivision for residential or rural residential purpose or for a special fire protection purpose listed under section 100B of the RF Act.
Special Fire Protection Purpose	Refers to the development of land for which the end user/s are people who are considered to be at-risk members of the community, and thus more susceptible to the impacts of bushfire. These include schools, hospitals, nursing homes and tourist accommodation.

3. Summary

Table 1 is a summary of compliance with relevant documents and approaches to limit bushfire attack and meet the requirements of the NSW planning framework for new development in Bushfire Prone Areas.

Table 1: Summary

Planning for Bushfire Protection 2019 Classification	Special Fire Protection Purpose Development
NCC Classification	5, 9b
Location	417 Rosehill Rd, Blakebrook NSW
Local Government Area	Lismore City Council
Can this proposal comply with AS3959:2018	BAL 12.5
Does this development comply with the requirements of *Planning for Bushfire Protection 2019?*	Yes
Does this development comply with the Aims and objectives of *Planning for Bushfire Protection 2019?*	Yes
Is the proposal on Bushfire Prone Land	No
Is referral to the NSW RFS required?	No
Is a Bush Fire Safety Authority (BFSA) required?	No

Assessment Framework	☒ *Planning for Bushfire Protection 2019:*
	☒ Meets the deemed to satisfy provisions
	☐ Alternate solution/ performance-based assessment

4. Introduction

School Infrastructure NSW (SINSW) have commissioned Blackash Bushfire Consulting (Blackash) to prepare a Bushfire Hazard Assessment in support of modifications to Blakebrook Public School (BPS) which is an existing school at 417 Rosehill Rd, Blakebrook NSW (Figure 1) which is legally known as Lot 2 DP 859866.

The existing buildings at Blakebrook Public School were significantly inundated during the February / March 2022 floods and most of the structures are no longer habitable due to the damages caused by the flood waters. As a result, the NSW Department of Education is proposing to demolish most of the existing school buildings and construct a new elevated school building to replace it. The floor level of the new building will be located above the design flood level to increase flood resistance and create useable undercroft spaces.

The works are being undertaken as a Development Application (DA) to Lismore City Council (Council).

The site is not designated as Bushfire Prone and as such does not require referral to the NSW Rural Fire Service (RFS) for a Bushfire Safety Authority (BSA). The school is within an existing modified landscape with some remnant vegetation. As such, mitigation measures are proposed to provide for a better bushfire risk outcome with basic ember protection to the buildings to afford a degree of resilience from ember attack. Assessment will be undertaken in accordance with the new education-based *State Environmental Planning Policy Transport and Infrastructure 2021* (the SEPP). This bushfire assessment has been completed as a deemed to satisfy assessment, having regard to *Planning for Bushfire Protection 2019* (PBP) as required by the SEPP.

A conservative position has been taken having regard to the remnant vegetation within proximity of the school as a potential bushfire hazard. The school is surrounded by agricultural land and grazing paddocks. As such, mitigation measures are proposed to provide for a better bushfire risk outcome with basic ember protection to the buildings to afford a degree of resilience from ember attack.

This bushfire hazard assessment details the proposed bush fire protection measures and demonstrates compliance with PBP. This assessment has been prepared by Lew Short, Principal Bushfire & Resilience (FPAA BPAD Level 3 Certified Practitioner No. BPAD16373) who is recognised by the RFS as qualified in

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bushfire risk assessment and has been accredited by the Fire Protection Association of Australia as a suitably qualified consultant to undertake alternative solution proposals.

A site inspection was performed on the 1 November 2022 as part of the assessment process.

Figure 1 Site location

5. The Proposal and site context

The proposed development is to be undertaken in two (2) stages as follows:

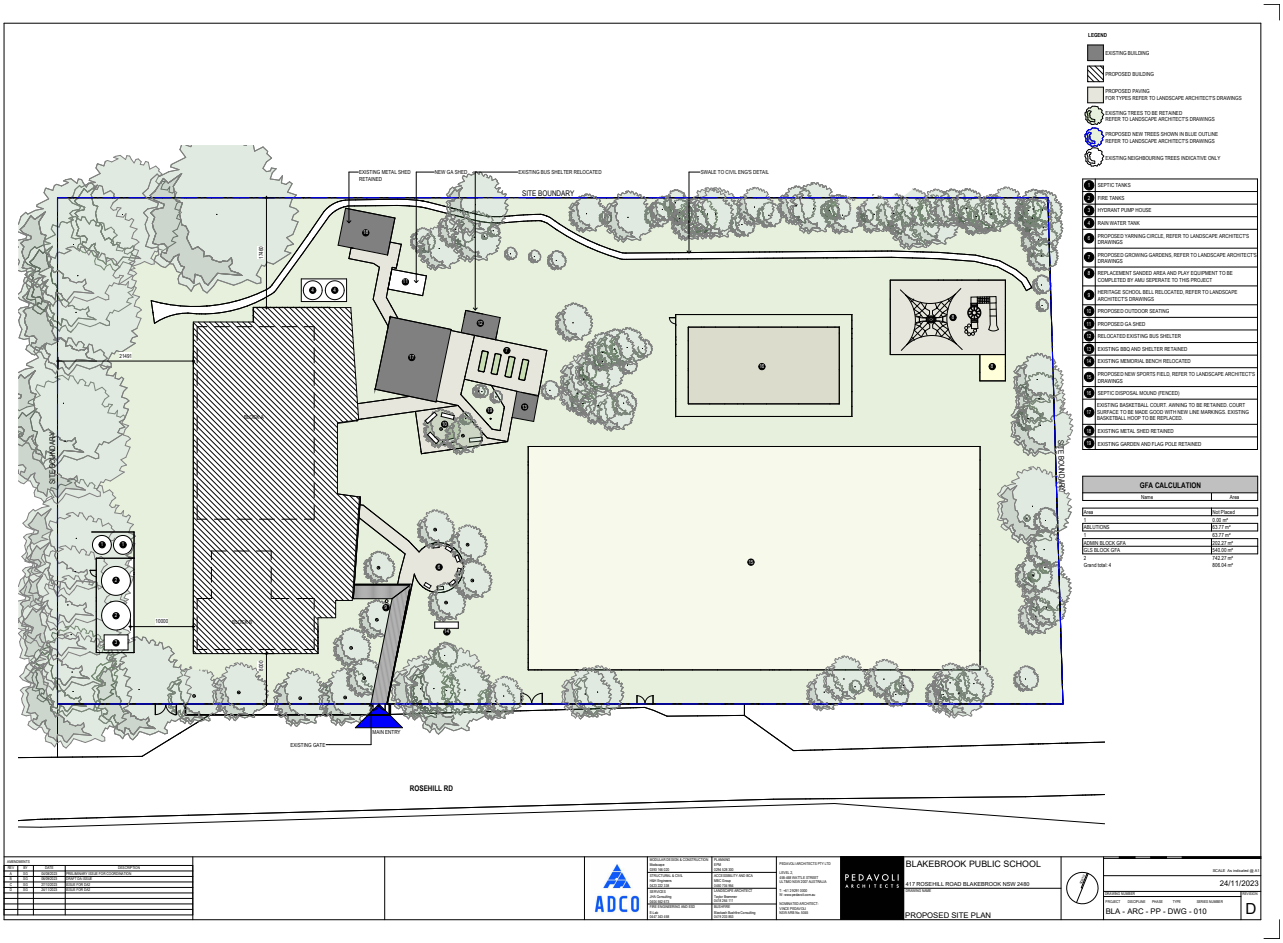
- Stage 1: Demolition of the existing buildings and tree removal (separate Early Works DA)
- Stage 2: Construction of a new elevated school building and landscaping and ancillary works and structures (this Main works DA).

The Main Works development comprises:

- Construction of a new elevated school building, with at-grade (undercroft) amenities and storage, including:
- Ground Level:
    - Open undercroft space for covered outdoor learning and play. Male and female amenities and accessible toilet / change room facility.
    - Cleaners' store.
    - Equipment store.
    - Sport equipment store.
- Elevated Level:
    - New administration comprising interview room, clerical spaces, Principal's office, staff
    - room, sick bay and male, female and accessible amenities.
    - School library with computer room, store, main communications room and library office.
    - Four(4)GeneralLearningSpaces(GLS)withlearningcommonsandmulti-purposespace.
    - Canteen with open servery space.
    - Store.
    - Male, female and accessible amenities.
- Mechanical plant.
- New and hard soft landscaping including replacement play equipment, vegetable garden, fernery and yarning circle.
- New hydrant pump house with fire tanks.
- Relocation and replacement of existing septic tanks and water tanks.

It is not proposed to increase staff or student numbers as a result of these works.
The site consists of the existing school within a highly modified environment. The site is not designated as being bushfire prone land. The school has good access to other areas by Nimbin Road and Rosehill Road and the grounds within the school are cleared and managed that meet the *RFS Standards for Asset Protection Zones*. No additional vegetation management is required within or external to the site.

Figure 2 Proposed works



6. Legislative Framework

The site is not located on designated Bushfire Prone Land (BFPL). BFPL is designated in accordance with s.10.3 of the EP&A Act. BFPL is land which can support a bushfire or is subject to bushfire attack, that has been identified and mapped by the local council and certified by the Commissioner of the NSW RFS. The BFPL provide a trigger for formal assessment of new development and compliance with PBP. As the site is not affected by designated Bushfire Prone Land, referral to the RFS is not required and a Bushfire Safety Authority is not required.

The NSW Government has introduced a new education-based State Environmental Planning Policy. The *State Environmental Planning Policy (SEPP) Transport and Infrastructure 2021* (the SEPP) has provisions that will make it easier for child-care providers, schools, TAFEs and Universities to build new facilities and improve existing ones by streamlining approval processes to save time and money and deliver greater consistency across NSW. The SEPP balances the need to deliver additional educational infrastructure with a focus on good design. The SEPP provides for the legislative planning framework for NSW.

Section 2.16 of the SEPP requires that:

> *A public authority, or a person acting on behalf of a public authority, must consider Planning for Bush Fire Protection before carrying out the development in an area that is bush fire prone land.*
>
> *(3) In this section—*
>
> - *bush fire prone land means land recorded for the time being as bush fire prone land on a map certified under the Act, section 10.3(2).*
> - *Planning for Bush Fire Protection means the document entitled Planning for Bush Fire Protection, ISBN 978 0 646 99126 9, prepared by the NSW Rural Fire Service in co-operation with the Department of Planning, Industry and Environment, dated November 2019.*

And

> *3.11 Consideration of Planning for Bush Fire Protection*
>
> *(1) This section applies to development for the purposes of an educational establishment or school-based child care that this Chapter provides may be carried out without development consent.*
>
> *(2) A public authority, or a person acting on behalf of a public authority, must consider* Planning for Bush Fire Protection *before carrying out the development in an area that is bush fire prone land.*
>
> *(3) In this section—*

> bush fire prone land *means land recorded for the time being as bush fire prone land on a map certified under the Act, section 10.3(2).*

This bushfire assessment has been completed as a deemed to satisfy assessment, having regard to PBP 2019 as required by the SEPP. As such, School Infrastructure NSW (SINSW) and or the Department of Education (DoE) or any other Planning Authority can issue consent in accordance with the recommendations provided within this report.

Blackash (Lew Short) being a Level 3 Certified Practitioner can confirm whether the proposed development conforms to the relevant specifications and requirements of *Planning for Bush Fire Protection 2019* in compliance with s4.14 (1)(b) of the *Environmental Planning and Assessment Act 1979*. As such, no formal referral under the EP&A Act is required to the RFS for the development proposal.

7. Specification 43 of the National Construction Code

The project team have advised Blackash that:

> *As per section 6.28(2) of the Environmental Planning and Assessment Act (the EP&A Act), the BCA that is applicable to a Crown project is the one in force at the time of the date of invitation to tender. This is legislated and not a Government Dispensation.*

Section 6.28 Crown subdivision, building, demolition and incidental work is:

> *(1) In the case of a subdivision carried out by the Crown, a reference in this Part to a certifier in relation to that subdivision includes a reference to a person acting on behalf of the Crown.*
> *(2) Crown building work cannot be commenced unless the Crown building work is certified by or on behalf of the Crown to comply with the Building Code of Australia in force as at—*
>
> ***(a) the date of the invitation for tenders to carry out the Crown building work, or***
>
> *(b) in the absence of tenders, the date on which the Crown building work commences, except as provided by this section.*
>
> *(3) A Minister may at any time, by Ministerial planning order, determine in relation to buildings generally or a specified building or buildings of a specified class that a specified provision of the Building Code of Australia—*
>
> *(b) does apply, but with such exceptions and modifications as may be specified. The determination has effect according to its tenor.*
> *(4) A determination of a Minister applies only to—*
>
> *(a) a building erected on behalf of the Minister, or*
> *(b) a building erected by or on behalf of a person appointed, constituted or regulated by or under an Act administered by the Minister.*
>
> *(5) The application of this section is subject to the regulations.*

In consideration of the section 6.28(2) the EP&A Act, Blackash have been advised that the National Construction Code at the time of invitation to tender was BCA 2019. As such, Specification 43 is not in play for this application. However, Blackash have provided BAL levels at Figure 8 with a minimum BAL 19 provided to new buildings that are within nominal Bushfire Prone Land.

8. Planning for Bushfire Protection 2019

This assessment has been completed as a deemed to satisfy assessment, having regard to PBP 2019 as required by the SEPP. The PBP 2019 guidelines are performance-based, seeking to achieve a safe outcome based on innovation and the specific circumstances of the individual site and development proposal. PBP provides a planning framework for developments in rural and urban areas close to land, which is likely to be affected by bushfire.

PBP 2019 (p. 49) identifies the vulnerable nature of occupants of SFPP developments:

> *"An SFPP development is one which is occupied by people who are identified as at-risk members of the community. In a bush fire event, these occupants may be more susceptible to the impacts of radiant heat and other bush fire effects. Evacuating at-risk members of the community is more challenging because they may be physically or psychologically less able to relocate themselves or are unfamiliar with their surroundings. Examples of SFPP developments are schools, hospitals, nursing homes and tourist accommodation."*

PBP sets out an overall framework consisting of an aim and objectives, specific objectives for defined development types, types of bushfire protection measures (**BPMs**), which may be employed in a development, and performance criteria for each BPM. In this regard, the structure of PBP 2019 is similar to the structure of the National Construction Code (NCC) and provides considerable flexibility for outcomes. However, the aim of PBP in terms of ensuring appropriate consideration of risk and protection is paramount.

The intent (aim) of PBP is:

> *to protect people and property from the impact of bushfires. It also helps ensure that the firefighters who come to their aid in an emergency are not placed in greater danger because of unsuitable or unsafe developments.*

The objectives are to:

i. *Afford buildings and their occupants protection from exposure to a bush fire*
ii. *Provide for a defendable space to be located around buildings*
iii. *Provide appropriate separation between a hazard and buildings which, in combination with other measures, minimises material ignition*
iv. *Ensure that appropriate operational access and egress for emergency service personnel and residents is available*
v. *Provide for ongoing management and maintenance of BPMs*
vi. *Ensure that utility services are adequate to meet the needs of firefighters.*

Due to the vulnerable nature of the occupants of SFPP developments, there is more reliance on the provision of an APZ and emergency management. For SFPP development, PBP 2019 provides a range of specific objectives (PBP p. 50):

- *minimise levels of radiant heat, localised smoke and ember attack through increased APZ, building design and siting;*
- *provide an appropriate operational environment for emergency service personnel during firefighting and emergency management;*

- *ensure the capacity of existing infrastructure (such as roads and utilities) can accommodate the increase in demand during emergencies as a result of the development; and*
- *ensure emergency evacuation procedures and management which provides for the special characteristics and needs of occupants.*

PBP requires that a planning and development proposal satisfy:

- The broad aim and objectives of PBP 2019;
- The planning principles;
- Specific objectives for the development type under consideration;
- The intent of measures for the various (BPM's);
- The performance criteria for the various proposed BPMs, which can be achieved by providing either the "acceptable solutions" specified in PBP 2019 or alternative solutions, which fulfill the intent of the relevant performance criterion.
- Infill provisions for SFPP development.

This report aims to demonstrate that these requirements have been met for the proposed development.

8.1. Development of existing SFPP facilities

As an existing school, the works are designated as SFPP infill development. The NSW RFS have been consulted early of the project to identify compliance pathways and requirements for those schools that are not designated as Bushfire Prone and those that are designated as Bushfire Prone.

As required by PBP 2019 (p. 52), *the intention for any building work occurring within an existing SFPP development is to achieve a better bush fire outcome than if the development did not proceed. Achieving this may require a combination of measures including improved construction standards, APZs and evacuation management. This may result in a level of retrofitting of existing buildings and managing other portions of the site (i.e. APZs) to ensure an improved level of bush fire protection.*

Blackash has been advised by the project team that works for new buildings at Blakebrook will be undertaken within BAL 12.5 areas within the site.

9. Building Code of Australia

The Building Code of Australia (BCA) Performance Requirement GP5.1(NSW) relates to the protection of buildings on bushfire-prone land (applicable to Class 9 buildings that is a special fire protection purpose):

A building that is constructed in a designated bushfire prone area must, to the degree necessary, be designed and constructed to reduce the risk of ignition from a bushfire appropriate to the:

a) *Potential for ignition caused by burning embers, radiant heat or flame generated by a bushfire; and*
b) *Intensity of the bushfire attack on the building.*

The proposed development can comply to the relevant specifications and requirements of *Planning for Bush Fire Protection 2019*.

9.1. Deemed-to-Satisfy Requirement

Deemed-to-Satisfy Clause G5.2 (NSW) States:

> In a designated bushfire prone area, a Class 2 building, a Class 3 building, a Class 4 part of a building or a Class 9 building that is a special fire protection purpose or a Class 10a building or deck associated with such a building or part, must comply with the following—
>
> > (a) AS 3959 except for Section 9 Construction for Bushfire Attack Level FZ (BAL-FZ). Buildings subject to BAL-FZ must comply with specific conditions of development consent for construction at this level; or
> > (b) the requirements of (a) above as modified by the development consent following consultation with the NSW Rural Fire Service under section 79BA of the Environmental Planning and Assessment Act 1979; or
> > (c) the requirements of (a) above as modified by development consent with a bushfire safety authority issued under section 100B of the Rural Fires Act 1997 for the purposes of integrated development.

The new building will be designed to BAL 12.5 and the existing buildings can be provided with basic ember protection to the openable portions of windows to comply with PBP 2019.

9.2. Bushfire Protection Measures

PBP identifies that the Bushfire Protection Measures (BPMs) are general measures which are required to improve life safety, property protection and community resilience to bushfire attack. PBP promotes detailed site analysis and the application of a combination of BPMs to achieve an acceptable outcome. The BPMs work in combination to provide a suite of measures that meet the Aim and Objectives, and Chapter 6 (SFPP) of PBP. Appropriate combinations depend upon the bushfire risk, type of development, and the specific geographic location and site circumstances.

The types of protection measures include APZs, access, landscaping, water supply, building design and construction and emergency management arrangements as shown in Figure 3. These measures assist building and occupant survival during a bushfire. They also contribute to the safety of firefighters and members of the community occupying buildings during the passage of a bushfire front.

Each of the BPMs have been reviewed and applied separately based upon the development type and the assessed level of bushfire risk. Specific strategies have been put in place for each of the BPMs that meet or exceed the requirements of PBP 2019. These will be discussed throughout the report.

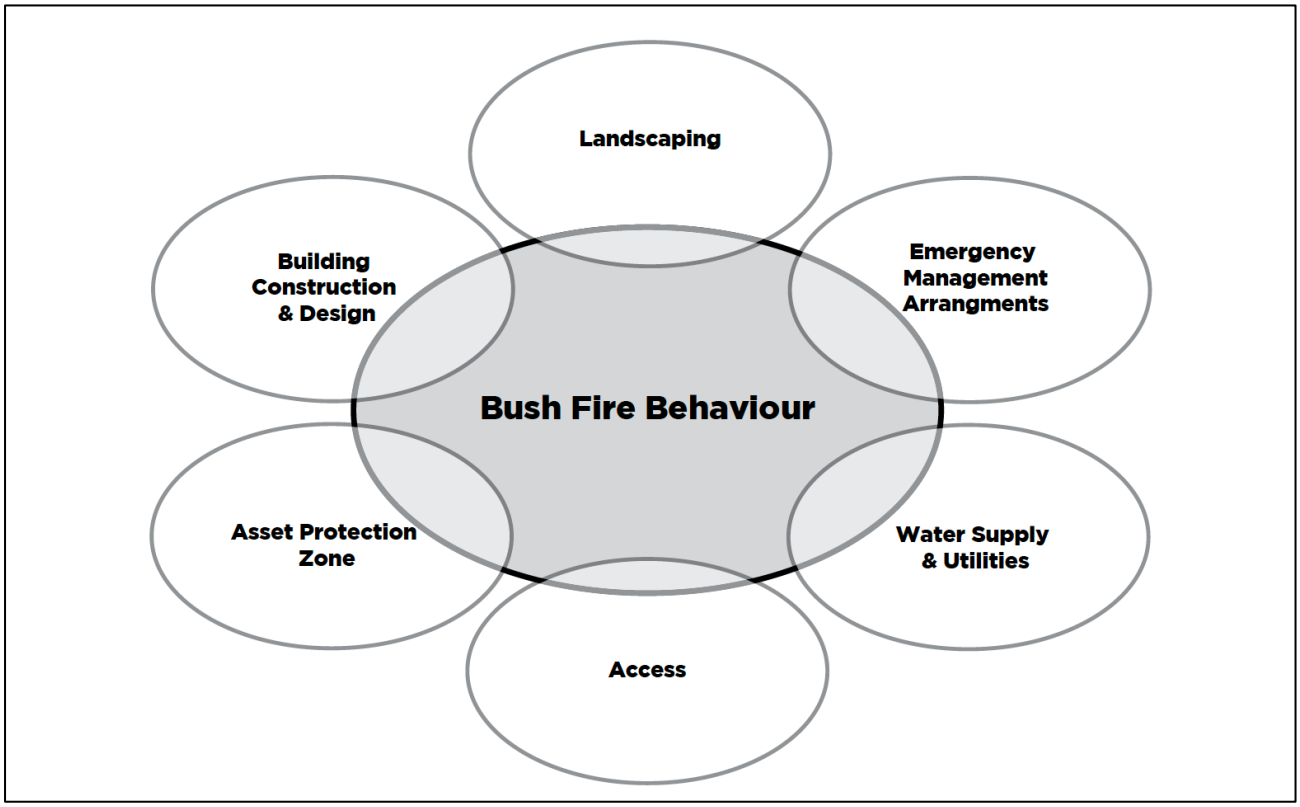


Figure 3 Bushfire Protection Measures in combination (PBP p.26)

10. Bushfire Hazard Assessment

10.1. Bushfire Prone Land

The site is not identified as 'bushfire prone land' (Figure 4) for the purposes of Section 10.3 of the EPA Act and the legislative requirements for building on bushfire prone lands are not applicable.

Bushfire prone land maps provide a trigger for the development assessment provisions and consideration of sites that are bushfire prone. Bush fire prone land (BFPL) is land that has been identified by council, which can support a bushfire or is subject to bushfire attack. Bushfire prone land maps are prepared by the local council and certified by the Commissioner of the RFS.

An area of Category 2 vegetation is to the west of the school site along the river. This vegetation is a low bushfire risk and is impacted by exotic weeds. The RFS *Bushfire Prone Land Mapping Guidelines* (p. 11) define Category 2 land as:

> *Vegetation Category 2 is considered to be a lower bush fire risk than Category 1 and Category 3 but higher than the excluded areas. It is represented as light orange on a bush fire prone land map and will be given a 30 metre buffer. This vegetation category has lower combustibility and/or limited potential fire size due to the vegetation area shape and size, land geography and management practices. Vegetation Category 2 consists of:*
>
> - *Rainforests.*
> - *Lower risk vegetation parcels. These vegetation parcels represent a lower bush fire risk to surrounding development and consist of:*
>   - *Remnant vegetation;*
>   - *Land with ongoing land management practices that actively reduces bush fire risk. These areas must be subject to a plan of management or similar that demonstrates that the risk of bush fire is offset by strategies that reduce bush fire risk; AND include:*
>   - *Discrete urban reserve/s;*
>   - *Parcels that are isolated from larger uninterrupted tracts of vegetation and known fire paths;*
>   - *Shapes and topographies which do not permit significant upslope fire runs towards development;*

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- *Suitable access and adequate infrastructure to support suppression by firefighters;*

- *Vegetation that represents a lower likelihood of ignitions because the vegetation is surrounded by development in such a way that an ignition in any part of the vegetation has a higher likelihood of detection.*

The determination of the remnant vegetation as Category 2 is supported and reflects the low bushfire risk affecting the site.

The land within the site will continue to be managed as an asset Protection Zone which meets the definition of managed land as defined within PBP (p. 112):

> *Managed land is land that has vegetation removed or maintained to limit the spread and impact of bush fire. It may include existing developed land (i.e. residential, commercial or industrial), roads, golf course fairways, playgrounds or sports fields, vineyards, orchards, cultivated ornamental gardens and commercial nurseries. Most common will be gardens and lawns within curtilage of buildings. These areas will be managed to meet the requirements of an Asset Protection Zone.*

The school provide the necessary setbacks from the area of Category 2 Vegetation to be beyond the acceptable solutions within PBP and more specifically limit the radiant heat level exposure to the sited buildings to a maximum 10kW/m^2.

Figure 4 Bushfire Prone Land Map

11. Bushfire Threat Assessment

11.1. Bushfire Hazard

An assessment of the Bushfire prone land is necessary to determine the application of bushfire protection measures such as APZ locations, risk and Bushfire Attack Levels (BAL).

The vegetation formations (bushfire fuels) and the topography (effective slope) combine to create the bushfire threat that may affect bushfire behaviour at the site, and which determine the planning and building response of the bushfire planning framework and PBP.

The bushfire hazard affecting the investigation area was assessed during site inspections and using recent aerial photographs for at least a distance of 140m from the perimeters of the investigation area (in line with PBP).

This assessment identifies the potential bushfire threat from outside of the site. The method used for this assessment is outlined in PBP and relies on consideration of vegetation and slope and is outlined below along with results.

11.2. Methodology

PBP provides a methodology to determine the bushfire threat and commensurate size of any asset protection zone (APZ) that may be required to offset possible bushfire attack. These elements include the potential hazardous landscape that may affect the site and the effective slope within that hazardous vegetation. For new schools, APZ requirements are based on keeping radiant heat levels at new buildings below 10kW/m^2.

The following assessment is prepared in accordance with Section 100B of the RF Act, Clause 44 of the RF Reg and PBP. This assessment is based on the following resources:

- Planning for Bush Fire Protection (NSW RFS, 2019)
- Council Bushfire Prone Land Map
- Aerial mapping
- Detailed GIS analysis
- Site inspection

The methodology used in this assessment is in accordance with PBP Appendix 1 Site Assessment Methodology and is outlined in the following sections.

- Step 1: Determine vegetation formation in all directions around the building to a distance of 140 metres;

- Step 2: Determine the effective slope of the land from the building for a distance of 100 metres;

- Step 3: Determine the relevant FFDI for the council area in which the development is to be undertaken; and
- Step 4: Match the relevant FFDI, vegetation formation and effective slope to determine the APZ required from the appropriate table of PBP.

11.3. Fire Danger

For SFPP development, PBP has designated the appropriate fire areas and corresponding Forest Fire Danger Rating (**FDI**). The FDI within PBP is based on a historical fire weather assessment which assumes a credible worst-case scenario and an absence of any other mitigating factors relating to aspect or prevailing winds. The site has a Fire Danger Index (FDI) of 80 as identified within PBP.

11.4. Vegetation Analysis

PBP requires a classification of the vegetation on and surrounding the site out to a distance of 140 metres from the boundaries of the property in accordance with the system for classification of vegetation contained in PBP.

The predominant vegetation is classified by structure or formation using the system adopted by *Ocean Shores to Desert Dunes* (Keith, 2004) and by the general description using PBP. There are 7 vegetation formations (with sub-formations) identified in PBP. Vegetation types give rise to radiant heat and fire behaviour characteristics. The predominant vegetation is determined over a distance of at least 140 metres in all directions from the proposed site boundary. Where a mix of vegetation types exist, the type providing the greater hazard is said to predominate.

A conservative position has been taken with the assessment and determination of vegetation. The classified vegetation is shown in Figure 5 as grassland to the north, east, south and west of the site (see Photo 1, 2, 3). A band of remnant trees is to the west of the site along the creekline and some remnant trees are to the immediate west of the site boundary (Photo 3). These are not considered a hazard.

Photograph 1 Looking into school grounds from the north

Photograph 2 Managed grassland to the north of the site

Photograph 3 Remnant trees to the south of the site showing managed land

11.5. Slopes Influencing Bushfire Behavior

The RF Reg requires an assessment of the slope of the land on and surrounding the property out to a distance of 100 metres from the boundaries of the property or from the proposed development footprint.

The 'effective slope' influencing fire behaviour approaching the sites has been assessed in accordance with the methodology specified within PBP and is shown in Figure 10. This is conducted by measuring the worst-case scenario slope where the vegetation occurs over a 100 meter transect measured outwards from the development boundary or the existing/ proposed buildings.

- Effective Slopes to the west – Downslope 5 – 10 degree range;
- Effective Slopes to the east – flat and managed land within an existing house site
- Effective Slopes to the south – flat
- Effective Slopes to the north – flat.

The effective slopes for the site are shown in Figure 5.

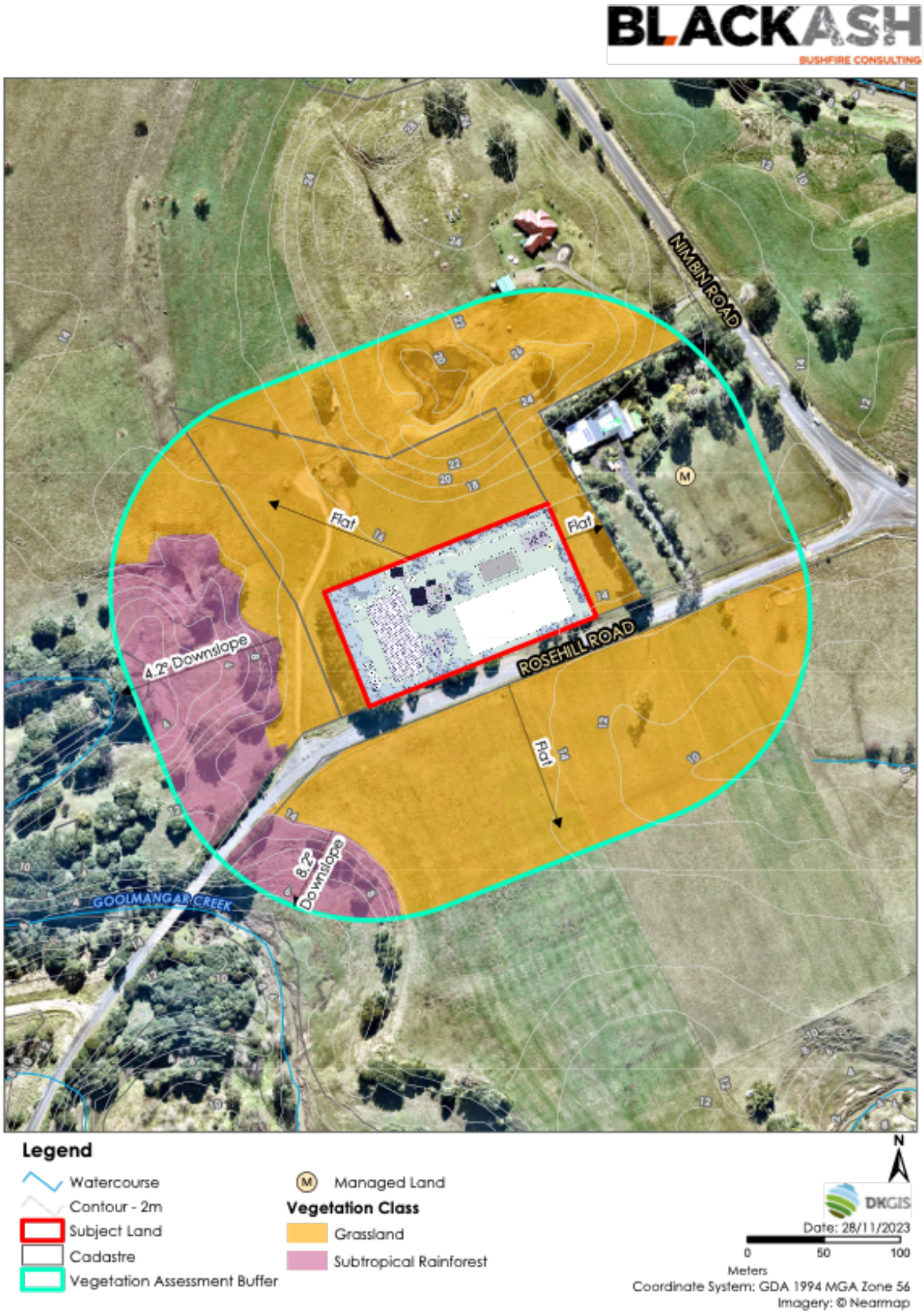

Figure 5 Slope and Vegetation map

11.6. Asset Protection Zones and Bushfire Attack Levels

An APZ is a fuel-reduced area surrounding a built asset or structure which provides a buffer zone between a bushfire hazard and an asset. The APZ includes a defendable space within which firefighting operations can be carried out. The entire school site is managed to meet the APZ requirements and is considered managed lands.

An APZ is land that has vegetation removed or maintained to a level that limits the spread and impact of bushfire. This may include:

- developed land (residential, commercial, or industrial),
- permanent roads, bike paths, parking areas,
- golf course fairways, playgrounds, sports fields,
- vineyards, orchards, cultivated ornamental gardens and commercial nurseries,
- most common will be gardens and lawns within curtilage of buildings.

The APZ is required to be managed in compliance with the APZ standards set out in NSW RFS document *Standards for Asset Protection Zones (refer Appendix 3)*. As the APZ provides a fuel-reduced, physical separation between buildings and bush fire hazards, it is a key element in the suite of bushfire measures and dictates the type of construction necessary to mitigate bushfire attack. In practical terms, the setback of each building will form part of the APZ and will need to be conditioned to be maintained to the standard of an Inner Protection Area as detailed in PBP Appendix 4 (p. 107).

The requirements for vegetation within the APZ are:

IPA Requirements (PBP p. 107)

Trees

- *tree canopy cover should be less than 15% at maturity;*
- *trees at maturity should not touch or overhang the building;*
- *lower limbs should be removed up to a height of 2m above the ground;*
- *tree canopies should be separated by 2 to 5m; and*
- *preference should be given to smooth barked and evergreen trees.*

Shrubs

- *create large discontinuities or gaps in the vegetation to slow down or break the progress of fire towards buildings should be provided;*
- *shrubs should not be located under trees;*

- *shrubs should not form more than 10% ground cover; and*
- *clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation.*

Grass

- *grass should be kept mown (as a guide grass should be kept to no more than 100mm in height); and*
- *leaves and vegetation debris should be removed.*

OPA Requirements (PBP p. 107)

Trees

- *tree canopy cover should be less than 30%; and canopies should be separated by 2 to 5m.*

Shrubs

- *shrubs should not form a continuous canopy; and shrubs should form no more than 20% of ground cover.*

Grass

- *grass should be kept mown to a height of less than 100mm; and*
- *leaf and other debris should be removed.*

The Bushfire Attack Level (BAL) is a means of measuring the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact. In the NCC, the BAL is used as the basis for establishing the requirements for construction to improve protection of building elements. A conservative position has been taken to determine the BAL which is shown at Figure 6.

The site is considered as managed land and no additional trees or vegetation is required to be removed.

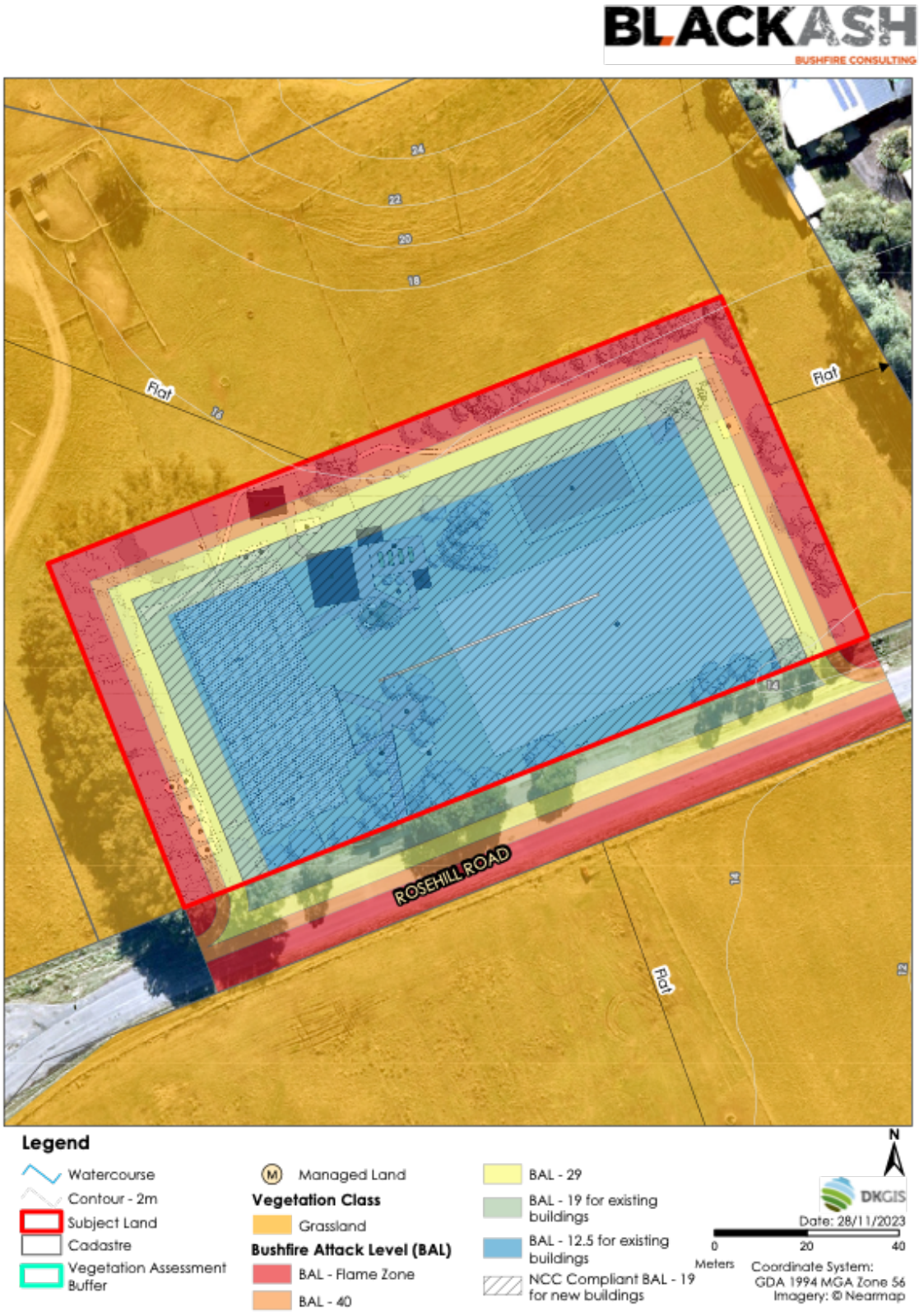

Figure 6 Bushfire Attack Levels

11.7. Access

The existing road infrastructure is in place. No modifications to the public road system are proposed or required as part of the works. Adequate access is provided to the school on Rosehill Road which connects into Nimbin Road to the north. The multiple access points from the overall site and in different directions, assist in maintaining access / egress in case one route is blocked due to fires or related incidents (e.g. tree fall, car accident). Importantly there is also the ability to evacuate the site from fires approaching from different directions.

Given the nature of the existing public road network and the proposed design of the defendable space within the staff carpark, the proposal complies with the requirements of PBP.

11.8. Water Supply & Utilities

PBP (p. 47) requires that adequate services of water for the protection of buildings during and after the passage of a bush fire, and to locate gas and electricity so as not to contribute to the risk of fire to a building. The existing services will be maintained.

12. Evacuation and Emergency Management

The school is low bushfire risk but would benefit, prior to occupation for a detailed *Bushfire Evacuation Plan* consistent with NSW RFS publication: A Guide to *Developing a Bush Fire Emergency Management and Evacuation Plan* will be completed prior to occupation.

13. Significant Environmental Features

Separate assessment to be completed by suitably qualified consultant, if required.

14. Threatened Species

Separate assessment to be completed by suitably qualified consultant, if required.

15. Aboriginal Objects or Places of Significance

Separate assessment to be completed by suitably qualified consultant, if required.

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16. Compliance Summary Tables

16.1. Aim and Objectives

The RF Reg requires an assessment of the extent to which the proposed development conforms with or deviates from the standards, aim and objectives and performance criteria set out in Chapter 6 of PBP. All development in Bushfire Prone Areas needs to comply with the aim and objectives of PBP. Table 4, 5 and 6 is an assurance approach using expert judgement.

Table 2: Aim and Objectives of PBP (Section 1.1)

Aim	Meets Criteria	Comment
The aim of PBP is to use the NSW development assessment system to provide for the protection of human life (including fire fighters) and to minimise impacts on property from the threat of bushfire, while having due regard to development potential, onsite amenity and the protection of the environment.	Yes	Areas around the school will meet APZ requirements.
Objectives	**Meets Criteria**	**Comment**
Afford occupants of any building adequate protection from exposure to a bushfire.	Yes	New buildings to BAL 12.5 Basic ember protection to openable windows of any retained and existing modified buildings.
Provide for defendable space to be located around buildings.	Yes	Defendable space is provided for on all sides of the existing development and within the site.
Provide appropriate separation between a hazard and buildings, which, in combination with other measures, prevent direct flame contact and material ignition.	Yes	An asset protection zone is provided within the site.
Ensure that safe operational access and egress for emergency service personnel and occupants is available.	Yes	The site has direct access to public roads, and access and egress for emergency vehicles and evacuation is adequate. A detailed evacuation plan may be completed prior to occupation.
Provide for ongoing management and maintenance of bushfire protection measures, including fuel loads, in the asset protection zone.	Yes	The school site will be maintained as managed land.
Ensure that utility services are adequate to meet the needs of firefighters (and others assisting in bushfire fighting).	Yes	No upgrades required.

16.2. PBP Chapter 6: Specific Objectives

Table 5: Compliance summary against specific objectives of Chapter 6:

Objectives	Meets Criteria	Comment
Minimise levels of radiant heat, localised smoke and ember attack through increased APZ, building design and siting.	Yes	A compliant asset protection zone is provided within the site.
Provide an appropriate operational environment for emergency service personnel during firefighting and emergency management.	Yes	Defendable space is provided for on all sides of the development.
Ensure the capacity of existing infrastructure (such as roads and utilities) can accommodate the increase in demand during emergencies as a result of the development.	Yes	The site has direct access to public roads, and access and egress for emergency vehicles and evacuation is adequate. A detailed evacuation plan may be completed prior to occupation.
Ensure emergency evacuation procedures and management which provides for the special characteristics and needs of occupants.	Yes	A detailed evacuation plan may be completed prior to occupation.

16.3. PBP Chapter 6: Performance Criteria

Table 6: Compliance summary against performance criteria Tables 6.8a, 6.8b, 6.8c and 6.8d:

Performance Criteria		Comment	Complies
Asset Protection Zones	Radiant heat levels of greater than 10kW/ m² (calculated at 1200K) will not be experienced on any part of the building.	The school is existing and will undergo minor works to raise buildings above the PMF flood levels.	YES
	APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is minimised.	APZs are located on lands with a slope less than 18 degrees.	YES
	APZs are managed and maintained to prevent the spread of fire to the building.	APZs are to be managed in accordance with the requirements of Appendix 4 of PBP.	YES
	The APZ is provided in perpetuity.	APZs are to be provided in perpetuity.	YES
Landscaping	Landscaping is designed and managed to minimise flame contact and radiant heat to buildings, and the potential for wind-driven embers to cause ignitions.	Landscaping is to comply with Appendix 4 of PBP.	YES
Construction Standards	The proposed building can withstand bush fire attack in the form of wind, embers, radiant heat and flame contact.	Basic ember protection is provided to the buildings as per Figure 6.	YES
Access	Firefighting vehicles are provided with safe, all-weather access to structures and hazard vegetation.	Access through existing public road system. Access roads are two-wheel drive, all-weather roads.	YES
	The capacity of access roads is adequate for firefighting vehicles.	The capacity of road surfaces and any bridges / causeways are to be sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes).	YES
	There is appropriate access to water supply.	Reticulated water supply.	YES

	Perimeter roads - access roads are designed to allow safe access and egress for firefighting vehicles while residents are evacuating as well as providing a safe operational environment for emergency service personnel during firefighting and emergency management on the interface.	NA existing school	NA
	Non-perimeter roads - access roads are designed to allow safe access and egress for firefighting vehicles while residents are evacuating.	NA existing school	YES
Water supplies	An adequate water supply for firefighting purposes is installed and maintained.	Reticulated water supply.	YES
	Water supplies are located at regular intervals.	Reticulated water supply.	YES
	The water supply is accessible and reliable for firefighting operations.	Reticulated water supply.	YES
	Flows and pressure are appropriate.	Reticulated water supply.	YES
	The integrity of the water supply is maintained.	Reticulated water supply.	YES
	Water supplies are adequate in areas where reticulated water is not available.	Reticulated water supply.	YES
Electricity Services	Location of electricity services limits the possibility of ignition of surrounding bush land or the fabric of buildings.	Consideration required during design phase of the development - can be achieved.	YES
Gas services	Location and design of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.	Any new gas services are to be installed and maintained in accordance with AS/NZS 1596:2008. Consideration required during design phase of the development - can be achieved.	YES

Emergency Management	A Bush Fire Emergency Management and Evacuation Plan is prepared.	A Bush Fire Emergency Management and Evacuation Plan is to be prepared consistent with the: • The NSW RFS document: A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan	**Yes**
	Appropriate and adequate management arrangements are established for consultation and implementation of the Bush Fire Emergency Management and Evacuation Plan.	• Low risk site. • NA	**Yes**

17. Recommendations

The following recommendations are provided:

Recommendation 1: New buildings will be built in accordance with Figure 7 and or to minimum BAL 19 within the site. The modified buildings are provided with basic ember protection in accordance with BAL-12.5 of AS3959 2018 Construction of buildings in bushfire-prone areas.

Recommendation 2: Any upgrades to water, electricity and gas supplies through the proposed development must comply with section 6.8.3 of PBP (pages 59-60).

Recommendation 3: All Asset Protection Zones and landscaping within the site are to be maintained in accordance with Appendix 4 of PBP 2019 and the NSW RFS "Asset protection zone standards". No trees or additional vegetation is to be removed.

Recommendation 4: A Bush Fire Emergency Management and Evacuation Plan is to be prepared consistent with the NSW RFS document: A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan.

18. Conclusion

This Bushfire Hazard Assessment to assist with the recovery of affected communities to recent flood events.

This bushfire assessment has been completed as a deemed to satisfy assessment, having regard to PBP 2019 as required by the SEPP. As such, School Infrastructure NSW, the Department of Education or any other Planning Authority can issue consent in accordance with the recommendations provided within this report.

The existing school is in a low bushfire risk area and recommendations have been provided to ensure compliance with Planning for PBP 2019. This assessment has demonstrated that the proposed SFPP development can comply with *PBP 2019*.

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Appendix 1 References

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NSW Rural Fire Service (2015) Guide for Bushfire Prone Land Mapping

NSW Government (1979) Environmental Planning and Assessment Act 1979.

Appendix 2 Overview of bushfire attack mechanisms

Bushfires have long remained a fundamental characteristic of the Australian bush landscape, and likewise Australians have long retained a strong affinity with bush environments. There remain a number of common factors which are associated with bushfire hazard and events and these include the incidence of fire weather, availability of fuel along with its type, structure and continuity or fragmentation, and the context of development at the bushland interface.

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

- Direct flame contact
- Ember attack
- Radiant heat flux
- Fire-driven wind
- Smoke

In the progression of a bushfire event, these methods interact either exclusively or in concert and are explained in the following section.

Direct flame contact

Direct flame attack refers to flame contact from the main fire front, where the flame which engulfs burning vegetation is one and the same as that which assumes contact with the building. It is the highest level of bushfire attack because of direct flame contact from the fire front in addition to heat flux and ember attack.

Ember attack

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, thus it is the longest lasting impact of bushfire attack.

Ember attack is attack by smoldering or flaming windborne debris that is capable of entering or accumulating around a building, and that may ignite the building or other combustible materials and debris.

In essence, building loss via ember attack relates largely to the vulnerabilities and peculiarities of each building, its distance from hazardous vegetation and whether an occupant (or the like) is present to actively defend it. It is estimated by the CSIRO that approximately 80 to 90 per cent of buildings lost by

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bushfire are lost as a result of ember attack either in isolation or in combination with radiant heat impact.

Radiant heat flux

Exposure to radiant heat remains one of the leading causes of fatalities associated with bushfire events. Measured in kilowatts per square metre (kWm^2), radiant heat is the heat energy released from the fire front which radiates to the surrounding environment, deteriorating rapidly over distance.

In terms of impact on buildings, radiant heat can pre-heat materials making them more susceptible to ignition or can cause non-piloted ignition of certain materials if the energy transmitted reaches a threshold level. Radiant heat can also damage building materials such as window glazing, allowing openings into a building through which embers may enter. Radiant heat impact is an especially important factor in building-to-building ignition.

In terms of radiant heat exposure for humans, it can cause pain to unprotected skin in milder situations or life threatening and fatal injury in higher exposure thresholds. The effects of radiant heat are shown in Table 3.

Table 2 The effects of radiant heat (NSWRFS 2006; Drysdale, 1999; CFA, 2012)

Radiant heat flux kW/m^2	Observed effect
1	Maximum for indefinite skin exposure
3	Hazardous conditions, firefighters expected to operate for a short period (10 minutes)
4.7	Extreme conditions, firefighters in protective clothing will feel pain after 60 seconds of exposure
6.4	Pain after 8 seconds of skin exposure
7	Likely to be fatal to unprotected person after exposure for several minutes
10	Critical conditions, firefighters not expected to operate in these conditions although they may be encountered. Considered to be life threatening in less than 60 seconds in protective equipment. Fabrics inside a building could ignite spontaneously with long exposure.
12.5 (BAL-12.5)	Volatiles from wood may be ignited by pilot after prolonged exposure. Standard float glass could fail during the passage of a bushfire.
16	Blistering of skin after 5 seconds
19 (BAL-19)	Screened float glass could fail during the passage of a bushfire.
29 (BAL-29)	Ignition of most timbers without piloted ignition (3 minutes of exposure) during the passage of a bushfire. Toughened glass could fail.
40+	Flame zone – exposure to direct flame contact from fire front.

Fire driven wind

The convective forces of bushfire typically result in strong to gale force fire-driven winds which in itself, can lead to building damage. The typical effects of fire driven wind include the conveyance of embers,

damage from branches and debris hitting the building, as well as direct damage to vulnerable building components such as lifting roofs or roof materials and the damage / breakage of windows.

Smoke

Smoke emission remains a secondary effect of bushfire and is one which is typically not addressed by bushfire assessments. Irrespective, it is important to note the potentially severe impact of smoke emission on the human respiratory system. It can lead to difficulties in breathing, severe coughing, blurred or otherwise compromised vision, and can prove fatal. It is also important to note that toxic smoke can occur during bushfire, particularly where buildings or materials are ignited. With regard to evacuation, it can reduce visibility and create difficulties for particularly vulnerable persons.

Appendix 3 Asset Protection Zone Requirements

Source PBP 2019. P. 107

A4.1.1 Inner Protection Areas (IPAs)

The IPA is the area closest to the building and creates a fuel-managed area which can minimise the impact of direct flame contact and radiant heat on the development and act as a defendable space. Vegetation within the IPA should be kept to a minimum level. Litter fuels within the IPA should be kept below 1cm in height and be discontinuous.

In practical terms the IPA is typically the curtilage around the building, consisting of a mown lawn and well maintained gardens.

When establishing and maintaining an IPA the following requirements apply:

Trees

- tree canopy cover should be less than 15% at maturity;
- trees at maturity should not touch or overhang the building;
- lower limbs should be removed up to a height of 2m above the ground;
- tree canopies should be separated by 2 to 5m; and
- preference should be given to smooth barked and evergreen trees.

Shrubs

- create large discontinuities or gaps in the vegetation to slow down or break the progress of fire towards buildings should be provided;
- shrubs should not be located under trees;
- shrubs should not form more than 10% ground cover; and
- clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation.

Grass

- grass should be kept mown (as a guide grass should be kept to no more than 100mm in height); and
- leaves and vegetation debris should be removed.

A4.1.2 Outer Protection Areas (OPAs)

An OPA is located between the IPA and the unmanaged vegetation. It is an area where there is maintenance of the understorey and some separation in the canopy. The reduction of fuel in this area aims to decrease the intensity of an approaching fire and restricts the potential for fire spread from crowns; reducing the level of direct flame, radiant heat and ember attack on the IPA.

Because of the nature of an OPA, they are only applicable in forest vegetation.

When establishing and maintaining an OPA the following requirements apply:

Trees

- tree canopy cover should be less than 30%; and
- canopies should be separated by 2 to 5m.

Shrubs

- shrubs should not form a continuous canopy; and
- shrubs should form no more than 20% of ground cover.

Grass

- grass should be kept mown to a height of less than 100mm; and
- leaf and other debris should be removed.

An APZ should be maintained in perpetuity to ensure ongoing protection from the impact of bush fires. Maintenance of the IPA and OPA as described above should be undertaken regularly, particularly in advance of the bush fire season.

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