BLACKASH
BUSHFIRE CONSULTING

Bushfire Hazard Assessment & Fire Engineering Brief

Special Fire Protection Purpose Development

Phase 2 & 3 Lindfield Learning Village
Eton Road, Lindfield

Prepared for

NSW Department of Education

BPAD
Bushfire
Planning & Design
Accredited Practitioner
Level 3

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Contents

Glossary of Terms

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 2009*
BAL	*Bushfire attack level*
BCA	*Building Code of Australia*
BSA	Bushfire safety authority
EPA Act	*Environmental Planning & Assessment Act 1979*
FDI	Fire danger index
ha	Hectare
m	Metres
PBP	*Planning for Bush Fire Protection 2006*
RF Act	*Rural Fires Act 1997*

1. Introduction

This Bushfire Hazard Assessment & Fire Engineering Brief has been prepared by Blackash Bushfire Consulting on behalf of the NSW Department of Education and School Infrastructure NSW (the Applicant). It accompanies a Response to Submissions Report in support of State Significant Development Application (SSD 16_8114) for Lindfield Learning Village (the site).

The site is at 100 Eton Road, Linfield and Lindfield Learning Village (the School) which incorporates Lot 2 and 4 in DP 1151638 known as 100 Eton Road Lindfield (**the site**). The site is within the Ku-ring-gai Local Government Area (**LGA**) and is shown at Figure 1 and land zoning at Figure 2.

On 24 October 2018 the Minister for Planning granted partial development consent to SSD 8114 for Phase 1 construction and operation of a new school for 350 students. The remainder of SSD 8114 (as originally proposed) has not yet been granted consent and has been subject to further approvals, assessment and engagement with the relevant agencies (DPE, RFS, OEH, RMS, TfNSW) and Council. The Response to Submissions and supporting documents seek approval for the remainder of SSD 8114, being:

Phase 2(a):

- Minor internal works within the approved Phase 1 area to accommodate an additional 35 students.
- The additional 35 students (a total of 385 enrolled students) is needed for Day 1 Term 1 2020, prior to Phase 2(b) being completed.
- Phase 2(a) will occur immediately on approval to allow the additional students for Day 1 Term 1 2020.

Phase 2(b) of construction:

- Works to accommodate 1,050 students (including the approved 350).
- Repurposing of the Phase 1 area to staff and administration uses.
- A loop road around the southern portion of the site for emergency vehicles, buses and drop off and pick up vehicles.

Phase 3 of construction:

- Works to accommodate an additional 950 students in the western wing of the building.

Vegetation management will be required to achieve the necessary APZ. The SSD does not seek approval for vegetation management outside the site boundary.

Stage 1 works were approved by the NSW Department of Planning (**DoP**) and supported by the NSW Rural Fire Service (**RFS**) in 2018 for the State Significant Development (SSD) application (SSD 16_8114) for the Lindfield Learning Village Stage 1.

Phase 2 and 3 are for the reuse and re-purposing of the existing educational facilities through State SSD application (SSD 16_8114).

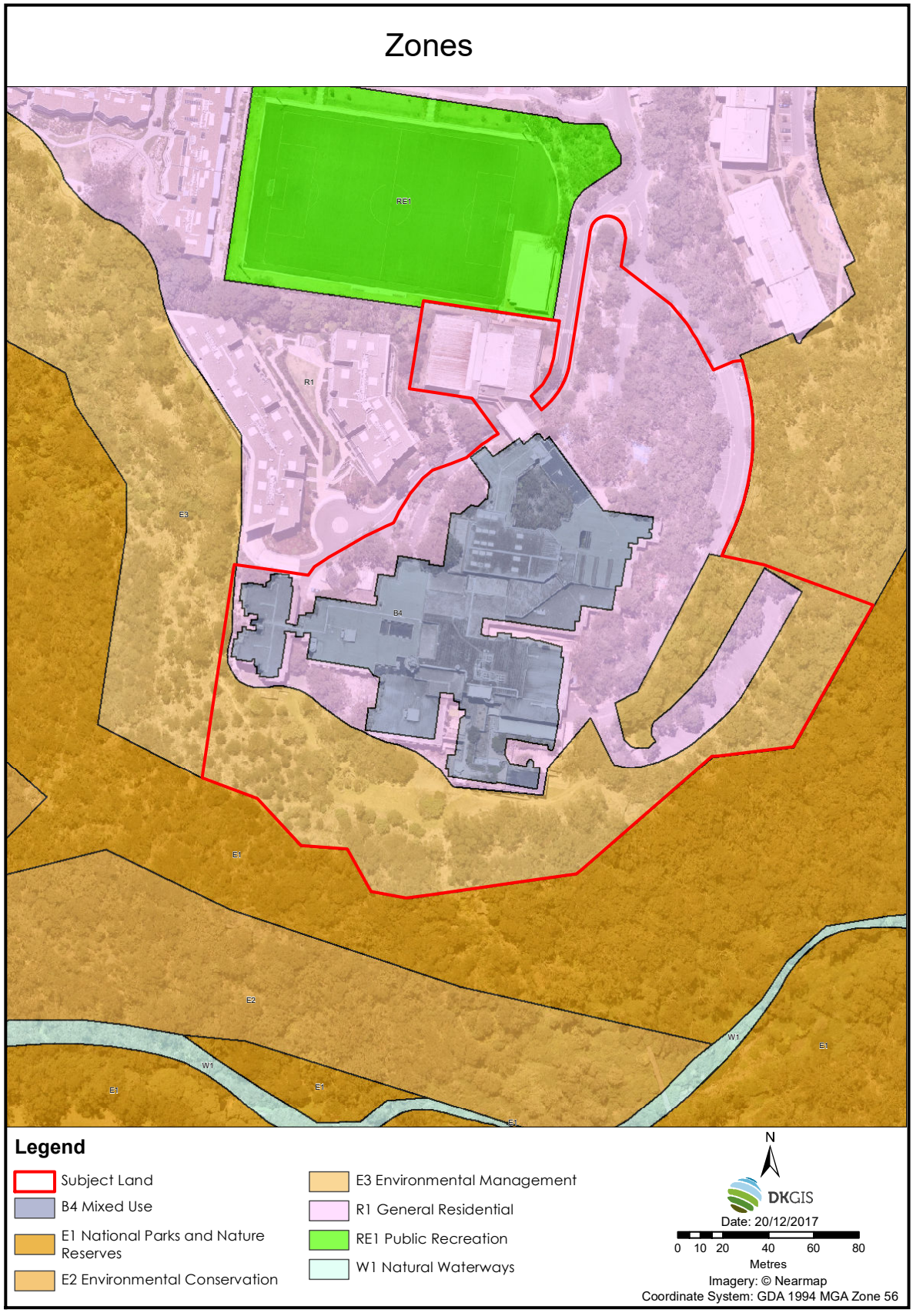
Because of their size, complexity, importance and/or potential impact, the DoP is responsible for assessing development applications relating to these project types. The Minister for Planning is the consent authority for SSD applications.

The Department of Education remain committed to delivering the government's vision and commitment for Phase 2 and 3 while incorporating measures to address the bushfire issues.

This assessment has been prepared by Lew Short, Principal Blackash Bushfire Consulting (FPAA BPAD-A Certified Practitioner No. BPD-PA-16373) who is recognised by the RFS as qualified in bushfire risk assessment and has been accredited by the Fire Protection Association of Australia as a suitably qualified consultant to undertake alternative solution proposals. Inspections of the site have continued from December 2017 to present.

Figure 1 Site Location

Figure 2 Land Zoning of the Site and Surrounds



2. Supporting Documentation

This document is supported by the following separate documents:

***Bushfire Emergency Management and Evacuation Plan* by Blackash Bushfire Consulting**

The *Bushfire Emergency Management and Evacuation Plan* has been designed to assist school and Department of Education management to protect life in the event of a bushfire and to put into play strategies to mitigate the risk on high fire danger weather days. The bushfire evacuation procedures have been completed in accordance with NSW Rural Fire Service *Guide to Developing A Bushfire Emergency Management Plan* and with consideration of *Australian Standard AS 3745-2010 – Planning for Emergencies in facilities* and NSW Government *Evacuation Management Guidelines* (March 2014).

The *Bushfire Emergency Management and Evacuation Plan* is based on the premise that:

- On Total Fire Ban days and above, the Principal will determine the operation of the school in line with local decision-making provisions;
- On days of Total Fire Ban the NSW RFS will liaise with the School Principal should the need arise to evacuate or limit occupation.
- Leaving a high-risk bushfire location is the safest action and evacuating before a bushfire threatens is always safer than remaining until a bushfire starts. Leaving early becomes increasingly appropriate with higher Fire Danger Ratings.
- DoE policy require schools on the Bush Fire Register to temporarily cease operations on days when a Catastrophic Fire Danger Rating (FDR) is issued in their NSW Fire Area.

Roof & Façade Bushfire Measures Conformance Report by Grubits & Associates

The *Roof & Façade Bushfire Measures Conformance Report* by Grubits & Associates assesses the bushfire compliance for Stage 1 of Lindfield Learning Village.

***Fire Safety Strategy Report* by Grubits & Associates**

The *Fire Safety Strategy Report* by Grubits & Associates is preliminary only and demonstrates that the specified Fire Safety Strategy for the building will comply with the identified Performance Requirements which will be the subject of a Fire Engineering Assessment and include consultation with Fire and Rescue NSW. This assessment is to be undertaken at a later stage, using firev safety engineering methodologies in accordance with the International Fire Engineering Guidelines.

***Bushfire Evacuation Analysis* by Grubits & Associates**

As an outcome of the *Bushfire Evacuation Analysis* by Grubits & Associates it has been demonstrated that 2520 occupants are expected to move into the refuge area, namely the auditorium and BAL FZ area in 650 seconds with the given conditions of the model.

Bushfire Radiation Assessment Report by Grubits & Associates

The Bushfire Radiation Assessment Report relates to the likely radiant heat flux upon the proposed re-development of the LLV. The methodology of the assessment was agreed with the RFS and the results of the assessment have determined the separation distance required along each Long Section in order to limit the received radiant heat flux to 10kWm^2 on the buildings. These separation distances have defined the APZ boundaries and natural terrain has been included in the assessment.

These documents should be read in conjunction with this report. Relevant areas have been utilised to demonstrate satisfaction of requirements in Planning for Bushfire Protection 2018.

3. Background

The Stage 1 School provides for 350 students and teachers which opened for the commencement of Term 1, 2018.

At the request of the RFS, The Stage 1 School was located beyond 100m from unmanaged vegetation that could support a bushfire. A series of fire compartments have been installed within the buildings to provide separation from any areas within 100m of unmanaged bushfire hazard lands. The fire compartments provide two-hour fire rated walls to separate the Stage 1 School from other existing components of the school.

The Stage 1 School does not provide any functions associated with "schooling" for children within the 100m separation distance for APZs. Some common areas for teachers and administrative staff have been provided within the 100m to utilise small portions of the existing space.

A number of conditions were placed on the Stage 1 school that were completed prior to opening. These included:

- Managing the entire site as an Inner Protection Zone;
- The provision of access throughout the site that complies with the RFS document *Planning for Bushfire Protection 2006* (**PBP 2006**);
- Construction for the Stage 1 area to meet BAL Flame Zone as per Australian Standard for *Construction of Buildings in Bushfire Prone Areas* (**AS3959**);
- Provision of upgraded water services throughout the site including a 150,000L tank and firefighting attachments;
- Bespoke Bushfire Evacuation Plan and training of staff;
- Management plans that are in place providing for ongoing maintenance of the asset protection zones (APZ).

On Friday 31 May 2018, the LLV Project and design team met with the RFS. At the meeting, the RFS accepted legal advice from the Department of Education that the school is not a change of use but is a change of purpose. As a change of purpose, the LLV is considered Special Fire Protection Purpose (**SFPP**) infill development that provides options for the implementation of a range of mechanisms to provide an acceptable level of bushfire risk to the site, in accordance with Planning for Bushfire Protection 2018 (**PBP 2018**).

4. The Proposal

'Lindfield Learning Village' is proposed to eventually accommodate approximately 2,000 students from kindergarten to Year 12. The school will take enrolment pressure off surrounding primary schools exceeding student capacity and accommodate future population growth within Ku-ring-gai Local Government Area (**LGA**). The school will contain high quality classrooms, collaborative learning spaces, open play spaces, sports courts and associated facilities.

The scope of the project as it is currently briefed is as follows:

- Major capital works to expand on the current Stage 1 partial school of 350 children, to reconfigure and refurbish the remaining internal spaces of the ex- Lindfield UTS site into a new K - 12 School and other facilities.
- The project will involve refurbishment of the existing facilities (approx. 31,000m2 across 7 levels in a complicated floorplan) and potential construction of some additional accommodation, and will likely provide:
- 6 'schools within a school' for 2000 students from Kindergarten to Year 12
- Aurora distance learning facility
- Theatres for both dance & drama
- Specialised learning areas such as science, wood & metal, kitchen & visual arts
- Staff Lounges
- Outdoor play with COLA
- Loop Road to assist in bus & car drop off and pick up
- Upgrading of external facades of the existing buildings to meet BAL Flame Zone building requirements in accordance with the *Australian Standard for Construction of Buildings in Bushfire Prone Areas* (AS3959)

Vehicular and pedestrian access to the campus is available via Eton Road and a private road within the site. A total of 166 marked parking spaces are currently available within the site, including 35 spaces within the basement and 149 at-grade spaces. A pedestrian footbridge over Dunstan Grove links the main campus building to the gymnasium.

Existing Asset Protection Zones (**APZs**) established in Stage 1 to the property boundaries will be maintained and new areas will be established within discrete areas of the adjoining National Parks and private property (Defence Housing Australia to the west of the site) to provide appropriate separation from bushfire hazard areas and to minimise radiant heat load on the buildings and site in general.

The existing complying access will be maintained and augmented with a loop road to the perimeter of the site. Internal fire services will be upgraded throughout the site including significant upgrading of the interior of the buildings to provide National Construction Code (**NCC**) compliance and fire compartmentation. External elements of the buildings will be upgraded to provide for BAL Flame Zone construction elements.

The authorised comprehensive Bushfire Evacuation Plan has been refined for Stages 2 and 3 to continue the bespoke solution for emergency management. The *Bushfire Evacuation Plan* has been enhanced through modelling of fire compartments and travel times throughout the building by Grubits and Associated Fire Engineers.

Several meetings have been held with DoE representatives, the RFS and the DoP in preparing the Response to Submissions and for Stage 2 and 3 to ensure that issues were understood and reflected in this application.

5. Building Code of Australia Summary

Building Classification	Class 5, 7a, 7b and 9b
Rise in Storeys	6
Type of Construction	Type A
Effective Height	<25m
Floor Area	22,560m^2

6. Site and Building Characteristics

Lindfield Learning Village is situated at the former University of Technology site at 100 Eton Road, Lindfield. The project consists of utilising the existing university buildings to school facilities for students from Year 1 to Year 12, as well as administration and support facility.

There are three stages to the conversion and construction works, Stages 1, 2 and 3. This brief relates to Stage 2 & 3, wherein the existing "partial school" will be expanded into the remaining parts of the existing buildings. Stage 2 is intended to provide capacity for 1000 students for 2018, and Stage 3 is intended to provide capacity for 2000 students. Access to the school is via Eton Road and Dunstan Grove.

The original buildings, which are to be retained, are generally concrete buildings with concrete roofs (there are a small number of steel roofs. The buildings are to be developed to contain classrooms, learning rooms, offices and event spaces in addition to a Performing Arts Auditorium (classed as an "Entertainment Venue").

The site is located at the end of a ridgeline and is surrounded by deeply transacted sandstone gullies and unmanaged bushland on the edge of Lane Cove National Park.

The area around the site includes:

- Land Cove National Park Lot PT 20 DP 1204689 (Attachment 1) to the south;
- Lot 1 D 270770 being Community Title (Attachment 2) to the immediate west of the site;
- Lot 3 DP 1151638 being Education – University (Attachment 3) west of Lot 1 D 270770;
- Lot 3 D 270770 known as 5-7 Dunstan Grove to the north of the site;
- Lot 7 D 270770 Community Title sports field known as 4 Shout Ridge;
- Lot 9 D 270770 Community title known as 2 Shout Ridge;
- Lot 4 D 270770 Community title known as 1 – 3 Tubbs View.

The site is accessed by Eton Road, Dunstan Grove and a private road (extension of Eton Road). Existing developments are located at Hamilton Corner, Tubbs View and Shout Ridge. These include medium rise buildings.

7. Occupant Characteristics

The site is to have up to 2000 students, and at least 250 staff (an approximate 1 staff member for 8 students on average). The site may have visitors at the time of a fire incident.

Students will range in age from 4 years of age to 18 years of age, with corresponding variation in needs. Primary-age students will need assistance and close supervision to evacuate in an emergency, including where to go, how to crossroads, and may be distressed or confused. Older students may require less assistance and understand evacuation routes but still require guidance, and may feel distressed. Students are generally expected to be awake at the time of an event.

Some students may be physically or mentally impaired and may require special assistance or one-on-one care to evacuate safely.

Staff are expected to be trained in bushfire evacuation, including how to assist students in their care and very familiar with escape routes.

Visitors to the site may be parents, students or staff from other facilities (e.g. distance learners), contractors or other visitors. These visitors may be a range of ages, including students and are not likely to be familiar with evacuation procedures or escape routes. Therefore, it is expected that visitors may require assistance to evacuate.

The Bushfire Evacuation Plan has provided detailed consideration of the occupant characteristics in arriving at a range of options to mitigate the impact of fire and to provide for life safety in the event of bushfire impacting the site.

8. Fire Engineering Brief

The Bushfire Design Brief is a documented process that defines the scope of work for the fire safety engineering analysis. Its purpose is to set down that basis, as agreed by all the relevant stakeholders, upon which the fire safety engineering analysis will be undertaken. This includes agreement on the objectives, proposed trial designs, analysis methods and acceptance criteria.

8.1. The Bushfire Hazard Assessment and Bushfire Design Brief

This document incorporates the requirements for a Bushfire Hazard Assessment and a Bushfire Design Brief (BDB) – to demonstrate the performance-based solution for LLV. All relevant stakeholders have been engaged (as per Section 8.2) and agreement has been reached which has paved the way for this report. The BDB is a documented process that defines the scope of work for the fire safety engineering analysis as per the *International Fire Engineering Guidelines* (IFEG). Its purpose is to set down that basis, as agreed by all the relevant stakeholders, upon which the fire safety engineering analysis will be undertaken. This includes agreement on the objectives, proposed trial designs, analysis methods and acceptance criteria.

The fires safety analysis for the radiant heat calculations and separation distances are in a separate report by Stephen Grubits and Associates titled Bushfire Radiation Assessment Report and this should be reviewed as part of the merits-based assessment by the RFS.

This integrated Bushfire Hazard Assessment & Fire Engineering Brief document translates subjective performance criteria into tangible and measurable parameters that can then be evaluated in the bushfire analysis.

The BDB has involved all relevant stakeholders and agreement has been reached on the ground rules for the ensuing bushfire analysis which has been completed by Grubits and Associates. This has involved extensive modelling of radiant heat loads based on detailed site survey work to determine the effect of landforms (particularly cliff lines) on fire run and radiant heat loads on the LLV buildings.

8.2. Stakeholder Consultation

In the preparation of a planning proposal the relevant planning authority must consult with the Commissioner of the RFS following receipt of a gateway determination under section 56 of the Act, and prior to undertaking community consultation in satisfaction of section 57 of the Act, and take into account any comments so made.

Consultation with the RFS has occurred throughout the life of the design Stage of the proposal and construction and operation of Stage 1.

The relevant stakeholders in the bushfire design identified in Table 1 have been consulted during the Fire Engineering Brief process.

Table 1 Stakeholder Consultation

Company/Organization	Role
DesignInc	Architect
Savills	Project Manager
BlackAsh	Bush Fire Consultant
Stephen Grubits & Associates	Fire Safety Engineer
Rural Fire Service	State Rural Fire Authority
Fire & Rescue New South Wales	State Fire Authority
Department of Education	School Principal (Building User)
BCA Logic	Certifier
Council	Ku-ring-gai Council
Department of Education	Building owner and user
Department of Education	Building owner, user, responsible for maintenance
NSW National Parks and Wildlife Service	Neighbor and adjoining land manager

8.3. Consultation Process

Consultation with stakeholders regarding the Fire Engineering Brief and Bushfire Hazard Assessment was conducted by way of the following:

- Department of Education, Savills, BlackAsh and Stephen Grubits & Associates meet regularly (approximately fortnightly) to discuss bushfire design of the Lindfield School.
- Meetings have been held with RFS throughout the development of Stage 2 and 3
- Meetings and site inspections have been undertaken with National Parks and Wildlife Service and the RFS to determine the extent and management of Asset Protection Zones (APZ)

9. Assessment Framework

9.1. Legislative Framework

Land use planning within bushfire prone areas is guided by legislation, directives and guidelines. In September 2011, Part 3A of the *Environmental Planning and Assessment Act, 1979* (EPA Act) was repealed, leading to the creation of two new major project development categories: state significant infrastructure (SSI) and state significant development (SSD). This application is an SSD.

Because of their size, complexity, importance and/or potential impact, the DOP is predominantly responsible for assessing development applications relating to these project types. The Minister for Planning is the consent authority for SSI and SSD applications.

Applications for SSD are exempt from requiring a bushfire safety authority (**BFSA**) from the RFS. Given SSD scale, the requirements of PBP 2006 (currently in force) and the new version *Planning for Bushfire Protection 2018* (PBP 2018) which is in draft form and due to be adopted in late 2019, has been used in this assessment to ensure best practice is applied to the proposal.

While the SSD does not require a BFSA, this assessment has utilised the framework provided by section 100B (4) of the Rural Fires Act 1997 and Clause 44 of the Rural Fires Regulation 2013, and includes the following:

1) a description (including the address) of the property on which the development the subject of the application is proposed to be carried out

2) a classification of the vegetation on and surrounding the property (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
3) 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)
4) identification of any significant environmental features on the property
5) the details of any threatened species, population or ecological community identified under the Threatened Species Conservation Act 1995 that is known to the applicant to exist on the property
6) the details and location of any Aboriginal object (within the meaning of the National Parks and Wildlife Act 1974) or Aboriginal place (within the meaning of that Act) that is known to the applicant to be situated on the property,
7) a bush fire assessment for the proposed development (including the methodology used in the assessment) that addresses the following matters: i. the extent to which the development is to provide for setbacks, including APZs ii. the siting and adequacy of water for firefighting
    a) the capacity of public roads in the vicinity to handle increased volumes of traffic in the event of a bush fire emergency
    b) whether or not public roads in the vicinity that link with the fire trail network have two-way access
    c) the adequacy of arrangements for access to and egress from the development site for the purposes of an emergency response
    d) the adequacy of bush fire maintenance plans and fire emergency procedures for the development site
    e) the construction standards to be used for building elements in the development
    f) the adequacy of sprinkler systems and other fire protection measures to be incorporated into the development
8) h. an assessment of the extent to which the proposed development conforms with or deviates from the standards, specific objectives and performance criteria set out in Chapters 5-8 of PBP.

9.2. Planning for Bushfire Protection 2006 and 2018

A review has been conducted of PBP 2006. It is anticipated that PBP 2018 will be released as a final document in September 2019 and become legislated in October 2019 with no savings provisions or transitional arrangements. PBP 2018 is in a 'pre-release' stage, also known as the transitionary period. Until PBP 2018 becomes legislated, PBP 2006 will remain the legally referenced document and PBP 2018 can be used on a performance basis in consultation with NSW RFS only. This approach has been agreed to as part of the consultation process.

The PBP 2006 and 2018 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 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 2006 is similar to the structure of the 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 specific objectives for SFPP developments (p. 28) are to:

- *provide for the special characteristics and needs of occupants. Unlike residential subdivisions, which can be built to a construction standard to withstand the fire event, enabling occupants and firefighters to provide property protection after the passage of fire, occupants of SFPP developments may not be able to assist in property protection. They are more likely to be adversely affected by smoke or heat while being evacuated.*
- *provide for safe emergency evacuation procedures. SFPP Developments are highly dependent on suitable emergency evacuation arrangements, which require greater separation from bushfire threats.*

PBP requires that a planning and development proposal satisfy:

- The broad aim and objectives of PBP 2018;
- 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 2018 or alternative solutions, which fulfill the intent of the relevant performance criterion.
- Infill provisions for SFPP development

These requirements have been met for this development.

9.2.1. General Objectives of Planning for Bushfire Protection

All development on BFPL must satisfy the aim and objectives of PBP. The aim of PBP is to provide for the protection of human life and minimise impacts on property from the threat of bush fire, while having due regard to development potential, site characteristics and protection of the environment. 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.*

9.2.2. Specific Objectives for SFPP Development

The Lindfield Learning Village is considered a Special Fire Protection Purpose. This is defined in Section 100B(6) of the Rural Fires Act 1997, as a development that includes schools (as well as other purposes). Planning for Bushfire Protection states that an SFPP development is one that:

"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."

The specific objectives within PBP 2018 for SFPP developments are to:

i. Minimise levels of radiant heat, smoke and ember attack through increased APZ, building design and siting;
ii. Provide an appropriate operational environment for emergency service personnel during firefighting and emergency management;
iii. Ensure the capacity of existing infrastructure (such as roads and utilities) can handle the increase in demand during emergencies as a result of the development; and
iv. Ensure emergency evacuation procedures and management which provides for the special characteristics and needs of occupants.

9.3. SFPP Infill Development

The original buildings, which are to be retained, are generally concrete buildings with concrete roofs (there are a small number of steel roofs). The buildings are to be modernised to continue to provide the education function.

Hunt and Hunt Lawyers provided advice to the Department of Education supporting designation of the proposal as SFPP Infill. The designation of the development as SFPP Infill development has been accepted by the RFS.

The NSW Government has introduced a new education-based State Environmental Planning Policy. The State Environmental Planning Policy (Educational Establishments and Child Care Facilities) 2017 (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 State Environmental Planning Policy (Educational Establishments and Child Care Facilities) 2017 (the SEPP) provides for the legislative planning framework for the NSW. Section 5 of the SEPP provides the definition of:

> *educational establishment means a building or place used for education (including teaching), being:*
>
> *(a) a school, or*
>
> *(b) a tertiary institution, including a university or a TAFE establishment, that provides formal education and is constituted by or under an Act.*

As such, an educational establishment includes a school and a tertiary institution, including a university or TAFE establishment. **At a meeting on Friday 31 May 2018 the RFS agreed to the LLV being treated as SFPP Infill development.**

While the proposal is not seeking approval for new buildings, it is seeking continued use of the existing education facilities. As the current buildings were constructed in the 1960's they predate modern bushfire requirements. The Department of Education are committed to bringing the buildings and site up to modern BCA and PBP 2018 requirements.

In circumstances where alterations or additions to existing SFPP's facilities are proposed, the RFS requires an appropriate combination of bush fire protection measures and compliance with the intent and performance criteria of each measure within PBP 2018.

Alterations and additions to existing SFPP's (i.e approved prior to 1st August 2002), including their external appearance or finish, which may involve an increase in size and footprint of the building or redevelopment of an existing building are considered to be infill development. It is also acknowledged in PBP 2018 that existing circumstances may make the preferred standards difficult to achieve. In such cases, the specific objectives of PBP 2018 are to be followed.

SFPP Infill development should also seek to achieve a better bushfire risk outcome (such as improved construction standards) than if the development did not proceed. The new building work should comply with AS 3959 - 1999 (and Appendix 3 of PBP) or be no closer to the hazard than the existing building. Existing facilities such as water supply should also be upgraded.

Blackash has worked with the DOE, the project design team to provide a suite of Bushfire Protection Measures that are commensurate with the risk and provide for the safety of occupants and fire fighters.

9.4. 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 building 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.

9.4.1. 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.

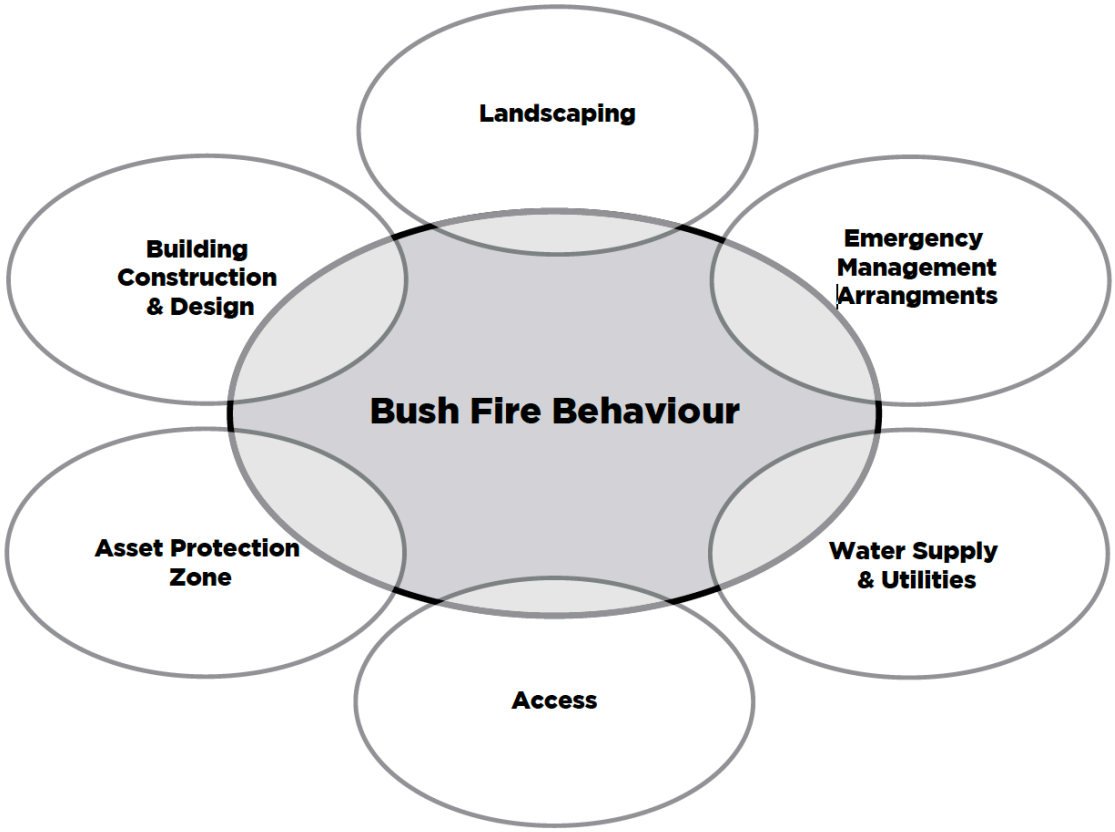
9.5. The Bushfire Protection Measures

PBP 2018 identifies that the Bushfire Protection Measures (BPMs) are general measures which are required to improve life safety, property protection and community resilience to bush fire attack.

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 assessed and applied separately and used in based upon the development type and the assessed level of bushfire risk. Specific strategies have been put into place for each of the BPMs that meet or exceed the requirements of PBP 2018. These will be discussed throughout the report.

Figure 3 Bushfire Protection Measures (source PBP 2018 p. 26)



10. Bushfire Hazard Analysis

10.1. Bushfire Prone Land

The site is identified as 'bushfire prone land' (See Figure 4) for the purposes of Section 10.3 of the EPA Act and the legislative requirements for developing bushfire prone lands are applicable.

Bushfire prone land maps provide a trigger for the development assessment provisions and consideration of sites that are bushfire prone. Bushfire prone land (BFPL) is land which can support a bushfire or is likely to be subject to bushfire attack (radiant heat, embers or flame). Bushfire prone land maps are prepared by local council and certified by the Commissioner of the RFS.

The bushfire hazards are presented by the risk of bushfire originating in the vegetation near the school. As shown in Figure 1 and 4, there is bushland to the south, west and east of the site. The site is surrounded by dry sclerophyll forest, deep valley complexes with significance amounts of bushland adjacent to the site.

The precinct carries a high bush fire risk due to the nature of the topography and surrounding vegetation including steep, densely vegetated slopes leading up to developed areas. The northern aspect of the site faces built-up areas comprising predominantly housing.

The area has significant fire history (wildfire and hazard reduction burns) as shown in Figure 5.

Figure 4 Bushfire Prone Land Map

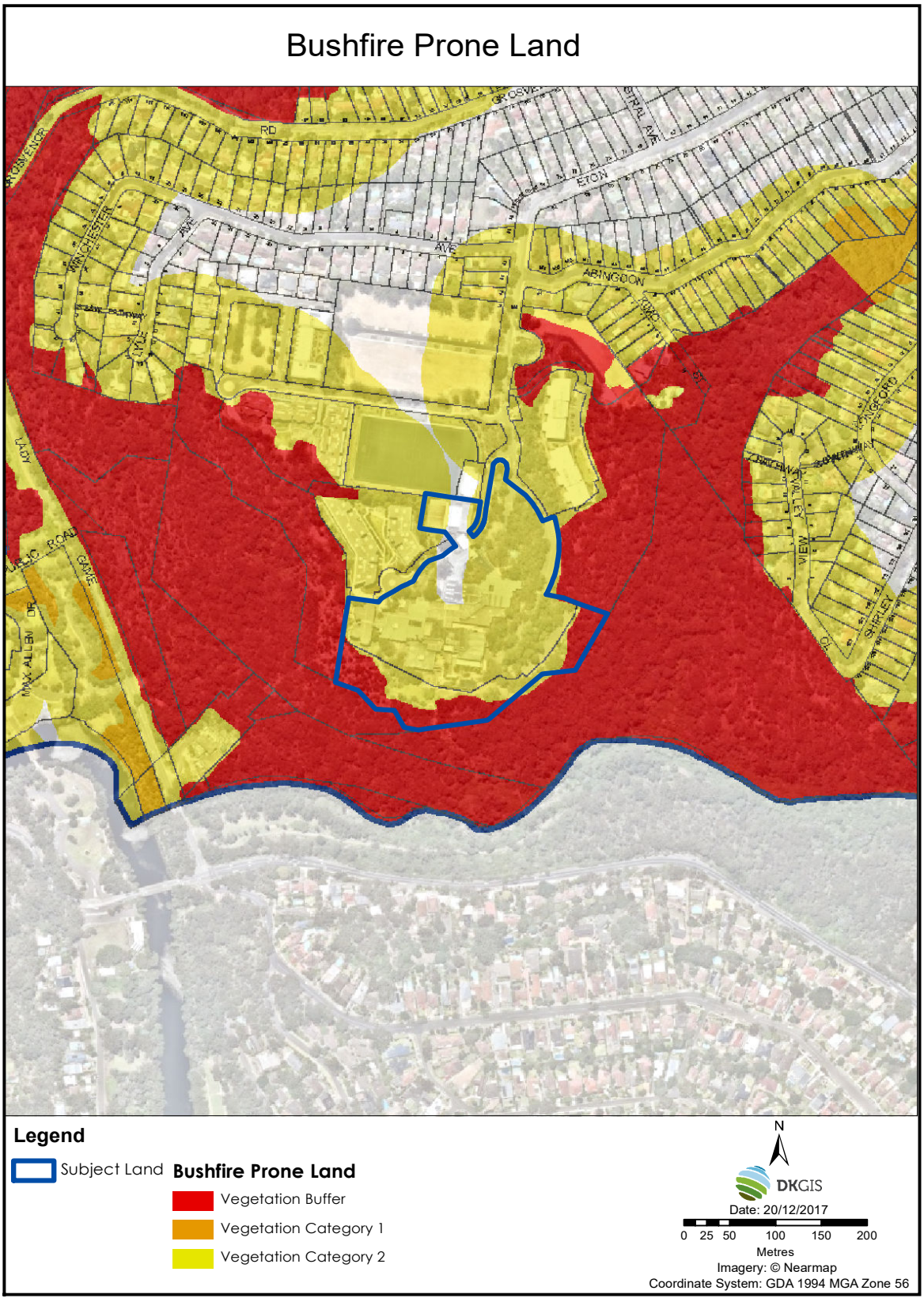


Figure 5 Bushfire History

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 configuration of the existing development and adjoining unmanaged bushland within National Park lands provides a potential that the site will be impacted by high intensity bushfire. There is potential for the site to be impacted from three sides with prolonged bushfire attack in the form of ember attack, smoke and radiant heat. However, the framework provided by PBP 2006 and PBP 2018 and the required BPM for the school have been achieved to ensure the school meets modern bushfire safety requirements and in many areas is above that required by PBP 2018. The Stage 2 and 3 school will meet the aim, objectives and Standards within PBP 2018 for SFPP.

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 2018).

This assessment identifies the potential bushfire threat from both within and outside of the investigation area and provides an indication of required asset protection zones for risk and future development within the site. The method used for this assessment is outlined in PBP 2018 and relies on consideration of vegetation and slope and is outlined below along with results.

11.2. Methodology

PBP 2018 provides a methodology to determine the size of any 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.

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 both a desktop assessment and numerous site inspections of the site assessment utilising the following resources:

- *Planning for Bushfire Protection* (NSW RFS, 2018)
- Council Bushfire Prone Land Map
- Aerial mapping
- Detailed GIS analysis
- Detailed site survey
- Detailed site inspections

The methodology used in this assessment is in accordance with PBP 2018 and is outlined in the following sections.

11.3. Fire Danger

For SFPP development, PBP has designated the appropriate fire areas and corresponding 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 1:50 year fire weather scenario for most of the State was determined as FDI 80. However, a number of areas including the Greater Sydney, Greater Hunter, Illawarra, Far South Coast and Southern Ranges Fire Areas have higher FDIs which are set at 100 and does not take into account climate change. The FDI for Ku-ring-gai local government area is 100 and the assessment has been completed against FDI 100.

11.4. Vegetation Assessment

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 2018.

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 2006. 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.

The vegetation is shown in Figure 6 and for assessment purposes has forest has been used as a basis to determine APZ and radiant heat loads within the site.

Figure 6 Vegetation Assessment

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.

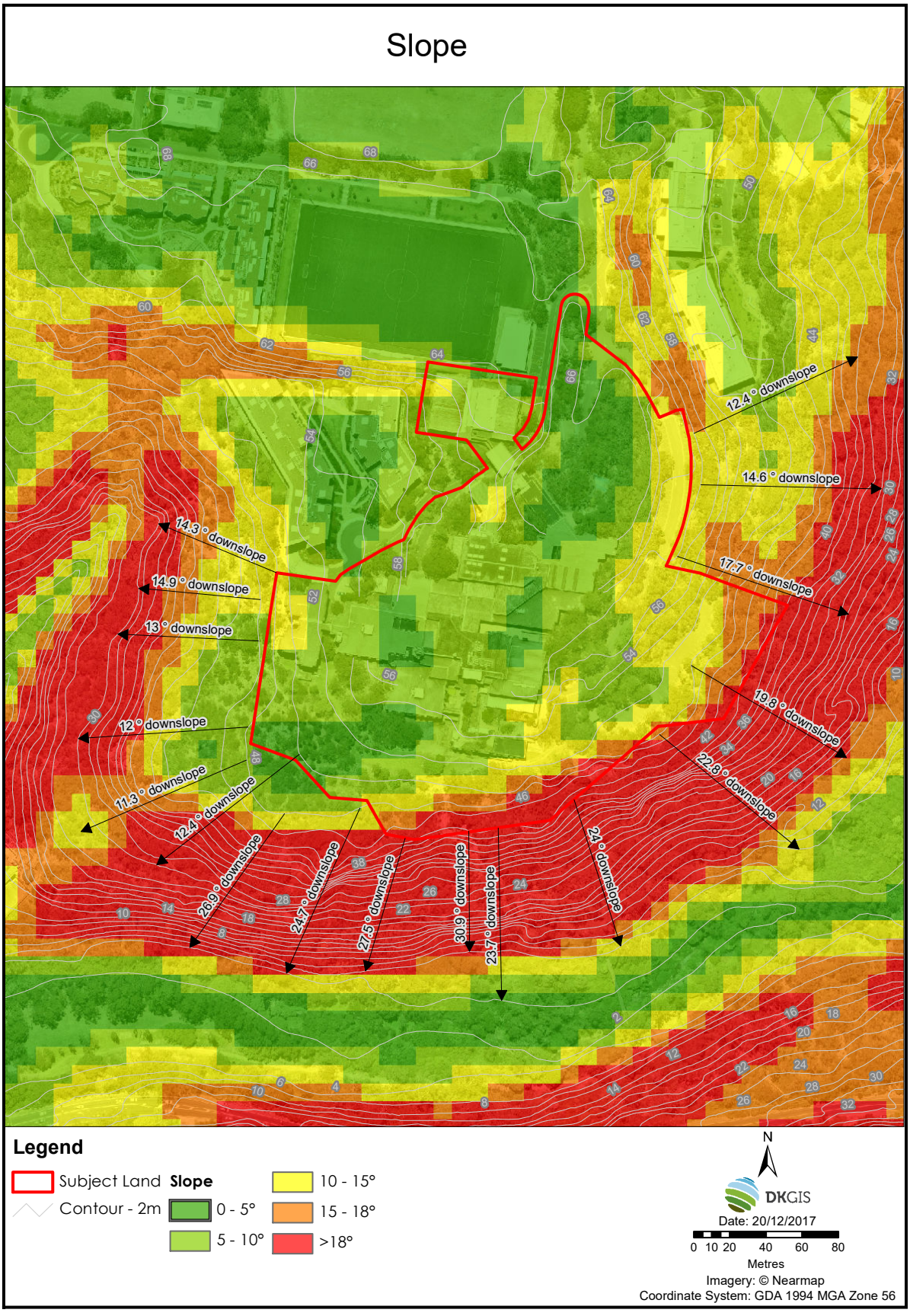
The 'effective slope' influencing fire behaviour approaching the sites has been assessed in accordance with the methodology specified within PBP. This is conducted by measuring the worst-case scenario slope where the vegetation occurs over a 100 m transect measured outwards from the development boundary or the existing/ proposed buildings. Detailed surveys have been completed for the slopes of the land to determine the impact of the cliff lines around the site and any impact on reduced heat loads.

Transects are shown in Figure 7 to provide an indication of slope. However, the detailed site survey has been used as the basis of the radiant heat calculations. The site has a number of significant cliff lines that affect the likely spread of fire and have been used as radiant heat barriers in the Fire Engineering analysis. This has been agreed to by the RFS and the methodology accepted.

Small sections of slopes over 18 degrees have APZs within the site (southern boundary). However, these sections are short and will be accessed by foot with contractors using hand tools. APZ establishment and maintenance has be undertaken in accordance with PBP 2006 and RFS Standards for Asset Protection Zones and the site can be accessed in all areas.

All areas within the site are currently managed to IPA standards and have been certified as meeting the RFS Standards for IPA.

Figure 7 Slope Assessment



11.6. APZ Requirements

The site assessment identifies the potential bushfire threat from outside of the site area and provides an indication of required asset protection zones to meet the deemed to satisfy distances of PBP.

As part of the Stage 1 work, the entire site meets Inner Protection Area APZ Standards.

A whole of government approach has been taken to mitigating the impact of bushfire on the site and to reduce the modelled radiant heat to the SFPP requirements for 10kW at the buildings.

A number of meetings have been held between various stakeholders including NSW National Parks and Wildlife Service (NPWS) and the RFS to discuss the extent and management of APZs.

Mutually beneficial APZs are provided on adjoining land that are associated with Defence Housing approved developments and small areas of NPWS lands. Arrangements that are legally binding will be entered into with adjoining landowners where mutually beneficial APZs are required.
Initial discussions with the RFS provided significant APZs into NPWS lands (Figure 8). However,
Detailed fire engineering analysis and modelling has been completed by Grubits and Associates in the Bushfire Radiation Assessment Report.

The outputs of the modelling are shown in Figure 9 and show that radiant heat levels at or below 10kW can be achieved at the existing buildings. Long section 9 has a slightly elevated RH of 14.9kW. The commensurate APZs are shown in Figure 10 and will be provided for the Stage 2 and 3 works.
The entire site will be managed to IPA Standards. An Outer Protection Area of a maximum of 30m is provided from the outer most extent of the APZ boundary.

Figure 8 Original Extent of APZs

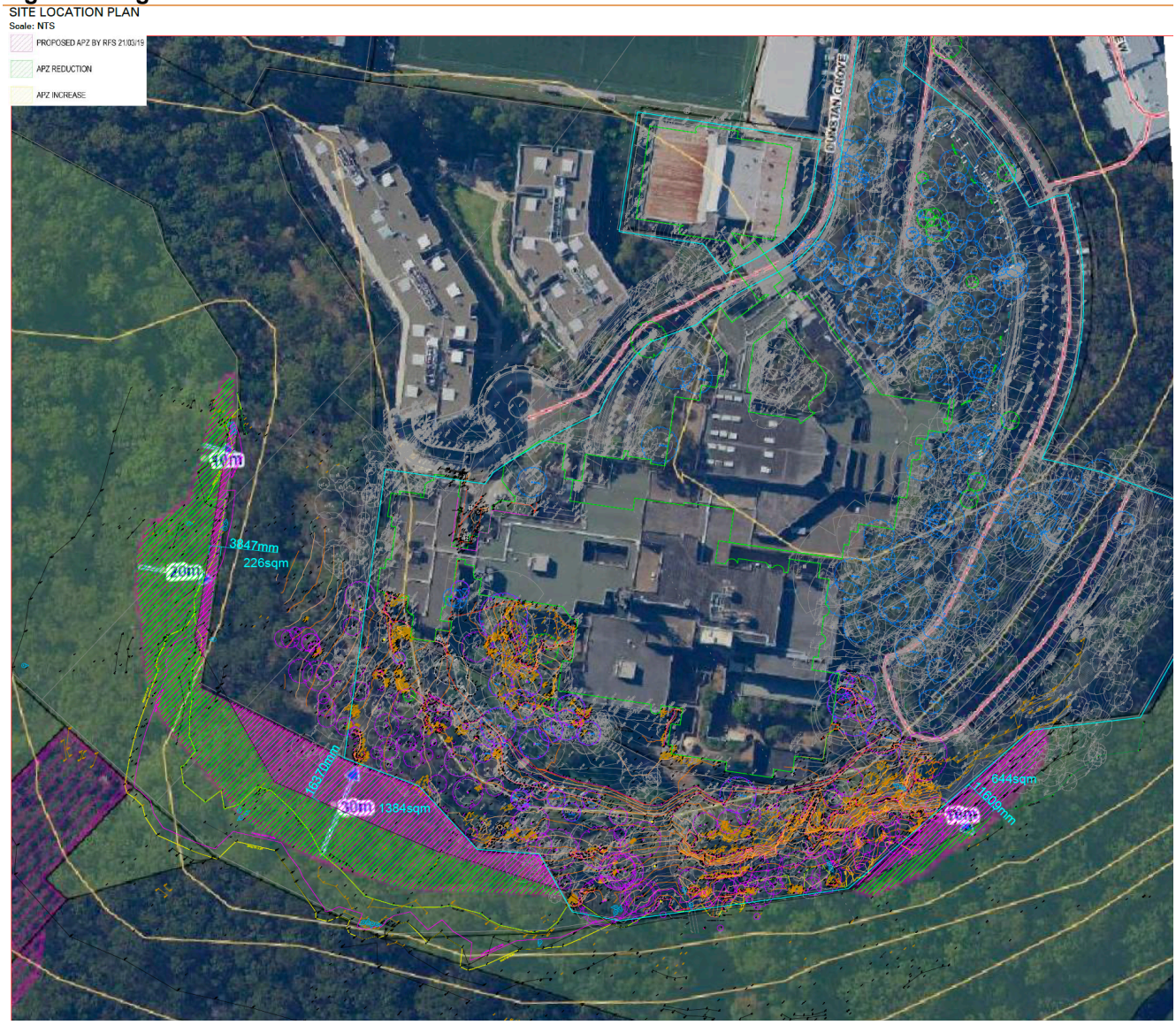


Figure 9 APZ and Radiant Heat Load on Buildings (Grubits and Associates Bushfire Radiation Assessment Report)

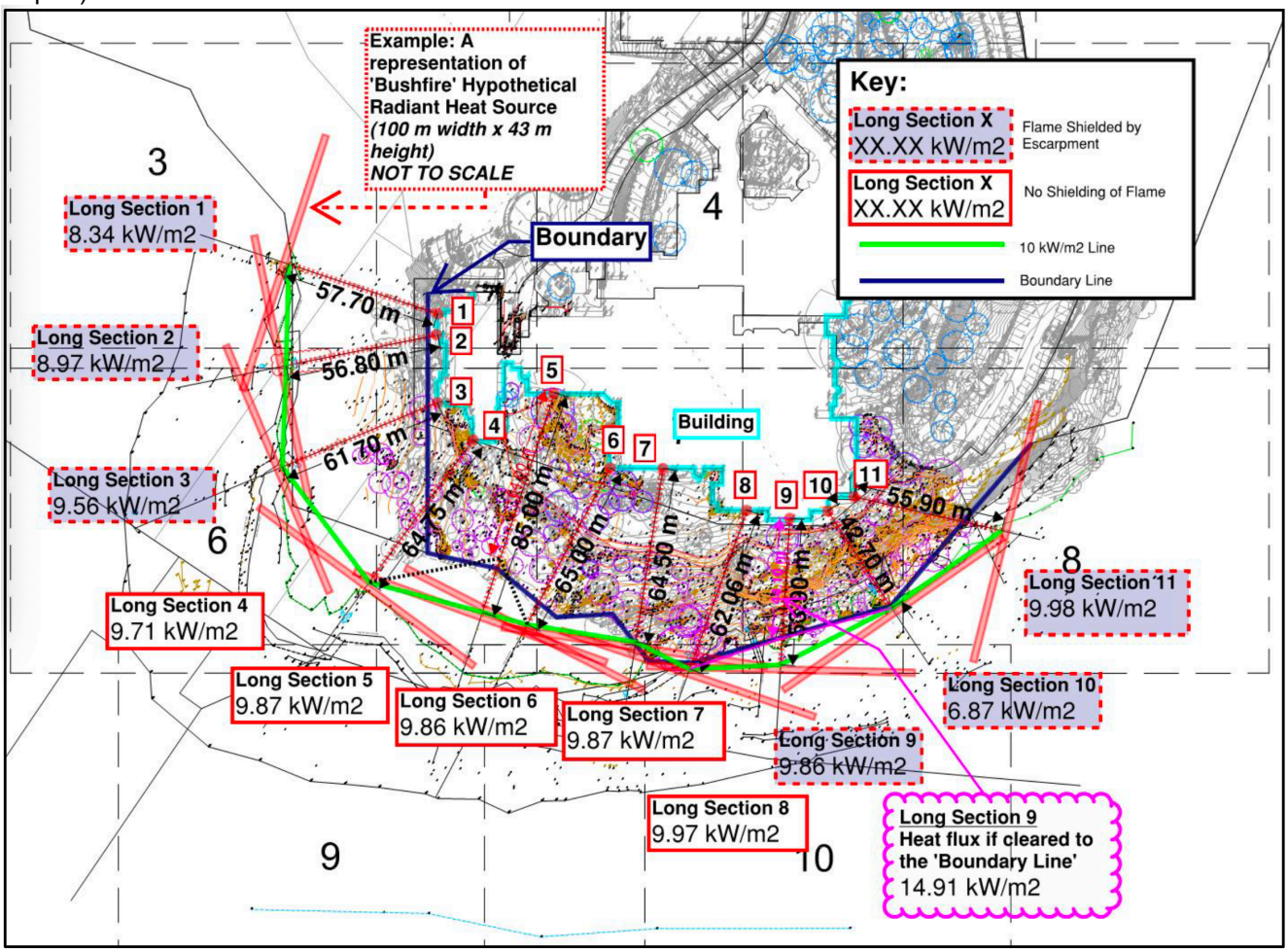
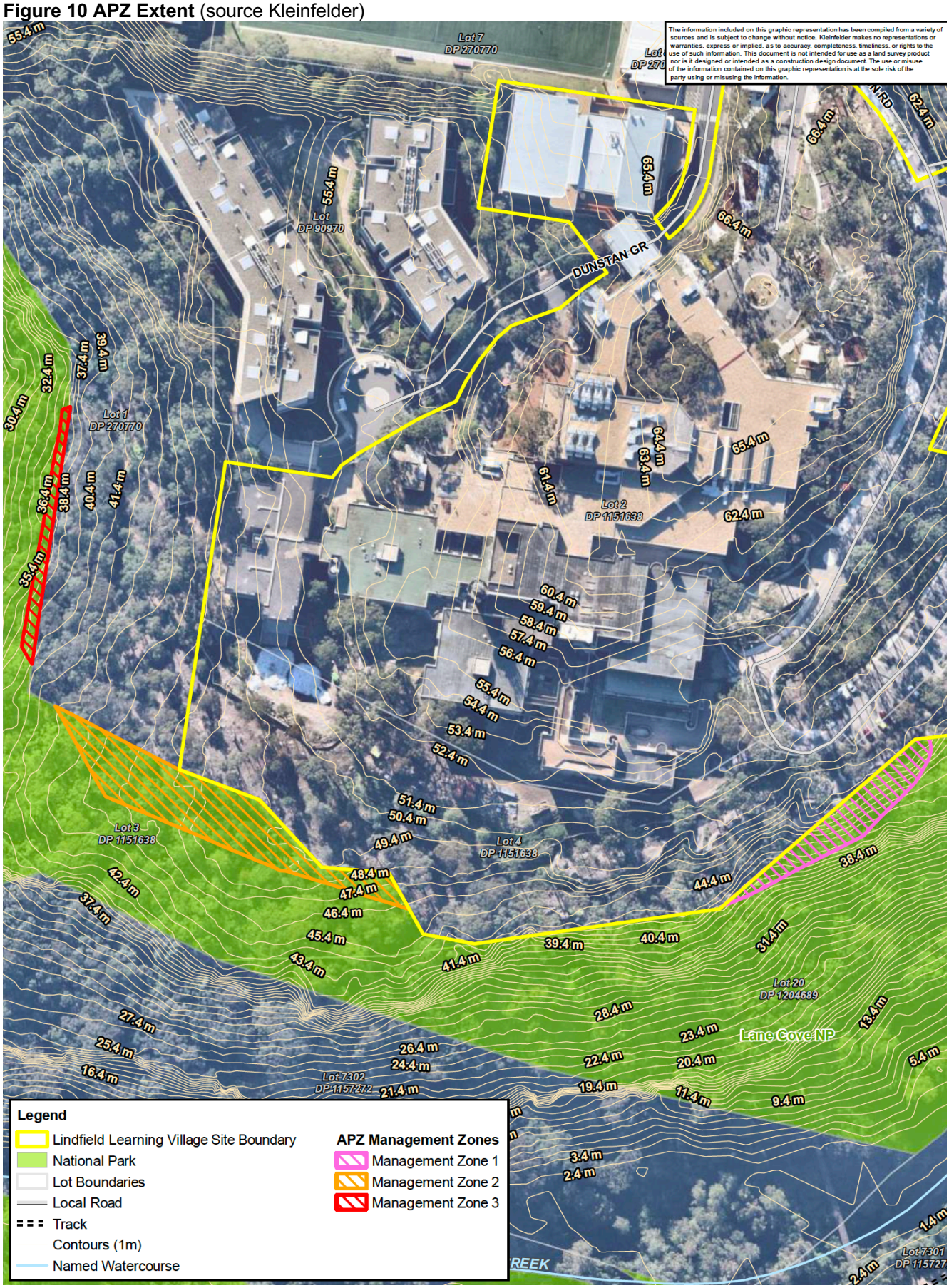


Figure 10 APZ Extent (source Kleinfelder)



11.7. Establishment and maintenance of APZs

An APZ is a buffer zone between a bushfire hazard and buildings, which is managed progressively to minimise fuel loads and reduce potential radiant heat levels, flame, ember and smoke attack. The appropriate APZ is based on vegetation type, slope and levels of construction (and for SFPPs the nature of development). The APZ can include managed areas, perimeter roads, existing roads, other buildings or managed properties can be considered as part of the APZ.

Management of APZs will be provided for under a separate Fire Management Program and Vegetation Management Plan (VMP) which will be completed upon consent for the opening of the school. All asset protection zones will be the responsibility of the Department of Education.

12. Water Supplies

The Site land is currently serviced by reticulated water. A new ring mains system was provided as part of the Stage 1 works, including a 150,000L tank dedicated for firefighting purposes at the entrance to the school.

Hydrant spacing, sizing and pressures will comply with AS2419-2005. The development is located within 70 m of these hydrants. Existing single head hydrants will be replaced with dual head hydrants. The fire hydrant system (incorporating internal and external hydrant connections) has been designed to ensure coverage in accordance with AS 2419.1:2005 and NCC Clause E1.3. This complies with PBP.

13. Gas and electrical supplies

The existing electricity supply for the site will be utilised and will comply with PBP. Gas services are to be installed and maintained in accordance with *Australian Standard AS/NZS 1596 'The storage and handling of LP Gas'* (Standards Australia 2008). This complies with PBP.

14. Access

The design of public access roads and property access (within a site) should enable safe access, egress and defendable space for fire fighters and emergency services. Eton Road is a public Road and provides a two-way road to the site boundary. From Abingdon Road, the existing urban infrastructure and development provides suitable access arrangements and depth for evacuation. From the site boundary to the north, a private road exists that provides access into and around the site. Shout Ridge Road, Dunstan Grove Road and Tubbs View all service new, high density residential developments and comply with PBP 2006.

The precinct bound by the junction of Abingdon Rd to the north of the site has existing medium density development throughout. The combination of a range of developments (including the school) will result in an increased demand on existing services and may result in an increased risk to occupants and the existing community. It is likely that the road system will become bottle necked at the junction of Eton, Shout Ridge and Tubbs View in the event of a bushfire emergency.

Schools are particularly prone to traffic-generated congestion on roads at start and finish times. This is heightened when parents believe that their children are likely to be exposed to bushfire and in seeking to reach the school, cause road congestion and hamper the firefighting effort. A detailed *Bushfire Evacuation Plan* has been drafted that will provide for a range of scenarios including seeking

onsite refuge within the school buildings. The Evacuation Plan will cater for access provisions including potential use of busses within the site and options to walk the school community to Lindfield Public School if required.

As a condition of consent for the Stage 1 works, the road network within the school was significantly modified and upgraded to comply with PBP 2006. As such, all roads within the site provide 8m carriage width for fire fighting vehicles.

In recognition of the need to provide access to bushfire hazard areas for fire fighters, a loop road is proposed for the south and the west of the site (see Figure 11) that will provide perimeter access for firefighting purposes for most of the site.

The loop road will include hydrants for firefighting purposes. The new loop road is 8m kerb to kerb for its length, except a short constriction between the two buildings where it drops to 5m. It should be noted that this constriction will allow the passage of buses which is above the requirement for fire fighting vehicles within PBP 2018. Gates will be provided in the proposed fence to permit access for emergency service vehicles to the southern and western APZs.

The existing road and proposed loop road will form part of the APZ and is required to provide a separation between the SFPP and the boundary of the bushfire hazard. The private road provides sufficient width to allow firefighting vehicle crews to work with firefighting equipment about the vehicle and to provide passing areas for fire appliances if required. Roll-top kerbing is provided throughout the site.

A new fence (1800mm) is proposed around the perimeter for security and safety on the site. All fencing will be coated tubular security fencing to allow for suppression activities through the fence if required. Gates will be provided around the perimeter to ensure access to all roads, pedestrian walkways and to provide access into the APZ for management and fire suppression activities. A summary of access provisions is at Table 2.

Figure 11 Site Access including new Loop Road (source Birzulis Associates dated July 2019)

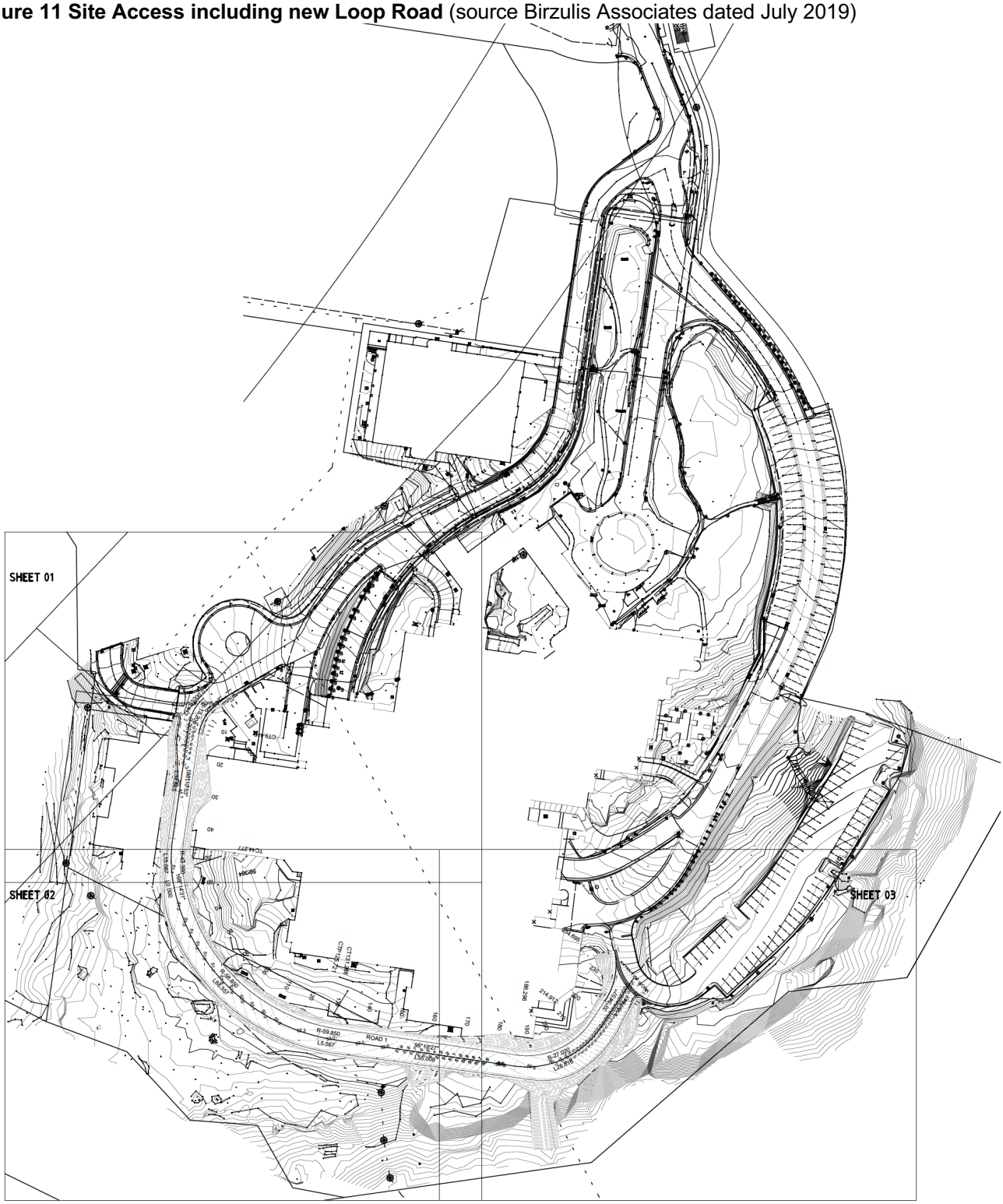


Figure 12 Loop Road Masterplan

14.1. Fire Brigade Access for Bushfire

The provisions for Fire Brigade Access will consist of:

- Routes for Fire Brigade which minimize overlap with routes for egress
- Provision of turning circles and passing bays, and hard stand
- Provision of firefighting water.

Fire Brigade Access is provided to the site from the Pacific Highway (Figure 13). There are also access routes from the west, however this western route is via Lady Game Drive which may not be viable in bushfire in Lane Cove National Park. The Fire Brigade may choose to access the site via Grosvenor Road, Eton Road, or to avoid possible congestion at the intersection between Winchester Avenue and Eton Road, Abingdon Road may be used.

The access to the site meets the Fire Brigade requirements in terms of provision of egress width and turning areas in accordance with Planning for Bushfire Protection 2018. A fire trail is currently constructed to provide access to the south and west of the site. This will be upgraded as part of the Stage 2 and 3 works to provide a loop road capable of carrying buses.

Figure 13 Fire Brigade Access Routes

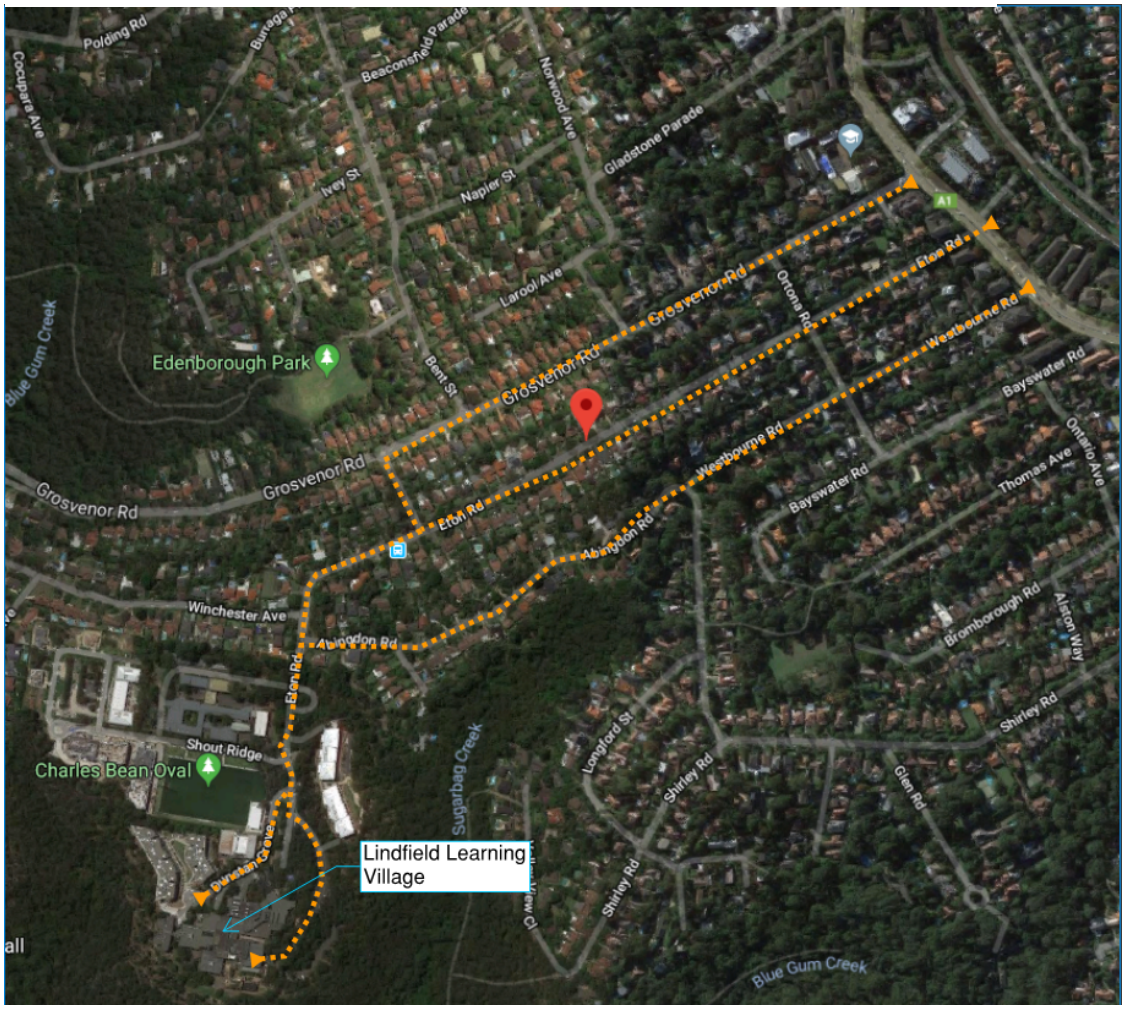


Table 2 Access - Internal Roads

Intent of Measures	To provide safe operational access for emergency services personnel in suppressing a bush fire, while residents are accessing or egressing an area (PBP p 34).	
Performance Criteria	**Acceptable Solutions**	**Compliance**
The intent may be achieved where:		
Internal road widths and design enable safe access for emergency services and allow crews to work with equipment about the vehicle.	internal roads are two-wheel drive, sealed, all-weather roads;	**Achieved**
	internal perimeter roads are provided with at least two traffic lane widths (carriageway 8 metres minimum kerb to kerb) and shoulders on each side, allowing traffic to pass in opposite directions;	**Achieved**
	roads are through roads. Dead end roads are not more than 100 metres in length from a through road, incorporate a minimum 12 metres outer radius turning circle, and are clearly sign posted as a dead end;	**Achieved.** 12 metres outer radius turning circle provided at key turning locations. Dead end roads will be clearly sign posted.
	traffic management devices are constructed to facilitate access by emergency services vehicles.	**Achieved.** No traffic management devices installed
	a minimum vertical clearance of four metres to any overhanging obstructions, including tree branches, is provided.	**Achieved**
	curves have a minimum inner radius of six metres and are minimal in number to allow for rapid access and egress.	**Achieved**
	the minimum distance between inner and outer curves is six metres.	**Achieved**
	maximum grades do not exceed 15 degrees and average grades are not more than 10 degrees.	**Achieved**
	Cross fall of the pavement is not more than 10 degrees.	**Achieved**
	roads do not traverse through a wetland or other land potentially subject to periodic inundation (other than flood or storm surge).	**Achieved**
	roads are clearly sign-posted and bridges clearly indicate load ratings.	**Achieved**
	the internal road surfaces and bridges have a capacity to carry fully-loaded firefighting vehicles (15 tonnes).	**Achieved**

15. Construction Standards

The existing buildings will be upgraded, where relevant, as described in the *RFS Building Best Practice Guideline – Upgrading Existing Buildings* to meet BAL Flame Zone in accordance with AS3959.

The BAL FZ construction requirements are well above the BAL 12.5 construction that is required as a result of the radiant heat modelling.

In working through issues with the RFS, considerable redundancy has been provided that will provide BAL FZ construction to the external façade of the buildings for Stage 2 and 3 that will complement works already completed for Stage 1.

The external façade and roofs are to be constructed to achieve at least BAL-FZ in accordance with AS 3959-2009 Amendment 3 to withstand flame impingement. Additionally, the school building (contained Homebases 1-5, excluding Homebase 6) is to be subdivided into three fire-separated compartments, to provide provision for horizontal evacuation of students, in the event of one part of the building being affected by fire. This strategy is further aided by the provision of internal sprinklers to control fire growth in the event of a fire spreading into the building as a result of bushfire.

16. Evacuation and Emergency Management

The adopted and signed off *Bushfire Evacuation Plan* and procedures have been completed in accordance with RFS *Guide to Developing A Bushfire Emergency Management Plan* and meet the requirements of *Australian Standard AS 3745-2010 – Planning for Emergencies in facilities*. On-site and off-site evacuation procedures are included and will be re-worked through with key stakeholders (emergency services and staff) prior to occupation of Stage 2 and 3 opening. The *Bushfire Emergency Management and Evacuation Plan* is a separate document.

Emergency Management arrangements and the Bushfire Evacuation Plan will cater for a wide range of scenarios including large campaign fires and fast run fires impacting the site within a short time frame. A bushfire refuge will be provided within the school that provides a two-hour fire rating within a designated building that can provide short-term shelter from the immediate life-threatening effects of a bushfire event.

The refuge will provide one of a number of contingency shelter and evacuation options for the school community. The Australian Building Codes Board (ABCB) has developed a technical handbook for the design and construction of Community Fire Refuges which will be used in the design and construction of the refuge.

The Evacuation Plan will clearly state that the safest option is to be out of bushfire prone areas in the event of a fire. However, it will provide sheltering options in a refuge as a last resort option when it is no longer safe to move to an area not prone to bushfire risk.

16.1. Occupant Evacuation

For occupant evacuation, these provisions will consist of the following:

- Detection and monitoring provisions to provide ample warning to users
- Adequate egress routes, in terms of the number of routes, the width and quality of the routes, capacity of any staging areas and shelters
- Provision for disabled or occupants requiring particular assistance
- Training of teachers as wardens
- Automatic updates to parents and caregivers to deter parents from collecting children and clogging roads once evacuation has begun
- Measures to manage effects of simultaneous evacuation of occupants of nearby buildings who are evacuating at the same time.

Detection will take the form of an automated Emergency Management System which will notify the School Principal and staff are notified of fire ignition and fire progression within the nearby bush. This has been completed and will be further developed with the Department of Education and key stakeholders.

The Emergency Management System (EM System) utilises the trigger points from the *Bushfire Management and Evacuation Plan* with a series of "Evacuation Region" and "Stay-in-Place Regions," which are derived according to the geography, vegetation, expected bushfire behaviour and weather conditions. Bushfire spread into these zones are intended to inform the response of school staff. If bushfire ignites within, or progresses into, the Evacuation Region applicable to that day's weather conditions, then the Principal will be advised to commence evacuation.

In the unlikely event that bushfire proceeds past the Evacuation Region into Stay in Place Region prior to the commencement of evacuation, then Defend-in-Place procedures are to be initiated. It is proposed to include updates to parents (via text message or other means) to keep parents informed once students are evacuating.

Once the decision to evacuate has been taken, a full-school evacuation to Lindfield Public School (corner of Eton Road and the Pacific Highway) is to be initiated. Egress is to proceed from the school via Dunstan Grove and Eton Road. The school population may then be split via Grosvenor Road (access via Austral Avenue) and Eton Road. Evacuation is to take place via footpaths with some roads crossed (i.e. there is no walking on the carriageways).

In order to manage the evacuation of students, teachers are to be provided with regular (bi-annual) training on egress procedures, including when to commence evacuating, the evacuation route (s), and any hazards en route (road crossings, pinch points etc).

Students requiring particular assistance to evacuate are to be allocated a staff member prior to a bushfire event to supervise during evacuation. It is anticipated that local residents may be evacuating at the same time as the school evacuates which could lead to congestion on the carriageways, but it is unlikely to lead to congestion on the footpaths. Similarly, the fire brigade may be attempting to access the site or the vicinity. It is expected that most local residents would evacuate by vehicle, rather than on foot.

Fire Brigade is provided with alternative routes on roads parallel to the streets upon which the school is evacuating. Nevertheless, the contribution of simultaneous evacuation of neighbouring occupants,

and access by fire brigade is to be addressed by providing planned and demarcated road crossing locations and is to be factored into the calculation of evacuation times so that early evacuation is favoured to avoid congestion.

16.2. Defend-in-Place as last resort

In the unlikely event that the school is not closed on a high risk day or evacuation is not initiated in time for safe egress of all occupants based on the progress of the bushfire against the mapped response plans, the buildings has been designed to permit "Defend in Place" as a fall-back position.

During Defend-in-Place, students and staff will shelter within the buildings (see separate Bushfire Emergency Management and Evacuation Plan) until the immediate fire danger is passed and safe evacuation is possible. Support from the Fire Brigade during Defend-in-Place may be provided but is not relied upon. The provisions for "Defend in Place" will consist of:

- BAL- FZ construction of building envelope (façade and roofs as a minimum) including bushfire shutters;
- Compartmentation within buildings to allow horizontal evacuation in the event of failure of the external protection in bushfire
- Provision of internal sprinklers

The external façade and roofs are to be constructed to achieve at least BAL-FZ in accordance with AS 3959-2009 Amendment 3 to withstand flame impingement. Additionally, the school building (contained Homebases 1-5, excluding Homebase 6) is to be subdivided into three fire-separated compartments, to provide provision for horizontal evacuation of students, in the event of one part of the building being affected by fire. This strategy is further aided by the provision of internal sprinklers to control fire growth in the event of a fire spreading into the building as a result of bushfire.

17. Fire Spread Control and NCC fire compliance

Internal construction and management requirements will be undertaken prior to occupation of Stage b2 and 3 to achieve an acceptable level of life safety within the building to satisfy the performance requirements of the NCC.

These requirements will provide a safe refuge in the event of a fire in the adjoining reserve.
The following internal works will be undertaken to meet NCC and Australian Standard requirements:

- The building is of type A construction and will be divided into a number of fire compartments based on the requirements of NCC, which include 120-minute fire rating between compartments.
- A smoke detection system will be installed in accordance with NCC and AS1670.1: 2004.
- The building will be equipped with portable fire extinguishers in accordance with Clause E1.6 of the NCC and AS2444: 2001.
- Exit signage in accordance with AS 2293.1:2005.
- A sound system and intercom system for emergency purposes shall be installed in accordance with AS 1670.1:2004 and AS 1670.4:2004. This warning system will be connected to the smoke detection and sprinkler systems throughout the buildings and will sound throughout upon activation of these systems.
- Emergency lighting in accordance with AS 2293.1:2005 will be installed throughout the buildings to assist the evacuation of occupants in low light conditions.
- The fire hydrant system incorporating internal and external hydrant connections as required to ensure coverage in accordance with AS 2419.1:2005.

18. Proposed Bush Fire Safety Design Requirements

This section describes the Bush Fire Safety system, and its constituent features. The measures shall include (but are not limited to):

1. All new and existing external facades and roofs of the school buildings are to comply with AS 3959-2009 Amendment 3.

2. All buildings are to be provided with internal sprinkler system complying with AS 2118.1 – 2017.

3. On-site water storage and pumping is to be provided where the use of water in a bushfire event (firefighting by Fire Brigades, or neighboring properties) could result in a loss of flow or pressure to the Lindfield Learning Village.

4. The school buildings are to be subdivided into not less than three fire compartments, separated by fire-resisting construction achieving an FRL of at least -/120/120. Each compartment will have sufficient capacity for the entire school population (students and staff).

5. Sufficient egress width (2 x 1.2 m footpaths as a minimum) is to be provided so that school users travelling on footpaths can reach the corner of Austral Avenue and Eton Road within 15 minutes of the commencement of evacuation. Egress width must accommodate obstacles on footpaths such as powerboxes, telephone boxes and other amenities which would otherwise reduce the available egress width.

6. Any road crossings needed for evacuation must be provided with pedestrian crossings or be manned by assigned staff.

7. Live updates of fire weather and bushfire risk, as well as notification of any bushfires in Lane Cove is to be provided visually as well as directly to the School Principal. Mapping of bushfire "Evacuation" and "Defend-in-Place" regions is to be undertaken to inform bushfire response decisions. School management is to undergo regular training on the response to bushfire alerts.

8. Teachers are to undergo bi-annual (semi-annual) bush fire training, including egress routes, when to commence evacuating, any equipment or procedures to assist those needing assistance.

9. Students who may require special assistance in order to evacuate in a bushfire event must be allocated a supervisor (teacher, staff member) to assist their evacuation. A bushfire evacuation plan for each student requiring assistance is to be made.

10. A fire trail is to be provided to provide access to the south and east perimeter of the site. All roads are to comply with the fire brigade vehicular access requirements of Planning for Bushfire Protection 2018

19. Assessment Against the Aim and Objective of PBP

The RF Reg requires an assessment of the extent to which the proposed development conforms with or deviates from the standards, specific objectives and performance criteria set out in Chapter 4 (Performance Based Controls) of PBP. All development in Bushfire Prone Areas needs to comply with the aim and objectives of PBP. Table 5 shows the compliance with PBP.

Table 3 Compliance with Aim & Objectives of PBP

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	Landscaping, defendable space, access and egress, emergency risk management and construction standards are in accordance with the requirements of PBP and the aims of PBP have been achieved. APZs of 100m have been provided to the school parts of the existing buildings and no students will be within 100m of bushfire hazard vegetation for the Stage 1 School.
Objectives	**Meets Criteria**	**Comment**
Afford occupants of any building adequate protection from exposure to a bushfire.	Yes	The maximum exposure to a bushfire for the area where the development is proposed is 10KwM of radiant heat. Transect 9 models radiant heat of 14.9kW. BAL FZ provides significant redundancy to prevent material ignition.
Provide for defendable space to be located around buildings.	Yes	Defendable space and APZs are provided on all sides of the proposed development.
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 of has been provided to the Stage 2 and 3 School. See Figure 10
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 will be completed prior to occupation. A new loop road is proposed around the southern and western perimeter of the site that will meet PBP 2018.
Provide for ongoing management and maintenance of bushfire protection measures, including fuel loads, in the asset protection zone.	Yes	A landscape and bush management plan for the compound and area surrounding the compound is included with the development application.
Ensure that utility services are adequate to meet the needs of firefighters (and others assisting in bushfire fighting).	Yes	Fire services are being updated throughout the site. Existing ring mains supply a hydrant system.

20. Project Specific Objectives – Addressing Specific Objectives

This section describes the Performance Requirements applicable to the site that are to be met. Table 1 provides a summary of the non-compliances to be addressed as part of the Bush Fire Performance Solutions.

Table 4 - Summary Table of Performance Criteria and Proposed Strategy

Performance Criteria	Acceptable Solution	Proposed Strategy	Proposed Solution
Radiant heat levels of greater than 10kW/m² (calculated at 1200K) are not experienced by emergency service personnel and occupants during firefighting and emergency management.	The building is provided with an APZ in accordance PBP	Establish and maintain APZ as per Figure 10.	Options for to mitigate the risk are provided in the Bushfire Evacuation Plan including; • closure of the school under local arrangements • early evacuation off site • seeking refuge in the designated refuge area within the school
Issues relating to slope are addressed: Maintenance is practical, soil stability is not compromised and the potential for crown fires is negated	Issues relating to slope are addressed: maintenance is practical, soil stability is not compromised and the potential for crown fires is negated	A management plan is to be prepared that describes the maintenance measures required to maintain the APZ, including management of sloping aspects.	An APZ management plan is to be prepared that describes the maintenance measures that the Department of Education will undertake to manage the APZ to the IPZ. The plan will include timings of any treatments, health and safety and access requirements.
APZs are managed and maintained to prevent the spread of a fire towards the building	The APZ is managed in accordance with the requirements of RFS Standards for APZS, and mechanisms are in place to provide for the maintenance of the APZ over the life of the development.	The APZ is partially within the subject site and partially on neighbouring property. The Dept of Education is to take responsibility for the management of all APZs to ensure these are adequately managed.	The APZ is partially within the subject site and partially on neighbouring property. Access is to be established to these areas to provide measures to manage the APZ to the level of IPZ A positive covenant under Section 88 of the Land Titles Act, is to be sought to broaden coverage to adjacent areas of APZ so that these areas can be maintained.
Landscaping is managed to minimise flame contact, reduce	Landscaping is in accordance with 'Asset protection zone standards' (see Appendix	A management plan is to be prepared that describes the	An APZ management plan is to be prepared that describes the

Performance Criteria	Acceptable Solution	Proposed Strategy	Proposed Solution
radiant heat levels, minimise embers and reduce the effect of smoke on residents and firefighters	4)	maintenance measures required to maintain the APZ, including management of landscaping.	maintenance measures that the Department of Education will undertake to manage the landscaping around the school buildings, including removing fuel load close to buildings. The plan will include timings of any treatments, health and safety and access requirements.
The proposed building can withstand bush fire attack in the form of wind, smoke, embers, radiant heat and flame contact	A construction level of BAL-12.5 under AS 3959 or NASH and Table 7.4b is applied.	All new and existing facades and roofs are to achieve BAL-FZ in accordance with AS 3959	The existing concrete facades are to be retained, with windows/doors/openings treated with fire-resisting shutters or replaced with fire-resisting equivalents. Roofs are to achieve an FRL of at least -/30/- and the outer layer is to be noncombustible.
Firefighting vehicles are provided with safe, all-weather access to structures and hazard vegetation	▪ SFPP access roads are two-wheel drive, all-weather roads, and ▪ access is provided to all structures and hazard vegetation ▪ traffic management devices are constructed to not prohibit access by emergency services ▪ vehicles access roads must provide suitable turning areas in accordance with PBP	A new road is to provided to provide access to the site. The roads comply with the Acceptable Solution.	All existing roads within the site are 8m drivable surface. A new loop road is to provide to provide access to the perimeter of the site. The roads comply with the Acceptable Solution.
The capacity of access roads is adequate for firefighting vehicles	▪ The capacity of road surfaces and any bridges/ causeways is sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes); bridges and causeways are to clearly indicate load rating	Surfaces comply with the Acceptable Solutions.	Surfaces comply with the Acceptable Solutions.
There is appropriate access to water supply	▪ Hydrants are located outside of parking reserves and road	Hydrants are provided in accordance with AS 2419.1-2005.	Comply with acceptable solution Hydrants are provided in

Performance Criteria	Acceptable Solution	Proposed Strategy	Proposed Solution
	carriageways to ensure accessibility to reticulated water for fire suppression, and ▪ hydrants are provided in accordance with AS 2419.1:2005 ▪ there is suitable access for a Category 1 fire appliance to within 4 m of the static water supply where no reticulated supply is available	Static water supply may be required to ensure sufficient pressures and flows in times of bushfire (high water use)	accordance with AS 2419.1-2005
Perimeter access roads are designed to allow safe access and egress for medium rigid firefighting vehicles while occupants are evacuating as well as providing a safe operational environment for emergency service personnel during firefighting and emergency management on the interface	▪ There are two-way sealed roads, and ▪ 8 m carriageway width kerb to kerb, and ▪ parking is provided outside of the carriageway width, and ▪ hydrants are to be located clear of parking areas, and ▪ there are through roads, and these are linked to the internal road system at an interval of no greater than 500m, and ▪ curves of roads have a minimum inner radius of 6m, and ▪ the maximum grade road is 15° and average grade is 10°, and ▪ the road crossfall does not exceed 3°, and ▪ a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided	Comply with acceptable solution	Comply with acceptable solution
Non-perimeter access roads are designed to allow safe access and egress for medium rigid firefighting vehicles while occupants are evacuating	▪ Minimum 5.5m width kerb to kerb, ▪ and parking is provided outside of the carriageway width, and ▪ hydrants are located clear of parking areas, and ▪ there are through roads, and these are linked to the internal road system	All roads are to comply with the fire brigade vehicular access requirements of Planning for Bushfire Protection 2018.	Comply with acceptable solution

Performance Criteria	Acceptable Solution	Proposed Strategy	Proposed Solution
	at an interval of no greater than 500m, and ▪ curves of roads have a minimum inner radius of 6m, and ▪ The maximum grade road is 15° and average grade is 10°, and ▪ the road crossfall does not exceed 3°, and ▪ a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.		
A water supply is provided for firefighting purposes	▪ reticulated water is to be provided to the development, where available, or ▪ a 10,000 litres minimum static water supply dedicated for firefighting purposes is provided for each occupied building where no reticulated water is available.	Complies with Acceptable Solution	Reticulated water is provided to the development.
Water supplies are located at regular intervals the water supply is accessible and reliable for firefighting operations	▪ fire hydrant spacing, design and sizing comply with the Australian Standard AS2419.1:2005, and ▪ hydrants are not located within any road carriageway, and ▪ reticulated water supply to SFPPs uses a ring main system for areas with perimeter roads, and	Complies with Acceptable Solution	Fire hydrants to be provided in accordance with AS 2419.1:2005.
Flows and pressure are appropriate	▪ fire hydrant flows and pressures comply with AS2419:2005, and	Complies with Acceptable Solution, however, additional onsite storage may be required to ensure that the sprinkler system achieves required pressure and flow during a bushfire.	
The integrity of the water supply is maintained	▪ all above-ground water service pipes external to the building are metal, including and up to any taps, and		
A static water supply is provided	▪ a connection for firefighting purposes	Comply with acceptable solution	Comply with acceptable solution

Performance Criteria	Acceptable Solution	Proposed Strategy	Proposed Solution
for firefighting purposes in areas where reticulated water is not available	is located within the IPA or non hazard side and away from the structure; a 65mm Storz outlet with a ball valve is fitted to the outlet, and ▪ ball valve and pipes are adequate for water flow and are metal, and ▪ supply pipes from tank to ball valve have the same bore size to ensure flow volume, and ▪ underground tanks have an access hole of 200mm to allow tankers to refill direct from the tank, and ▪ a hardened ground surface for truck access is supplied within 4m of the access hole, and ▪ above-ground tanks are manufactured from concrete or metal, and ▪ raised tanks have their stands constructed from non-combustible material or bush fire-resisting timber (see Appendix F AS 3959), and ▪ unobstructed access can be provided at all times, and ▪ tanks on the hazard side of a building are provided with adequate shielding for the protection of firefighters, and ▪ underground tanks are clearly marked, and ▪ all exposed water pipes external to the building are metal, including any fittings, and ▪ where pumps are provided, they are a minimum 5hp or 3kW petrol or diesel-powered pump, and are shielded against bush fire attack; any hose and		

Performance Criteria	Acceptable Solution	Proposed Strategy	Proposed Solution
	reel for firefighting connected to the pump shall be 19mm (internal diameter), and ▪ fire hose reels are constructed in accordance with AS/NZS 1221:1997 Fire hose reels, and installed in accordance with AS 2441:2005 Installation of fire hose reels		
The location of electricity services limits the possibility of ignition of surrounding bush land or the fabric of buildings	▪ Where practicable, electrical transmission lines are underground, and ▪ where overhead, electrical transmission lines are proposed as follows: o lines are installed with short pole spacing (30m), unless crossing gullies, gorges or riparian areas, and o no part of a tree is closer to a power line than the distance set out in accordance with the specifications in ISSC3 Guideline for Managing Vegetation Near Power Lines	Complies with Acceptable Solution	Comply with acceptable solution
The location and design of gas services will not lead to ignition of surrounding bushland or the fabric of buildings	▪ Reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:2014 and the requirements of relevant authorities, and metal piping is used, and ▪ all fixed gas cylinders are kept clear of all flammable materials to a distance of 10m and shielded on the hazard side, and ▪ connections to and from gas cylinders are metal, and ▪ if gas cylinders need to be kept close	Complies with Acceptable Solution	

Performance Criteria	Acceptable Solution	Proposed Strategy	Proposed Solution
	to the building, safety valves are directed away from the building and at least 2m away from any combustible material, so they do not act as a catalyst to combustion, and ▪ polymer-sheathed flexible gas supply lines to gas meters adjacent to buildings are not used, and ▪ above-ground gas service pipes external to the building are metal, including and up to any outlets.		
A bush fire emergency and evacuation management plan is prepared	▪ bush fire emergency management and evacuation plan is prepared consistent with the: o The NSW RFS document: A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan, NSW RFS Schools Program Guide (where applicable) o Australian Standard AS 3745:2010 Planning for emergencies in facilities, and o Australian Standard AS 4083:2010 Planning for emergencies – Health care facilities (where applicable), and ▪ The emergency and evacuation management plan should include a mechanism for the early relocation of occupants. Note: A copy of the bush fire emergency management plan should be provided to the Local Emergency Management Committee for its information prior to occupation of the development.	Complies with Acceptable Solution. Detailed bush fire emergency and evacuation management plans are to be prepared. Regular training provided to school staff.	Complies with Acceptable Solution

Performance Criteria	Acceptable Solution	Proposed Strategy	Proposed Solution
Stable management arrangements are established for consultation and implementation of the bush fire emergency and evacuation management plan.	▪ an Emergency Planning Committee is established to consult with residents (and their families in the case of aged care accommodation and schools) and staff in developing and implementing an Emergency Procedures Manual, and ▪ Detailed plans of all emergency assembly areas including 'on-site' and 'off-site' arrangements as stated in AS 3745 are clearly displayed, and an annual (as a minimum) trial emergency evacuation is conducted.	Complies with Acceptable Solution. Detailed bush fire emergency and evacuation management plans are to be prepared. Regular training provided to school staff.	Complies with Acceptable Solution

21. Significant Environmental Features

Separate ecological assessment.

22. Threatened Species

Separate ecological assessment.

23. Aboriginal Objects or Places

Separate assessment

24. Recommendations

The DoE primarily seeks full approval to the amended SSD 16_8114 to provide for the opening of the Stage 2 School in Term 1, 2020.

The following recommendations are made for the bushfire protection measures for the site.

1. All new and existing external facades and roofs of the school buildings are to comply with AS 3959-2009 Amendment 3 for BAL Flame Zone.
2. Prior to the issue of a Construction Certificate for the Stage 2 and 3 School, the Department of Education shall deliver a Bushfire Management Plan, including Vegetation Management Plan setting out how it will comply with the provision and ongoing management of Asset Protection Zones in accordance with *Planning for Bushfire Protection, 2018*.
3. Prior to occupation and in perpetuity, an Asset Protection Zone shall be established and maintained in accordance with Figure 10.
    3.1. The APZ shall be established and maintained as an inner protection area as outlined within PBP and the NSW RFS document '*Standards for Asset Protection Zones*' except where an Outer Protection Area of a maximum of 30m is provided from the outer most extent of the APZ boundary.
    3.2. The areas adjacent to buildings and between the private access road will be managed as open space above APZ Standards to provide an outcome that is in keeping with a highly managed parkland environment.
4. Prior to the issue of a Construction Certificate for the Stage 2 and 3 School, the Department of Education shall update the Blackash Bushfire Consulting *Bushfire Emergency Management and Evacuation Plan* that is locally relevant and tailored with key stakeholders to a range of scenarios.
5. The proposed loop road is to comply with the requirements of *Planning for Bushfire Protection 2018*.
6. Gates will be provided in the proposed fence to permit access for emergency service to the southern and western APZs.

25. Conclusion

State Significant Development application (SSD 16_8114) for the Lindfield Learning Village includes development for a school. This report supports the approval of the Stage 2 and 3 to be operational for Term 1, 2020. The Stage 1 works were approved by the NSW Department of Planning and supported by the NSW Rural Fire Service in 2018. Stage 2 and 3 are for the reuse and re-purposing of the existing educational facilities through State SSD application (SSD 16_8114).

As a State Significant Development application, the Department of Planning and Environment is responsible for assessing development applications relating to these project types. The Minister for Planning is the consent authority for SSD applications.

The design team has worked with a range of stakeholder's top provide a best practice performance-based solution for Stage 2 and 3. Recommendations have been made to provide for the life safety of occupants and emergency services.

The Stage 2 and 3 School meets the requirements of *Planning for Bushfire Protection 2006 and 2018*.

BPAD Bushfire Planning & Design Accredited Practitioner Level 3

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Appendix 1 References

Australian Building Codes Board *Building Code of Australia Volumes 1&2*

Australian Standard AS/NZS 1596 'The storage and handling of LP Gas'

Councils of Standards Australia AS3959 (2009) – *Australian Standard Construction of buildings in bushfire-prone areas*

International fire engineering guidelines (2005) ABCB for the Australian Government, State and Territories of Australia 2005

Keith, David (2004) – *Ocean Shores to Desert Dunes – The Native Vegetation of New South Wales and the ACT*. The Department of Environment and Climate Change

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

NSW Rural Fire Service (2011) Practice Note 1/11 Telecommunication Towers in Bushfire Prone Areas

NSW Rural Fire Service (RFS). 2006. *Planning for Bushfire Protection: A Guide for Councils, Planners, Fire Authorities, Developers and Home Owners.* Australian Government Publishing Service, Canberra

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