BLACKASH
BUSHFIRE CONSULTING

Strategic Bushfire Study

Planning Proposal:

Proposed Low Density Residential

Cumberland State Forest
89-97 Castle Hill Road &
121-131 Oratava Avenue,
West Pennant Hills

Prepared for
Forestry Corporation of NSW

BPAD Bushfire Planning & Design Accredited Practitioner Level 3

Version 1.0

21 November 2024

Document Tracking

Project Name:	Planning Proposal – Cumberland State Forest, West Pennant Hills
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Project ref.:	J3786

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Document Control

Version	Primary Author(s)	Description	Date Completed
0.1	Corey Shackleton	Draft	13 November 2024
0.2	Corey Shackleton	Draft (minor changes)	20 November 2024
1.0	Corey Shackleton	Final	21 November 2024

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Disclaimer

Contents

1. Glossary

This section defines those core terms and concepts which are adopted throughout the body of this report.

Term	Definition
Asset Protection Zone (APZ)	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 size of the required APZ varies with slope, vegetation and FFDI.
Bushfire	A general term used to describe fire in vegetation, includes grass fire.
Bushfire attack mechanisms	The various ways in which a bushfire can impact upon people and property and cause loss or damage. These mechanisms include flame contact, radiant heat exposure, ember attack, fire wind and smoke.
Bushfire Attack Level (BAL)	A means of measuring the severity of a building's potential exposure to ember attack, radiant heat, and direct flame contact. The BAL is used as the basis for establishing the requirements for construction to improve protection of building elements and to articulate bushfire risk.
Bushfire Design Requirements	A separate (Attachment 17) design document to assist the master planning with requirements and specifications to provide compliance with PBP 2019.
Bushfire prone land (BPL)	An area of land that can support a bushfire or is likely to be subject to bushfire attack, as designated on a bushfire prone land map.
Bushfire Hazard	Any vegetation that has the potential to threaten lives, property, or the environment.

Bushfire Strategic Study (SBS)	Provides the opportunity to assess whether new development is appropriate in the bushfire hazard context.
Bushfire Threat	Potential bushfire exposure of an asset due to the proximity and type of a hazard and the slope on which the hazard is situated.
Hazard	A hazard is any source of potential harm or a situation with a potential to cause loss. A hazard is therefore the source of risk.
Likelihood	The chance of an event occurring. Likelihood may be represented as a statistical probability (such as an annual exceedance probability), or whether this is not possible, it can be represented qualitatively using measures such as 'likely', 'possible' and 'rare'.
Managed land	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), roads, 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. These areas are managed to meet the requirements of an APZ.
Mitigation	The lessening or minimizing of the adverse impacts of a bushfire event. The adverse impacts of bushfire cannot be prevented fully, but their scale or severity can be substantially lessened by various strategies and actions. Mitigation measures include engineering techniques, retrofitting and hazard-resistant construction as well as on ground works to manage fuel and separate assets from bushland.
Planning for Bushfire Protection 2019 (PBP)	NSW Rural Fire Service publication effective from 1 March 2020 which is applicable to all new development on bushfire prone land in NSW.

Resilience	The ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management. UNDRR 2017
Risk	The degree of risk presented by that interaction will depend on the likelihood and consequence of the bushfire occurring. Risk may be defined as the chance of something happening, in a specified period of time that will have an impact on objectives. It is measured in terms of consequences and likelihood.
Risk assessment	A systematic process of evaluating the potential risks that may be involved in a projected activity or undertaking, having regard to factors of likelihood, consequence, vulnerability, and tolerability.
Risk-based land use planning	The strategic consideration of natural hazard risk and mitigation in informing strategic land use planning activities.

2. Overview

Blackash Bushfire Consulting (Blackash) has been engaged by Forestry Corporation of NSW to undertake a Strategic Bushfire Study (SBS) in support of a Planning Proposal (PP) to enable the divestment of surplus forestry land and to facilitate low density residential development that is consistent with surrounding development at the Cumberland State Forest 89-97 Castle Hill Road and 121-131 Oratava Avenue, West Pennant Hills. The Subject Land (the site) is shown in Figure 1. The proposed northern lots for rezoning are shown in Figure 2 and the southern lots in Figure 3.

The Planning Proposal is not the result of a strategic study or report. Rather, the Planning Proposal is the result of Forestry identifying an opportunity to improve management of its assets and allocation of its resources and also to meet the housing needs of the local community.

Forestry has identified the sites as financially burdensome and surplus to its needs. The vacant caretaker dwellings are in disrepair, and the resources required for regenerating and managing the sites would impose a disproportionate financial burden on Forestry. Divesting the sites will enable Forestry to direct its resources in a more productive manner towards more other critical areas of the forest.

The intent of the Planning Proposal is to enable the divestment of surplus forestry land and to facilitate low density residential development that is consistent with surrounding development.

The proposed rezoning is consistent with the adjoining residential areas in terms of zoning, height and minimum lot size.

The PP has been prepared by Corey Shackleton (BPAD Level 3 Certified Practitioner BPAD 34603).

3. Site Description

The site is located in Cumberland State Forest in the suburb of West Pennant Hills in the local government area of The Hills Shire Council, approximately 3 km south east of the Castle Hill Strategic Centre and 20 km north west of Sydney CBD.

The site is separated into two distinct sub-sites, the northern site at 87-97 Castle Hill Road, and the southern site at 121-131 Oratava Avenue (see Figure 1).

The sites each contain a vacant single dwelling being former caretakers' dwelling and are not publicly accessible.

Figure 1: Location

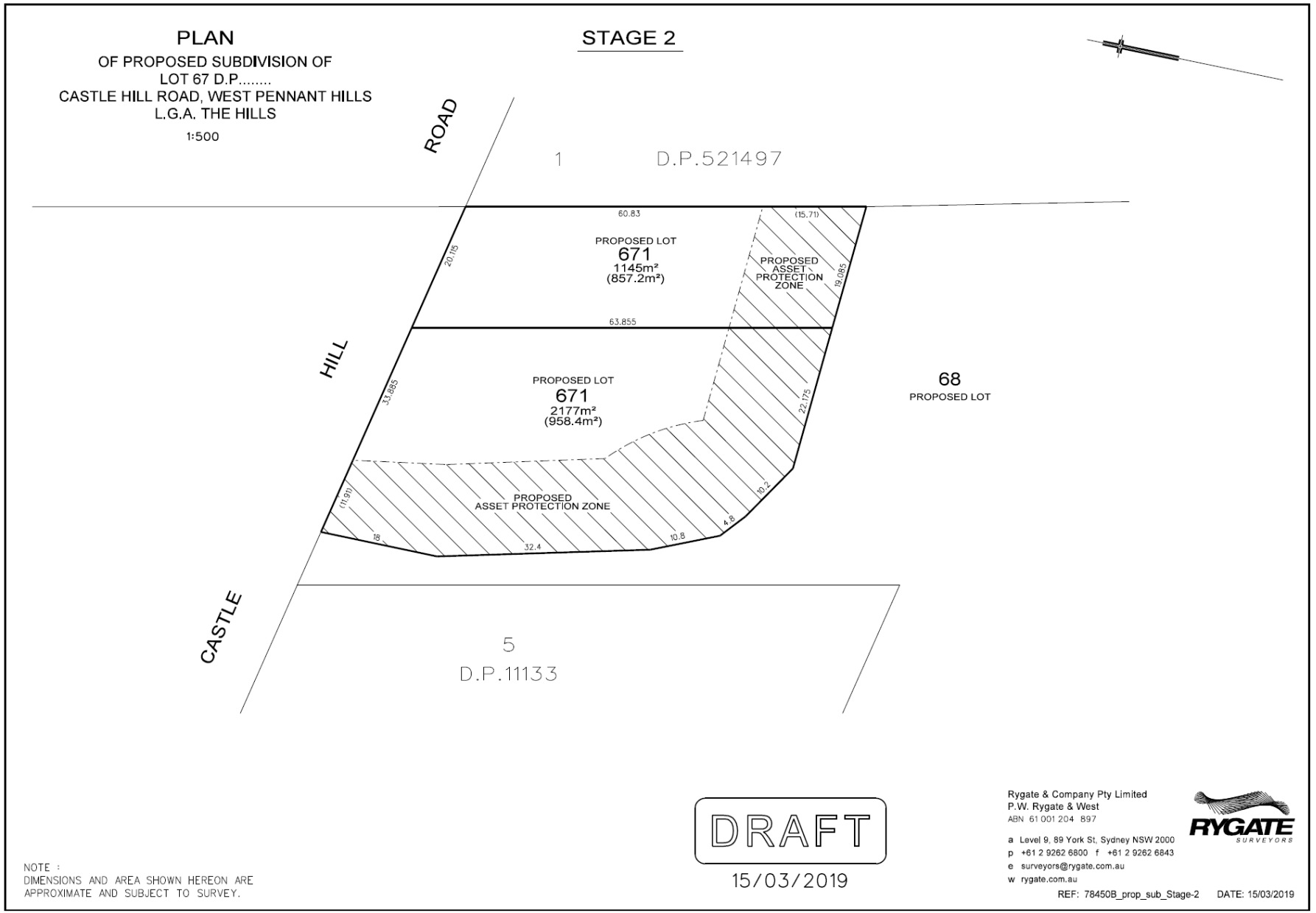

Figure 2: Proposed Rezoning – Northern Lots

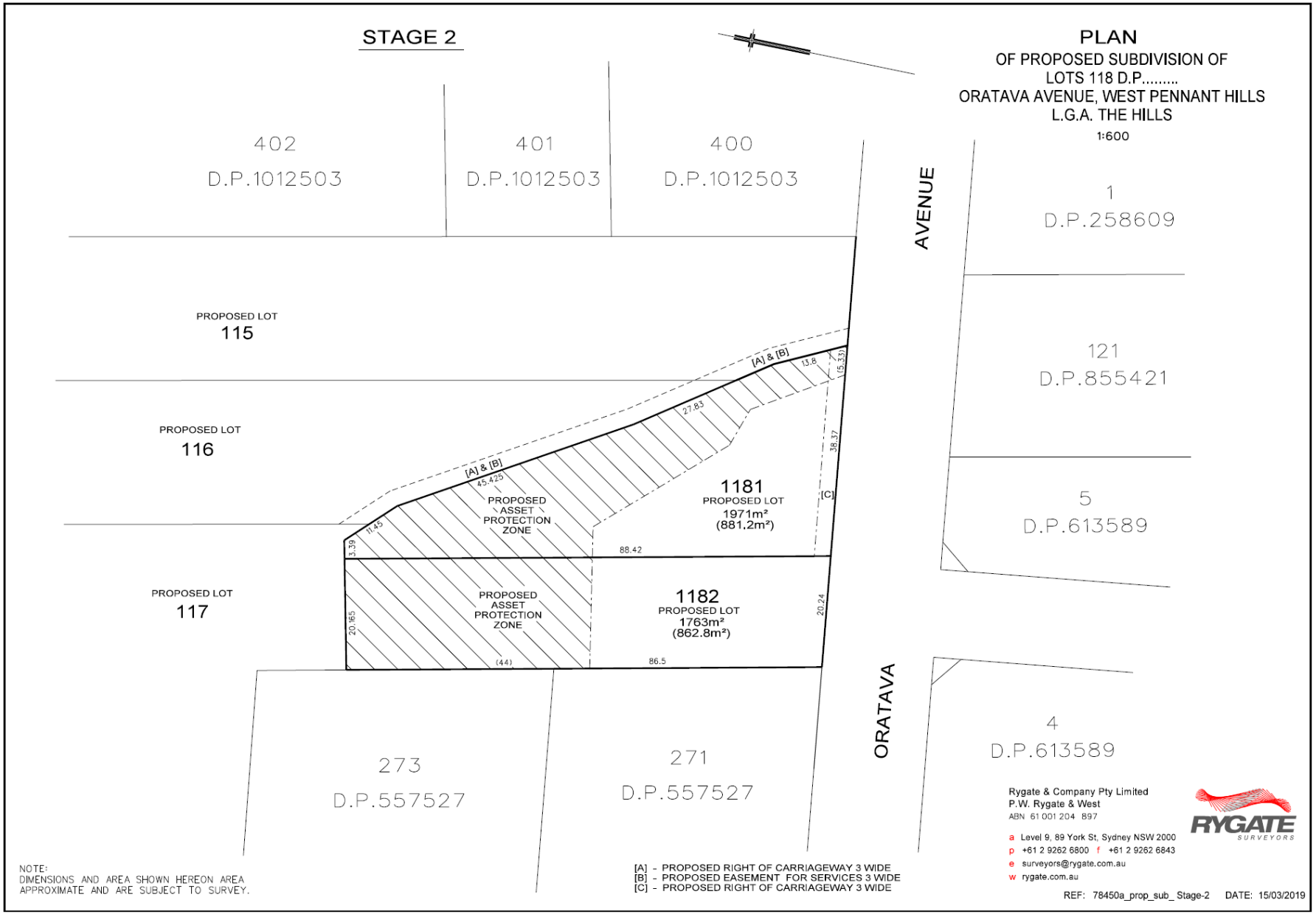

Figure 3: Proposed Rezoning – Southern Lots

4. Development Concept

This Planning Proposal is submitted on behalf of Forestry Corporation of NSW (the proponent) to seek amendments to The Hills Local Environmental Plan 2012 (The Hills LEP 2012) in relation to the site at 87-97 Castle Hill Road and 121-131 Oratava Avenue, West Pennant Hills.

The intent of the Planning Proposal is to enable the divestment of surplus forestry land and to facilitate low density residential development that is consistent with surrounding development.

To achieve this intent, the Planning Proposal proposes to:

- rezone the land from RU3 Forestry to R2 Low Density Residential
- apply a height limit of 9 m to the land
- amend the land's minimum lot size from 40 ha to 1,140 m2 for the northern site and 1,700 m2 for the southern site.

5. Credentials

This assessment has been prepared by Mr. Corey Shackleton, Principal Bushfire & Resilience at Blackash Bushfire Consulting (Level 3 FPAA BPAD-A Certified Practitioner No. BPD-PA-34603) who is recognised by the NSW Rural Fire Service (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.

Corey joined the NSW RFS in 2006 and held several roles before being promoted to Director Community Resilience in 2013. Corey also spent two years as Director Operational Mitigation Services where he was responsible for over 130 staff which included the State Mitigation crews as well as Remote Area Firefighting and Special Operations.

As the Director Community Resilience, with the NSW Rural Fire Service, Corey has been responsible for the leadership, management and implementation of the NSW legislative planning framework for developments in bushfire prone areas, bushfire prone land mapping, environmental approvals, Neighbourhood Safer Places, bushfire risk management and community planning, NSW bushfire mitigation grants and fire behaviour and predictive services.

Corey is an expert in the bushfire field and can interpret and apply legislation, policy and bushfire requirements while drawing on extensive professional expertise and experience.

6. Approach to the Bushfire Strategic Study

The PP and design of the site satisfies the requirements of PBP. Due to the merits of the site, a performance-based assessment has been used to more appropriately address APZ requirements.

The strategic planning process provides the opportunity to determine if the site complies with the legislative requirements pertaining to safety and potential risk to life and the capability of the site to comply with various bushfire objectives. This report uses a conservative approach that demonstrates the proposal can meet the legislative and planning requirements. The fundamental issue being tested in this PP application, is the determination of the suitability of the site for rezoning, considering bushfire safety and for the ability of future development to comply with PBP.

Pending rezoning approval, detailed information building on this PP will be provided in subsequent development applications. This PP provides opportunity for the plan-making authority and referral agencies to flag areas of concern and to determine the suitability of the proposal for rezoning.

In a bushfire context, strategic land use planning must ensure that future land uses are in appropriate locations to minimise the risk to life and property from bushfire attack. The broad principles which apply to the analysis, and which are demonstrated in this report are[1]:

- ensuring land is suitable for development in the context of bushfire risk and broader environmental impacts;
- ensuring new development on BPL will comply with the minimum requirements of PBP;
- minimising reliance on performance-based solutions;
- providing adequate infrastructure associated with emergency evacuation and firefighting operations; and
- facilitating appropriate ongoing land management practices.

This report will demonstrate that the PP affords utilisation of the site for the proposed residential development and is able to meet the Ministerial Direction and PBP.

A Method 2 approach has been used to determine the APZ requirements due to the existing circumstances of the site. Due to the small-scale (4 lots), this is considered an appropriate approach which ensures the best outcome for the site. All other BPM have been met using acceptable solutions provisions within PBP.

[1] Planning for Bushfire Protection 2019 p. 34

7. Strategic Planning for Bushfires

Land use planning is widely recognised as an important measure for limiting future vulnerabilities and losses in areas of new development and a critical element for building disaster resilient communities.

The physical design and layout of communities and settlements are central to the many functions that sustain the social, economic and environmental support systems for the community. Land use planning provides the opportunity to manage new growth and residual risk resulting from new development by complying with legislation and standards, limiting or modifying the location of new development and influencing its layout. This can limit both the impacts of new development on natural systems, ecosystem services and hazards and the flow on impacts on the existing community, as well as limiting the impacts that natural hazards can have on new development and its users.

The strategic planning system is particularly important in contributing to the creation of resilient, safe and sustainable communities that are in keeping with the policy and intent of government.

Comprehensive consideration of bushfires and risks in the NSW planning system needs sound understanding of the landscape context and risks, as well as clarity on risk management principles and on the approach to strategic planning and development controls that will adequately mitigate identified risks. Where there are competing policy objectives, such as biodiversity conservation and fuel reduction, an agreed methodology or guidance is critical. As such, planning decisions must be based on the best available evidence and rigorous merits-based assessment to ensure that new development - people, homes and businesses are not exposed to unacceptable risk from bushfire. The framework provided within PBP provides the minimum requirements for new development within bushfire prone areas.

The importance of sound land use planning has been recognised in most significant bushfire inquiries, including Natural Disasters in Australia which noted that land use planning that considers natural hazard risks is the single most important mitigation measure in preventing future disaster losses in areas of new development, and that planning, and development controls must be effective, to ensure that inappropriate developments do not occur[2]. The application of legislation, policy, and guidelines provides one of the most effective means of bushfire planning to ensure future developments are resilient and capable of protecting life.

This report focuses on disaster resilience which means planners, hazard leaders, emergency managers and other built environment professionals can contribute to:

[2] Ellis, S et al (2004) National Inquiry on Bushfire Mitigation and Management (p.92)

- understanding and anticipating bushfire risks before they happen and developing more resilient land use and built form tailored to address bushfire risks; and
- minimising the increase in risks to people and disruptions to social and economic functions when a disaster strikes by ensuring compliance with state requirements for new development in Bushfire Prone Areas.

This report uses the balanced approach provided within NSW for new development in Bushfire Prone Areas (BPA) that recognises the need to protect human life and provide safe operating environments for fire and emergency services, while having due regard to the environmental impacts, development potential of land and the need to cater for growing populations.

The *National Strategy for Disaster Resilience* (2011)[3] recognises that strategic planning is essential in creating safer and sustainable communities. In keeping with the policy and intent of government at all levels. Priority outcomes of Section 3.6 include:

- *All levels of decision making in land use planning and building control systems take into account information on risks to the social, built, economic and natural environments.*

This SBS has been completed having regard to the following Commonwealth documents:

- *National Strategy for Disaster Resilience* (2011);
- *Land Use Planning for Disaster Resilient Communities* (2020); and
- *National Disaster Risk Reduction Framework* (2018).

[3] NSDR https://www.homeaffairs.gov.au/emergency/files/national-strategy-disaster-resilience.pdf

8. Legislative Framework

The landuse planning framework as it relates to landuse planning and bushfire in NSW is embedded in the *Environmental Planning and Assessment Act, 1979* (EPA Act), the *Rural Fires Act 1997* (RF Act), *Rural Fires Regulation* 2013 (RFR) which is articulated through PBP.

The site contains designated Bushfire Prone Land (Figure 4). 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 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.

The site is identified as 'bushfire prone land' as mapped by The Hills Shire Council (Hills Shire LGA) for the purposes of Section 10.3 of the EPA Act and the legislative requirements for building on bushfire prone lands are applicable.

Figure 4 shows the hazard vegetation impacting on the site as Category 1 Bushfire Vegetation and the buffer zone associated with the Category 1 Bushfire Vegetation. As per the NSW Rural Fire Service (RFS) document *Planning for Bushfire Protection 2019* (PBP), the bushfire assessment will focus on the risk associated with the identified Forest vegetation. This does not preclude development; it merely starts the process to consider bushfire in the design of any new development.

8.1. Ministerial Direction 4.3 Planning for Bushfire Protection

NSW Ministerial Direction 4.3, titled "Planning for Bushfire Protection," outlines guidelines and requirements for managing bushfire risk in land use planning and development in New South Wales, Australia. It aims to ensure that development decisions consider and mitigate potential bushfire hazards effectively. The direction includes provisions for assessing bushfire risk, establishing appropriate buffer zones around designated bushfire-prone areas, and implementing measures to enhance community safety and resilience against bushfires. The directive emphasizes collaboration between relevant authorities, landowners, and developers to prioritize bushfire protection in urban and rural planning processes. The Ministerial Direction is provided in Appendix 2.

The EPA Act sets out the laws under which planning in NSW takes place. The main parts of the EPA Act that relate to development assessment and approval are Part 3 (Planning Instruments) and Part 4 (Development Assessment).

EPA Act Section 9.1 provides for the Planning Minister to direct councils to apply certain standards (detailed in the Direction) when preparing Planning Proposals for consideration. These Directions cover a range of practice areas and carry legislative weight.

Planning Direction 4.3 *Planning for Bush Fire Protection* (Appendix 2) states that:

> *This direction applies to all local government areas when a relevant planning authority prepares a planning proposal that will affect, or is in proximity to, land mapped as bushfire prone land.*

Importantly, a Planning Proposal must:

(a) have regard to Planning for Bush Fire Protection 2019

(b) introduce controls that avoid placing inappropriate developments in hazardous areas, and

(c) ensure that bushfire hazard reduction is not prohibited within the APZ.

The PP to amend the LEP has been submitted to the Department of Planning and Environment (DPE) and received Gateway Determination to proceed to Community Consultation. However, prior to community consultation, consultation was required with the NSW Rural Fire Service (NSW RFS). The application was subsequently referred to the NSW RFS who provided a range of comments in correspondence dated 11 October 2024.

These comments have been addressed through this assessment and a summary provided in Appendix 3.

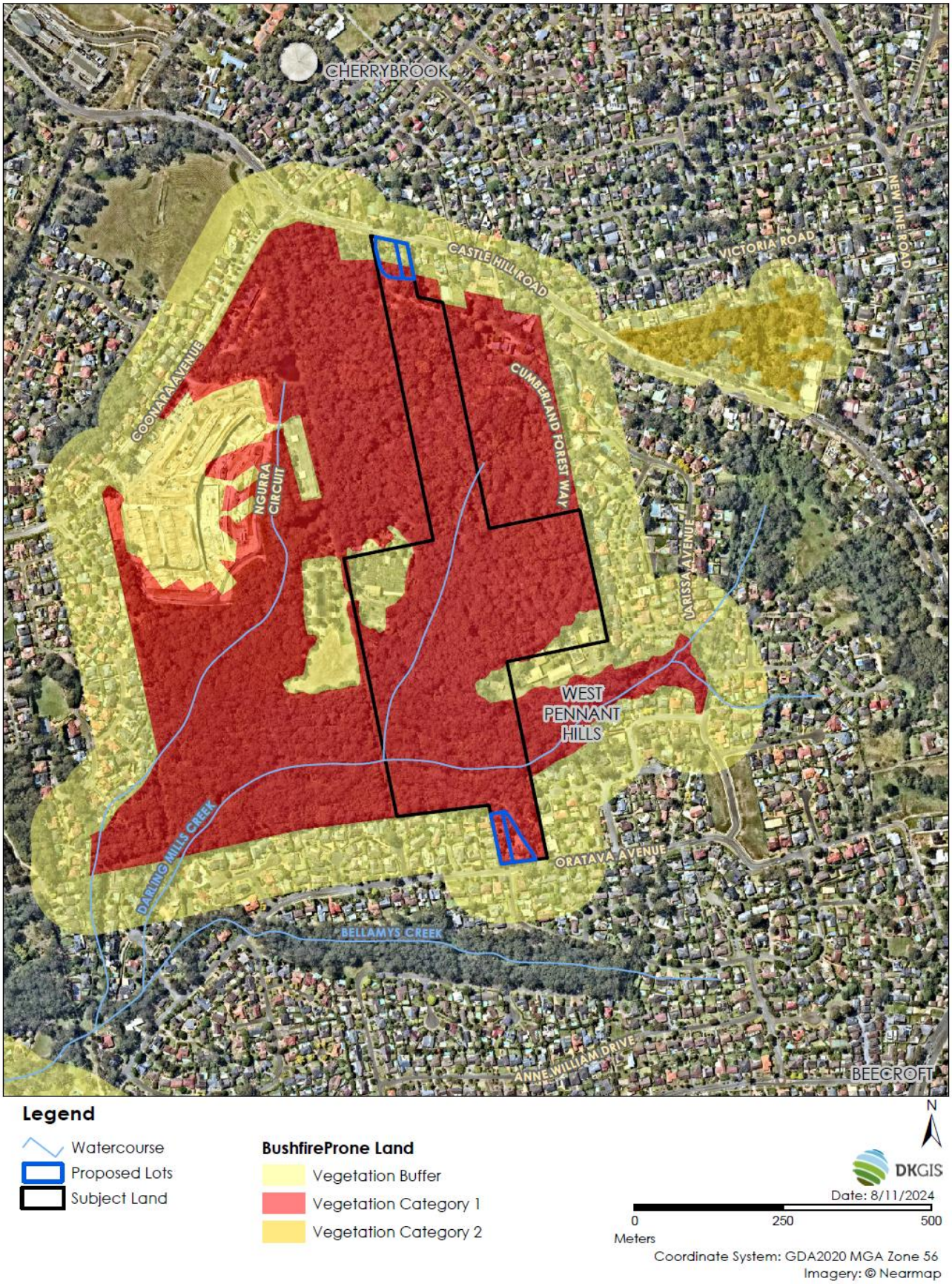

Figure 3: Bushfire Prone Land

8.2. Development Assessment

Bushfire Prone Land (BPL) is designated in accordance with s.10.3 of the EP&A Act. BPL 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 RFS. The entire site is designated Bushfire Prone Land.

Integrated development, under Division 4.8 of the EP&A Act, is development requiring consent and one or more additional approvals. Section 4.46 of the EP&A Act requires a Bushfire Safety Authority (BSA) from the RFS under Section 100B of the RFA for residential and rural residential subdivision, or development of land for a Special Fire Protection Purpose (SFPP) on BPL. The site is designated Bushfire Prone Land and as such, is Integrated development. An application for a BFSA must address the extent to which the development complies with PBP.

A BFSA authorises development to the extent that it complies with PBP including requirements for Asset Protection Zones (APZ), construction standards, landscaping, provision of water supply & utilities, access, and emergency management arrangements in combination considered by the Commissioner necessary to protect persons, property or the environment from danger that may arise from a bushfire.

On designated Bushfire Prone Land, new residential or rural residential subdivision development needs to justify that the PP results in development that can meet the requirements of PBP on a risk-based approach, inclusive of achieving a worst-case Bushfire Attack Level (BAL) of a maximum of BAL-29 at future potential building footprints.

Future building work on BPL must comply with the requirements of the *National Construction Code* (NCC). Under the Deemed to Satisfy provisions of the NCC, building work on BPL must comply with Australian Standard 3959:2018 *Construction of buildings in bushfire-prone areas* (*AS 3959*) or the National Association of Steel Framed Housing (2021) *Steel Framed Construction in Bushfire Areas* (NASH Standard).

8.3. General Obligations

All owners and land managers (both public and private) have a duty to prevent the occurrence and spread of bushfires on or from their land. This duty is legislated under Section 63 of the *RFA*.

Local risk mitigation is coordinated through Bushfire Risk Management Plans (BRMP). These guide programs to implement specific treatments. Treatments may include such things as hazard reduction burning, establishing and maintaining APZ, grazing, preparing pre-incident plans, establishing and maintaining fire trails and community engagement. These may be applied to public and private landowners and as notified steps carry the legislative weight of Section 63.

8.4. Planning for Bush Fire Protection 2019

The specific objective of this SBS is to assess the proposed development with the strategic assessment considerations in Chapter 4 of PBP. PBP provides the required considerations in addressing Ministerial Direction 4.3.

The PP outcome aligns with the strategic objective to deliver affordable housing supply, while demonstrating compliance with Ministerial Direction 4.3 and the requirements of PBP whilst also balancing other requirements such as access, amenity, ecology, and the like.

The SBS provides the opportunity to assess whether new development is appropriate in the bushfire hazard context at a strategic or landscape scale. It also provides the ability to assess the strategic implications of future development for bushfire mitigation and management. The SBS must first demonstrate the proposal complies with the overall Aim and Objectives of the document.

All new development on bushfire prone land must comply with PBP.

The **aim** of PBP (p. 10) is:

- *to provide for the protection of human life and minimise impacts on property from the threat of bushfire, while having due regard to development potential, site characteristics and protection of the environment.*

The **objectives** (PBP p. 10) are to:

- *Afford buildings and their occupants protection from exposure to a bushfire*
- *Provide for a defendable space to be located around buildings*
- *Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings*
- *Ensure that appropriate operational access and egress for emergency service personnel and occupants is available*
- *Provide for ongoing management and maintenance of Bushfire Protection Measures; and*
- *Ensure that utility services are adequate to meet the* needs of firefighters

Chapter 4 of PBP articulates the regulatory framework for Planning Proposals in NSW, along with a series of assessment considerations that are required before a determination can be made regarding a PP.

PBP Section 4.2 (in part, p. 34):

> *A Strategic Bush Fire Study must include, as a minimum, the components in Table 4.2.1.*
>
> *Once these strategic issues have been addressed, an assessment of whether the proposal can comply with this document should be carried out. If the strategic issues cannot be resolved, then the proposal cannot comply with PBP and will not be supported by the NSW RFS.*

Strategic planning will need to take account of the next level of detail required at Development Application (DA), but without needing to provide complete final project plans, or full assessments for each lot or the development proposed. This is designed to provide flexibility for later project stages while progressing the rezoning to permit the new uses.

To achieve compliance with PBP at DA stage, proposals must comply with either the acceptable solutions or the performance criteria, or a combination of both. While PBP is a performance-based document, the RFS have determined minimum standards for new development (PBP p. 26 and within each performance criteria – p. 43-48 for residential subdivision and p. 55 -61 for SFPP development).

- *For new residential development, potential building footprints must not be exposed to radiant heat levels exceeding 29 kW/m² on each proposed lot (calculated on a flame temperature of 1090 Kelvin); and*
- *SFPP developments, radiant heat levels of greater than 10kW/m² (calculated at flame temperature of 1200K) will not be experienced on any part of the building.*

Some dispensations are provided for specific types of SFPP development such as camping, bed and breakfast/ farm stay, ecotourism, and manufactured home estates (PBP p. 55). Commercial, industrial, and "other" development must meet the aim and objectives of PBP.

9. Strategic Planning Compliance

PBP requires that Planning Proposals in bushfire prone areas require the preparation of an SBS. For strategic level assessment, this requirement relies on the application demonstrating it is possible to provide complying asset protection zones (APZ) for the proposed development, and that roads and services (water, electricity and gas) will be able to be developed to meet PBP.

The SBS is a strategic level assessment, requiring a balance between providing sufficient information to determine the suitability of the site, without overly burdening proponents with detail to be managed / finalised at subsequent DA stage. PBP (p. 19) notes that:

> *The most important objective for strategic planning is to identify whether new development is appropriate subject to the identified bushfire risk on a landscape scale. An assessment of proposed land uses and potential for development to impact on existing infrastructure is also a key element of the strategic planning process in bushfire prone areas. Land use planning policies can be introduced to limit the number of people exposed to unacceptable risk.*
>
> *Once development has been assessed as being appropriate in its bush fire prone context, it will need to be capable of complying with PBP. The ability of proposed land uses and associated future developments to comply with PBP will be assessed at the strategic planning stage. The expectation will be that the development will be able to comply with PBP at the DA stage.*

The design team has considered and responded to the bushfire requirements within PBP. In a bushfire context, the design team has provided a PP that ensures future development is in appropriate locations to minimise the risk to life and property from bushfire attack. Future development will be able to comply with PBP at the DA stage.

The design team has incorporated the broad principles PBP (p. 34) for strategic planning into the PP which apply to the risk assessment of an area which includes:

- *ensuring land is suitable for development in the context of bushfire risk;*
- *ensuring new development on BPL will comply with PBP;*
- *minimising reliance on performance-based solutions;*
- *providing adequate infrastructure associated with emergency evacuation and firefighting operations; and*
- *facilitating appropriate ongoing land management practices.*

PBP also outlines exclusion of inappropriate development in bushfire prone areas which includes:

- *the development area is exposed to a high bushfire risk and should be avoided;*
- *the development is likely to be difficult to evacuate during a bushfire due to its siting in the landscape, access limitations, fire history and/or size and scale;*
- *the development will adversely effect other bushfire protection strategies or place existing development at increased risk;*
- *the development is within an area of high bushfire risk where density of existing development may cause evacuation issues for both existing and new occupants; and*
- *the development has environmental constraints to the area which cannot be overcome.*

PBP requires that the SBS must include, as a minimum, the components identified in Table 4.2.1 of PBP – Bushfire Strategic Study (p.35) as shown in Figure 5.

ISSUE	DETAIL	ASSESSMENT CONSIDERATIONS
Bush fire landscape assessment	A bush fire landscape assessment considers the likelihood of a bush fire, its potential severity and intensity and the potential impact on life and property in the context of the broader surrounding landscape.	❯ The bush fire hazard in the surrounding area, including: ❯ Vegetation ❯ Topography ❯ Weather ❯ The potential fire behaviour that might be generated based on the above; ❯ Any history of bush fire in the area; ❯ Potential fire runs into the site and the intensity of such fire runs; and ❯ The difficulty in accessing and suppressing a fire, the continuity of bush fire hazards or the fragmentation of landscape fuels and the complexity of the associated terrain.
Land use assessment	The land use assessment will identify the most appropriate locations within the masterplan area or site layout for the proposed land uses.	❯ The risk profile of different areas of the development layout based on the above landscape study; ❯ The proposed land use zones and permitted uses; ❯ The most appropriate siting of different land uses based on risk profiles within the site (i.e. not locating development on ridge tops, SFPP development to be located in lower risk areas of the site); and ❯ The impact of the siting of these uses on APZ provision.
Access and egress	A study of the existing and proposed road networks both within and external to the masterplan area or site layout.	❯ The capacity for the proposed road network to deal with evacuating residents and responding emergency services, based on the existing and proposed community profile; ❯ The location of key access routes and direction of travel; and ❯ The potential for development to be isolated in the event of a bush fire.
Emergency services	An assessment of the future impact of new development on emergency services.	❯ Consideration of the increase in demand for emergency services responding to a bush fire emergency including the need for new stations/ brigades; and ❯ Impact on the ability of emergency services to carry out fire suppression in a bush fire emergency.
Infrastructure	An assessment of the issues associated with infrastructure and utilities.	❯ The ability of the reticulated water system to deal with a major bush fire event in terms of pressures, flows, and spacing of hydrants; and ❯ Life safety issues associated with fire and proximity to high voltage power lines, natural gas supply lines etc.
Adjoining land	The impact of new development on adjoining landowners and their ability to undertake bush fire management.	❯ Consideration of the implications of a change in land use on adjoining land including increased pressure on BPMs through the implementation of Bush Fire Management Plans.

Figure 4: Requirements of a Bush Fire Strategic Study (PBP p. 35)

10. Landscape Assessment – Scale Context

10.1. Bushfire Prone Land

The bushfire landscape assessment considers the likelihood of a bushfire, its potential severity and intensity and the potential impact on life and property in the context of the broader surrounding landscape. The broader landscape and the potential size or scale of a bushfire has been a key design response by the project team throughout the preparation of the PP.

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 development on BPL are applicable.

Bushfire Prone Land Maps (BPLM) provide a trigger for the development assessment provisions and consideration of sites that are bushfire prone. BPL is land that has been identified by council, which can support a bushfire or is subject to bushfire attack. The BPLM are prepared by local councils and certified by the Commissioner of the NSW RFS.

BPLM map vegetation hazards and provide a suitable buffer distance from that vegetation. They are an indication of potential bushfire attack only and are not a risk assessment of land.

The current Hills Shire BPLM is accurate in the identification of land that is capable of sustaining a bushfire and areas that may be subject to bushfire attack.

The critical consideration here is that at the PP stage it is more important to consider the BPLM is based on the contemporary situation, rather than what will be the case as development occurs across the surrounding landscape. The BPLM remains a simple trigger to indicate hazard to be considered during stages of the development process.

The bushfire landscape assessment considers the likelihood of a bushfire, its potential severity and intensity and the potential impact on life and property in the context of the broader surrounding landscape. The broader landscape and the potential size or scale of a bushfire has been a key design response by the project team throughout the preparation of the PP.

The likelihood of a bushfire, its severity and intensity, and the potential impact on life and property varies depending on where a site is in the landscape. Two types of considerations are relevant in terms of assessing the bushfire hazard including:

- landscape scale hazard – where large expanses of vegetation over tens to hundreds of hectares are located in immediate proximity to, and may traverse, urban periphery suburbs/townships; and
- localised hazard – which is most commonly presented by fragmented areas of vegetation larger than 1 hectare in size.

These two types of hazard present different types of fire behaviour, fire intensity and potential rate of spread characteristics. The site is subject to a range of environmental and historical influences and features which provide the current urban form of the area, including bushfire, vegetation corridors, existing land uses, drainage and ecology/biodiversity values.

The site is affected by Category 1 Bushfire Vegetation and the buffer zone associated with the Category 1 Bushfire Vegetation. The site is not exposed to any possible landscape scale fires, but local fires are possible from within the isolated Cumberland State Forest. The bushfire protection measures have been designed in combination for the site to meet PBP. Separation from the unmanaged vegetation areas within the Cumberland State Forest meets the APZ requirements for Residential development, providing passive protection to both buildings and people within the site.

10.2. Assessment against adopted Bush Fire Risk Management Plan

The Hills Shire Bush Fire Management Committee (BFMC) is made up of local representatives of emergency services, land managers and the Council. They are appointed to the BFMC as they are considered the most expert bushfire management practitioners in their agencies in their respective local areas (note some individuals may be members of more than one BFMC). Their role is to combine both expert knowledge of bushfire and emergency management, and local knowledge to develop plans and priorities for bushfire risk management actions for their respective local areas.

The BFMC is responsible for producing *The Hills Shire Bush Fire Risk Management Plan 2024*. The Bush Fire Risk Management Plan (BRMP) is legislatively required under the *Rural Fires Act 1997* (RFA) and is a strategic document that identifies community assets at risk, rates the relative risks and set out a five-year program of coordinated multi-agency treatments to reduce the risk of bush fire to the assets. Treatments may include such things as mechanical hazard reduction (e.g., slashing, mowing), hazard reduction burning, grazing, community education and fire trail maintenance. The BRMP uses a state-wide methodology to risk assess all assets across the state consistently.

Forestry Corporation sits as a representative on The Hills District Bushfire Management Committee. The *Cumberland State Forest Fuel Management Plan* (FMP) 2020-2025, forms an addendum to the BFRMP, specifically stating CSF fuel management strategies and operational procedures over a 5 year period.

Cumberland State Forest is located within the NSW Fire Brigades precinct and works cooperatively with both the NSW Fire Brigade and the NSW Rural Fire Service North Rocks Brigade when undertaking fuel management activities, community consultation events and operational response.

10.3. The Cumberland State Forest Fuel Management Plan Assessment

The Cumberland State Forest FMP, provides the following relevant information for context:

> *'CSF is a 40ha forest located within West Pennant Hills, an urban suburb of Sydney. Originally privately owned land the area was cleared for agriculture in 1908. Purchased by the Forestry Commission in 1938, one third was planted as an arboretum and the remainder was allowed to regenerate and has been developed with a recreational and forest management focus.*
>
> *CSF is bounded to the south, north and east by residential development and to the west by the MIRVAC development . The grounds of MIRVAC are currently under construction and not only contain buildings, carparks and open areas but also 25ha of natural bushland. Together CSF and Mirvac form a significant area of vegetation and bushfire fuel located within an otherwise urban landscape.*
>
> *CSF is situated immediately south of the ridge forming the watershed between Berowra Creek (to the north) and Parramatta River. CSF is on the south west escarpment of the Hornsby Plateau near the Hornsby Warp that separates the plateau for the Cumberland Basin. A major geological interface between the Hawkesbury sandstone group and the overlying Wianamatta Shale group occurs within CSF. The shale rests comfortably on the sandstone, both dipping slightly south-east. The interface occurs at approximately the 120m contour.*
>
> *The shale series represented is Ashfield shale. This is evident in the northern section of CSF in a gently undulating topography without cliffs or rock outcrops. Sandstone occurs to a limited extent in the lower south-western section of the forest. This is evident by minor outcrops of sandstone rocks and small cliffs.*
>
> *The highest point of CSF is Castle Hill Road at 174m above sea level. From this altitude the height drops to 88m above sea level.*
>
> *The Forest falls within the Parramatta River catchment and Darling Mills sub catchment. First order streams are located within the upper slopes of CSF and form tributaries of the second order stream known as Darling Mills Creek.*
>
> *The general climate for the area is temperate with rainfall peaks during late summer/early autumn and lows during winter/early spring. High temperatures generally occur during the summer months and low temperatures during the winter months, where mean temperatures of 280C and 70C have been recorded over the last 40 years in January and July respectively by the Bureau of Meteorology North Parramatta (Masons Drive) weather station.*

The start of the bush fire season coincides with northwest winds, which often prevail during late spring (Sep/Oct). The majority of serious bushfires occur from this period until the onset of autumn. Longer fire seasons are experienced when summer rainfall is lower than normal, with the bush fire season extending through summer to early autumn. Serious bush fires have occurred late in the season under dry summer conditions.

There are approximately 100 employees working at CSF on a weekly basis. In addition to this there are an average of 100,000 visitors to the forest each year (or 500 a day), which not only include picnickers and bushwalkers but also include environmental groups (such as the Cumberland Bird Observers Club) school and community groups and special permit groups.

No major fire event has been recorded across the landscape of CSF since the time of land purchase in 1938 and commencement of forest regrowth some 70 years ago. There have however been small areas which have been treated with fuel management burns and only two areas impacted upon by arson.'

BFRMP: Planning Proposal site

The proposed residential sites are protected by existing APZ provided through the Cumberland State Forest FMP. In addition the remainder of the CSF is identified as an SFAZ and managed accordingly.

FCNSW aims to maintain the SFAZ areas by applying management actions in a considered manner in a mosaic across the landscape within appropriate ecological thresholds. Fuel management is applied by prescribing appropriate fire regimes to the forest communities to reduce the potential for large, high intensity wildfires and to maintain ecological processes and biodiversity across those communities. This is done within a framework of legislative and regulatory requirements that also influence fuel management policy and practice.

10.4. Landscape Scale Assessment Tool (LSAT)

The *Victorian Planning Permit Applications Bushfire Management Overlay – Landscape Scale Threat Assessment* has been used as the framework to assess the broader landscape scale potential of bushfire affecting the site. This document is the only Australian contemporary Landscape Scale methodology with legislative weight. Blackash has expanded and modified the criteria to emphasise the priority of life safety, and the criticality of bushfire Emergency Management and Evacuation Planning as part of the risk assessment process.

The Blackash Landscape Scale Assessment Tool (LSAT) combines quantitative and qualitative techniques which are scaffolded by the *Landscape Scale Threat Assessment* and associated documentation. The approach is shown in Table 1 and uses elements of the Bayesian decision making model and Expert Judgment techniques backed by data. Bayesian decision making has been used where there is both objective and subjective data to analyse, and decisions need to be made on the probability of successful outcomes where there are high levels of uncertainty. Expert Judgement has been used in the assessment and determination of landscape scale risk.

Blackash Expert Judgement is applied consistent with the criteria used in the *National Construction Code* (NCC)[4] Assessment Methods and NSW Land & Environment Court practice that calls up *Schedule 7 – Expert Witness Code of Conduct* in the *Uniform Civil Procedure Rules 2005*.[5]

The LSAT provides information on bushfire hazards more than 150 metres away from the site at a landscape scale. The broader landscape and the potential size or scale of a bushfire has been an important design response in the development of the PP. The likelihood of a bushfire, its severity and intensity, and the potential impact on life and property varies depending on where a site is in the broader landscape. Landscape scale fires will place greater pressure on emergency response capability and will have a wider impact on roads and the length of time roads cannot be safely used. This will affect the likelihood of successful evacuations taking place across larger areas and may affect the ability of firefighting resources to be deployed. Multiple factors have been considered for landscape scale assessment.

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[4] https://www.abcb.gov.au/sites/default/files/resources/2021/UTNCC_Using_assessment_methods%20%281%29.pdf

[5] https://legislation.nsw.gov.au/view/html/inforce/current/sl-2005-0418#sch.7

Key considerations in our assessment have included:

- extent and continuity of vegetation;
- topography;
- prevailing winds;
- the potential fire run and area that is likely to be impacted by the fire;
- the impact on evacuation routes to safer places considering road networks, distances, and landscape factors;
- the location and exposure of the development to bushfire;
- the ability to seek bushfire shelter on site or at alternative locations; and
- the extent of neighbourhood-scale damage the bushfire may produce.

PBP refers to the Hills Shire LGA being in the Greater Sydney Region Fire Weather District, and the appropriate maximum Forest Fire Danger Index (FFDI) to be applied in the LGA is FFDI 100.

Landscape scale fires are those that can span many kilometres or tens of kilometres, and that burn for days or weeks at a time. Typically, these fires can be many thousands of hectares in size with fire fronts many kilometres in length. On the east coast of Australia this scale of fire is only possible where there are very large areas of forested vegetation, typically National Parks and State Forests that also adjoin substantial areas of private bushland.

The PP site is within an urban setting with the isolated Cumberland State Forest being the only bushfire risk. The proposed development is able to comply with the access and APZ requirements within PBP. As such, the bushfire risk is reduced to designated tolerable levels in accordance with PBP and RFS requirements.

The local scale bushfire threat at the site itself, is not able to develop the size and intensity of a landscape scale fire that is likely to cause neighbourhood scale destruction. The local scale fires may still be significant and can cause local damage, as wherever vegetation is retained there will always be some residual risk to manage, however they will not result in widespread property destruction. Local scale fires also tend to be noticed quickly by the public and called in to emergency services soon after ignition.

Due to the application of PBP requirements throughout the development process there will be good access for firefighting at the interface, suitable construction standards keeping radiant heat levels at buildings below 29kW/m^2 (BAL-29 construction) and suitable firefighting water supplies. These will be detailed in the subsequent Bushfire Hazard Assessment with the DA.

There are 5 RFS brigades (Glenhaven, Dural, Cherrybrook, Westleigh and North Rocks) and 2 Fire & Rescue NSW stations (Castle Hill & Beecroft) within approximately 5 kilometers (<15mins response time) and therefore a very high likelihood that a significant 'weight of attack' will be provided by firefighting services. In addition, Forestry Corporation is one of four statutory firefighting authorities in NSW and has 3 x fire fighting vehicles permanently based within the CSF, and multiple trained firefighting staff are always on site ready for rapid response on elevated fire danger days.

Weight of attack refers to the number of firefighting resources that are likely to be immediately available to respond to a bushfire and a proxy for this can be used by considering the number of fire stations (Fire & Rescue and RFS) that are within a 20-30 minute response. Modern firefighting arrangements are also better coordinated than in previous decades and have the use of more resources including bulk water tankers, heavy plant (e.g. bulldozers and graders), helicopters and Large Air Tankers (LATS) that are much more readily available, and these enable a major addition to firefighting capabilities, especially on bad fire weather days. The substantial improvements to Operational Readiness systems on bad fire weather days means any fire at the site will have an efficient and effective response.

All these characteristics mean that when such fires are ignited there is a relatively quick and effective response, meaning that the fire is unlikely to grow to a significant scale. This is not to say that very difficult fire weather days or resources being used elsewhere don't have an impact, simply that there is a low likelihood of any significant fire impacting the study area, and such local fires are likely to be managed with local resources as part of normal emergency operations.

Taking the conservative approach required by PBP, all lots established are capable of providing practical building envelopes so that future dwellings are built to withstand radiant heat levels of 29kW/m^2 or less (BAL-29). Specific Bushfire Attack Levels (BAL) will inform the requirements for specific Asset Protection Zones (APZ) to be incorporated into the individual subdivision stages to ensure the RFS criteria is satisfied.

10.5. Overall Landscape Scale Assessment

The LSAT is heavily weighted to life safety and places significant emphasis on the ability for the future community to be able to shelter in place or evacuate safely, whilst emergency services can access the site at the same time. The safest methods of protection are not to be in a bushfire hazard area during a day of bad fire risk; have a clear evacuation to an urban area more than 100 metres from hazard vegetation; and to have a shelter in place strategy in a well prepared property with the dwelling built to contemporary standards. A combination of these methods is likely to maximise life safety whilst still allowing for normal life to continue during the bushfire season.

The site has access into Castle Hill Road and Oratava Avenue, both of which are well integrated into the local road network. The existing traffic network is likely to be impacted by heavy traffic during days

where bushfires are occurring in the local area, however road closures due to bushfire impacting on the roads that then affects access and egress to the site via Castle Hill Road, Coonara Avenue and Oratava Avenue are not likely. The primary method of life safety on the site is likely to involve a shelter in place strategy for smaller fires or evacuation from the site if directed by emergency services.

While there are remnant areas of vegetation to the south and south-west of the site, these will not be able to develop or maintain landscape scale fires, as opposed to local scale bushfire threat. The Rate of Spread of fires within the Cumberland State Forest is reduced due to the existing land management practices (APZ and SFAZ), fire trails and other infrastructure that exist within the site and limit any unimpeded, long fire runs.

Given there are no areas of large-scale adjoining bushland there is no opportunity for extreme bushfire behaviour associated with landscape scale fires to develop and result in neighbourhood scale destruction.

Once developed, the development will have been assessed against PBP and have a suitable combination of Bushfire Protection Measures (BPM) including significant water supplies, APZs, access, and construction standards.

The development will be subject to a formal bushfire assessment and specific building standards as required by PBP and AS 3959:2018 (or contemporary documents as time passes) and will therefore offer suitable shelter from bushfire for individual buildings ultimately approved within the PP site. This shelter in place approach, combined with quick and intuitive self-evacuation away from bushland to the adjoining Cherrybrook or West Pennant Hills residential areas and suitable buildings will provide options for immediate life safety for occupants and will reduce the need or desire for evacuations from the site.

When the individual factors are scored, after consideration of the landscape context, the site design complying with PBP, and surrounding urban areas, the overall Landscape Scale Threat for the site is assessed as **Moderate Risk**. The summary and weighted scores are presented in Table 1 below.

Table 1: Blackash Landscape Scale Assessment Tool

Landscape Scale Assessment Tool
Cumberland State Forest

Landscape scale bushfire risk factors

Parameter	Low landscape scale threat	Moderate landscape scale threat	High landscape scale threat	Extreme landscape scape threat	
1. Surrounding Vegetation	Bushfire cannot directly approach the site as it is surrounded by urban development and non-mapped vegetation or managed land.	Bushfire can only approach from one aspect and the site is within a suburban, township or urban area considered managed land. Typically an island of bushfire vegetation within a wider urban development area or interface site impacted only by linear vegetation corridors of 100m width or less.	Bushfire can approach from more than one aspect and site is on the bushland-urban interface with the developed area considered as managed land. Typically contigous bushfire vegetation with a typical fire run in any direction of 0.1-2.0 km distance.	Bushfire can approach from more than one aspect and/or fires have many hours or days to grow and develop before impacting and/or site is surrounded by significant unmanaged vegetation. Typically large areas of contigous bushland with fire runs of more than 2 km possible.	**Moderate**
2. Bushfire Behaviour	Extreme bushfire behaviour at the site is not possible given the broader landscape.	Extreme bushfire behaviour at the site is unlikely in this broader landscape due to combination of factors of vegetation type, vegetation fragmentation, aspect and topography.	Extreme bushfire behaviour at the site is likely in this broader landscape due to combination of factors of vegetation type, vegetation fragmentation, aspect and topography.	Extreme bushfire behaviour is very likely in this broader landscape due to combination of factors of vegetation type, vegetation fragmentation, aspect and topography.	**Moderate**
3. Impact of severe fire behaviour (FFDI 80 or 100 as relevant) coming onto site from wider fire catchment	There is little vegetation beyond 150 metres of the site (except grasslands and low-threat vegetation) and will not result in neighbourhood scale destruction of the site.	The type and extent of vegetation beyond 150m from the site may result in neighbourhood-scale destruction as it interacts with the bushfire hazard on and close to the site.	The type and extent of vegetation beyond 150m is likely to result in neighbourhood-scale destruction as it interacts with the bushfire hazard on and close to the site.	The type and extent of vegetation beyond 150m will result in neighbourhood-scale destruction as it interacts with the bushfire hazard on and close to the site.	**Moderate**
4. Vegetation Corridors	Vegetation within the site cannot enable fire to enter and move through the site by a continuous fire path from the primary fire source.	Vegetation within the site is unlikely to enable fire to enter and move through the site by a continuous fire path from the primary fire source.	Vegetation within the site may enable fire to enter and move through the site by a continuous fire path from the primary fire source.	Vegetation corridors on site provide for passage of fire to enter and move through the site from the primary fire source.	**Moderate**
5. Separation	Hazard separation between extreme bushfire hazard and buildings of greater than 100m. Extreme bushfire hazard does not include vegetated corridors of less than 100m width or grasslands.	Hazard separation between extreme bushfire hazard and buildings of 50-100m. Extreme bushfire hazard does not include vegetated corridors of less than 100m width or grasslands.	Hazard separation between extreme bushfire hazard and buildings of 20-50m. Extreme bushfire hazard does not include vegetated corridors of less than 100m width or grasslands.	Hazard separation between extreme bushfire hazard and buildings of <20m. Extreme bushfire hazard does not include vegetated corridors of less than 100m width or grasslands.	**High**
6. Shelter	Immediate access is available to a place that provides shelter from bushfire. This includes existing or proposed buildings on site constructed in accordance with PBP.	Access is readily available to a place that provides shelter from bushfire. This will often be the surrounding developed area. In the case of an eco-tourist facility it will be the designated bushfire refuge built in accordance with PBP requirements.	Access to a place that provides shelter from bushfire is not certain during a wildfire and existing buildings are not built to PBP standards.	Access to a place that provides shelter from bushfire is not possible during a wildfire.	**Moderate**
7. Evacuation	Multiple evacuation routes are available and unlikely to be impacted by fire.	Evacuation to alternate location that provides life safety refuge is <1km and can be completed by foot or vehicle.	Evacuation to alternate location that provides life safety refuge is 1km-10km.	Evacuation to alternate location that provides life safety refuge is > 10km.	**Low**
8. Isolation and emergency services	Seamless integration with existing settlement - no impact on evacuation or access for emergency services.	Short bushland pinch points that may carry fire across roads and restrict access briefly during passage of fire. Unlikely impact on evacuation or access for emergency services.	Short bushland pinch points that are likely to carry fire across roads and restrict access temporarily. Likely impact on evacuation or access for emergency services.	Large areas of bushland or multiple pinch points that are likely to carry fire across roads in forest areas and will block evacuation or emergency service access routes for extended time.	**Low**
9. Firefighting water supplies	Site is within urban area and has access to reticulated water supply OR site has dedicated firefighting water supply in accordance with PBP requirements.	Site is on the periphery of urban area and has access to reticulated water supply that may be more susceptible to interuption.	Site is outside urban area and relies on an on site water supply not in accordance with PBP.	Site is in an isolated area and relies on an on site water supply not in accordance with PBP.	**Low**
		Overall Threat Rating	**Moderate Risk**	**Total**	160

Assessed at Forest Fire Danger Index of 100 as the design fire, using Method 1 in accordance with PBP 2019

The scoring system uses a multiplier for each Threat level based on a conservative life safety approach.

The scaled scores for each Threat assessment are totalled and final scores are placed within a range to produce the final Risk Rating

10.6. Conclusion regarding compliance with PBP 4.1 Strategic Principles:

Consideration of the strategic bushfire context including an assessment of the local landscape characteristics and likely bushfire behaviour demonstrates the site is suitable for development in accordance with PBP.

Consideration of the location of the site in the wider landscape and the possibility of the site being impacted by either or both Landscape Scale bushfire threat and Local bushfire threat is that the site could potentially be impacted on by Local Bushfire Threat only.

The BFRMP does not raise bushfire risk issues for the site, nor is it identified as a Focus Area. The Blackash Landscape Scale Assessment Tool (LSAT) rates the Planning Proposal as 'Moderate Risk'.

As a new development, the ultimate residential component can be conditioned to meet the PBP and presents a low risk of high consequence bushfire impacting the site. Every future building provides for radiant heat levels no greater than 29 kW/m^2 within an APZ that can be established and reasonably maintained within the site, or which is managed land in accordance with PBP.

This Planning Proposal demonstrates it is consistent with Section 2.3 Strategic Planning (p. 19):

> *Strategic bush fire planning and studies are needed to avoid high risk areas, ensure that zoning is appropriate to allow for adequate emergency access, egress, and water supplies, and to ensure that future compliance with this document is achievable.*

The Planning Proposal is next assessed against the Aim and Objectives of PBP and will address in detail below the requirements of Chapter 4 – Strategic Planning and will consider relevant sections within Chapters 5 of PBP.

The following sections address the requirements of Chapter 4 Strategic Planning Table 4.2.1 of PBP (p. 35) as shown in Figure 5.

11. Bushfire Landscape Assessment

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 residential subdivision development, APZ requirements are based on providing practical building envelopes on lots that keep radiant heat levels at future buildings below 29kW/m^2 (BAL-29).

The proposed residential sites each contain a vacant single dwelling being former caretakers' dwelling and are not publicly accessible. The Cumberland State Forest site also includes a number of other assets such as recreational infrastructure, the West Pennant Hills Corporate Facility, Plants Plus Nursery, TreeTops Ropes Course, FCNSW Visitor Centre and Café Saligna, internal environmental assets such as the historical Arboretum. The proposed rezoning will not reduce the existing level of protection to any of these assets. Any future dwellings on the residential sites will comply with PBP 2019 and provide improved protection to adjoining residential properties.

The following assessment is prepared in accordance with Section 100B of the RFA, Section 44 of the *Rural Fires Regulation 2021* (RFR) and PBP. This assessment is based on the following resources:

- Planning for Bush Fire Protection (RFS, 2019);
- The Hills Shire Council Bush Fire Prone Land Map;
- Aerial mapping; and
- Detailed GIS and site analysis.

The methodology used in this assessment is in accordance with PBP (p.80) and is outlined in the following sections.

11.1. Fire Danger Weather District

PBP requires a credible worst case bushfire weather scenario at a 1:50 year bushfire weather event. PBP refers to the Hills Shire LGA being in the Greater Sydney Region Fire Weather District, and the appropriate maximum Forest Fire Danger Index (FFDI) to be applied is FFDI 100.

11.2. Vegetation Assessment

Vegetation is the fundamental physical component of determining the bushfire behaviour. Vegetation, in broad terms provides the available fuel to be consumed by a bushfire. Fuel load and arrangement represents a considerable component in dictating to a large degree the behaviour of fire in terms of intensity, rate of spread and flame height, and typically relates to dead plant material less than 6mm thick, and live plant material thinner than 3mm.

Vegetation type, density and arrangement can further influence fire behaviour and intensity. Vertical and horizontal continuity is also a significant element. Thus, vegetation forms a key consideration within this report.

The vegetation assessment has been completed in accordance with PBP. The predominant Vegetation is classified by structure or formation using the system adopted by David Keith (2004) and by the general description using PBP.

Vegetation types give rise to radiant heat and fire behaviour characteristics. The predominant vegetation has been determined for the site over a distance of at least 140 metres in all directions from the proposed site boundary or key assets on the development site. Where a mix of vegetation types exist, the type providing the greater hazard is said to predominate.

The vegetation assessment for the proposed northern development site (Castle Hill Road) is shown in Figure 6, while the southern development site (Oratava Road) is shown in Figure 7.

For assessment purposes, the predominant vegetation within the Cumberland State Forest is North Coast Wet Sclerophyll Forests.

The Cumberland State Forest has a series of well-established Asset Protection Zones which adjoin the proposed residential sites. These are established through the *Cumberland State Forest Fuel Management Plan (FMP) 2020-2025*, which states:

> *Under the Forestry Act 2012 and Rural Fires Act 1997, Forestry Corporation (FCNSW) has a statutory responsibility to protect life and property from wildfire and to minimise the spread of wildfire from areas it manages. FCNSW also has obligations to manage fire regimes on State forests to maintain ecosystem health and vitality and protect the full range of economic, social and environmental values of State forests.*
>
> *Apart from statutory responsibilities, Forestry Corporation has a number of business and risk management imperatives to maintain an effective and efficient fire management capacity. In relation to Cumberland State Forest (CSF) appropriate fuel management strategies will aid in the protection of internal built assets such as recreational infrastructure, the West Pennant Hills Corporate Facility, Plants Plus Nursery, TreeTops Ropes Course, FCNSW Visitor Centre and Café Saligna, internal environmental assets such as the historical Arboretum and threatened species and external assets such as Mirvac and neighbouring residential properties. In total these assets are valued at more than $100M with the corporate facility within CSF alone valued at approx $6M.*

The APZ established through the FMP are shown in Figures 6 and 7 and an extract in Appendix 4.

11.3. Slopes Influencing Bushfire Behavior

PBP requires assessment of slope. The slope of the land under the classified vegetation has a direct influence on the rate of fire spread, the intensity of the fire and the ultimate level of radiant heat flux. The effective slope is the slope of the ground under the hazard (vegetation). In identifying the effective slope, it may be found that there are a variety of slopes covering different distances within the vegetation. The effective slope is considered to be the slope under the vegetation which will most significantly influence the bushfire behaviour for each transect. This is usually the steepest slope.

The slope assessment for the proposed northern development site (Castle Hill Road) is shown in Figure 6, while the southern development site (Oratava Road) is shown in Figure 7. For assessment purposes, the effective slopes for the site range from 9.8 to 11.3 degrees downslope.

11.1. Potential Fire Behaviour

Given its isolated nature and well-established management practices, the Cumberland State Forest has a somewhat limited bushfire behaviour potential.

11.2. Fire History

Based on the *Cumberland State Forest Fuel Management Plan (FMP) 2020-2025, no* major fire event has been recorded across the landscape of the Cumberland State Forest since the time of land purchase in 1938 and commencement of forest regrowth some 70 years ago. There have however been small areas which have been treated with fuel management burns and only two areas impacted upon by arson. Figure 8 shows the wildfire history for the site.

11.3. Potential Fire Runs

As discussed above, there is limited potential fire behaviour potential for the site or surrounding areas and the site cannot be impacted by large landscape scale fires.

11.4. Fire Suppression

There are no identified difficulties in accessing and suppressing the fires that could occur around or within the site. The site has excellent sealed two-lane public road access, reticulated water, and the depth of the lots will allow firefighting to be conducted predominantly from the street.

Based on the *Cumberland State Forest Fuel Management Plan (FMP) 2020-2025,* access trails, roads and walking tracks enable access to different parts of the State Forest. The access within the State Forest enables access to infrastructure for undertaking fire management operations and activities, including direct attack of low-intensity fires, back-burning to contain high intensity fires, and conducting hazard reduction burning.

Access for incoming firefighting resources is excellent, with multiple roads and directions, and well-maintained sealed roads which do not traverse areas likely to be impacted by bushfire.

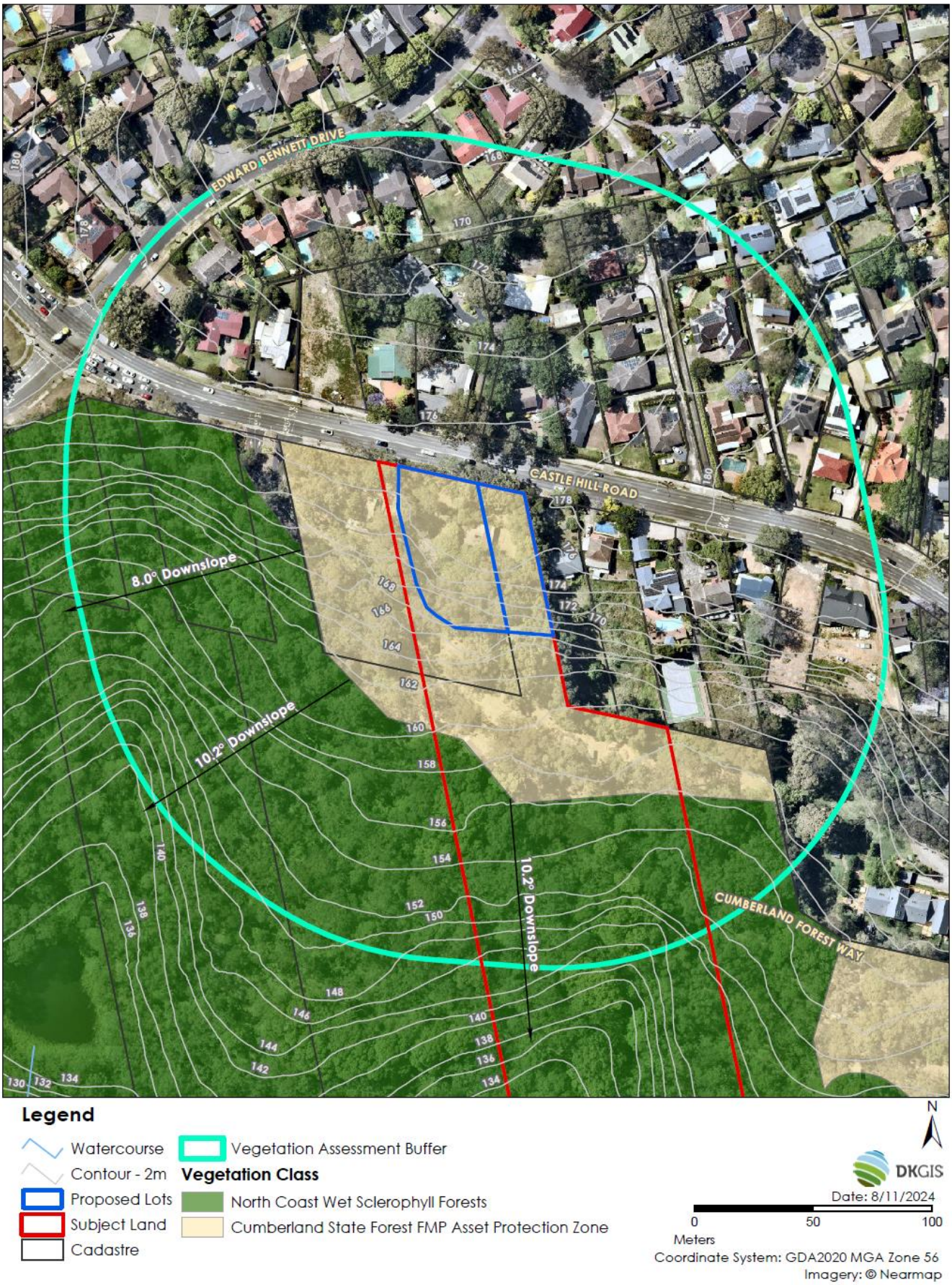

Figure 6: Vegetation and Slope Assessment at the Northern (Castle Hill Road) site

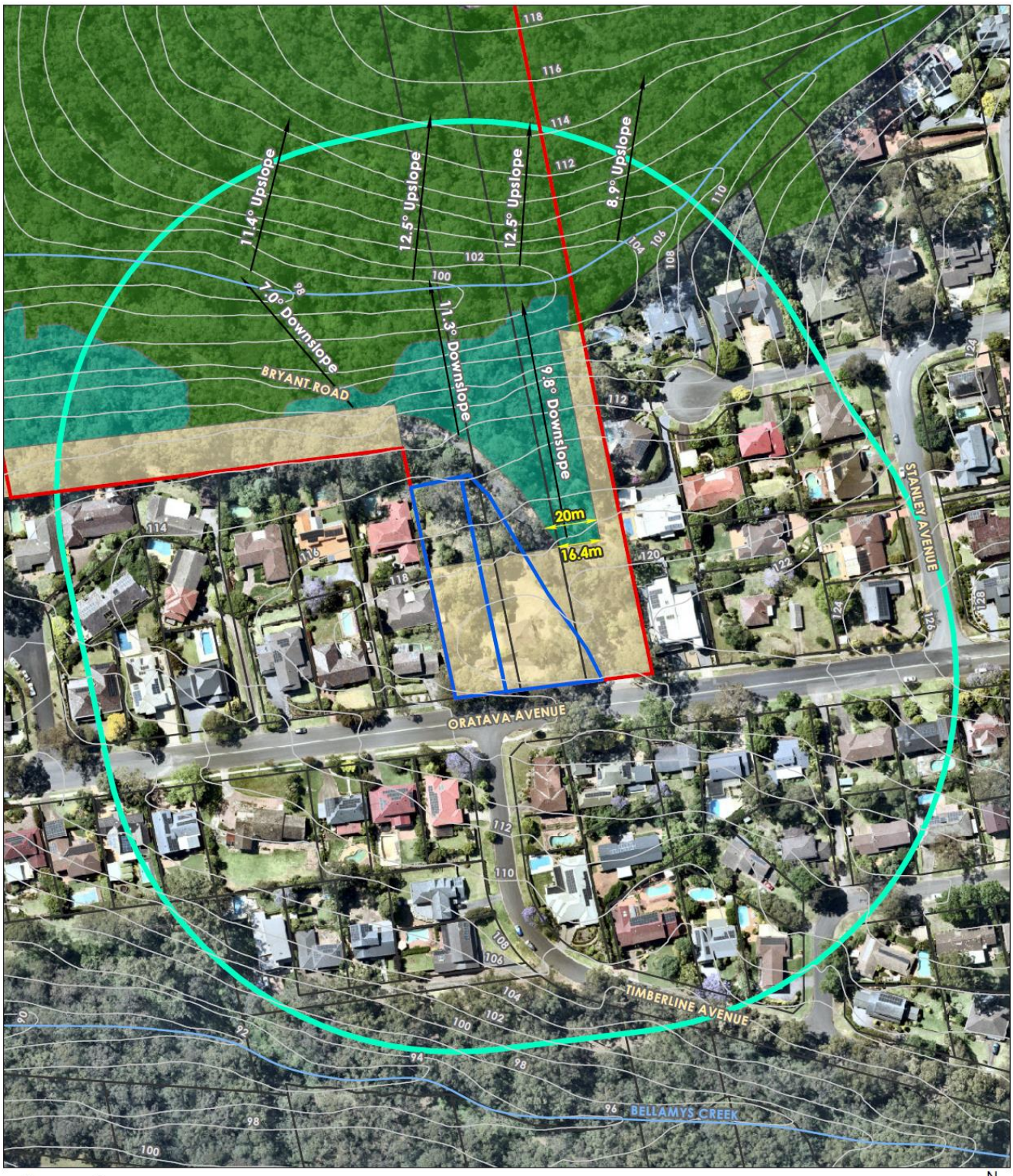

Figure 7: Vegetation and Slope Assessment at the Southern (Oratava Road) site

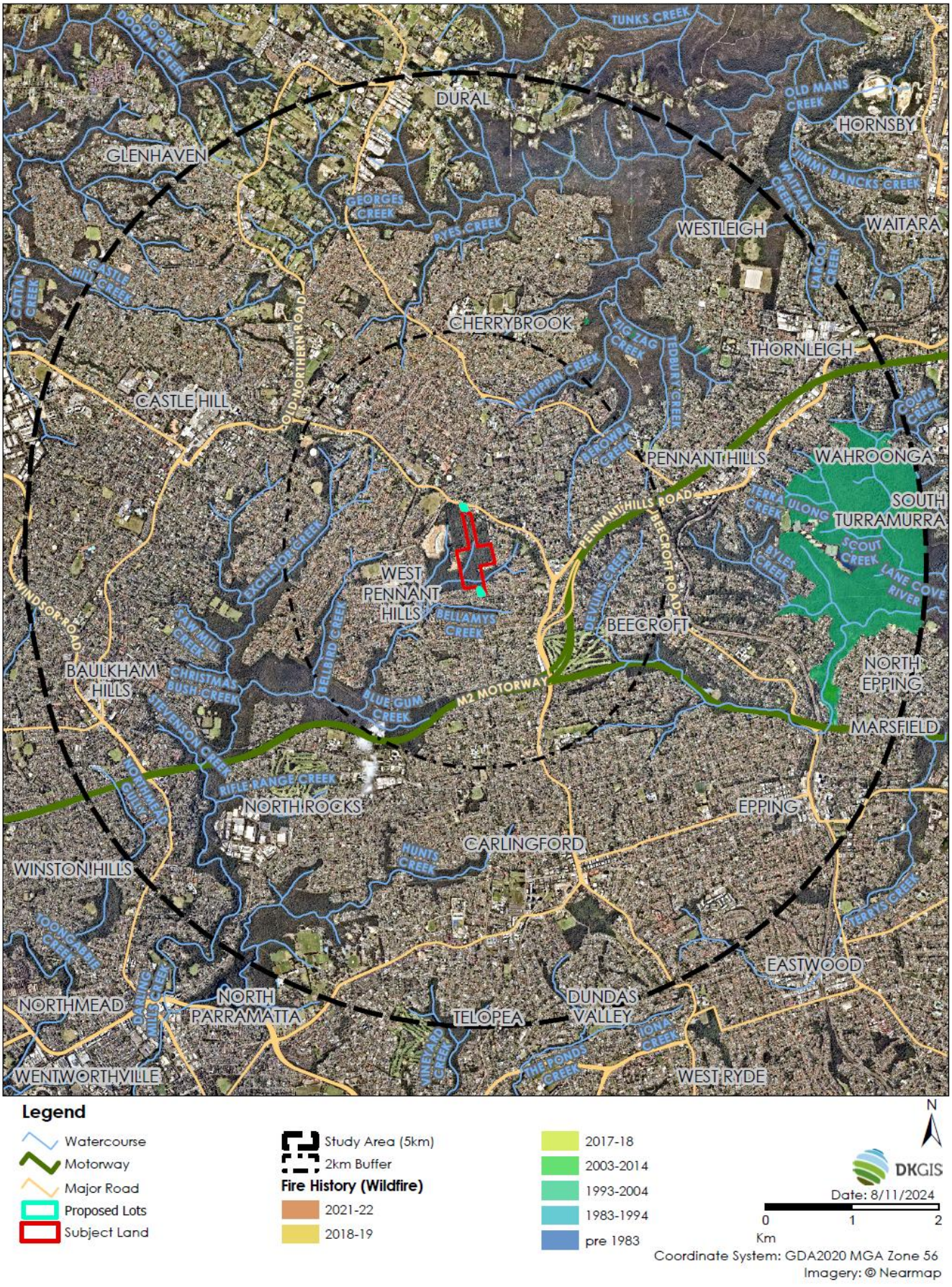

Figure 8: History of Wildfires

12. Land Use Assessment

12.1. Risk Profiles

The intensity of a bushfire, which largely determines how much damage it will do, is a product of the fuels burning (quantity, arrangement, size, moisture content), the weather at the time (temperature, wind speed and direction, relative humidity, atmospheric stability) and the topography of the land where the fire is burning (slope and aspect).

The risk profile of the site and future development area is very low due to the limited bushfire hazard in the area. The PBP compliant APZs will be more than adequate to mitigate the risk.

Appropriately designed (in accordance with PBP), constructed (in accordance with AS3959) and prepared buildings may offer people options for sheltering during most bushfires, reducing the likelihood of bushfire-related injury and death. The nationally agreed position is that the safest option is to leave a bushfire prone area early on days with a Fire Danger Rating of Severe or higher.

The bushfire risk is best mitigated by compliance with PBP and the ability of the Planning Proposal to provide complying APZs.

12.2. Asset Protection Zones

For proposed new subdivision development, PBP requires that a minimum separation is provided in the form of APZ. The APZ is a fuel-reduced, physical separation between buildings and bushfire hazards. For residential developments, APZ requirements are based on keeping radiant heat levels at buildings below 29kW/m^2 as the maximum exposure on all sides of the building.

The proposed development location has areas of adjoining managed land and areas of limited fire run. A conservative approach has been taken and the site has sufficient room to provide compliant APZ and practical building envelopes.

Table 2 is a summary of the APZ requirements and Figure 9 depicts the minimum APZ for the Northern (Castle Hill Road) site. Table 3 is a summary of the APZ requirements and Figure 10 depicts the minimum APZ for the Southern (Oratava Road) site.

Table 2: APZ Assessment of the Northern (Castle Hill Road) site

Direction	Slope	Vegetation	Min Required APZ	APZ provided
North	NA	Residential	Nil	NA
East	NA	Residential	Nil	NA
South	10.2° Downslope	North Coast Wet Sclerophyll Forests	39 metres*	>40 metres
West	10.2° Downslope	North Coast Wet Sclerophyll Forests	34 metres*	>40 metres

**Note: Based on detailed Radiant Heat modelling (see section 12.3).*

Table 3: APZ Assessment of the Southern (Oratava Road) site

Direction	Slope	Vegetation	Min Required APZ	APZ provided
North	11.3° Downslope	North Coast Wet Sclerophyll Forests	41 metres*	>56 metres
East	9.8° Downslope	North Coast Wet Sclerophyll Forests	30-41 metres*	30-41 metres
South	NA	Residential	Nil	NA
West	NA	Residential	Nil	NA

**Note: Based on detailed Radiant Heat modelling (see section 16.3).*

12.3. Radiant Heat Modelling

Detailed radiant heat modelling has been undertaken for the site due to the unique site-specific inputs. Tables 4 and 5 below is a summary of the key inputs, while the detailed outputs for each scenario can be found in Appendix 5.

The radiant heat modelling has considered the following scenarios which presents as the likely worst case bushfire scenario for each site.

Northern (Castle Hill Road) site

- South Fire Scenario – The reasonable worst-case scenario is a fire run from the south which burns through the North Coast Wet Sclerophyll Forest directly towards the site. An existing APZ exists between the proposed residential sites and the unmanaged vegetation. The effective slope in this area is 10.2 degrees downslope but has been rounded up to 11 degrees for radiant heat modelling purposes.
- West Fire Scenario – The reasonable worst-case scenario is a fire run from the west which burns through the North Coast Wet Sclerophyll Forest directly towards the site. A fire from the west has a limited run. An existing APZ exists between the proposed residential sites and the unmanaged vegetation. The effective slope in this area is 10.2 degrees downslope but has been rounded up to 11 degrees for radiant heat modelling purposes.

Table 4 (below) is a summary of the key inputs used for the Radiant Heat modelling. Full results for the Northern site are provided in Appendix 5.

Table 4: Key inputs and outputs – 29kW/m^2 threshold for the Northern (Castle Hill Road) site.

Direction	Slope	Vegetation	Separation	Head Width	Radiant Heat
South	11° Down	North Coast WSF	39 metres	100 metres	28.50kW/m^2
West	11° Down	North Coast WSF	39 metres	100 metres	28.50kW/m^2

Southern (Oratava Road) site

- North Fire Scenario – The reasonable worst-case scenario is a fire run from the north which burns through the North Coast Wet Sclerophyll Forest directly towards the site. An existing access road and APZ exists between the proposed residential sites and the unmanaged vegetation. The effective slope in this area is 11.3 degrees downslope but has been rounded up to 12 degrees for radiant heat modelling purposes.
- East Fire Scenario – The reasonable worst-case scenario is a fire run from the east which burns through a restricted area (narrowing) of North Coast Wet Sclerophyll Forest. A fire in this narrow area of bushland would burn directly towards the site with an effective slope of 9.8 degrees downslope (which has been rounded up to 10 degrees for modelling purposes) and has a narrow head width of 16.4 metres at the closest point to the site.

Table 5 (below) is a summary of the key inputs used for the Radiant Heat modelling. Full results for the Southern site are provided in Appendix 5.

Table 5: Key inputs and outputs – 29kW/m^2 threshold for the Southern (Oratava Road) site.

Direction	Slope	Vegetation	Separation	Head Width	Radiant Heat
North	12^o Down	North Coast WSF	41 metres	100 metres	28.35kW/m^2
East	10^o Down	North Coast WSF	30 metres	20 metres	25.92kW/m^2

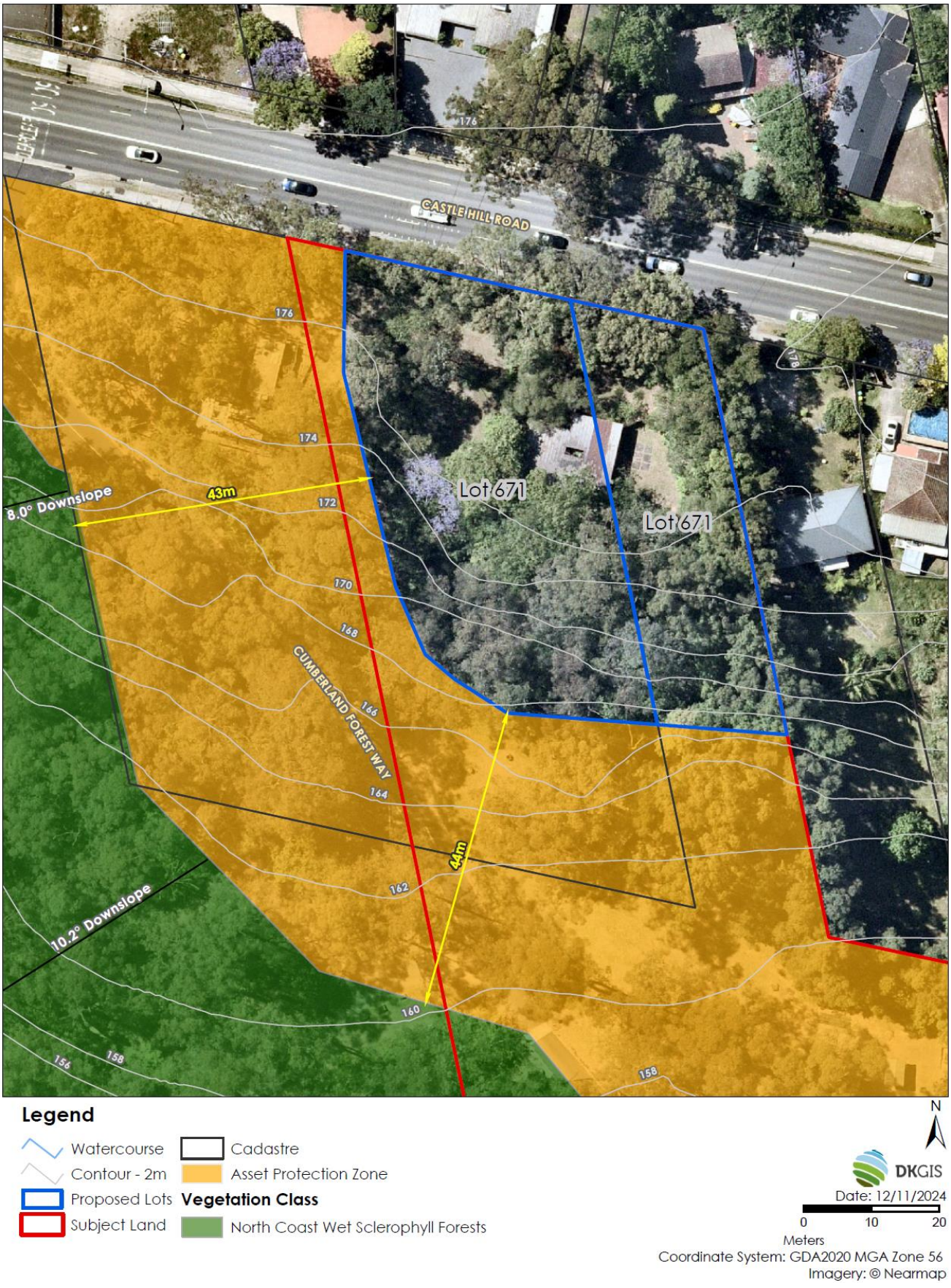

Figure 9: Asset Protection Zone requirements at the Northern (Castle Hill Road) site

Figure 10: Asset Protection Zone requirements at the Southern (Oratava Road) site

12.4. Bushfire Attack Levels

The Bushfire Attack Level (BAL) is a means of measuring the ability of a building to withstand attack from bushfire. The form of bushfire attack and the severity will vary according to the conditions (FFDI, vegetation, slope and setback) on the site.

The BAL assesses the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact, using increments of radiant heat expressed in kilowatts per square metre. This forms the basis for establishing the requirements for construction to improve protection of a building from potential attack by a bushfire, as defined in *Australian Standard AS 3959:2018 Construction of buildings in bushfire-prone areas* (AS3959:2018). The BAL ratings are used as the basis for establishing the requirements for construction for future buildings to improve protection from bushfire attack.

All future lots can achieve BAL-29 (or less) and BAL ratings for future buildings will be determined at the DA stage based specifically on the location of the dwellings.

12.5. Access and Egress

Capacity

The site has existing connections to the arterial and local road networks that service the region. This enables the effective distribution of traffic from the site to the wider road network. The future lots will have direct access to public roads. The local road network is capable of servicing the volumes of traffic generated by the future subdivision and while not considered ever required, the roads could accommodate the evacuation of residents and concurrently the responding of emergency services.

The road design provides for direct access to the public road network, providing access for firefighting vehicles to each lot and allowing for property protection to be undertaken in a safe manner. The road network meets the standards detailed in the provisions of Table 5.3b and therefore the planning proposal complies with PBP 2019.

The location of key access routes and direction of travel

The national position of fire agencies is that *the safest action to protect life is for people to be away from the bushfire or threat of bushfire*[6]. This is underpinned by comprehensive emergency management arrangements and operational fire management systems that focus on the provision of information, advice, and warnings to assist communities to make informed decisions prior to the impact of bushfire and if necessary be out of Bushfire Prone Areas well before the impact of fire.

Within the NSW Bushfire planning system and PBP, there is a hierarchy of controls in place, from planning schemes to design and construction etc, to mitigate bushfire risk to communities. The BPM work in unison to enhance resilience by the provision of minimum standards for new development while reducing the vulnerability of negative impacts on occupants (including fire fighters) of these areas.

There are significant firefighting resources located within 5km of the site, including large areas of managed land, so travel routes will not be isolated even in the most extreme circumstances.

Given the nature of the site and the isolated bushfire risk, there are no key access roads which will be impacted by bushfire in a manner that will cause issues for residents or responding brigades. The site provides for travel away from the site with limited bushfire risk.

The potential for development to be isolated in the event of a bushfire

The site is not isolated development as defined by PBP (p111):

> *Development which is located predominantly in native bushland or is considered to be within a remote area. Access and evacuation may be challenging due to distances that are required to be travelled through bush fire prone areas.*

The development is not in a remote area as discussed above, and the wider area is suitable for development in compliance with PBP.

There are multiple routes for firefighting resources to access the site and all routes are unlikely to be impassable by firefighting vehicles at once except in the most extreme circumstances.

It is not reasonably expected that the site would be isolated in the event of a bushfire.

[6] Australasian Fire and Emergency Services Authorities Council. (2019) *Bushfires and Community Safety Position* (AFAC Publication No. 2028)

12.6. Emergency services

Demand for Emergency Services

The nature of the bushfire risk does not create a potential increase in demand for emergency services responding to a bush fire emergency considered above or beyond the typical demands for such a development.

Ability of Emergency Services to Carry out Fire Suppression

The nature of the bushfire risk and proposed development does not impact on the ability of emergency services to carry out fire suppression in a bushfire emergency.

12.7. Infrastructure

Reticulated Water

The subsequent development applications will detail provisions for water. The site will be serviced by reticulated water which, given the low bushfire risk, is appropriate to deal with a bushfire in the local area. Details can be resolved during development applications stage. This complies with PBP.

Electricity supply for the new development will comply with PBP. Any 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.

12.8. Life Safety Issues

There are no issues identified with high voltage power lines and gas supply mains. Specific details will be managed during subdivision development stage; however, it is expected that all local services will be provided underground. Electricity supply for the new development will comply with PBP. Any 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).

12.9. Adjoining Land

Implications on Adjoining Land

The change in land use will have no negative implications on adjoining land from a bushfire perspective. The existing long-term land management practices within the Cumberland State Forest, including SFAZ and APZ will continue.

The Cumberland State Forest has a series of well-established Asset Protection Zones which adjoin the proposed residential sites. These are established through the *Cumberland State Forest Fuel Management Plan (FMP) 2020-2025* which is shown in Appendix 4.

12.10. Bush Fire Strategic Study - Summary

As per the analysis in sections 9-11 above, the site can provide all BPMs as required by PBP 2019 and is therefore considered appropriate in the bush fire hazard context.

13. Suitability of the Planning Proposal

This SBS had demonstrated that the Planning Proposal has considered and responded to the requirements of PBP. In a bushfire context, PBP (p. 34) requires that *strategic planning must ensure that future land uses are in appropriate locations to minimise the risk to life and property from bush fire attack. Services and infrastructure that facilitate effective suppression of bushfires also need to be provided for at the earliest stages of planning*.

The bushfire risk has been considered at the macro-scale, looking at fire runs, slopes, fire behaviour, bushfire attack into the site and it has addressed the access and evacuation requirements of PBP.

This section assesses the broad principles outlined within PBP (p. 34) which are at Table 7 and the consideration of exclusion of development as required within PBP (p. 34) at Table 8.

14. Summary Tables

This Section evaluates the Planning Proposal against the bushfire strategic planning requirements of PBP and is shown in Table 6.

Table 6: Strategic bushfire study - compliance with PBP Table 4.2.1

Issue	Detail	Assessment considerations	Evidence	Suitable site
Bush fire landscape assessment	A bushfire landscape assessment considers the likelihood of a bush fire, its potential severity and intensity and the potential impact on life and property in the context of the broader surrounding landscape.	The bushfire hazard in the surrounding area including: • Vegetation • Topography • Weather	SBS, Landscape Scale Assessment Tool, Bush Fire Risk Management Plan review, Asset Protection Zone modelling and consideration of BPMs.	**YES**
		The potential fire behaviour that might be generated based on the above	Potential is limited to local scale fires only and access and water supplies will improve, future dwellings will build to PBP standards and AS3959.	**YES**
		Any history of bush fire in the area.	No fire history for the site and any fires expected to be managed locally.	**YES**
		Potential fire runs into the site and the intensity of such fire runs; and	Potential is limited to local scale fires which can be managed on site.	**YES**
		The difficulty in accessing and suppressing a fire, the continuity of bush fire hazards or the fragmentation of landscape fuels and the complexity of the associated terrain.	No identified difficulties for accessing and suppressing the type of fires that may occur. Acceptable terrain and consistent vegetation generally, good local road network, close to major urban development etc.	**YES**

Issue	Detail	Assessment considerations	Evidence	Suitable site
Land use assessment	The land use assessment will identify the most appropriate locations within the masterplan area or site layout for the proposed land uses.	The risk profile of different areas of the development layout based on the above landscape study	The combination of BPMs is provided based on the residential nature of the development. The proposed residential development is a suitable and practical use of the land with respect to bushfire.	YES
		The proposed land use zones and permitted uses	Residential development is a suitable and practical use of the land.	YES
		The most appropriate siting of different land uses based on risk profiles within the site (i.e. not locating development on ridge tops, SFPP development to be located in lower risk areas of the site); and	The proposed layout is consistent with adjoining landuses and responds to the site suitably.	YES
Access and egress	A study of the existing and proposed road networks both within and external to the masterplan area or site layout.	The capacity for the proposed road network to deal with evacuating residents and responding emergency services, based on the existing and proposed community profile;	Low scale development (4 dwellings). The road network provides multiple connections through the local road network and meets or exceeds the requirements of PBP.	YES
		The location of key access routes and direction of travel; and	The road network provides multiple directions of travel and there is little chance of these routes being impacted by fire.	YES

Issue	Detail	Assessment considerations	Evidence	Suitable site
		The potential for development to be isolated in the event of a bush fire.	The road network provides multiple options for evacuation and will not be impacted by bushfire. The road exceeds the requirements of PBP. There is little chance of isolation due to multiple routes in and out.	YES
Emergency services	An assessment of the future impact of new development on emergency services.	Consideration of the increase in demand for emergency services responding to a bush fire emergency including the need for new stations/brigades; and	Low scale development (4 dwellings). No new emergency services generated by this development alone.	YES
		Impact on the ability of emergency services to carry out fire suppression in a bush fire emergency.	Insignificant negative impact. May have positive impact with more water supplies, and active land management.	YES
Infrastructure	An assessment of the issues associated with infrastructure and utilities.	The ability of the reticulated water system to deal with a major bush fire event in terms of pressures, flows, and spacing of hydrants; and	Existing supplies are sufficient to service the new dwellings, and no significant additional demand is expected on the supply.	YES
		Life safety issues associated with fire and proximity to high voltage power lines, natural gas supply lines etc.	No life safety issues identified.	YES

Issue	Detail	Assessment considerations	Evidence	Suitable site
Adjoining land	The impact of new development on adjoining landowners and their ability to undertake bush fire management.	Consideration of the implications of a change in land use on adjoining land including increased pressure on BPMs through the implementation of Bush Fire Management Plans.	No significant negative impact identified. Existing long-term land practices within the Cumberland State Forest will continue.	**YES**

15. Suitability of the Planning Proposal

This SBS had demonstrated that the PP has considered and responded to the requirements of PBP. In a bushfire context, PBP (p. 34) requires that *strategic planning must ensure that future land uses are in appropriate locations to minimise the risk to life and property from bush fire attack. Services and infrastructure that facilitate effective suppression of bushfires also need to be provided for at the earliest stages of planning*.

The bushfire risk has been considered at the macro-scale, looking at fire runs, slopes, fire behaviour, bushfire attack into the site and it has addressed the access and evacuation requirements of PBP.

This section assesses the broad principles outlined within PBP (p. 34) which are at Table 7 and the consideration of exclusion of development as required within PBP (p. 34) at Table 8.

Table 7: Strategic Principles

Principle within PBP	**Comment**	**Compliance**
Ensuring land is suitable for development in the context of bushfire risk	The Planning Proposal provides compliance with the requirements of PBP in all BPM. The bushfire risk has been considered at FFDI 100 as required by PBP and the risk to future occupants and emergency services can be managed by meeting the requirements of PBP.	**Yes**
Ensuring new development on BPL will comply with PBP	The Planning Proposal meets all the requirements of PBP. Future development is able to meet the standard of <29kW/m2 radiant heat at building exposures. Roads and APZs can comply with PBP.	**Yes**
Minimising reliance on performance-based solutions	A Method 2 approach has been used to determine the APZ requirements due to the existing circumstances of the site. Due to the small-scale (4 lots), this is considered an appropriate approach which ensures the best outcome for the site. All other BPM have been met using acceptable solutions provisions within PBP.	**Yes**

Principle within PBP	Comment	Compliance
Providing adequate infrastructure associated with emergency evacuation and firefighting operations	The existing road network meets or exceeds the minimum requirements of PBP. All services can be provided in accordance with Table 5.3c of PBP. Multiple short distance evacuation routes are available.	Yes
Facilitating appropriate ongoing land management practices	The future development will not burden or change the existing obligations or management actions of neighbours. The existing long-term land management within the Cumberland State Forest through the *Cumberland State Forest Fuel Management Plan (FMP) 2020-2025* ensures APZ will be maintained.	Yes

Table 8: Exclusion of Development

Principle within PBP	Comment	Compliance
The development area is exposed to a high bush fire risk and should be avoided	The landscape bushfire risk is Moderate (Table 2) as it is adequately separated from landscape scale bushfires. The new development lots can comply with the minimum requirements of PBP, and the risk has been managed to the appropriate level required by PBP.	Yes
The development is likely to be difficult to evacuate during a bush fire due to its siting in the landscape, access limitations, fire history and/or size and scale	The planning proposal will have all future lots directly accessing an existing local road network providing at least two evacuation areas within short distances.	Yes
The development will adversely affect other bush fire protection	All new development within the site will be designed to meet the minimum standards of PBP which	Yes

Principle within PBP	Comment	Compliance
strategies or place existing development at increased risk	achieve an appropriate level of bushfire resilience. The existing long-term land management within the Cumberland State Forest through the *Cumberland State Forest Fuel Management Plan (FMP) 2020-2025* ensures APZ will be maintained for the site. The development will provide a positive impact to adjoining neighbours by ensuring ongoing active management.	
The development is within an area of high bushfire risk where density of existing development may cause evacuation issues for both existing and new occupants	The landscape bushfire risk is Moderate (Table 2) as it is adequately separated from landscape scale bushfire and will only be exposed to local scale fires due to the limited vegetation and fragmented bushland patterns. The proposal will provide practical building envelopes and PBP compliant APZ on site, and all future lots will have direct access to the existing public road network.	**Yes**
The development has environmental constraints to the area which cannot be overcome	The development has no environmental constraints which cannot be overcome.	**Yes**

16. Conclusion

This Strategic Bushfire Study considers the suitability of the Planning Proposal with respect to bushfire risk. The Planning Proposal provides a well-considered design that as appropriate in the context of the moderate bushfire risk affecting the site and the aim and subsequent requirements within PBP to provide for the protection of life and the minimisation of impact on property while having due regard to the development potential, site characteristics and protection of the environment.

This SBS has followed the Aim and Objectives of *PBP*, Section 2.3 Strategic Planning, and specifically addressed the requirements of Chapter 4 – Strategic Planning. The suitability of the Planning Proposal has considered the broad land scape scale risk and the site-specific requirements of PBP.

The proposed residential zoning has been assessed against PBP Chapter 5 – Residential and Rural Residential Subdivisions to satisfy the requirements of Section 4.4.1 regarding the indicative development layout. The proposed development can satisfy the detailed criteria to be assessed at the next stage of the process. All future lots will be supported by APZ to meet the standard of <29kW/m^2 at building exposures and will be further assessed at development application stage.

The Planning Proposal meets the requirements of PBP and should be supported.

In the authors professional opinion, the Planning Proposal is a suitable use of the land, and the bushfire protection measures demonstrated in this report comply with the Aim and Objectives of Planning for Bush Fire Protection 2019, the Ministerial Direction 4.4 Planning for Bush Fire Protection, and allow for the progression to Public Consultation.

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Grad. Cert. (Applied Management, Police and Emergency Services)
Fire Protection Association of Australia BPAD Level 3 – 34603

BPAD Bushfire Planning & Design Accredited Practitioner Level 3

Appendix 1: References

Australasian Fire and Emergency Service Authorities Council (2012) *Bushfires and Community Safety*

Australasian Fire and Emergency Service Authorities Council (2019) *Bushfires and Community Safety*

Australian Institute for Disaster Resilience (2020) *Land Use Planning for Disaster Resilient Communities*

Bush Fire Management Committee (2020) *Wollondilly / Wingecaribee Bush Fire Risk Management Plan*. Approved by NSW Bush Fire Coordinating Committee.

Bush Fire Management Committee (2019) *Macarthur Bush Fire Risk Management Plan*. Approved by NSW Bush Fire Coordinating Committee.

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 Bush Fire Prone Land Mapping*

NSW Rural Fire Service (2019). *Planning for Bush Fire Protection: A Guide for Councils, Planners, Fire Authorities, Developers and Home Owners.*

NSW Rural Fire Service (2017) *Neighbourhood Safer Places: Guidelines for the Identification and Inspection of Neighbourhood Safer Places in NSW*. Issued November 2019.

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

Standards Australia (2017) *Fire hydrant installations - System design, installation and commissioning*, AS 2419.1, SAI Global, Sydney.

Standards Australia (2018) Construction of buildings in bushfire-prone areas, AS 3959-2018. SAI Global, Sydney.

Standards Australia (2014) The storage and handling of LP Gas, AS/NZS 1596:2014. SAI Global, Sydney.

LOCAL PLANNING DIRECTIONS

Section 9.1(2) of the *Environmental Planning and Assessment Act 1979*

4.4 Planning for Bushfire Protection

Objectives

(1) The objectives of this direction are:

(a) to protect life, property and the environment from bush fire hazards, by discouraging the establishment of incompatible land uses in bush fire prone areas, and

(b) to encourage sound management of bush fire prone areas.

Where this direction applies

(2) This direction applies to all local government areas in which the responsible Council is required to prepare a bush fire prone land map under section 10.3 of the *Environmental Planning and Assessment Act 1979* (the EP&A Act), or, until such a map has been certified by the Commissioner of the NSW Rural Fire Service, a map referred to in Schedule 6 of that Act.

When this direction applies

(3) This direction applies when a relevant planning authority prepares a planning proposal that will affect, or is in proximity to land mapped as bushfire prone land.

What a relevant planning authority must do if this direction applies

(4) In the preparation of a planning proposal the relevant planning authority must consult with the Commissioner of the NSW Rural Fire Service following receipt of a gateway determination under section 3.34 of the Act, and prior to undertaking community consultation in satisfaction of Schedule 1, clause 4 of the Act, and take into account any comments so made,

(5) A planning proposal must:

(a) have regard to *Planning for Bushfire Protection 2019*,

(b) introduce controls that avoid placing inappropriate developments in hazardous areas, and

(c) ensure that bushfire hazard reduction is not prohibited within the APZ.

(6) A planning proposal must, where development is proposed, comply with the following provisions, as appropriate:

(a) provide an Asset Protection Zone (APZ) incorporating at a minimum:

(i) an Inner Protection Area bounded by a perimeter road or reserve which circumscribes the hazard side of the land intended for development and has a building line consistent with the incorporation of an APZ, within the property, and

(ii) an Outer Protection Area managed for hazard reduction and located on the bushland side of the perimeter road,

(b) for infill development (that is development within an already subdivided area), where an appropriate APZ cannot be achieved, provide for an appropriate performance standard, in consultation with the NSW Rural Fire Service. If the provisions of the planning proposal permit Special Fire Protection Purposes (as defined under section 100B of the *Rural Fires Act 1997*), the APZ provisions must be complied with,

(c) contain provisions for two-way access roads which links to perimeter roads and/or to fire trail networks,

(d) contain provisions for adequate water supply for firefighting purposes,

(e) minimise the perimeter of the area of land interfacing the hazard which may be developed,

(f) introduce controls on the placement of combustible materials in the Inner Protection Area.

Consistency

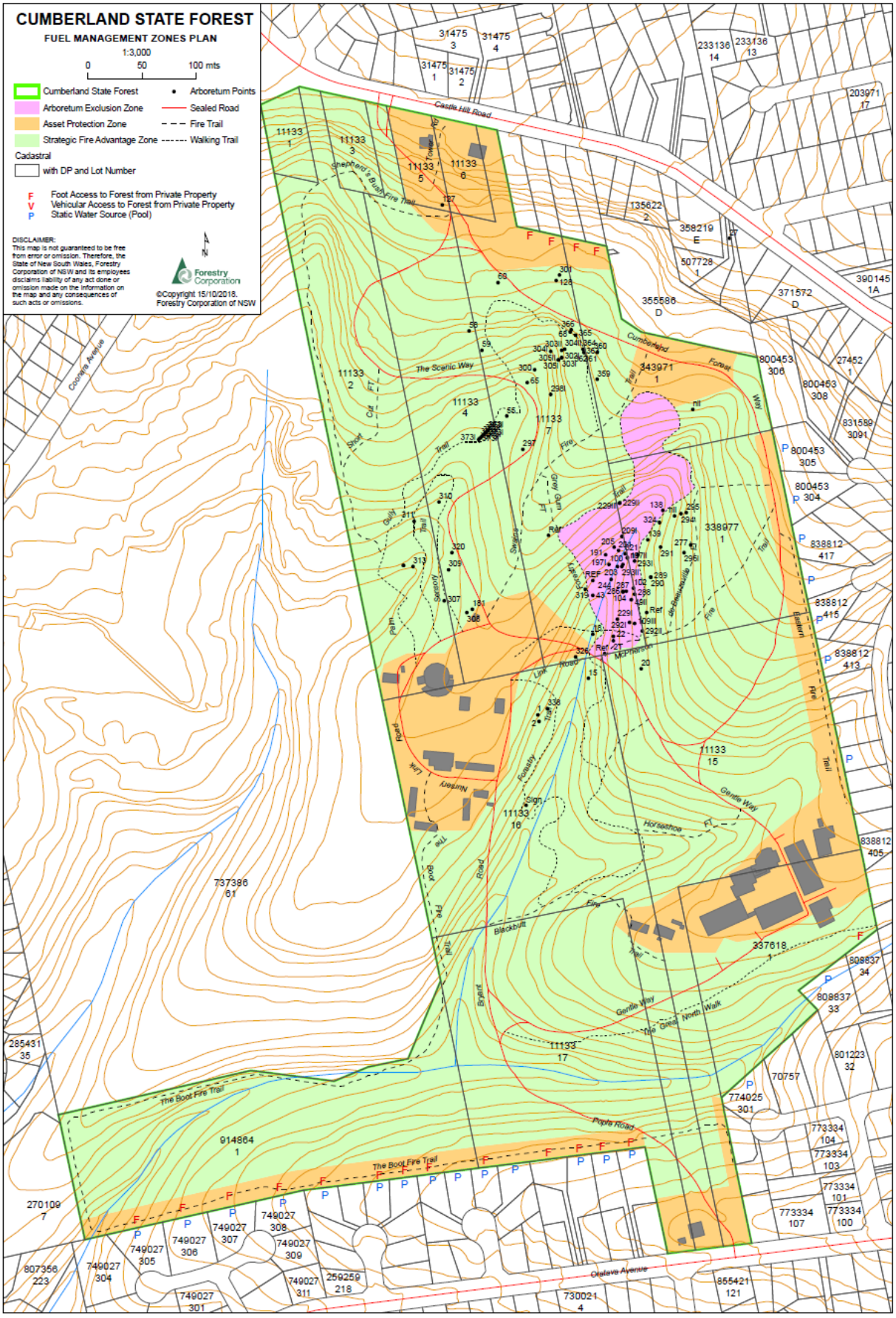
(7) A planning proposal may be inconsistent with the terms of this direction only if the relevant planning authority can satisfy the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General) that the council has obtained written advice from the Commissioner of the NSW Rural Fire Service, to the effect that, notwithstanding the non-compliance, the NSW Rural Fire Service does not object to the progression of the planning proposal.

Direction 4.4 – issued 20 February 2020

Appendix 3: NSW RFS Concerns

NSW RFS Concern	Response
Northern Site	
The vegetation bordering the northern site in the west direction cannot be considered remnant hazard due to canopy cover connectivity and insufficient separation from the broader hazard located further west of Cumberland Forest Way. As such, the hazard in the west direction is assessed as forest requiring larger Asset Protection Zone (APZ) on site compared to the APZs identified in the bush fire report.	**RESOLVED** The radiant heat modelling has demonstrated that the minimum APZ can be provided. The radiant heat modelling has not utilised the short fire run methodology or remnant vegetation classifications.
Steeper effective slopes are assessed in the west and south directions compared to the slopes identified in the bush fire report, therefore modelling must be updated to reflect this unless justified with a survey plan prepared by a registered surveyor.	**RESOLVED** The radiant heat modelling has utilised effective slopes based on the slope assessment using 2 metre contours and the 'rise over run' method. Slope assessment is provided in Section 11.3.
Where hazard is downgraded to remnant formation due to its limited fire runs and area under A1.11.1 of *Planning for Bush Fire Protection (PBP) 2019*, deemed to satisfy (DTS) APZ as per Tables A1.12.2 or A1.12.5 of *PBP 2019* must be used for determining bush fire attack levels. Where modelling is proposed, fuel loads associated with assessed hazard formation must be used. Modelling undertaken in the submitted bush fire report uses rainforest fuel loads for remnant forest hazard (as opposed to forest fuel loads) which is not accepted under *PBP 2019*.	**RESOLVED** The radiant heat modelling has not utilised the short fire run methodology or remnant vegetation classifications. North Coast Wet Sclerophyll Forest has been used for radiant heat modelling purposes.
Southern Site	
The vegetation in the east of the subject site cannot be considered remnant hazard due to broader connectivity with the larger hazard in the north direction. As such, the hazard located east of the Bryant Road is assessed as forest requiring larger APZ on site compared to the APZs identified in the bush fire report.	**RESOLVED** The radiant heat modelling has demonstrated that the minimum APZ can be provided. The radiant heat modelling has not utilised the short fire run methodology or remnant vegetation classifications. The modelling has recognised the limited potential fire head width in the assessment and modelling.
Steeper effective slopes are assessed in the North East direction compared to the slopes identified in the bush fire report, therefore modelling must be updated to reflect this unless justified with a survey plan prepared by a registered surveyor.	**RESOLVED** The radiant heat modelling has utilised effective slopes based on the slope assessment using 2 metre contours and the 'rise over run' method. Slope assessment is provided in Section 11.3.
Where a combination of hazard is identified, hazard with higher fuel loads must be used in accordance with A1.2 of *PBP 2019*. The submitted bush fire report has identified a combination of North Coast Wet Sclerophyll Forest (WSF) and Northern Hinterland WSF in the North East direction, where modelling using both the hazard formation has been undertaken. As such, in accordance with A1.2 of *PBP 2019*, North Coast WSF must be considered as the predominant hazard and any modelling undertaken must utilise North Coast WSF fuel loads.	RESOLVED The radiant heat modelling has not utilised the short fire run methodology or remnant vegetation classifications. North Coast Wet Sclerophyll Forest has been used for radiant heat modelling purposes.

Appendix 4: Cumberland State Forest - Fuel Management Plan Zones



Appendix 5: Radiant Heat Modelling

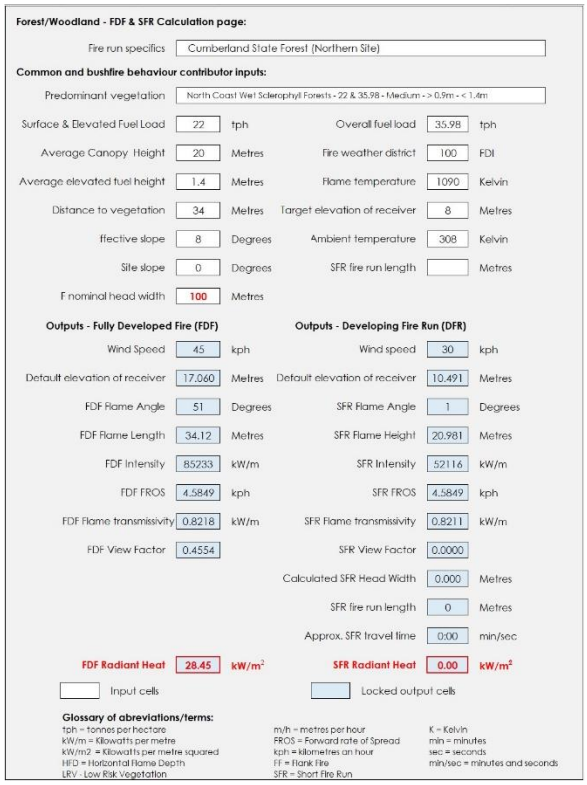
Forest/Woodland - FDF & SFR Calculation page:

Fire run specifics	Cumberland State Forest (Northern Site)				
Common and bushfire behaviour contributor inputs:					
Predominant vegetation	North Coast Wet Sclerophyll Forests - 22 & 35.98 - Medium - > 0.9m - < 1.4m				
Surface & Elevated Fuel Load	22	tph	Overall fuel load	35.98	tph
Average Canopy Height	20	Metres	Fire weather district	100	FDI
Average elevated fuel height	1.4	Metres	Flame temperature	1090	Kelvin
Distance to vegetation	39	Metres	Target elevation of receiver	8	Metres
Effective slope	11	Degrees	Ambient temperature	308	Kelvin
Site slope	0	Degrees	SFR fire run length		Metres
F nominal head width	100	Metres			
Outputs - Fully Developed Fire (FDF)			**Outputs - Developing Fire Run (DFR)**		
Wind Speed	45	kph	Wind speed	30	kph
Default elevation of receiver	20.487	Metres	Default elevation of receiver	12.184	Metres
FDF Flame Angle	47	Degrees	SFR Flame Angle	1	Degrees
FDF Flame Length	40.97	Metres	SFR Flame Height	24.368	Metres
FDF Intensity	104835	kW/m	SFR Intensity	64101	kW/m
FDF FROS	5.6394	kph	SFR FROS	5.6394	kph
FDF Flame transmissivity	0.8171	kW/m	SFR Flame transmissivity	0.8125	kW/m
FDF View Factor	0.4588		SFR View Factor	0.0000	
			Calculated SFR Head Width	0.000	Metres
			SFR fire run length	0	Metres
			Approx. SFR travel time	0:00	min/sec
FDF Radiant Heat	28.50	kW/m²	**SFR Radiant Heat**	0.00	kW/m²

Input cells Locked output cells

Glossary of abreviations/terms:
tph = tonnes per hectare; kW/m = Kilowatts per metre; kW/m2 = Kilowatts per metre squared; HFD = Horizontal Flame Depth; LRV - Low Risk Vegetation; m/h = metres per hour; FROS = Forward rate of Spread; kph = kilometres an hour; FF = Flank Fire; SFR = Short Fire Run; K = Kelvin; min = minutes; sec = seconds; min/sec = minutes and seconds

Northern Site – South Scenario



Forest/Woodland - FDF & SFR Calculation page:

Fire run specifics	Cumberland State Forest (Northern Site)				
Common and bushfire behaviour contributor inputs:					
Predominant vegetation	North Coast Wet Sclerophyll Forests - 22 & 35.98 - Medium - > 0.9m - < 1.4m				
Surface & Elevated Fuel Load	22	tph	Overall fuel load	35.98	tph
Average Canopy Height	20	Metres	Fire weather district	100	FDI
Average elevated fuel height	1.4	Metres	Flame temperature	1090	Kelvin
Distance to vegetation	34	Metres	Target elevation of receiver	8	Metres
Effective slope	8	Degrees	Ambient temperature	308	Kelvin
Site slope	0	Degrees	SFR fire run length		Metres
F nominal head width	100	Metres			
Outputs - Fully Developed Fire (FDF)			**Outputs - Developing Fire Run (DFR)**		
Wind Speed	45	kph	Wind speed	30	kph
Default elevation of receiver	17.060	Metres	Default elevation of receiver	10.491	Metres
FDF Flame Angle	51	Degrees	SFR Flame Angle	1	Degrees
FDF Flame Length	34.12	Metres	SFR Flame Height	20.981	Metres
FDF Intensity	85233	kW/m	SFR Intensity	52116	kW/m
FDF FROS	4.5849	kph	SFR FROS	4.5849	kph
FDF Flame transmissivity	0.8218	kW/m	SFR Flame transmissivity	0.8211	kW/m
FDF View Factor	0.4554		SFR View Factor	0.0000	
			Calculated SFR Head Width	0.000	Metres
			SFR fire run length	0	Metres
			Approx. SFR travel time	0:00	min/sec
FDF Radiant Heat	28.45	kW/m²	**SFR Radiant Heat**	0.00	kW/m²

Input cells Locked output cells

Glossary of abreviations/terms:
tph = tonnes per hectare; kW/m = Kilowatts per metre; kW/m2 = Kilowatts per metre squared; HFD = Horizontal Flame Depth; LRV - Low Risk Vegetation; m/h = metres per hour; FROS = Forward rate of Spread; kph = kilometres an hour; FF = Flank Fire; SFR = Short Fire Run; K = Kelvin; min = minutes; sec = seconds; min/sec = minutes and seconds

Northern Site – West Scenario

Forest/Woodland - FDF & SFR Calculation page:

Fire run specifics	Cumberland State Forest (Southern Site)				
Common and bushfire behaviour contributor inputs:					
Predominant vegetation	North Coast Wet Sclerophyll Forests - 22 & 35.98 - Medium - > 0.9m - < 1.4m				
Surface & Elevated Fuel Load	22	tph	Overall fuel load	35.98	tph
Average Canopy Height	20	Metres	Fire weather district	100	FDI
Average elevated fuel height	1.4	Metres	Flame temperature	1090	Kelvin
Distance to vegetation	41	Metres	Target elevation of receiver	8	Metres
Effective slope	12	Degrees	Ambient temperature	308	Kelvin
Site slope	0	Degrees	SFR fire run length		Metres
F nominal head width	100	Metres			
Outputs - Fully Developed Fire (FDF)			**Outputs - Developing Fire Run (DFR)**		
Wind Speed	45	kph	Wind speed	30	kph
Default elevation of receiver	21.796	Metres	Default elevation of receiver	12.807	Metres
FDF Flame Angle	46	Degrees	SFR Flame Angle	1	Degrees
FDF Flame Length	43.59	Metres	SFR Flame Height	25.615	Metres
FDF Intensity	112324	kW/m	SFR Intensity	68680	kW/m
FDF FROS	6.0423	kph	SFR FROS	6.0423	kph
FDF Flame transmissivity	0.8150	kW/m	SFR Flame transmissivity	0.8091	kW/m
FDF View Factor	0.4575		SFR View Factor	0.0000	
			Calculated SFR Head Width	0.000	Metres
			SFR fire run length	0	Metres
			Approx. SFR travel time	0:00	min/sec
FDF Radiant Heat	28.35	kW/m²	**SFR Radiant Heat**	0.00	kW/m²

Input cells Locked output cells

Glossary of abreviations/terms:
tph = tonnes per hectare; kW/m = Kilowatts per metre; kW/m2 = Kilowatts per metre squared; HFD = Horizontal Flame Depth; LRV - Low Risk Vegetation; m/h = metres per hour; FROS = Forward rate of Spread; kph = kilometres an hour; FF = Flank Fire; SFR = Short Fire Run; K = Kelvin; min = minutes; sec = seconds; min/sec = minutes and seconds

Southern Site – North Scenario

Forest/Woodland - FDF & SFR Calculation page:

Fire run specifics	Cumberland State Forest (Southern Site)				
Common and bushfire behaviour contributor inputs:					
Predominant vegetation	North Coast Wet Sclerophyll Forests - 22 & 35.98 - Medium - > 0.9m - < 1.4m				
Surface & Elevated Fuel Load	22	tph	Overall fuel load	35.98	tph
Average Canopy Height	20	Metres	Fire weather district	100	FDI
Average elevated fuel height	1.4	Metres	Flame temperature	1090	Kelvin
Distance to vegetation	30	Metres	Target elevation of receiver	8	Metres
Effective slope	10	Degrees	Ambient temperature	308	Kelvin
Site slope	0	Degrees	SFR fire run length		Metres
F nominal head width	20	Metres			
Outputs - Fully Developed Fire (FDF)			**Outputs - Developing Fire Run (DFR)**		
Wind Speed	45	kph	Wind speed	30	kph
Default elevation of receiver	19.265	Metres	Default elevation of receiver	11.591	Metres
FDF Flame Angle	30	Degrees	SFR Flame Angle	1	Degrees
FDF Flame Length	38.53	Metres	SFR Flame Height	23.183	Metres
FDF Intensity	97845	kW/m	SFR Intensity	59827	kW/m
FDF FROS	5.2634	kph	SFR FROS	5.2634	kph
FDF Flame transmissivity	0.8522	kW/m	SFR Flame transmissivity	0.8358	kW/m
FDF View Factor	0.4001		SFR View Factor	0.0000	
			Calculated SFR Head Width	0.000	Metres
			SFR fire run length	0	Metres
			Approx. SFR travel time	0:00	min/sec
FDF Radiant Heat	25.92	kW/m²	**SFR Radiant Heat**	0.00	kW/m²

Input cells Locked output cells

Glossary of abreviations/terms:
tph = tonnes per hectare; kW/m = Kilowatts per metre; kW/m2 = Kilowatts per metre squared; HFD = Horizontal Flame Depth; LRV - Low Risk Vegetation; m/h = metres per hour; FROS = Forward rate of Spread; kph = kilometres an hour; FF = Flank Fire; SFR = Short Fire Run; K = Kelvin; min = minutes; sec = seconds; min/sec = minutes and seconds

Southern Site – Northeast Scenario (20m head)