

BUSH FIRE RISK and OPERATIONS PLAN

SOLAR FARM and BESS DEVELOPMENT
6 Euromedah Road, Narromine, NSW

Reference #:262930

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1 INTRODUCTION

IDEA Group Australia Pty Ltd has engaged Bushfire Environmental Management Consultancy (BEMC) to complete a Bush fire Risk and Operations Plan for land at 6 Euromedah Road, Narromine NSW 2821. This report supports a New Development Application to Narromine Shire Council (Council) for a sub-5 megawatt (MW) Standalone battery energy storage system (BESS) located within the same leased area as the Approved Development.

The Approved Development was approved under DA2019/47 and was subsequently modified and approved on 1 October 2025 under Section 4.55(2) of the Environmental Planning and Assessment Act 1979 to incorporate a Hybrid BESS.

The assessed area, bush fire hazard, vegetation, slope and landscape context are identical for Both Developments. Except where expressly stated otherwise, the assessment in this report applies to Both Developments. Content that applies to a specific development is identified using the defined terms in Section 1.2.

This report is a Bush fire Risk and Operations Plan that assesses the potential impacts associated with Bush fire risk. This assessment demonstrates how Both Developments meet the development criteria for Bush fire protection, specifically for the protection of life and safety, infrastructure and environmental values associated with the Site.

The Site, and therefore Both Developments, is in a designated Bush fire prone area. All new development on Bush fire prone land must comply with the NSW Rural Fire Service (RFS) document Planning for Bush fire Protection 2019 (PBP 2019).

This Bush fire Assessment Report supports the Statement of Environmental Effects (SEE) for the New DA to install a Standalone BESS within the same leased area as the Approved Development. This technical paper provides an assessment of the forecast impacts of Both Developments on the surrounding landscape, as required by PBP 2019, with special consideration of the vulnerability of Both Developments and the mitigation measures relating to Bush fire risk.

1.1 SITE CONTEXT

The land at 6 Euromedah Road, Narromine NSW 2821, legally identified as Lots 41 and 46 of DP 752581 (162.34 ha), is the leased area common to Both Developments. The Site is irregularly shaped and covers an area of 162.34 hectares.

The Site's topography is relatively flat and there are no watercourses running through the Site. The Site is mostly cleared of vegetation with a small cluster of trees located in the north westerly quadrant of the Site, and on the eastern border along the Macquarie River.

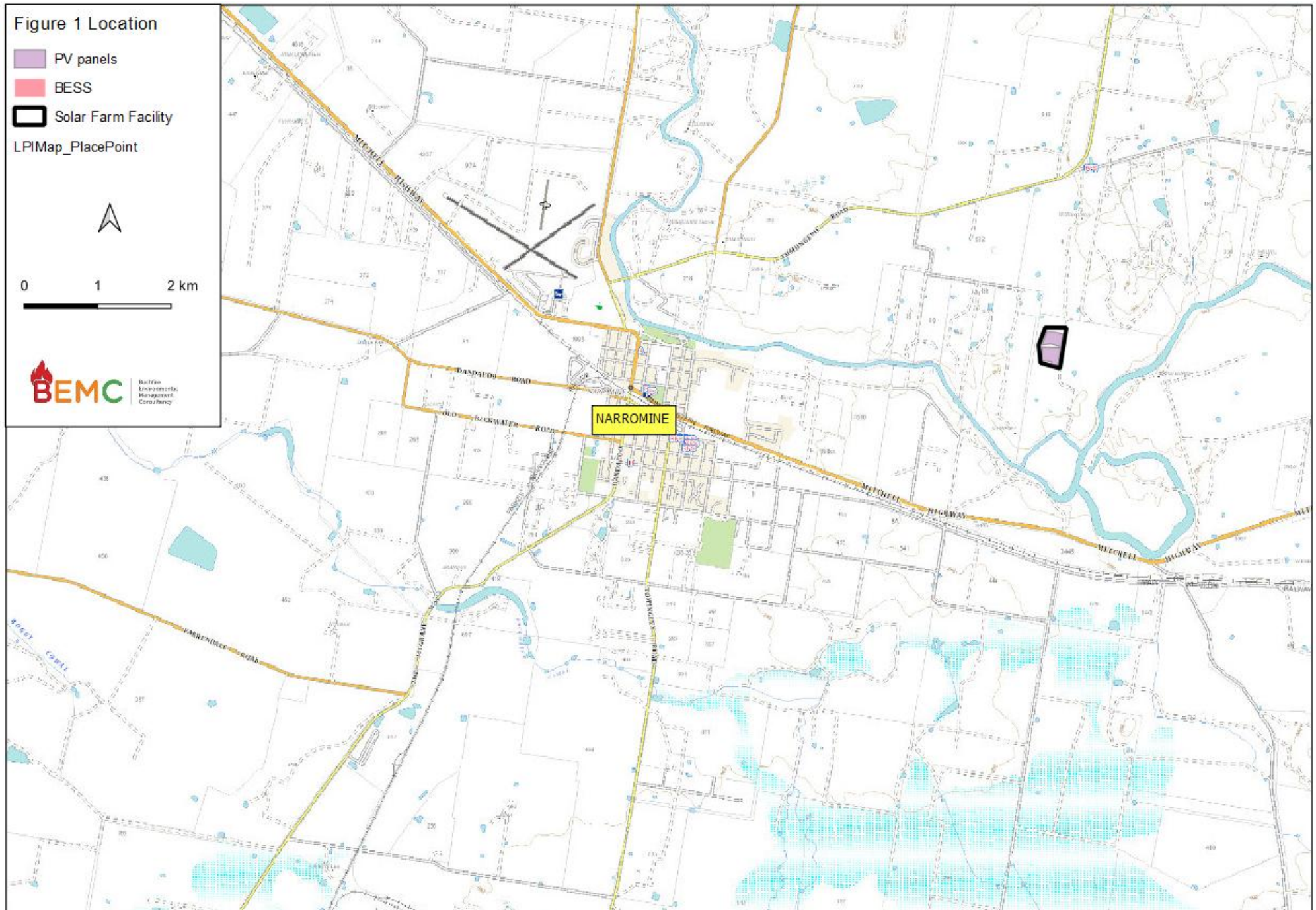
1.2 DEFINED TERMS AND APPLICATION PATHWAYS

This report supports a New DA to Council for a Standalone BESS over the same assessed area as the Approved Development. To maintain a clear distinction between the approved and proposed developments, the following defined terms are used throughout this report:

Table 1 Project definitions

Term	Meaning
the Site	The land at 6 Euromedah Road, Narromine NSW 2821, legally identified as Lots 41 and 46 of DP 752581 (162.34 ha), being the leased area common to both developments.
Approved Development	The Electricity Generating Works – 5MW Solar Farm approved under DA2019/47 by the Regional Planning Panel on 12 November 2019, as modified (including by DA2019/47.2, approved 4 May 2021, and by the Modification Application DA2019/47.3, approved 1 October 2025).
Modification Application	The application under s4.55(2) of the Environmental Planning and Assessment Act 1979 to modify DA2019/47 to incorporate the Hybrid BESS into the Approved Development, approved on 1 October 2025 by Council (DA2019/47.3).
Hybrid BESS	The battery energy storage system added to the Approved Development by the Modification Application, comprising four battery units and 10 DC-DC converters, situated in the northerly quadrant of the fenced compound.
New DA	The new development application to Narromine Shire Council for the Standalone BESS within the Site. The New DA has not been approved and remains to be determined.
Standalone BESS	The standalone battery energy storage system the subject of the New DA, comprising four battery units and ancillary infrastructure, located in the southern quadrant of the same leased area as the Approved Development.
Both Developments	The Approved Development (including the Hybrid BESS) and the Standalone BESS, collectively.

Where this report refers to “Both Developments”, the relevant statement, assessment or measure applies equally to the Approved Development and the Standalone BESS. Where a statement applies to only one development, the relevant defined term is used.



2 PROJECT OVERVIEW

The proposed location of the Standalone BESS is 6 Euromedah Road, Narromine. The Site is located on the Northern side of the Macquarie River – 5.6km East of Narromine CBD in the central west region of NSW.

This report supports the New DA, as defined in Section 1.2. The approvals history of Both Developments — including the Modification Application, under which the Hybrid BESS has been approved — and the consent to which each element of the works belongs, are summarised in **Table 2** below.

Table 2 Approvals history and application pathways

Consent / application	Status	Development covered
DA2019/47	Approved by the Regional Planning Panel, 12 November 2019	Electricity Generating Works – 5MW Solar Farm
DA2019/47.2	Approved by Council, 4 May 2021	Modification of conditions of consent; no change to physical works or use
Modification Application (s4.55(2)) approved	Approved by Council, 1 October 2025	Addition of the Hybrid BESS (four battery units and 10 DC-DC converters) to the Approved Development
New DA — proposed	To be lodged.	The Standalone BESS (four battery units and ancillary infrastructure) within the same leased area

The New DA seeks consent for the Standalone BESS, consisting of four battery units and ancillary infrastructure, within the same leased area as the Approved Development. The locations of Both Developments are shown in Figure 9 and Appendix 1.

The design of Both Developments is to include a minimum 10-metre Asset Protection Zone (APZ) surrounding the solar arrays and 10-metre Fire Break around the BESS/inverter stations, and to be contained within a non-combustible chain-link security fence. The APZ will not be located on land exceeding a slope of 18 degrees. This APZ is also intended to act as a defensible space and a buffer against radiant heat effects for emergency services. **Appendix 1** illustrates the APZ encompassing the solar farm and Hybrid BESS site and a 5-metre landscape vegetation screening is proposed adjacent to the property/lot fence line.

For Both Developments a minimum 10m APZ shall be established around each battery station, which includes the cubicles and associated structures of the Hybrid and Standalone BESS, and other infrastructure including gravel off-set areas. Road access to the Site and fencing are excluded from the APZ. Internal curves of the APZ and Inner Protection Area (IPA) are designed with minimum 6m radius turning circles to assist in vehicle access. Additionally, the vertical clearance above the APZ/IPA exceeds 6m in height.

There will be no infrastructure within the APZ. The ongoing maintenance of APZs is recognised under *100C of the Rural Fires Act 1997*¹ and supported by *2.8(1)(d) of the Biodiversity Conservation Act 2016*². Any clearing of vegetation within the Site to allow the development to occur may require assessment under the *Biodiversity Conservation Act 2016*.

For Both Developments, from the commencement of building works and throughout the operational life of the asset, the entire site shall be managed in accordance with Appendix 4 of Planning for Bushfire Protection 2019³ and NSW Rural Fire Service 'Standards for Asset Protection Zones'⁴.

2.1 RELATIONSHIP BETWEEN THE TWO DEVELOPMENTS

The Standalone BESS is located within the same leased area, and within the fenced compound, of the Approved Development. For the purposes of the New DA, the Approved Development (as modified to incorporate the Hybrid BESS) constitutes the existing approved context of the Site; the Standalone BESS is a separately proposed development and does not form part of the modified consent.

Certain bush fire protection measures serve as a whole and are relied upon by Both Developments. These shared measures, and the consent under which each is proposed to be delivered, are set out below:

- Perimeter Asset Protection Zone (10m) and perimeter fire trail — delivered under DA2019/47 (as modified); relied upon by the Standalone BESS.
- Site access, gates (RFS lock) and internal access roads — delivered under DA2019/47 (as modified); relied upon by the Standalone BESS.
- Static water supply — one 10,000L tank within 70m of the Hybrid BESS and one 10,000L tank for perimeter firefighting purposes delivered under DA2019/47 (as modified); one 10,000L tank within 70m of the Standalone BESS delivered under the New DA (total 30,000L on Site).
- Bush fire Emergency Management and Evacuation Plan — a single integrated Site-wide plan will be prepared and maintained covering Both Developments, satisfying the requirements of each consent.

¹ Rural Fires Act (1997), Accessed online: <https://www.legislation.nsw.gov.au/#/view/act/1997/65>

² Biodiversity Conservation Act (2016), Accessed online: <https://legislation.nsw.gov.au/view/html/inforce/current/act-2016-063>

³ NSW Rural Fire Service (2019). Planning for Bushfire Protection – A Guide for Councils, Planners, Fire Authorities, Developers and Home Owners, NSW Rural Fire Service.

⁴ NSW Rural Fire Service (2005). Standards for Asset Protection Zones. NSW Rural Fire Service, Sydney.

3 LEGISLATIVE FRAMEWORK

The statutory requirements outline the relevant statutory and regulatory obligations relevant to Bush fire risk management for Both Developments. This section also includes relevant policies, standards, and guidelines for the consideration of Bush fire risk for new development.

Environmental Planning and Assessment Act 1979

The (NSW) EP&A Act^{5 6 7} requires that any development on Bush fire-prone land (BPL) for any purpose complies with the aims and objectives of PBP 2019.

Environmental Planning and Assessment Act 1979: Section 10.3 Bush fire Prone Land

The designation of Bush fire Prone Land (BPL) in NSW is required under the EP&A Act (s.10.3). BPL Maps provide the trigger for the various development assessment provisions. The BPL Map is a trigger for the consideration of Bush fire matters for new development. It is not intended as a detailed measure of risk.

Rural Fires Act 1997

The (NSW) Rural Fires Act 1997 (RF Act) establishes the NSW Rural Fire Service, defines its functions and makes provision for the prevention, mitigation and suppression of rural fires. Section 63 of the RF Act requires public authorities and owners and occupiers of land to prevent Bush fires and to manage land they are responsible for. The RF Act states that it is the duty of public authorities, landowners and occupiers to take all notified and practical steps to prevent ignition and minimise spread on or from their land. Permits are required to light fires for Bush fire fuel hazard reduction or to clear fire breaks. The Act reiterates that certain instruments under the EP&A Act, NPW Act, Local Government Act 1993, Biodiversity Conservation Act 2016, and the Local Land Services Act 2013 do not apply when responding to fire emergencies.

The RF Act provides for the RFS Commissioner to declare the Bush fire danger period which generally runs from October to March (inclusive), which can be modified by the RFS. Total fire bans (TOBANs) may be issued by the RFS Commissioner in the interests of public safety.

Section 63 places an ongoing Bush fire management requirement on Both Developments to mitigate the risk of Bush fire within Both Developments.

3.1 GOVERNMENT PLANS, POLICIES, STANDARDS AND GUIDELINES

The relevant guidelines and requirements in NSW for the consideration of Bush fire risk for new development are:

Planning for Bush fire Protection 2019 NSW Rural Fire Service

This document contains specifications for planning and building on land identified as Bush fire prone. PBP seeks to provide for human safety (including fire fighters) during Bush fire events and minimise the effects

⁵ Environmental Planning & Assessment (1975) No 203 <https://legislation.nsw.gov.au/>

⁶ Environmental Assessment Legislation Amendment Act (2002). Accessed online: <https://www.legislation.nsw.gov.au/#/view/act/1979/203>

⁷ Environmental Planning & Assessment Amendment (Planning for Bush Fire Protection) Regulation 2007, accessed online: <https://www.legislation.nsw.gov.au/regulations/2014-285.pdf>

of Bush fires on property; while considering development potential, site characteristics and protection of the environment.

Solar farms are specifically addressed in section 8.3.5 of PBP 2019. BESS, substations, and transmission lines are not specifically addressed in PBP. This document's intent is to reduce Bush fire risk to nearby buildings or surrounding bush.

The main Bush fire risk associated with electricity assets as identified by PBP is the risk of ignition associated with electrical conduction. For this risk, PBP refers to ISSC3 - Guide for Management of Vegetation in the Vicinity of Electricity Assets (ISSC, 2016). However, ISSC3 does not provide guidance for transmission lines. Commercial and industrial development with no residential component is held to the aims and objectives of PBP and requires that appropriate Bush fire protection measures be put in place, however, no measures are mandated.

Standards for Asset Protection Zones NSW Rural Fire Service

This document provides standards for the establishment and maintenance of asset protection zones. Relevant Asset Protection zones as identified in this document have been considered in the Bush fire planning and design for this Project with the BESS area and onsite substation being managed as an APZ.

Guide for Bush fire Prone Land Mapping

The identification of Bush fire prone land (BPL) in NSW is required under the EP&A Act. It is the responsibility of local government to prepare the Bush fire Prone Land Map (BPLM) for the local government area. The RFS Commissioner certifies the BPL according to guidance provided by NSW RFS (2015)⁸.

BPL assessments are based on allocation of the vegetation present into one of three broad categories, as follows:

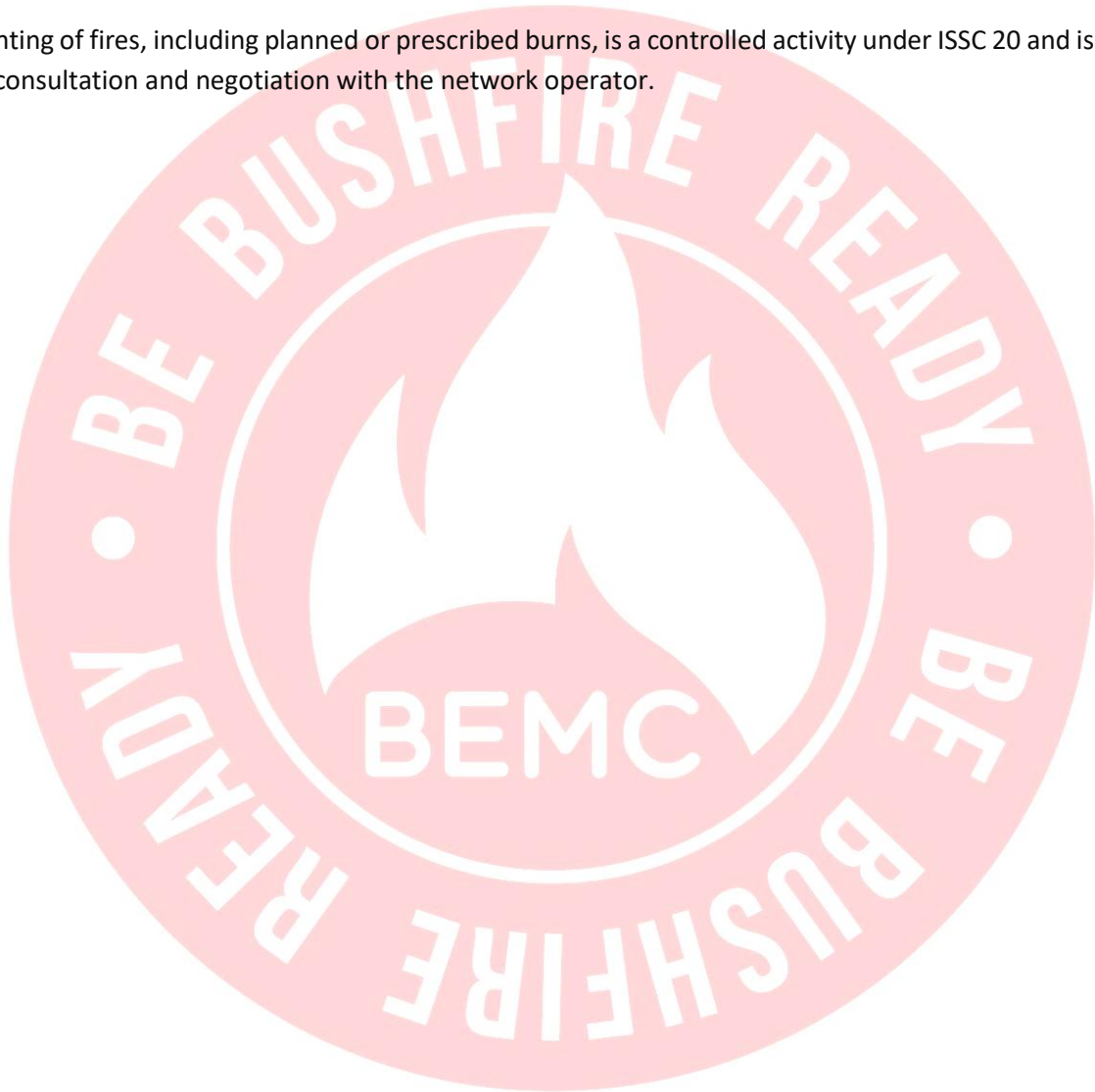
- Category 1: which includes areas of forest, woodland, heath, forested wetland and timber plantation. Highest risk category
- Category 2: rainforests and “lower risk vegetation parcels” these parcels contain remnant vegetation, but it is limited in its connectivity to larger areas and contain land management practices and a Bush fire plan that identifies the appropriate management of Bush fire risk
- Category 3: which includes grasslands, freshwater wetlands, semi-arid woodlands, alpine complex and arid shrublands. Moderate risk category
- Exclusion: Areas of vegetation less than 1 hectare and greater than 100 metres separation from category 1, 2 or 3 vegetation; small patches or strips of remnant vegetation; managed grasslands; agricultural cropland; gardens; and mangroves are not mapped as Bush fire prone.

⁸ NSW RFS Guide for Bushfire Prone land mapping, Accessed online.
https://www.rfs.nsw.gov.au/data/assets/pdf_file/0011/4412/Guideline-for-Councils-to-Bushfire-Prone-Area-Land-Mapping.pdf

ISSC 20 – Guideline for the Management of Activities Within Electricity Easements and Close to Electricity Infrastructure

The proposed BESS transmission line is required to comply with ISSC 20 - Guideline for the Management of Activities Within Electricity Easements and Close to Electricity Infrastructure (ISSC, 2012)⁹ which was written to protect public safety and electricity assets and by offering guidance on the management of activities in electricity easements including the consideration of access and safety aspects associated with the operation and maintenance, repair, replacement, upgrade or renewal of electricity infrastructure on property, whilst being mindful of the property owner's rights to maximise use and enjoyment of the land.

Lighting of fires, including planned or prescribed burns, is a controlled activity under ISSC 20 and is subject to consultation and negotiation with the network operator.



⁹ ISSC 20 Guideline for the Management of Activities within Electricity Easements and Close to Electricity Infrastructure, Accessed online: https://www.energy.nsw.gov.au/sites/default/files/2022-08/2012_09_ISSC20_ElectricityEasements.pdf

4 LIMITATIONS

Australia has a history of high consequence Bush fires, which have caused loss of life, damage, and disruption. Risk based land use planning provides the tolerable Bush fire risk levels through documents such as PBP 2019, legislation, policy, and guidelines.

Risk based land use planning has consistently been identified as one of the key means to reduce natural disaster risks to assets and communities. Improved risk-based land use planning in areas that are subject to natural hazard is fundamental to developing and enhancing resilient development, critical infrastructure, and communities.

The objectives of PBP 2019 articulate the criteria to determine tolerable risk to assets and people associated with 'other' development. Electricity assets such as battery storage, substations and high-voltage transmission lines are not specifically addressed in PBP.

To understand the nature of Bush fire risks posed to the assets, people working within the Site and people using the access road to and from the Site, it is critical to contemplate the elements of Bush fire risk which may be relevant.

The tolerable level of Bush fire risk (i.e. Bush fire from outside the site impacting Both Developments) to the asset is assessed within this document. Both Developments will be managed as an asset protection zone, screening vegetation and firefighting access.

The Bush fire assessment undertaken for this report has been based on publicly available data and desktop specialist investigations.

5 BUSH FIRE RISK

Bush fires are a normal part of the landscape, and due to climate change are predicted to become more severe, more frequent and an increasingly common part of life in eastern Australia. Future changes in weather^{10 11 12} predict increasing frequency and severity of fire events correlating with altered rainfall and drought patterns and increasing numbers of severe and intense heat events. As the dryness of more areas increases beyond levels historically considered 'normal', the footprint of areas with a propensity to burn is likely to increase.

Not all Bush fires lead to loss of life or damage to assets. Bush fires of low to moderate intensity often pose little threat to life, property, and community assets. Fire agencies are very successful at extinguishing low to moderate intensity fires before they lead to injury or death. However, Bush fires that burn during dangerous conditions have a much higher risk of leading to loss of life and property and causing significant injuries and environmental impact. The risk is greatest when fire occurs on hot, dry windy days, and where ignition occurs in heavy fuels, and in steep terrain. These conditions present fire that can spread rapidly, crown in forests, produce powerful convection columns and create extensive spot fires ahead of the fire front. This often makes their control impossible until weather conditions moderate.

When fires reach a certain intensity, they are beyond the capacity of firefighting resources to suppress. Firefighting resources are allocated where they will be most effective at protecting lives, not necessarily where property losses are most likely. Firefighting resources are also unlikely to be allocated to property infrastructure and community assets that cannot be defended safely. Both Developments are in a remote area and may not be actively defended by firefighters.

Radiant heat is the primary cause of death or serious injury in a Bush fire, and this can impact people at the Site or travelling to or from the Site. In addition, wind conditions can cause branches and trees to fall and block access roads, making driving hazardous. Smoke and embers will make driving hazardous.

Fires burning under extreme conditions can behave erratically and with intensity well above what has been assessed in this report. This report takes a balanced approach to considering Bush fire risk and has assumed a credible worst case fire scenario burning up to a Catastrophic Fire Danger Rating (FDR). The risk-based approach used in this assessment is that provided by PBP 2019 with a credible worst-case scenario of Forest Fire Danger Index 80 or a 1:50 year Bush fire event.

¹⁰ Clarke, H., Lucas, C., Smith, P., 2012. Changes in Australian fire weather between 1973 and 2010, International Journal of Climatology. DOI: 10.1002/joc.3480

¹¹ Douglas, G., 2017. Property Protection from Extreme Bushfire Events under the Influence of Climate Change. Doctor of Philosophy at the Western Sydney University, Sydney, Australia

¹² Lucas, C. 2010. On developing a historical fire weather data-set for Australia. Australian Meteorological and Oceanographic Journal. 60.1-14

6 ASSESSMENT METHODOLOGY

The assessed area is identical for both the Approved Development and the Standalone BESS. The identification of bush fire prone land, the landscape scale assessment, bush fire history, fire weather, hazard assessment, slope analysis and Bushfire Attack Level (BAL) assessment in this Section 6 therefore apply equally to Both Developments and are not repeated separately for each. Project-specific measures are identified in Sections 7, 8 and 9 and Table 4 using the defined terms in Section 1.2.

The aim of PBP 2019 is to provide for the protection of human life and minimise impacts on property from the threat of bush fire, while having due regard to development potential, site characteristics and protection of the environment. The objectives are to:

- Afford buildings and their occupants protection from exposure to a Bush fire.
- Provide for a defensible 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 (BPMs); and
- Ensure that utility services are adequate to meet the needs of firefighters.

PBP 2019 articulates the regulatory framework for new development in NSW, along with the relevant bush fire protection measures to be contemplated in the delivery of bush fire-resilient development design. The document provides detailed provisions for various types of development which is focussed at residential and Special Fire Protection Purpose development which are vulnerable uses such as schools, hospitals, aged care etc.

Both Developments are considered as 'other development' in PBP 2019. 'Other development' includes industrial, commercial and infrastructure development. PBP 2019 does not provide a framework for Both Developments in a meaningful way as the document is focussed on new residential development in Bushfire Prone Areas. However, 'other development' must satisfy the aims and objectives of PBP 2019. This assessment includes an analysis of the hazard, threat and subsequent bush fire risk to Both Developments and provides recommendations that satisfy the aims and objectives of PBP 2019.

PBP 2019 identifies the methodology to determine Bushfire Attack Levels (BAL) based on calculated radiant heat levels at a site. This assessment is based on mapping of vegetation formations and slope assessment in accordance with PBP 2019. This assessment is based on a detailed GIS analysis of the Site with accessible public data layers utilising the following resources:

- Planning for Bushfire Protection (RFS, 2019)
- aerial mapping
- detailed GIS analysis.

Bush fire risk as influenced by fire history and future mitigation strategies (e.g., hazard reduction burning) has no bearing on the determination of bush fire protection strategies for future development of Both Developments. This is due to the fact that PBP 2019 assesses bush fire threat based purely on vegetation

and slope (i.e., hazard and not risk), making the assumption that a fire may occur at a near worst-case fire weather scenario and with maximum fuel loads.

In undertaking the report, BEMC has undertaken a landscape wide assessment of the bush fire risk and review of the Orana Bushfire Risk Management Plan (2020) to gain an appreciation of the broader risk affecting Both Developments.

The 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 more detailed consideration of bush fire risk to Both Developments has followed the methodology outlined in accordance with PBP 2019. The following methodology is from PBP 2019 which has been used to determine the BAL at the Site. The process to determine BAL is outlined below:

To Determine Bushfire Attack Level

- Step 1: Determine vegetation formation in all directions around the building to a distance of 140 metres.
- Step 2: Determine the effective slope of the land from the building for a distance of 100 metres.
- Step 3: Determine the relevant FFDI for the council area in which the development is to be undertaken.
- Step 4: Determine the separation distance by measuring from the edge of the unmanaged vegetation to the closest external wall of an asset.
- Step 5: Match the relevant FFDI, appropriate vegetation, distance and effective slope to determine the appropriate BAL using the relevant tables in PBP 2019.

The vegetation formations (bush fire fuels) and the topography (effective slope) combine to create the bush fire threat that may affect Both Developments' Bush fire behaviour, which determine the planning and building response of PBP 2019. A detailed assessment has been undertaken to determine the Bush fire hazard and likely radiant heat at Both Developments.

6.1 BUSH FIRE PRONE LAND

The identification of BPL in NSW is provided under Section 10.3 of the EP&A Act. The Site and Project are on designated BPL (**Figure 2**) and the surrounding grassland area is not managed which causes a bush fire risk. The Bushfire Prone Land Maps provide the trigger for the consideration of bush fire matters for new development. The area of Both Developments is mapped as Category 3 bush fire Prone Land with the associated transmission line also traversing Category 3 land. Bushfire Prone Land is considered an area of land that can support a bush fire or is likely to be subject to bush fire attack.

The grassland surrounding the Site is designated as being bush fire prone on the BFPL map and it is able to carry a bush fire. As such, the unmanaged grassland areas have been treated within this bush fire Hazard Assessment as a hazard.

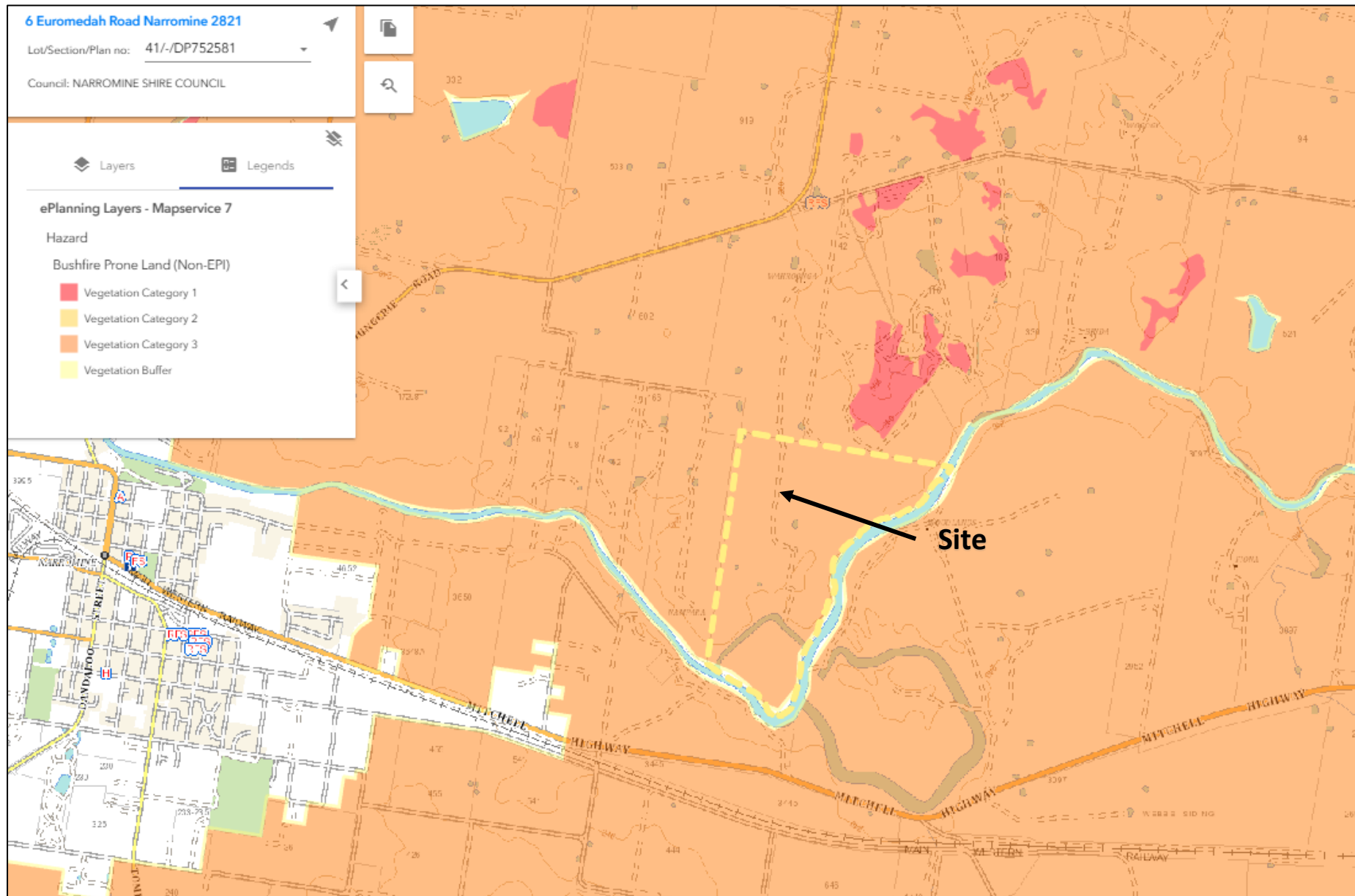


Figure 2 Bush fire Prone Land Map (Extract NSW Planning Portal, 2026)

6.2 LANDSCAPE SCALE BUSH FIRE ASSESSMENT

Planning for Bushfire Protection (2019) is based on the worst-case scenarios for each of the bush fire behaviour elements of fire weather, vegetation, slope and assumes no human intervention. All development shall be assessed on an individual basis as broad-brush approaches of documents such as PBP 2019 may not be applicable in every instance.

The Broader Landscape Assessment (BLA) examines the area external to the requirements of the planning proposal, extending for approximately two kilometres. The assessment includes an understanding of the bushfire hazards (vegetation extent), the broader road network, proximity to townsites, emergency response capacities, urban areas and suitable destinations within a context of increasing fire behaviour and exposure within the life of Both Developments. It provides a means of quantifying the characteristics and the potential for a landscape scale bushfire when considering the suitability and risk to Both Developments. The BLA utilises a point-based assessment process to quantify the landscape risk. This enables the identification of the actual bushfire risk and determines if strict adherence to PBP 2019 is warranted, and if a proposed development is appropriate in the bush fire hazard context.

The likelihood of a bush fire, 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. Multiple factors have been considered for the landscape scale assessment. 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 Bush fire.
- The ability to seek Bush fire shelter on site or at alternative locations.
- The extent of neighbourhood-scale damage the Bush fire may produce.

The BLA provides a quantifiable assessment of the landscape risk to guide the appropriate level of bushfire protection measures to mitigate bushfire risk to acceptable levels. Future changes in weather¹³ ¹⁴ ¹⁵ have been considered within this assessment and the requirements for bushfire protection measures to be adequate for the life of the property¹⁶.

Both Developments are considered **MODERATE** risk and strict compliance with PBP 2019 is not warranted and significant deviations from the acceptable solutions of PBP within prior consultation with

¹³ Clarke, H., Lucas, C., Smith, P., 2012. Changes in Australian fire weather between 1973 and 2010, International Journal of Climatology. DOI: 10.1002/joc.3480

¹⁴ Douglas, G., 2017. Property Protection from Extreme Bushfire Events under the Influence of Climate Change. Doctor of Philosophy at the Western Sydney University, Sydney, Australia

¹⁵ Lucas, C. 2010. On developing a historical fire weather data-set for Australia. Australian Meteorological and Oceanographic Journal. 60.1-14

¹⁶ NSW Department of Justice Office of Emergency Management (2018) NSW Critical Infrastructure Resilience Strategy

NSW RFS through a PRE-DA process and applying fire engineering to calculated accurate radiant heat exposures are warranted to achieve acceptable risk level.

Consider 4.15(1)(c) of the EP&A Act which provides a mandatory consideration of the ‘suitability of the site for the development’, and simply complying with PBP2019 may not be adequate for some sites. The BLA illustrates the site is suitable from a bushfire perspective.



Table 3 Landscape scale Bush fire risk assessment

ELEMENT	0 points	1 point	3 points	5 points	SCORE
LAND-USE					
Will the proposed development impact on adjoining lands	Positive impacts on the ability of adjoining landowners to implement Bush fire Protection Measures.	Reduce the requirements of adjoining landowners to implement Bush fire Protection Measures	Adjoining landowners will be required to increase Bush fire Protection Measures	Significantly inhibit adjoining landowners to implement Bush fire Protection Measures.	3
Will the proposed development impact on utilities or add hazards	Positive impacts on utilities or add hazards.	Minor impact on utilities or add hazards although considered within planning constraints.	Major impact on utilities or add hazards.	The wildfire risk profile of significant infrastructure will increase due to this development.	3
Community profile	High social-economic connected community	Rural disconnected community	Low social-economic connected community	Vulnerable development	1
Catastrophic landscape Wildfire Behaviour	Not possible given the broader landscape.	Unlikely given the broader landscape.	Likely given the broader landscape.	Very likely given the broader landscape.	1
EMERGENCY RESPONSE					
Proximity to potential built refuge	Within 5km	5-10km	10-50km	>50km	1
Impact on the ability of emergency services to respond, within fire growth period	Within 5-minutes of a fire stations (RFS or F&R)	Within 45-minutes of >5 fire stations (RFS or F&R)	Within 45mins-minutes of >5 fire stations (RFS or F&R)	<5 fire stations (RFS or F&R) within 45 hr	3
Proposed development within aviation response areas	Located within 15 minutes flight from a Large Air Tanker (LAT) airbase	located within 15-30 minutes flight from a Large Air Tanker (LAT) airbase	located more than 30-minute flight from a Large Air Tanker (LAT) airbase	It is unlikely aviation services deployed to this location.	5
WATER					
Water availability	Stand-alone, visual dedicated firefighting water provided	Relies on water system <70m of furthest elevation of building	Relies on water system >70m of furthest elevation of building	Relies on natural water supplies (dams, creeks etc.)	0

ELEMENT	0 points	1 point	3 points	5 points	SCORE
ACCESS					
Local road pattern is suitable during a bushfire	Multiple evacuation routes are possible and connect with the public road network in a direction away from the wildfire threat to refuge location.	More than one egress route provided from the property to a safer location.	One egress route is provided, which is <200m from the property to a safer location.	Only one access or egress route with no nearby safe location.	0
Relationship between hazard and vehicle access	Seamless integration with existing settlement - no effect on evacuation.	Short bushland pinch points that may restrict access temporarily or carry fire across roads. Unlikely impact on evacuation.	Pinch points that are likely to restrict access along evacuation routes for short periods (15-30mins) and carry fire across roads.	Large areas of bushland or multiple pinch points along evacuation routes that could block evacuation routes for an extended time.	0
FUEL HAZARD					
Vegetation continuity	Forested vegetation beyond 140m from the site is scattered with low continuity due to urban development.	Forested vegetation beyond 140m from the site is scattered and isolated, forming a dominate fast moving grassland or open woodland fire event.	Patches of forested vegetation associated riparian and isolated ridgelines beyond 140m from the site may result in localised forest fire event.	Continuous forested areas within mountainous terrain beyond 140m from the site will result in broadscale landscape emergency management operations.	0
Vegetation connectiveness	Forested vegetation corridors beyond 140m are restricted and do not enable landscape fire to enter and move through the site by a continuous fire path.	Forested vegetation corridors beyond 140m from the site exist, although separation >100m between forested vegetation restricting the fire head growth	Forested vegetation corridors beyond 140m from the site exist, although separations <100m existing providing some impact on fire head growth.	Forested vegetation corridors beyond 140m from the site provide for passage of landscape fire to enter and move through the site.	0
Vegetation Location	Wildfire within forests can only approach from one direction surrounded by a suburban, township or urban area managed in a minimum fuel condition.	Wildfire within forests can approach from two directions and the site is within a suburban, township or urban area managed in a minimum fuel condition.	Wildfire within forests can approach from several directions although gaps within forested vegetation are present.	Wildfire within forests can approach from several directions and have hours or days to grow and develop before impacting the site.	0

ELEMENT	0 points	1 point	3 points	5 points	SCORE
Separation	Hazard separation between forested hazard and buildings of greater than 100m.	Hazard separation between forested hazard and buildings of 50-100m	Hazard separation between forested hazard and buildings of 30-50m	Hazard separation between forested hazard and buildings of <30m	0
Vegetation flammability	Within the dominated fire direction, the fire fuel is restricted to surface, partially managed and separated through land use practises.	Within the dominated fire direction, the fire fuel is highly aerated, with significant separations (>50m) between these patches with partially managed vegetation between.	Within the dominated fire direction, the fire fuel is highly aerated, with <50m between these patches with partially managed vegetation between	Within the dominated fire direction, the fire fuel is highly aerated, continuous continuity vertically and horizontally with flammable species.	0
TOTAL					16



6.3 BUSH FIRE RISK MANAGEMENT PLAN

The Orana Bushfire Risk Management Plan 2020¹⁷ (Risk Plan) is a strategic document that identifies community assets at risk and sets out a five-year program of coordinated multi-agency (state and local) treatments to reduce the risk of bush fire to the assets. The Risk Plan identifies the typical climate in the Orana Bushfire Management Committee (BFMC) (in which the Site and Project are located) as:

The typical / average climate in the Orana BFMC area is:

- Warm to hot summers, ranging from 17°C to 34°C with some extremes exceeding 38°C for many days.
- Winter temperatures ranging from -4°C to 16°C with the regular early morning frosts in the southern area of the Dubbo Regional LGA.
- Mean average rainfall for the area is between 500-600mm per annum. Rainfall is usually fairly evenly distributed throughout the year with a slightly greater average in the summer months. January is on average, the wettest month with 60mm.

The bush fire season generally commences on the 1st October and concludes 31st March. Prevailing weather conditions associated with the bush fire season in the Orana BFMC area are North to Westerly winds created by consecutive high pressure systems causing the high daytime temperatures. Such hot winds are usually very dry with low relative humidity often going below 20%.

The Risk Plan follows the RFS guidelines for the assessment of bush fire risk. Identifying the level of bush fire risk firstly involved identifying important community assets considered to be at risk from bush fire in the Orana BFMC area and then assessing the likelihood and consequence ratings. The risk planning process requires that all asset types assess the likelihood of a bush fire occurring. This involves considering fire history, including ignition cause and patterns, known fire paths, access, containment potential and potential fire run (size of the vegetated area).

The Risk Plan does not specifically identify the area of Both Developments (**Figure 3**). The Risk Plan identifies the broader context as being a Land Management Zone. The Risk Plan notes the following for the Land Management Zone:

Purpose of LMZ: To meet relevant land management objectives in areas where APZs, IMZs or SFAZs are not appropriate.

Suppression objectives: As per the land management and fire protection objectives of the responsible land manager. To undertake mosaic burning to reduce the likelihood of spread of fires.

Zone characteristics: An area in the landscape where land management outcomes are also prioritised such as those related to social, cultural or environmental values, or those related to the management of agricultural and natural resource assets.

Treatment Scheduling: Managed for Natural and cultural outcomes

¹⁷ Orana Bush Fire Management Committee, 2020 Bush Fire Risk Management Plan, NSW RFS



Figure 3 Extract from Bushfire Risk Management Plan for the Site (source Orana Bushfire Risk Management Plan)

6.4 BUSH FIRE HISTORY

The Site has no history of fire within 10km, with the closest fire records 15km to the north-west, Rosewick wildfire, in 2009/10 burning 30ha. No fire records directly affect the Site.

The Risk Plan states: The Orana BFMC area has on average 200-250 fires per year, of which 10-15 can be considered to be major fires with Narromine Council area the following major fire years - 1957, 1964, 1979, 1987 and 2001, (Goobang s44 Fire). Local knowledge indicates that major fires occur approximately every 10 to 15 years.

The main sources of ignition in the BFMC area are careless acts by individuals, farm machinery, campfire escapes, lightning strikes, electrical power supply lines, burning of stolen vehicles, car exhaust within long dry grass and escaped controlled permit burns.

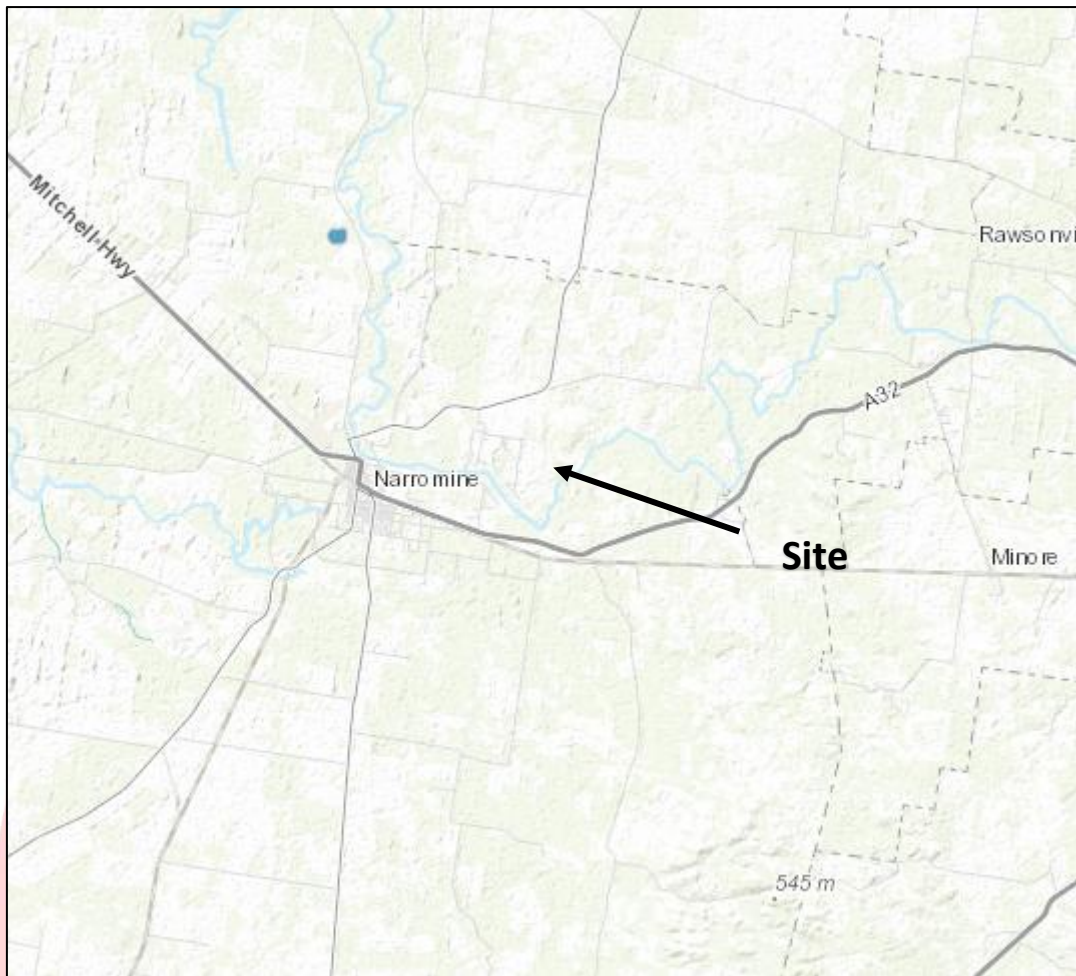


Figure 4 Bush fire History (Extract 100-years-of-bushfire-unsw-au)

6.5 FIRE WEATHER

The fire weather is dictated by PBP 2019 and assumes a credible worst-case scenario and an absence of any other mitigating factors relating to aspect or prevailing winds. The Forest Fire Danger Index (FFDI) measures the degree of danger of fire in Australian vegetation.

For the purposes of PBP 2019, the FFDI required to be used for development assessment purposes is based on local government boundaries. The area of Both Developments has a FFDI of 100 as required by the RFS and PBP 2019.

It may be possible that days of higher FFDI may be experienced at the Site. This may result in fire situations where conditions challenge survivability of buildings and their occupants. The framework provided for by PBP 2019 has been used in this assessment.

6.5.1 Australian fire danger rating system

The principal objective of the new Australian Fire Danger Rating System (AFDRS) is to implement a more accurate and nationally consistent system that will enable improved decision-making by response agencies and industry and provoke the desired community response to messaging in order to improve public safety.

The AFDRS uses the latest scientific understanding about weather, fuel and how fire behaves in different types of vegetation to improve the reliability of fire danger forecasts. This strengthens the ability of those working in emergency services to be better prepared, make improved decisions, and provide better advice to the community.

It is aimed at a simplified, action-oriented Fire Danger Rating System.

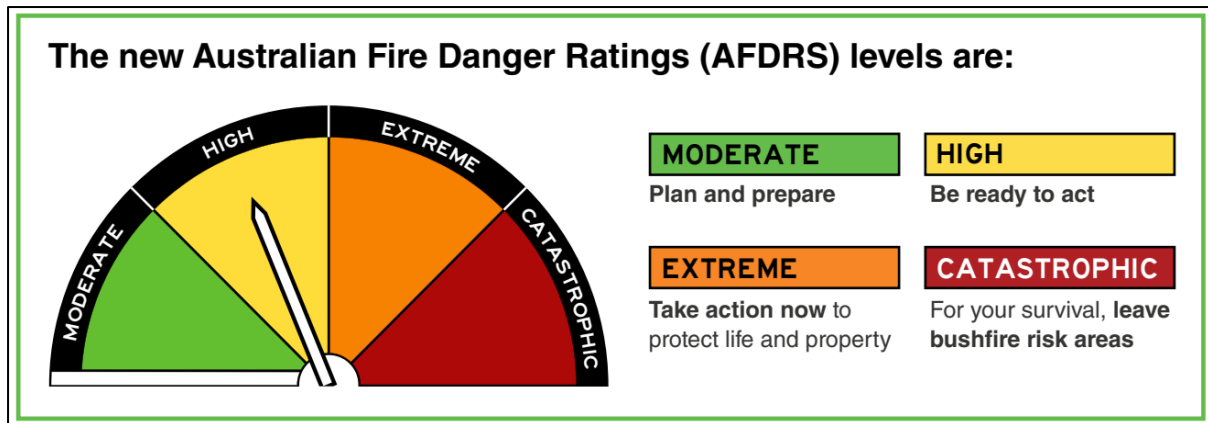


Figure 5 New Australian Fire Danger Rating System (AFAC, 2022)

MODERATE: *Plan and Prepare* - Have a plan and be ready to act if a fire starts.

HIGH: *Be ready to act* - Be alert for fires in your area and be ready to leave or be ready to defend.

EXTREME: *Take action* - Act before a fire starts.

CATASTROPHIC: *Leave high risk areas* - Protect your life, leave early.

6.6 FM GLOBAL PROPERTY LOSS PREVENTION DATA SHEETS

FM Global Property Loss Prevention Data Sheets¹⁸ provide standards help you reduce the chance of property loss due to fire, weather conditions, and failure of electrical or mechanical equipment, which can be applied to bush fire risk mitigation.

Data sheet 5-33: Electrical Energy Storage Systems has been reviewed with the following recommendations incorporated into this risk analysis:

- Locate energy storage systems away from surrounding critical buildings and equipment.
- Establish a dedicated building with support equipment away from the energy storage system.
- Where explosion vents or other penetrations are provided, ensure they are arranged and directed away from dedicated building with support equipment and entrance to the Site.
- Ensure bush fire water supply is quarantined from water supply that is required for automatic sprinkler systems for the Energy Storage Systems.

¹⁸ FM Global property loss prevention data sheets for commercial and industrial development. Accessed online: <https://www.fm.com/resources/fm-data-sheets>

Data Sheet 9-19, Wildland Fire has been reviewed with the following recommendations incorporated into this risk analysis:

- Strips of vegetation less than 20 m wide perpendicular to the exposed building wall and not within 20 m of the building or other vegetation is not considered a bushfire threat (such as perimeter screening vegetation).
- Apply construction schedules to protect built assets from direct flame, radiant heat and embers.
- Remove all combustible elements (vegetation, wooden fencing and landscaping) within 1.5m of the built asset.
- If the level of radiant heat is higher than 12.5 kW/m² for combustible wall construction (timber), or higher than 30 kW/m² (rounded up from 27 kW/m² in FM Global Property Loss Prevention Data Sheet 1-20 for this application only) for non-combustible exposed wall construction, then the wildland fire exposure exceeds the passive protection of the exposed building. If the wildland fire exposure exceeds the passive protection further works are required, such as increasing the reduced-fuel zone (APZ); upgrading the construction materials or providing and adequately designed exterior sprinkler systems.
- Avoid combustible yard storage.

Data Sheet 1-20, Protection Against Exterior Fire Exposure has been reviewed with the following recommendations incorporated into this risk analysis:

- The type, height and bulk of yard storage needs to be considered for the separations to buildings.
- Loaded trailers are considered yard storage.
- Provide > 10 m horizontally between combustible yard storage and building air intakes or exhaust vents.
- The location of hydrants needs to be considered in consecutively with yard storage plans.
- Locate dumpsters > 9m from building if opening (windows and doors) in exposed wall and wall has a < 1-hr fire rated.
- Provide a water supply capable of providing a minimum duration of 60 minutes to a specific application design within automatic-type sprinklers, water-spray nozzles, corrosion-resistant pipe and fittings and various other requirements.

Data Sheet 3-29, Reliability of Fire Protection Water Supplies

FM Global client loss history in sprinklered buildings shows that lack of adequate valve supervision, impairment handling, and lack of adequate testing and maintenance cause approximately 80% of sprinkler system failures. A further 16% of sprinkler system failures are attributed to prematurely shutting off the sprinkler system during a fire event. There is almost no history of uncontrolled fire losses at adequately sprinklered properties where a single water supply exists that is properly designed, installed, maintained, and tested. For this reason, FM Global recommends a single adequate and reliable fire protection water supply. Additional considerations, such as facility size/value, business continuity, occupancy, arrangement and condition of water supply and geographic location may drive the need for higher levels of reliability and water supply duplication.

Data sheet 7-106 Ground mounted Solar Photovoltaic Power

The types of materials used in ground-mounted solar panels may not necessarily be likely to propagate a fire, although insulation failure of cables may generate DC arcs at the fault point and commence ignition. Ground-mounted solar panels may be damaged when exposed to fire. Such damage could occur when exposed to radiant heat or burning embers from a bush fire or wild land fire, or nearby combustible construction or outside storage. While damage may be limited to cracking of the glass covering or thermal damage to the panels below, it may prevent or limit generation of electrical power. *Data sheet 7-106*

Ground mounted Solar Photovoltaic Power has been reviewed with the following recommendations incorporated into this risk analysis:

- Provide an access road to the Site and around the perimeter to ensure accessibility for firefighting apparatus to approach a fire inside the solar farm.
- Where row/string length exceeds 180 m, provide additional access roads at intervals of 90m to access internal to the PV layout for fire suppression.
- Where solar farms are in areas with vegetation, ensure adequate irrigation is provided to prevent vegetation from becoming a fire hazard. Where irrigation is not practical, ongoing vegetation control growth is required. Where mowing or cutting is used to control vegetation growth, remove cuttings from the area so that they do not pose a sustained fire hazard.
- Provide buffer zone between the access road and exterior edge of the solar farm.
- Do not use solar PV systems that contain foam plastic, such as extruded foam polystyrene.
- Preference for panels having the Australian equivalency of Class A or B rating in the Spread of Flame test, and a Class A or B rating in the Burning Brand test when tested in accordance with *ASTM E108, Standard Test Methods for Fire Tests of Roof Coverings*.

6.7 CFA DESIGN GUIDELINES AND MODEL REQUIREMENTS RENEWABLE ENERGY FACILITIES

CFA Design guidelines and model requirements renewable energy facilities (2025) ¹⁹ provide contemporary industry standards for renewable energy facilities. This document is not adopted in NSW although provides guidance on appropriate bushfire risk mitigation measures.

Facilities Fire hazards at solar energy facilities include:

- Electrical hazards, such as panel/inverter electrical faults; power surges; lightning strikes; water ingress; retained DC electricity in solar panels after shut-down/isolation.
- Potential fire spread and limited emergency response due to proximity of panel banks to each other, on-site infrastructure and vegetation (including screening vegetation).
- Landscape hazards, such as bushfire/grassfire ignition from fire within the facility, or external ignition of site infrastructure from embers or radiant heat.

Fire hazards at facilities with battery energy storage systems include:

- Electrical hazards, such as battery faults; overcharging; rapid discharge; loss of remote monitoring systems; internal short circuits; overheating; water ingress; lightning strike (leading to thermal events/runaway).
- Chemical hazards, such as the inherent hazards of the stored dangerous goods; spills and leaks of transformer oil/diesel, refrigerant gas/coolant; chemical reactions.
- Explosions, from ignition of venting gases.
- Potential fire spread due to proximity of batteries (and containers/enclosures) to each other, on-site infrastructure and vegetation (including screening vegetation).

Facility Location and Design

All reasonable steps must be taken to ensure that facility infrastructure is not located in peat areas on-site and provide adequate fire truck access to and within the facility.

Where practicable, solar energy facilities can be sited on grazed paddocks. Vegetation throughout the facility must be managed.

¹⁹ CFA Design guidelines and model requirements renewable energy facilities (2025), Accessed Online: <https://www.cfa.vic.gov.au/plan-prepare/building-planning-regulations/renewable-energy-fire-safety>

Solar energy facilities are to have a minimum six (6) metre separation between solar panel banks.

Wherever possible, battery energy storage systems must be sited in low-risk location, with vehicle access and any fire water tanks are not aligned to the prevailing wind direction.

Water Supplies

In the event of a fire (structure fire, grassfire or bushfire), sufficient water must be available and safely accessible to emergency responders and trucks to ensure that fire suppression activities are safe, timely, effective and not hindered in any way.

Firefighting infrastructure must be designed to allow effective response to the risks and hazards at the facility. Fire water must be provided to cover buildings, control rooms, substations and grid connections.

The quantity of water supply must be established through a comprehensive risk management process that considers all relevant hazards, documented in the Emergency Management Plan.

For micro solar facilities up to and including 5MW without battery storage that are not located within high-risk landscapes, fire water of not less than 22,500 litres effective capacity, in lieu of 45,000 litres, may be provided. Fire water tank(s) must be located at the primary vehicle access point to the facility.

Where micro solar facilities include battery energy storage systems, additional fire water supply should be considered.

For facilities with centralised battery energy storage systems (located amongst solar panel arrays) the guidelines suggest fire protection system shall:

- a) Where reticulated water is available, a fire protection system as per Model Requirement (1a) under 'Centralised Battery Energy Storage Systems'.

OR

- b) Where no reticulated water is available, a firewater supply in static storage tanks, where a minimum 45,000L static water tank is provided within 120m of each battery container. The aggregate quantity of fire water supply at the facility must be no less than 288,000L to the satisfaction of CFA.

Landscape Screening and On-Site Vegetation

Any proposed or existing vegetation must be considered in the Risk Management Plan for its potential to intensify and propagate fire within and away from the Site. Solar energy facilities must have grass maintained to no more than 100mm under solar panels during the Fire Danger Period and battery energy storage systems be clear of vegetation, including grass, for at least ten (10) metres on all sides.

Fire breaks

A fire break is a gap in fuel (vegetation) that reduces the potential for fire to enter or leave an area. Fire breaks may also be used for emergency vehicle access. Fire break must be established and maintained around the perimeter of the facility, commencing from the boundary of the facility or from the vegetation screening inside the property boundary, and the perimeter of control rooms, electricity compounds, substations and all other buildings onsite.

A fire break around the Hybrid and Standalone BESS, and related infrastructure, of a width of no less than 10m, or greater were determined in the Risk Management Plan.

6.8 BUSH FIRE HAZARD ASSESSMENT

The vegetation formations (bush fire fuels) and the topography (effective slope) combine to create the bush fire threat that may affect bush fire behaviour at the Site, and which determine the planning response. An assessment of the bush fire hazard is necessary to determine the application of bush fire protection measures such as setbacks from the hazard.

6.8.1 Vegetation Structure

Predominant vegetation is classified by structure or formation using the system adopted by David Keith (2004)²⁰ and by the general description using PBP 2019. 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 Site boundary or key assets on the Site. The vegetation surrounding the Site is dominated by Riverine Plain Grasslands. Inside the solar farm facility would be managed to Asset Protection Zone Standards and would be managed land.

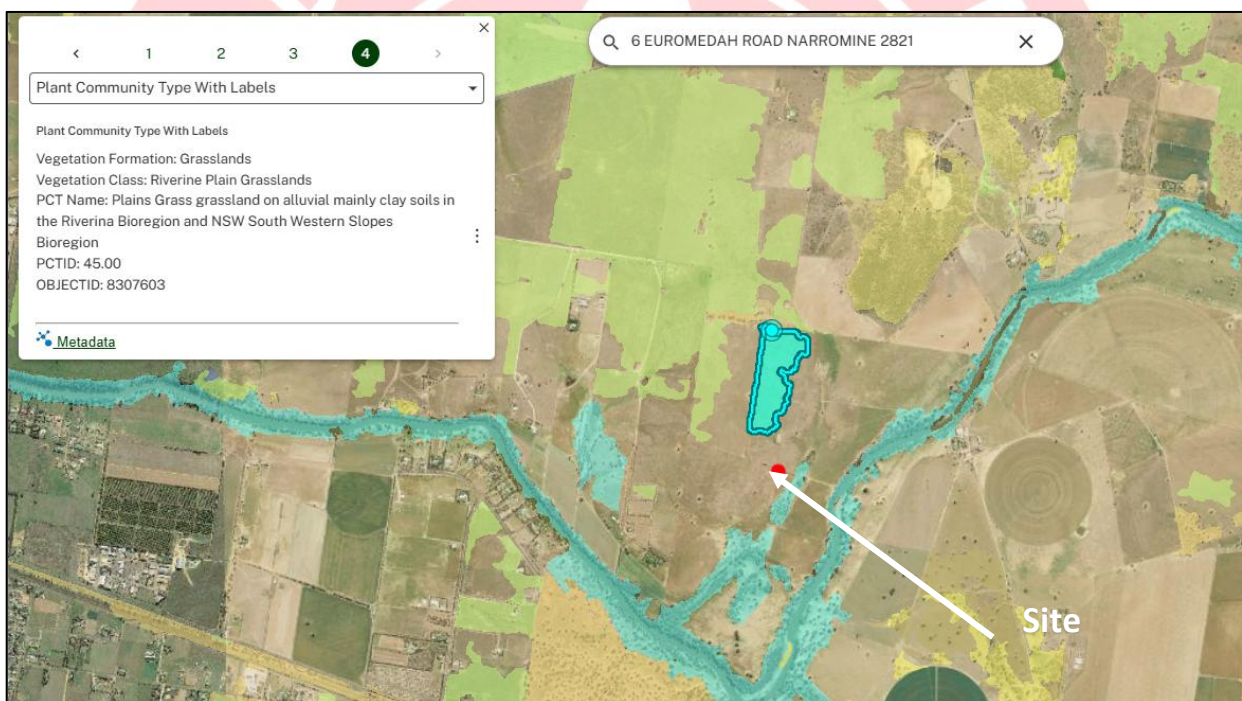


Figure 6 State Vegetation Type Map (SEED Portal, 2026)

6.9 SLOPES INFLUENCING BUSH FIRE BEHAVIOUR

The slope assessment for the Site has been undertaken in the GIS analysis and is a component of determining the BAL rating. 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). It is not the slope between the vegetation and the

²⁰ 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

asset (slope located between the asset and vegetation is the Site slope). The analysis of effective slope is undertaken in accordance with Fire Protection Association Australia Practise Note²¹.

The effective slope is considered to be the slope under the vegetation which will most significantly influence the bush fire behaviour for each aspect. This is usually the steepest slope which has been used in this assessment. A detailed slope analysis has been completed at **Figure 7**. The slopes in and around the Site are downslopes less than 5 degrees.

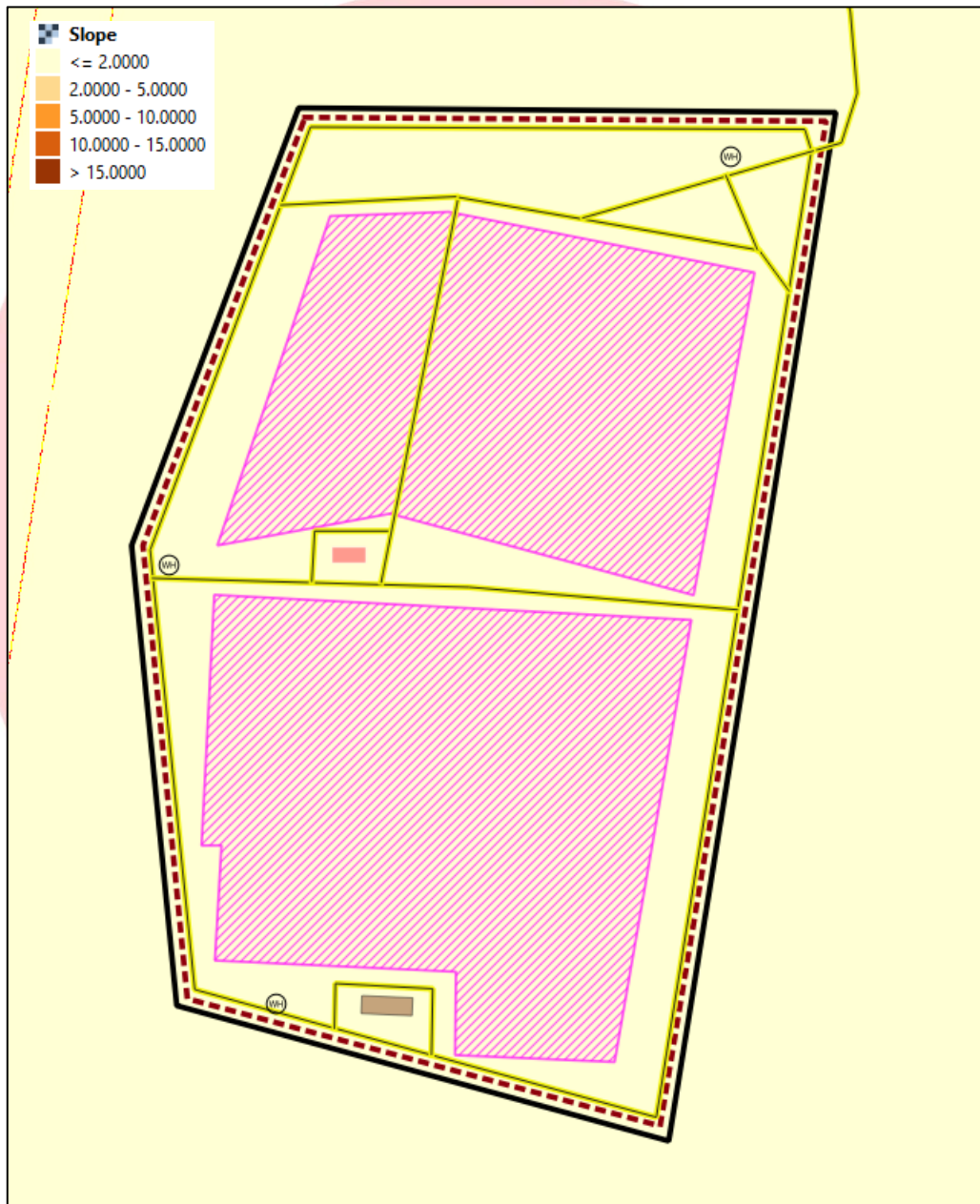


Figure 7 Detailed slope analyses

²¹ Fire Protection Association Australia. 2024. Practise Note PN-05 Calculating Effective Slope for BAL Assessment Report.

6.10 SETBACKS FROM HAZARD AND BUSH FIRE ATTACK LEVELS

The predominant (direct) threat to Both Developments is from grassfire being driven by north westerly, westerly or southerly winds. The risk posed by forest fire to Both Developments is minimal with potential for large uncontrolled grassland fire runs through the landscape to the north-west. The vegetation surrounding Both Developments is mapped in the NSW RFS Orana Risk Plan as a Land Management Zone with the management objective to:

- As per the land management and fire protection objectives of the responsible land manager. To undertake mosaic burning to reduce the likelihood of spread of fires.

The Bushfire Attack Levels (BAL) for Both Developments have been determined in accordance with PBP 2019 and the Australian Standards for Construction of Buildings in Bush fire Prone Areas (AS3959)²². The BAL is a means of measuring the severity of a building or asset's potential exposure to ember attack, radiant heat and direct flame contact (**Table 4**).

In the Building Code of Australia through AS3959 and in PBP, the BAL is used as the basis for establishing the requirements for construction to improve protection of building elements and to understand the radiant heat exposures for people in the open.

The BAL assessment, inclusive of radiant heat and APZs (**Figure 8, page 32**) has been completed based on the current boundary of Both Developments and that all vegetation would be managed as an APZ.

The actual location of heat-sensitive components within Both Developments would not be confirmed until detailed design.

²² Councils of Standards Australia AS3959 (2009) Australian Standard Construction of buildings in bushfire prone areas

Table 4 Bushfire Attack Levels (BAL) (Extract: Assael and Kakosimos, 2010, PBP 2006 and AS3959:2018)

Bushfire Attack Level	Radiant Heat Flux exposure kW/m ²	Description of predicted Bush fire attack and levels of exposure
BAL - Low	N/A	There is insufficient risk to warrant specific construction requirements
	2.1	No lethality – Unprotected person will suffer pain after 1-minute exposure.
	4.0	No lethality – Probable 2nd degree burns and pain after 20 sec exposure.
	7	Several minute exposures become fatal to unprotected person.
	10	Derived from the fire Intervention model. Critical conditions. Protected and adequately supplied firefighters can operate in these conditions although they may be marginal environments for extended periods. Considered to be life threatening < 1 minute in protective equipment. Fabrics inside a building could ignite spontaneously with long exposures.
BAL – 12.5	<12.5 kW/m ²	Ember attack 1% lethality in 1 min with significant injury in 10 sec. Standard float glass could fail (BAL 12.5 construction) during the passage of a bush fire. Some timbers can ignite with prolonged exposure and with piloted ignition source (e.g. embers).
	13kW/m ²	Plastic conduits start to fail
BAL – 19	>12.5kWm ² - <19kWm ²	Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing radiant heat flux. Screened float glass could fail (BAL 19 construction) during the passage of a bush fire.
	25	100% lethality in 1 min with 1st degree burns in 10 sec.
BAL – 29	>19kWm ² - <29kWm ²	Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing radiant heat flux
	37.5	100% lethality in 1 min with 1% lethality in 10 sec.
BAL – 40	>29kWm ² - <40kWm ²	Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing radiant heat flux with the increased likelihood of exposure to flames
BAL – Flame Zone	>40kWm ²	Direct exposure to flames from the fire front in addition to radiant heat flux and ember attack.
	55	Ignition from non-piloted flame of timber after 10 seconds



7 ASSESSMENT AND MITIGATION OF POTENTIAL IMPACTS – CONSTRUCTION

This section presents an assessment of the potential impacts that could not be avoided or minimised and are expected to occur as part of construction.

The key potential impacts relating to bush fire during construction include:

- On-site ignitions which may result in a fire escaping to the surrounding land and spreading in an uncontrolled manner causing damage to assets external to the Site.
- Occupational fire risk being the risk of workers being caught by out-of-control Bush fire impacting the Site or while using the access and egress routes.
- Provision of access for first responders.
- Water for firefighting - given the remote location, an adequate supply of water is essential for first response firefighting purposes.
- Emergency management during construction.

7.1 ON-SITE IGNITIONS

Construction activities pose risks for on-site ignitions which may result in a fire escaping to the surrounding land. These mainly arise from hot work, fire risk work, vegetation clearing and management and use of vehicles on site.

Hot work (activities involving high temperatures) and fire risk work (activities involving heat or with the potential to generate sparks) from maintenance activities may cause fire ignition. These works will be managed under a Hot Work and Fire Risk Work procedure, with measures including suspension of activities on days of elevated fire danger. Certain maintenance activities, including hot works, are prohibited by law on any day declared to be a Total Fire Ban (TOBAN)²³. Essential work during operations may be completed on a TOBAN providing it complies with the Hot Work and Fire Risk Work procedure and any exemption provided by the NSW RFS.

All land managers have responsibilities to prevent the occurrence and spread of fire on or from their land. Escaped fire may result in legal action and punitive damages. Reputational risk is an issue to be managed to ensure that contractors do not initiate an out-of-control fire that impacts surrounding assets and values.

Both Developments and associated APZ are in existing managed and cleared lands. Both Developments would be managed as an APZ. **Table 5** provides guidelines on what activities should be undertaken during Fire Danger Periods.

²³ NSW RFS Total Fire Ban. Accessed Online: <https://www.rfs.nsw.gov.au/fire-information/fdr-and-tobans>

Table 5 Activities and Fire Danger Ratings

ELEMENT	NONE	MODERATE	HIGH	EXTREME	CATASTROPHIC
Preparedness for ignition	Assessing the required level of day-to-day preparedness by monitoring Fire Danger Indexes and synoptic conditions on a continuous basis throughout the fire season. Identifying pre-emptive incident management and ensure staff are aware of response procedures. Prior to each fire season an annual and biannual inspection of the fire management requirements.				
Response to ignition	No requirements for specific bush fire preparedness or suppression.	Plan and commence preparation for a bush fire. Check fire equipment.	Fire suppression equipment tested, water ready and ready to act.	Fire suppression equipment tested, water ready and ready to act. Monitor for ignition points, if fire growth	Leave bushfire risk areas.
Minimise hot works through appropriate work scheduling		If deemed appropriate. Hot works should be accompanied by a spotter and a fire extinguisher.	If deemed appropriate. Hot works should be accompanied by a spotter and a fire extinguisher.	No hot works	No hot works
Minimise vegetation maintenance activities through appropriate work scheduling		No requirements	If deemed appropriate. Vegetation management should be accompanied by a spotter and a fire extinguisher/ fire vehicle.	If deemed appropriate. Vegetation management should be accompanied by a spotter and a fire extinguisher / fire vehicle.	No vegetation maintenance activities

7.2 OCCUPATIONAL FIRE RISK

Considering the bush fire risk and recent fire history to the north of the Site, a key risk management activity during construction would be to not expose people to unreasonable risk. The most effective way to reduce loss of life risk is to not occupy the area of Both Developments on above established thresholds for FBI and fires within the surrounding landscape. This would need to occur with an understanding of the evacuation time from the Site and potential for fire to burn through the evacuation roads.

Due to the remote location of the Site, it is recommended that non-essential works be postponed on days with Fire Danger Rating (FDR) of Extreme or greater. This will reduce the risk to personnel by out-of-control bush fire impacting the Site or access and egress routes.

7.3 EMERGENCY MANAGEMENT DURING CONSTRUCTION AND OPERATION

The design, operation and maintenance of Both Developments will need to consider and provide vegetation management within the asset protection zone in Both Developments that should mitigate the impact of uncontrolled bush fire.

A comprehensive Bush fire Emergency Management and Evacuation Plan would be completed for the construction and operational phase of Both Developments. The Bush fire Emergency Management and Evacuation Plan for the construction phase would be in place prior to the commencement of construction for the Standalone BESS. The Bush fire evacuation procedures should be completed in accordance with NSW Rural Fire Service Guide to Developing a Bushfire Emergency Management Plan. On-site and off-site evacuation procedures would be included.

The focus of the Bush fire Emergency Management and Evacuation Plan would be to put in place strategies that do not expose the workers to the effects of bush fire attack and focus on eliminating exposure to bush fire threat. The management team will be able to determine the safest options regarding forecast bush fire risk and providing for early evacuation from Site if there are fires in the vicinity.

8 ASSESSMENT AND MITIGATION OF POTENTIAL IMPACTS — OPERATION

This section presents an assessment of the potential impacts that could not be avoided or minimised and are expected to occur as part of operation. The key potential impacts relating to bush fire during operation include:

- On-site ignitions which may result in a fire escaping to the surrounding land and spreading in an uncontrolled manner causing damage to assets associated with the substation or external to the Site
- Occupational fire risk being the risk of workers being caught by out-of-control bush fire impacting the Site or while using the access and egress routes.
- Provision of access for first responders.
- Water for firefighting - given the remote location, an adequate supply of water is essential for first response firefighting purposes.
- Emergency management during operation.
- Disruption to power supply if the Site is impacted by fire.
- Loss of critical infrastructure.

8.1 ON SITE IGNITIONS

Hot work (activities involving high temperatures) and fire risk work (activities involving heat or with the potential to generate sparks) from maintenance activities may cause fire ignition. These works would be managed under a Hot Work and Fire Risk Work procedure, with measures including suspension of activities on days of elevated fire danger.

8.2 DISRUPTION TO POWER SUPPLY IF THE SITE IS IMPACTED BY FIRE

Uncontrolled bush fire has the potential to impact Both Developments. Bush fire impact could damage or destroy infrastructure to an extent that can stop the transmission of power for the Site and cause power outage. Mitigation measures will be considered in the detailed design.

8.3 LOSS OF CRITICAL INFRASTRUCTURE

Uncontrolled bush fire has the potential to impact Both Developments. Bush fire impact can damage or destroy the batteries, transmission lines, other critical infrastructure or the transmission network that can stop the transmission of power and cause power outage. Bush fires can cause the destruction of assets that are essential to power transmission.

8.4 APZ MAINTENANCE

Ongoing vegetation management would be in accordance with Operational Vegetation Monitoring and Management Procedures which would include routine inspections of Both Developments. Ongoing management would fall under an inspection and maintenance program, which would include identification, recording, prioritisation, and rectification of defects. These vegetation management standards are essential to maintain safety. APZs will be managed in accordance with RFS Standards for Asset Protection Zones to provide minimal ground fuel to support a fully developed bush fire.

8.5 MITIGATION MEASURES

The following recommendations are provided to mitigate the impact of Bush fire.

Table 6 Mitigation Measures - Design and Pre-Construction for consent

ID	Identified mitigation measure	Applicable location (s)
BF1	<u>ASSET PROTECTION ZONES</u> The solar farm site and each BESS would be managed as an APZ in accordance with RFS Standards for Asset Protection Zones. The APZ around the solar arrays and the Hybrid BESS is delivered under DA2019/47 (as modified); the APZ around the Standalone BESS is delivered under the New DA At the commencement of building works the entire construction site would be managed as an APZ as outlined within Appendix 4 of 'Planning for Bush fire Protection 2019' and the NSW Rural Fire Service's document 'Standards for asset protection zones'. APZ requirements are: Screening vegetation and related landscaping features shall be placed outside the designated APZ. Trees ▪ Tree canopy cover should be less than 15% at maturity; ▪ Trees at maturity should not touch or overhang the building; ▪ All lower limbs should be removed up to a height of 2m above the ground within the APZ <u>and screening vegetation</u>; ▪ Tree canopies should be separated by 2 to 5m; and ▪ Preference should be given to smooth barked and evergreen trees. Shrubs ▪ Create large discontinuities or gaps in the vegetation to slow down or break the progress of fire towards buildings should be provided; ▪ Shrubs should not be located under trees; ▪ Shrubs should not form more than 10% ground cover; and ▪ Clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation. Grass ▪ grass should be kept low (as a guide grass should be kept to no more than 100mm in height); and ▪ leaves and vegetation debris should be removed. Signage to indicate no storage of combustible materials within 10m of a BESS and any accumulation of combustible materials (including leaf litter) in or within ten (10) metres of any battery energy storage systems and related infrastructure to be removed.	DA2019/47 (as modified); Both Developments; Figure 9 reference

BF2	<u>BUSH FIRE CONSTRUCTION LEVEL</u> Vulnerable buildings and/or critical assets would be constructed to appropriate BAL levels in accordance with the Australian Standard for the Construction of Buildings in Bush fire Prone Areas (AS3959). This will be refined during detailed design. The external wall and roof will be non-combustible, and all vents metal screened with aperture <2mm.	DA2019/47 (as modified); Both Developments; Figure 9 reference
BF3	<u>WATER</u> Fire safety study to demonstrate that the thermal management system and fire suppression system of each of the Hybrid BESS and the Standalone BESS does not require water supplies in accordance with the CFA Design guidelines and model requirements renewable energy facilities (2025). Static water supply is provided as follows: (i) one 10,000L tank within 70m of the Hybrid BESS [DA2019/47 as modified]; (ii) one 10,000L tank within 70m of the Standalone BESS [New DA]; and (iii) one 10,000L tank for perimeter firefighting purposes [DA2019/47 as modified], Provision of static water tank shall meet the following specifications (total 30,000L provided on site): ▪ All above-ground water service pipes external to the building are metal, including and up to any taps, ▪ A connection for firefighting purposes is located within the IPA or non-hazard side and away from the structure; 65mm Storz outlet with a ball valve is fitted to the outlet, ▪ Ball valve and pipes are adequate for water flow and are metal, ▪ Supply pipes from tank to ball valve have the same bore size to ensure flow volume, ▪ Underground tanks have an access hole of 200mm to allow tankers to refill direct from the tank, ▪ A hardened ground surface for truck access is supplied within 4m, ▪ Above-ground tanks are manufactured from concrete or metal, ▪ Raised tanks have their stands constructed from non-combustible material or bush fire-resisting timber (see Appendix F AS 3959), ▪ Unobstructed access can always be provided, ▪ Static Water Supplies (SWS) are clearly marked with SWS signage placed at the front gate and in location that guide responding fire agencies to the location of the water supply on site (Refer to Appendix), ▪ Tanks on the hazard side of a building are provided with adequate shielding for the protection of firefighters, ▪ All exposed water pipes external to the building are metal, including any fittings. Water pumps and fire hose reels are not required for compliance with PBP 2019, although if provided shall: ▪ Where pumps are a minimum 5hp or 3kW petrol or diesel-powered pump, and are shielded against bush fire attack; any hose and reel for firefighting connected to the pump shall be 19mm (internal diameter), and	DA2019/47 (as modified); Both Developments; Figure 9 reference

	Fire hose reels are constructed in accordance with AS/NZS 1221:1997 Fire hose reels and installed in accordance with AS 2441:2005 Installation of fire hose reels.	
BF4	<u>EMERGENCY MANAGEMENT</u> A comprehensive Bush fire Emergency Management and Evacuation Plan would be completed for the construction and operational phase of Both Developments (Section 9, page 36). The Bush fire evacuation procedures would be completed in accordance with NSW Rural Fire Service Guide to Developing a Bushfire Emergency Management Plan. <u>Ignition Prevention:</u> - Hot work (activities involving high temperatures) and fire risk work (activities involving heat or with the potential to generate sparks) from construction activities may cause fire ignition. These works will be managed under a Hot Work and Fire Risk Work procedure, with measures including suspension of activities on days of elevated fire danger. - Certain construction activities, including hot works, are prohibited by law on any day declared to be a TOBAN. - Essential work during construction may be completed on a TOBAN providing it complies with the Hot Work and Fire Risk Work procedure exemption from the NSW RFS <u>Ignition Suppression</u> Firefighting equipment will be maintained and accessible to all active construction site during the declared Bush fire danger season, and site personnel trained in its use. Equipment should be appropriate to the activities being conducted and the fire danger at the time of works, but as a minimum must include: - McLeod tool (Rack-hoe). - Fire Extinguishers. - Backpack water (knapsacks).	DA2019/47 (as modified); Both Developments; Figure 9 reference
BF5	<u>ACCESS</u> Fire trail vehicle access shall be provided around the perimeter of the facility, associated with the APZ and circumnavigate each of the Hybrid BESS and the Standalone BESS. <i>Note:</i> in the applicability column that perimeter access is delivered under DA2019/47 (as modified) and relied upon by the New DA. A fire trail access shall: - Be established within the 10m perimeter APZ which is located within the perimeter fence, - The screening landscaping shall be located outside the 10m APZ, - RFS lock shall be established on the access gate, - A 10,000L static water supply provided in association with the perimeter trail accessible to fire response agencies. - Vehicle access shall be provided around the BESS compound. - A vehicle access gate be provided linking Lone Pine Avenue with the perimeter trail.	DA2019/47 (as modified); Both Developments; Figure 9 reference

- | | | |
|--|--|--|
| | <ul style="list-style-type: none"> ▪ Perimeter trails have a trafficable surface with capacity of 23T from Lone Pine Avenue, with a maximum grade of not more than 15 degrees, crossfall not more than 6 degrees, minimum vertical clearance of 4 metres is provided above the surface of the trafficable surface clear of obstructions, curves have a minimum inner radius of 6 metres, minimum distance between inner and outer curves is 6 metres ▪ Turn-a-round provided in accordance with Appendix 3 of PBP 2019 | |
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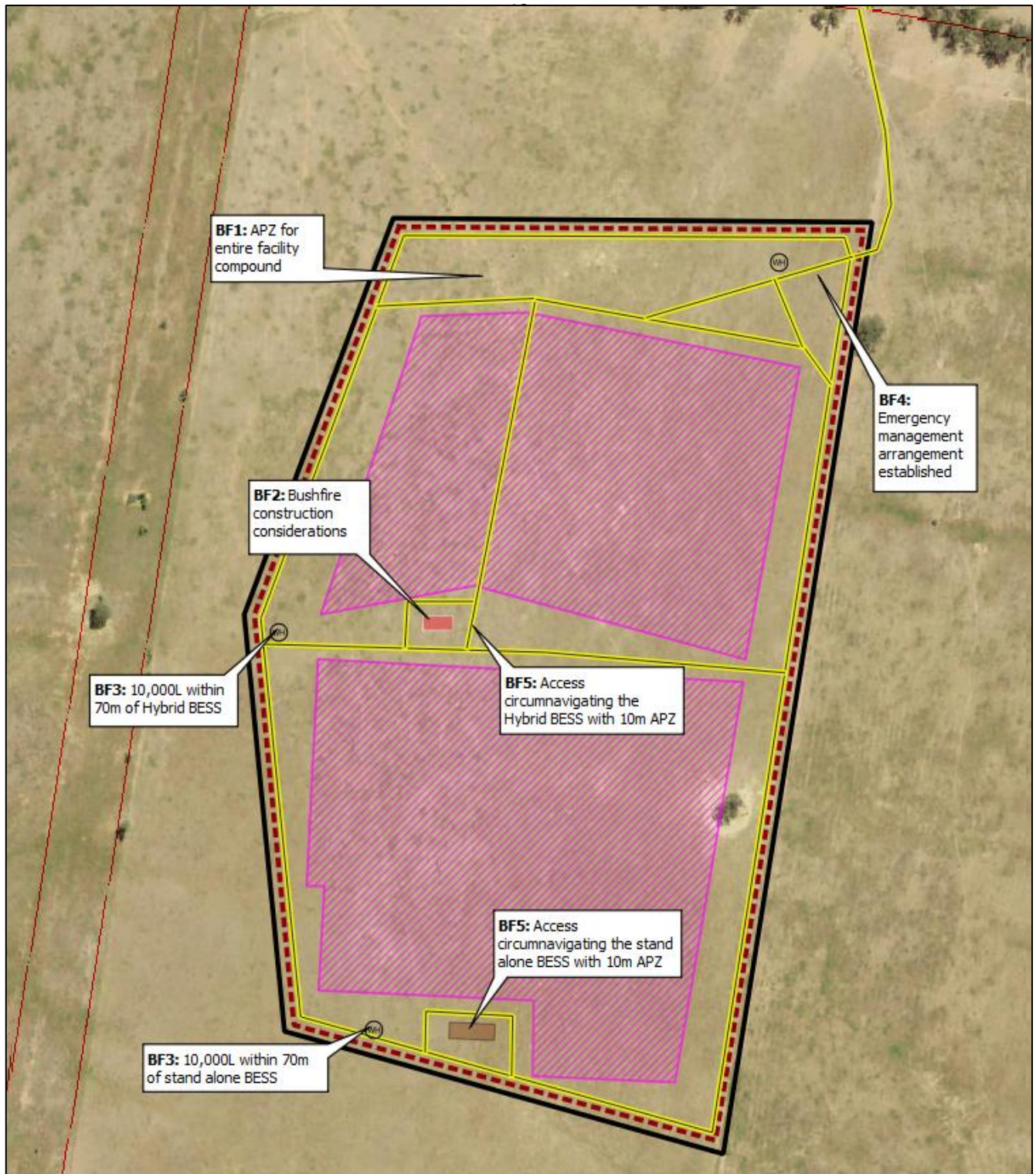


Figure 9 Bushfire Mitigation Measures



0 50 100 m



9 EMERGENCY MANAGEMENT

The proposed development initially involves clearing and construction of the Site, and then ongoing operation and maintenance works. Throughout these stages, the development will consider the safety of staff and contractors, and any attending emergency service workers if a bush fire impacts the Site.

A Bush fire Emergency Response Plan should be prepared for the construction of Both Developments that provides the following:

- Addresses foreseeable on-site and off-site fire events.
- Confirmation of acceptable access and emergency access provisions.
- Evacuation triggers and protocols (evacuate or shelter in place).
- Confirmation of water supplies and accessibility and any other response/protection measures.
- Suppression response strategies and tactics, including aerial suppression options/management.
- Clearly state work health and safety risks and procedures to be followed by fire-fighters, including:
 - personal protective clothing
 - minimum level of respiratory protection
 - minimum evacuation zone distances
 - any other risk control measures required to be followed by fire-fighters.
- Identify stakeholders (emergency response agencies, contractors, neighbours). Contact should be made by the Site operator with the Local Emergency Management Committee to establish emergency management procedures with relevant authorities for the safety hazards presented by the Site. The operator of Both Developments should brief the local volunteer fire brigades and neighbouring farmers at appropriate intervals on safety issues and procedures.

A Bush fire Emergency Management and Evacuation Plan should be prepared for the ongoing operations of the facility to inform and enhance emergency management arrangements during forecast bad fire weather and provide for evacuations during actual and or forecast bushfires. The document should also identify the operations that may be carried out on days of Total Fire Ban and any prohibited activities or exemptions that are notified by the Commissioner of the NSW RFS under the *Rural Fires Act s.99*. and requirements to notification of the local NSW RFS Fire Control.

A Bush fire Emergency Management and Evacuation Plan is developed to meet the bushfire planning requirements NSW Rural Fire Service, Planning for Bushfire Protection 2019 with two principal elements.

1. In detailing the measures to prevent and mitigate, a series of strategies will be established to protect the facility and neighbouring landowners from a bushfire ignition off and on the Site. This includes:
 - Ignition management and prevention.
 - Strategies to reduce ignition.
 - Strategies to suppress unplanned fires.
 - Strategies to minimise potential spread of bushfires.
 - Bushfire Mitigation treatments.
 - Appropriate works programming on fire danger days.
2. To establish bush fire Emergency Management procedures in the event of a bush fire, the following objectives are determined:
 - Notification procedures and Key Stakeholders.
 - Decision triggers for shelter-in-place and evacuation.

10 CONCLUSION

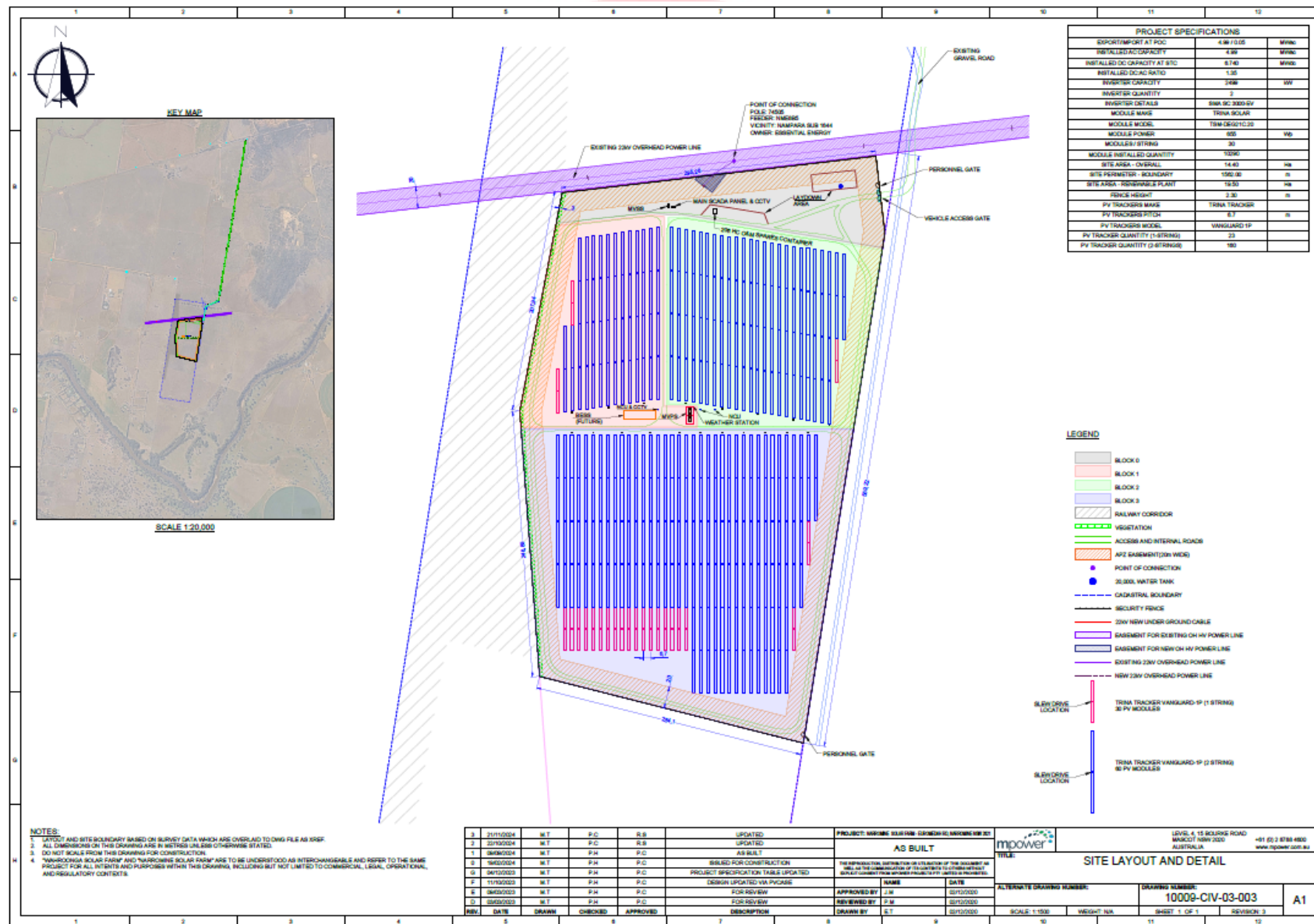
This report is a bush fire risk assessment that addresses the potential impacts associated with bush fire risk for the New DA (Standalone BESS) at 6 Euromedah Road, Narromine, over the same assessed area as the Approved Development (DA2019/47, as modified by the approved Modification Application to incorporate the Hybrid BESS). The Site is within bush fire prone land and bush fire risk is a key consideration for Both Developments. A landscape scale bush fire risk assessment and site-specific risk assessment have been undertaken and apply equally to Both Developments. The bush fire season in the area of Both Developments generally runs from October to March, although commencement has been declared as early as August. Days of elevated fire danger are frequent and mostly occur during August to April. Dry weather driven by north-westerly winds is common during the fire season with Eumungerie Road providing ignition for a short fuse fire run directly to the Site.

10.1 NEW DA (STANDALONE BESS)

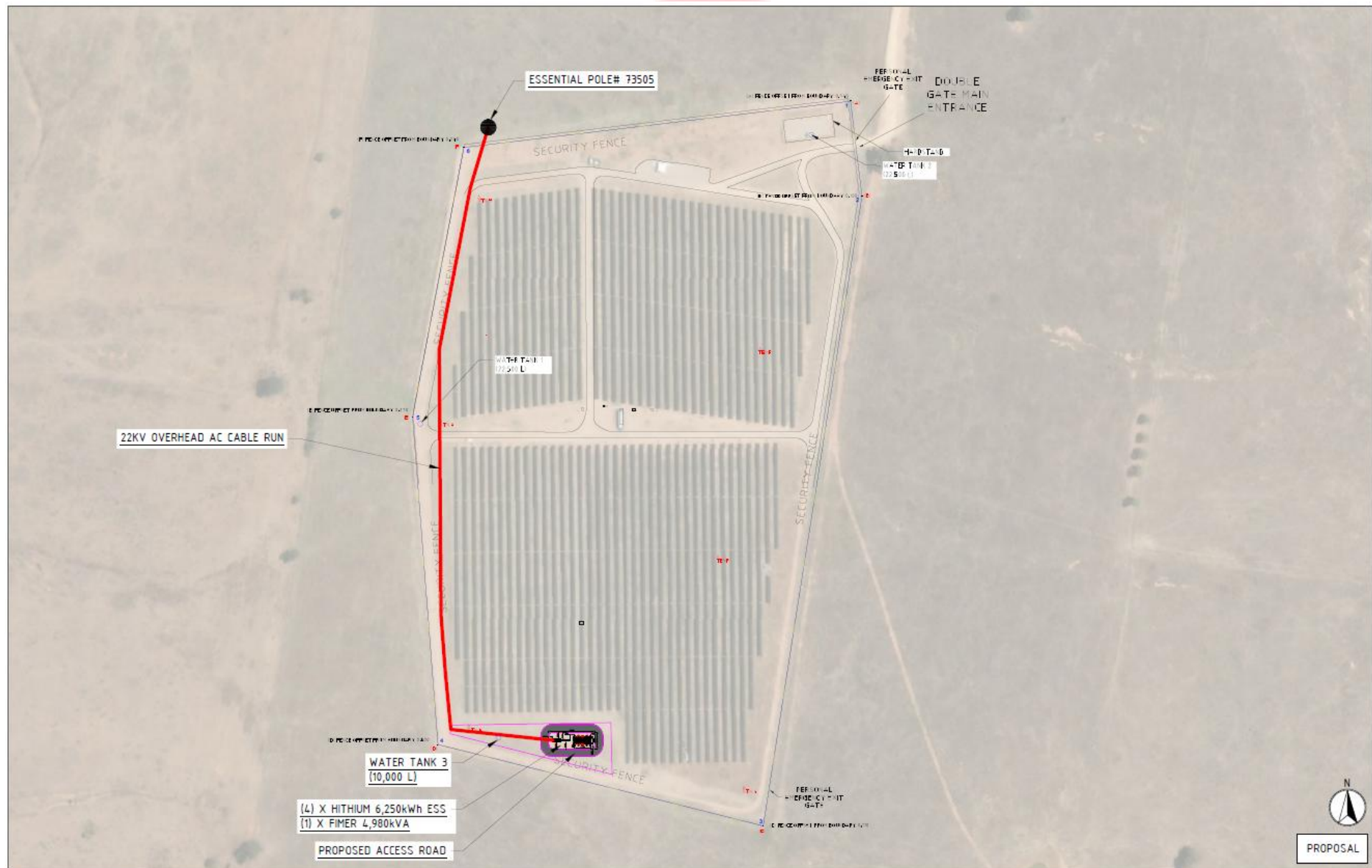
The Standalone BESS satisfies the aims and objectives of Planning for Bush fire Protection 2019, subject to the mitigation measures identified in Table 6 that are applicable to the New DA, and in reliance on the shared site infrastructure identified in Section 2.1. The bush fire hazard, BAL assessment and landscape risk assessment set out in Section 6 apply to the Standalone BESS without alteration, as the assessed area is unchanged. Bushfire mitigation measures include:

- Entire BESS site managed as an APZ
- Perimeter access around the BESS
- Static water within 70m of BESS
- Bushfire emergency management plan developed.

11 APPENDIX 1 SITE LAYOUT FOR THE SOLAR AUGMENTATION (APPROVED)



12 APPENDIX 2 SITE LAYOUTS FOR THE STANDALONE BESS (PROPOSED)



13 APPENDIX 3 PLATES (PHOTOGRAPHS)

Plates 1 –4 depict the elements in and around the Site that are considered within the bush fire hazard assessment.



Plate 1 View north along the existing compliant access trail from development site



Plate 2 View south-west from development site



Plate 3 View from the north-west to the south-east across development site



Plate 4 View north-west from development site.

14 APPENDIX 3 BUSH FIRE PROTECTION MEASURES

The following information on building survivability and the application of Bush fire Protection Measures should be considered continually for the life of the development. These measures facilitate meeting the aims and objectives of PBP 2019 and mitigating Bush fire risk and are provided to inform the client.

Why do buildings burn during Bush fires?

Research has been undertaken to over the last decades to analysis and determine the elements that determine the survivability of a building during a Bush fire event. As the research is validated, these elements are incorporated into planning documentation that guides construction in Bush fire prone areas, such as Australian Standard 3959 and NSW RFS Planning for Bush fire Protection.

Research has illustrated that there are three ways a Bush fire impacts a building:

1. Direct flame contact,
2. Radiant heat from the Bush fire, and
3. Embers generated by the Bush fire.

Most people expect direct flame contact to be the biggest risk to homes in a Bush fire, but this is not the case. Over 80% of house loss during Bush fires occurs because of ember attack; the burning firebrands of bark, leaves and twigs with winds drive away from the main fire front. They find weaknesses in houses such as gaps, cracks to combustible construction materials and can quickly lead to ignition of the building. **Significantly, vegetation is established adjacent to the building and within the Asset Protection Zone following the construction of the building, which provides fuel for burning embers to ignite** and increase the ignitability of the building. It is critical that the Asset Protection Zone are maintained throughout the life of the property, so that bush fire is not encouraged closer to the building.

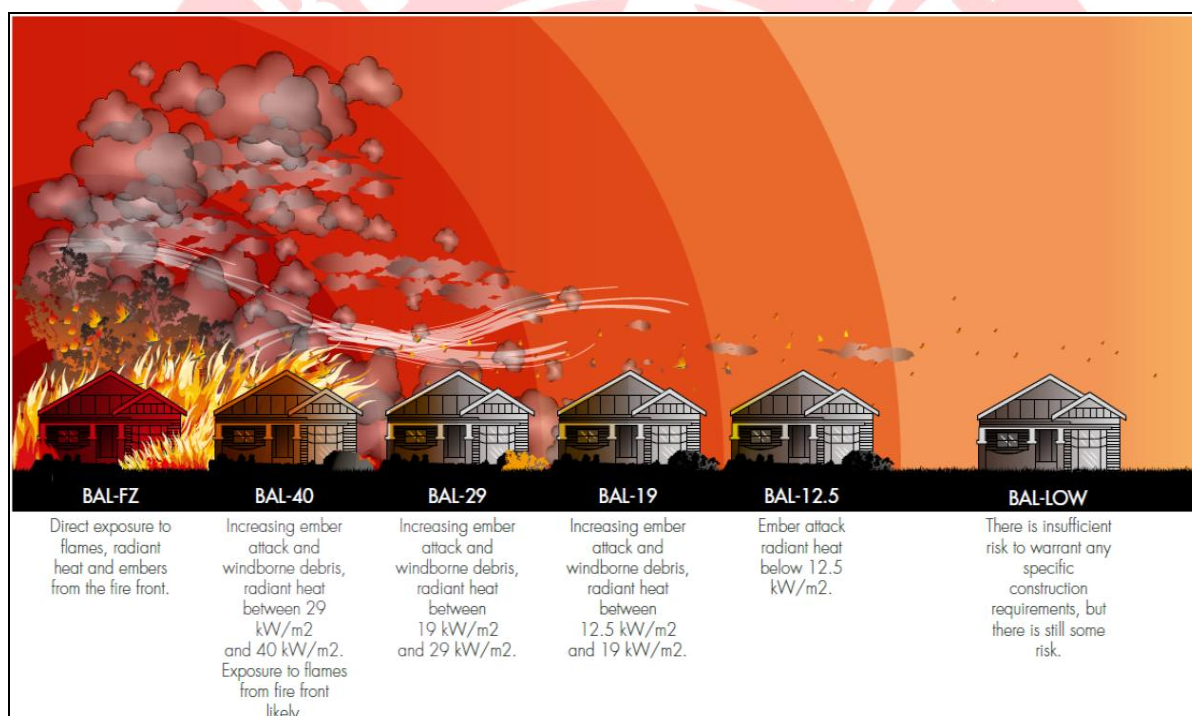
The research has illustrated the separation between the Bush fire threat and building; and the construction standards of the building are the principal elements to building survivability. It is critical that:

1. Any future alterations and additions to the building are undertaken with materials that comply with the relevant BAL of the building.
2. The separations between the building and Bush fire threat (known as the Asset Protection Zones (APZ)) are maintained to low flammability. This means restricted gardens and combustible elements, such as timber landscaping and furnishings. It is critical to maintain 'fire hygiene' around the building.

Australia Standard 3959 Construction of buildings in Bush fire prone areas and Bush fire Attack Level (BAL)

Bush fire Attack Level (BAL) ratings refer to the fire intensity your house is likely to be subjected to in a Bush fire, expressed in terms of radiant heat. The BAL assessment forms the construction component of the Bush fire assessment process. The other component is the Bush fire planning, which includes Asset Protection Zones (APZ), separation to provide defendable spaces, access, water, electricity, gas, landscaping and emergency management.

Furthermore, the measures contained in the *Australian Standard 3959 Construction of buildings in Bush fire Prone Areas* for each BAL construction level are not for fire resistance. The building will burn. The construction standards are aimed at slowing the ignition and fire spread of the building to provide adequate time to enable occupants to shelter within the building as the Bush fire front passes. The degree of vegetation management within the APZ, the unpredictable nature of behaviour of fire, and extreme weather conditions make building adjacent to vegetation very dangerous.



Relationship between fire behaviour and BAL (WA Guidelines for Planning in Bush fire Prone Areas, 2017)

Building Design and Siting

The design and siting of a building can be of critical importance during bush fire attack event. The appropriate design and siting can reduce the impact of Bush fire attack mechanisms of direct flame, radiant heat, ember attack, smoke, and wind. Key principles to consider when designing and siting a new development include the following:

- Avoid building on ridges, saddles and build on level ground wherever possible.
- Utilise cut-in benches, rather than elevating the building when building on sloping land.
- Avoid raised floors and protect the sub-floor areas by enclosing or screening.

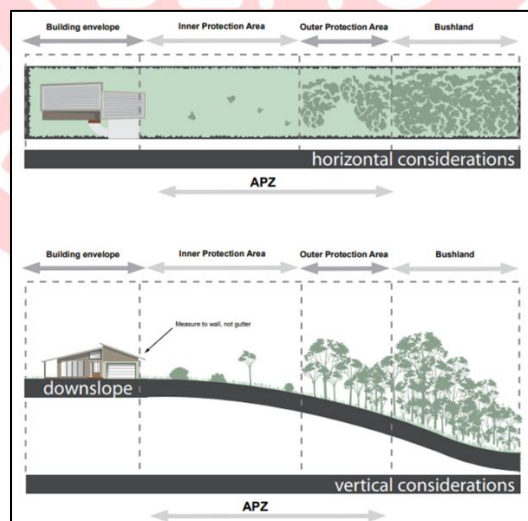
- Provide an appropriate shelter room that is located on the lowest or non-Bush fire hazard side of the building, near building exits and provides the occupant views of the outside environment.
- Reduce bulk of building, limit re-entrant corners, and incorporate simplified roof that are able to self-clean of debris.
- No gutters on second or consecutive storeys of building and avoid box gutters.
- If gutters are installed, incorporate gutter guards with a flammability index more than 5 when tested to AS1530.2, or aluminium, bronze, or stainless steel with maximum aperture of 5mm.
- Limit glazing elements on the sides of the building exposed to the Bush fire threat and use shutters to protect glazing elements.
- Carparking and storage of hazardous materials provided in a location that does not interfere with escape routes.
- Position development so any gas supplies and overhead electricity are positioned not to impede egress to and from the site.
- Class 10a buildings (such as shed, carport, and garages) should be a minimum of 6m away from any other building. Consider the storage of hazardous materials (petrol, kerosene, alcohol, LPG, natural gas, acetylene, vehicle, machinery etc.) within Class 10a buildings when siting in proximity to Class 1a occupied building and escape routes.

Asset Protection Zones

An APZ is an area surrounding a development that is managed to reduce the Bush fire hazard to an acceptable level to mitigate the risk to life and property. The required width of the APZ varies with slope and the type of hazard. An APZ should be maintained in perpetuity to ensure ongoing protection from the impact of Bush fires. Maintenance to the below standards should be undertaken on an annual basis, in advance of the fire season, as a minimum.

For a complete guide to APZs and landscaping, download the NSW RFS document Standards for Asset Protection Zones at www.rfs.nsw.gov.au/resources/publications.

An APZ can consist of both an Inner Protection Area (IPA) and an Outer Protection Area (OPA) as indicated below.



Components of an APZ (Figure A4.1 - PBP 2019)

An APZ can include the following:

- Footpaths.

- Lawns.
- Discontinuous gardens.
- Swimming pools.
- Driveways.
- Unattached non-combustible garages with suitable separation from the dwelling.
- Open space / parkland; and
- Car parking.

Isolated areas of shrub and timbered vegetation are generally not a Bush fire hazard as they are not large enough to produce fire of an intensity that will threaten dwellings. These areas include narrow strips of vegetation along road corridors.

Any areas that are designated Asset Protection Zones, should be delineated by rural fencing, signposted or bollards (whatever is practical in the circumstances) to ensure vegetation creep does not occur and further landowners and ground management are aware that the area is to be maintained for Bush fire protection purposes. Examples are provided below:



Inner Protection Area (IPA)

The IPA extends from the edge of the OPA to the development. The IPA is the area closest to the asset and creates a fuel-managed area which can minimise the impact of direct flame contact and radiant heat on the development and be a defensible space. The intent of an IPA is to stop the transmission of flame and reduce the transmission of radiant heat by the elimination of available fire fuel. This area also allows airborne embers to fall safely without igniting further outbreaks and provides a safer firefighting position and is operationally important for implementation of clear fire control lines.

In practical terms the IPA is typically the curtilage around the dwelling, consisting of a mown lawn and well-maintained gardens. When establishing and maintaining an IPA the following requirements apply:

- Vegetation within the IPA should be kept to a minimum level. Litter fuels (leaves and vegetation debris) within the IPA should be continually removed and kept below 1cm in height and be discontinuous. There is minimal fine fuel at ground level which could be set alight by a Bush fire.
- Canopy cover should be less than 15% (at maturity). Trees (at maturity) should not touch or overhang the building and should be separated by 2 to 5m.
- Lower limbs of canopy trees should be removed up to a height of 2m above ground.
- Preference should be given to smooth barked and evergreen trees.
- Large discontinuities or gaps in the shrub vegetation shall be established to slow down or break the progress of fire towards buildings.

- Shrubs should not be located under trees and not form more than 10% ground cover
- Clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation.
- Grasses should be kept mown (as a guide grass should be kept to no more than 100mm in height), and
- Woodpiles, wooden sheds, combustible material storage areas, large areas / quantities of garden mulch, stacked flammable building materials etc. are not permitted in the IPA.

Outer Protection Area (OPA)

An OPA is located between the IPA and the unmanaged vegetation. Vegetation within the OPA can be managed to a more moderate level. The reduction of fuel in this area substantially decreases the intensity of an approaching fire and restricts the pathways to crown fuels, reducing the level of direct flame, radiant heat and ember attack on the IPA.

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

In practical terms the OPA is an area where there is maintenance of the understorey and some separation in the canopy. When establishing and maintaining an OPA the following requirements apply:

- Tree canopy cover should be less than 30%, canopies should be separated by 2 to 5m
- Shrubs should not form a continuous canopy and form no more than 20% of ground cover
- Grasses should be kept to no more than 100mm in height with leaf and other debris should be mown, slashed or mulched.

Furthermore, the edge of the APZ should be clearly delineated to ensure vegetation creep does not occur over time, reducing the separation between the Bush fire hazard and building, as indicated below.

Access Requirements

In the event of a serious Bush fire threat to the proposed development, it will be essential to ensure that adequate ingress/ egress and the provision of defensible space are afforded in the development/building design.

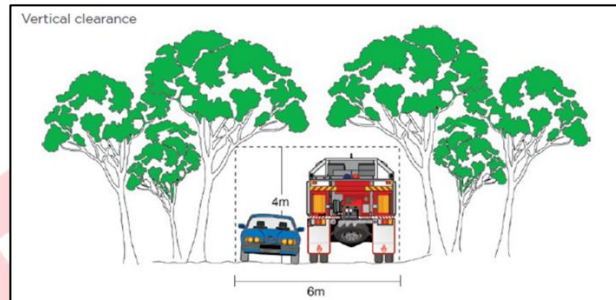
Local Area Traffic Management (LATM)

The objective of LATM is to attain an acceptable level of speed, volume, and composition of traffic within a local area and reduce the number of road accidents. This is achieved by modifying the street environment through the installation of various traffic control devices. LATM devices by their nature are designed to restrict and or impede the movement of traffic, especially large vehicles, which conflicts with the intent for access required by the NSW RFS and may significantly increase response times for emergency services.

Where LATM devices are provided they are to be designed so that they do not impede fire vehicle access.

Vertical clearance

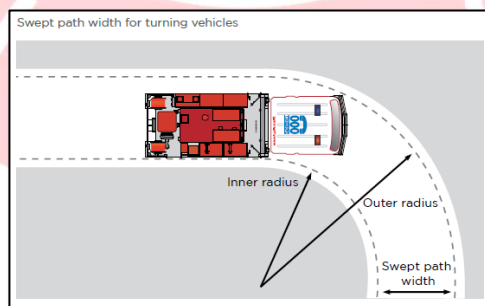
An unobstructed clearance height of 4 metres should be maintained above all access ways including clearance from building construction, archways, gateways/doorways, and overhanging structures (e.g., ducts, pipes, sprinklers, walkways, signs and beams). This also applies to vegetation overhanging roads and fire trails.

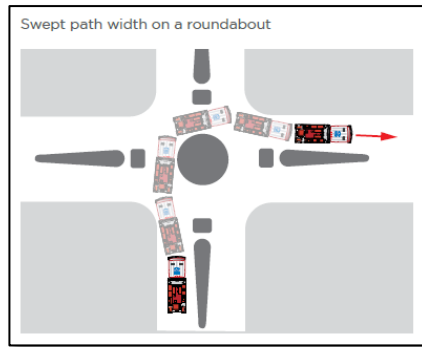


Vehicle Turning Requirements

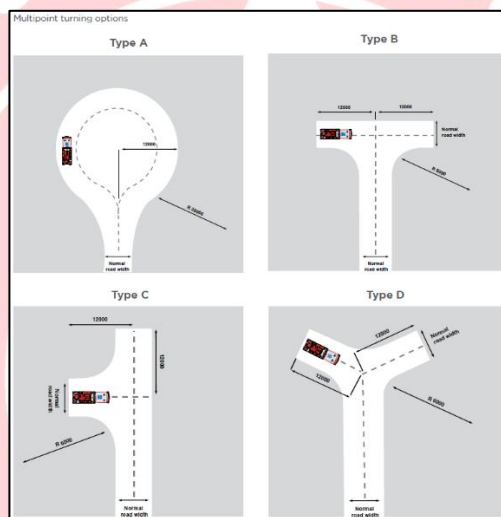
Fire crews must have rapid access and egress for vehicles, therefore curved carriageways should be constructed using the minimum swept path. The below diagrams from PBP2019 provide indication of the requirements to be achieved.

Minimum curve radius (inside edge (m))	Swept path (m) wide
<40	4.0
40 -69	3.0
70 - 100	2.7
>100	2.5





Where a turning head is proposed the NSW RFS requires that dead ends having a length greater than 20 metres should be provided with a turning head area which avoids multipoint turns.



Passing Bays

The construction of passing bays, where required, shall be 20m in length, provide a minimum trafficable width at the passing point of 6m.



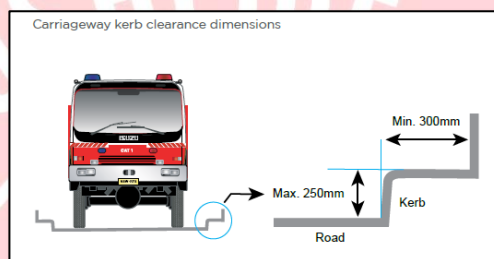
Parking

Parking can create a pinch point within the road reserve. The location of parking should be carefully considered to ensure fire appliance access is unimpeded. Hydrants should be located clear of any parking areas to ensure that access is always available.



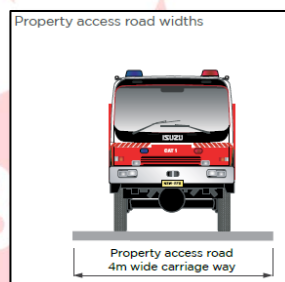
Kerb Dimensions

All kerbs constructed around access lanes should be no higher than 250mm and free of vertical obstructions at least 300mm back from the kerb face to allow clearance for front and rear body overhang.



Road Types

Property access is required to be 4m wide all-weather road. Can be sealed or unsealed.



Water Supply

The intent of water measures is to provide adequate services of water for the protection of dwellings during and after the passage of a Bush fire.

Where reticulated water supply is not provided, a static water supply for fire-fighting purposes should be above-ground, accessible, clearly marked and manufactured from concrete or metal. If raised, the tank stand should be made from non-combustible material. These static water supplies (tanks) should be positioned on the non-hazard side of the building and have 65mm Storz outlet with a ball valve fitted to the outlet within the IPA. If not appropriate, they should be appropriately shielded to protect the tank and fire fighters accessing the water. Category 1 fire appliances should be able to access within 4 m of static water supply with a hardened ground surface to support this access.

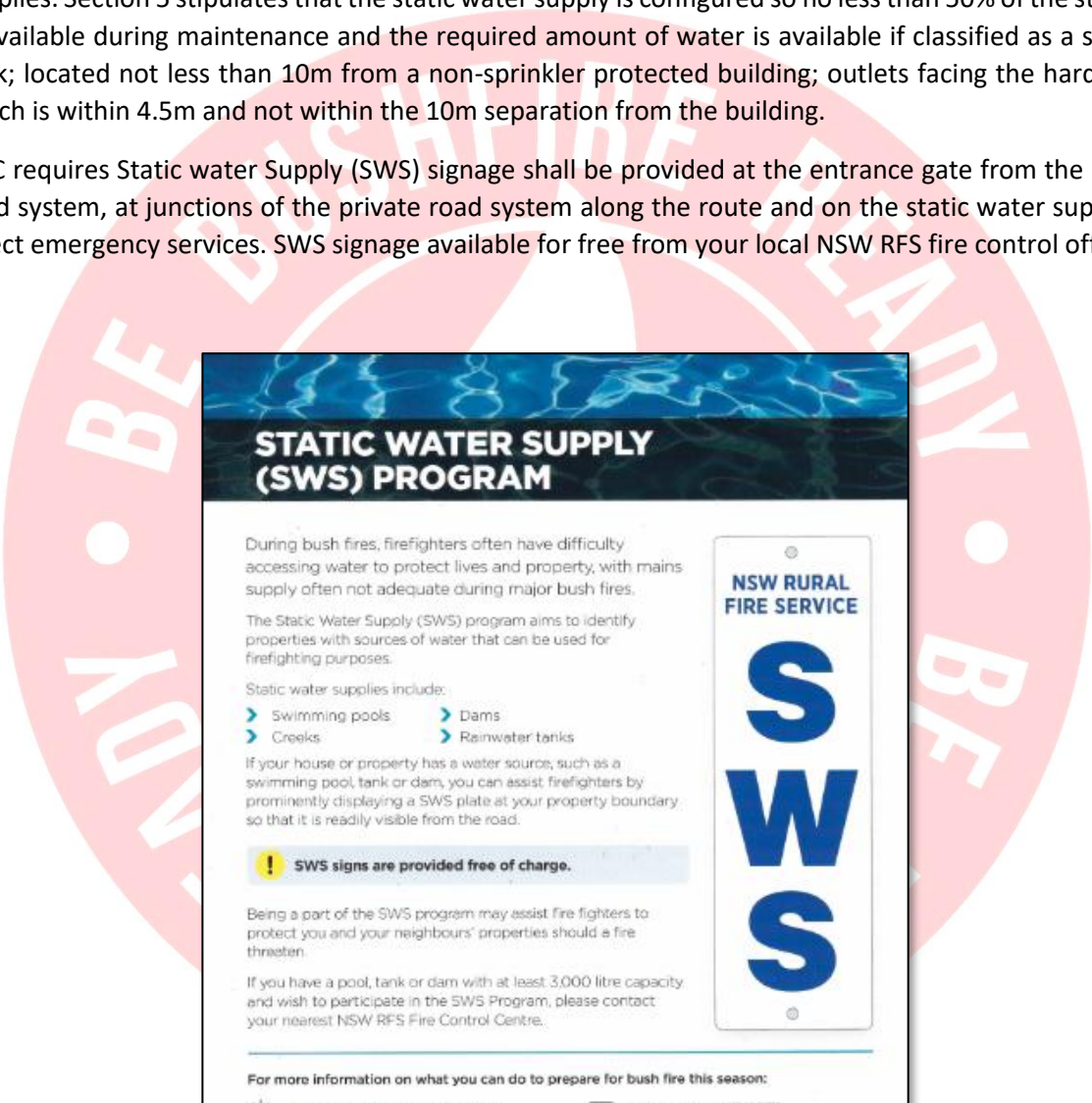
All exposed water pipes, values, taps and fittings should be metal and the supply line from tank to ball valve have the same bore size.

Where pumps are provided, they are a minimum 5hp or 3kW petrol or diesel-powered pump and are shielded against Bush fire attack. Any hose and reel for firefighting connected to the pump shall be 19mm (internal diameter), and fire hose reels are constructed in accordance with AS/NZS 1221:1997 Fire hose reels and installed in accordance with AS 2441:2005 Installation of fire hose reels.

Where static water supply is provided the following signage should be installed at the front gate and at a location that is clearly visible (assume smoke) to approaching emergency services to guide them to the static water supply.

Section 5 of AS2419.1.2021 Fire Hydrant Installation provides design requirements of static water supplies. Section 5 stipulates that the static water supply is configured so no less than 50% of the storage is available during maintenance and the required amount of water is available if classified as a shared tank; located not less than 10m from a non-sprinkler protected building; outlets facing the hardstand which is within 4.5m and not within the 10m separation from the building.

NCC requires Static water Supply (SWS) signage shall be provided at the entrance gate from the public road system, at junctions of the private road system along the route and on the static water supply to direct emergency services. SWS signage available for free from your local NSW RFS fire control office.



STATIC WATER SUPPLY (SWS) PROGRAM

During bush fires, firefighters often have difficulty accessing water to protect lives and property, with mains supply often not adequate during major bush fires.

The Static Water Supply (SWS) program aims to identify properties with sources of water that can be used for firefighting purposes.

Static water supplies include:

- Swimming pools
- Dams
- Creeks
- Rainwater tanks

If your house or property has a water source, such as a swimming pool, tank or dam, you can assist firefighters by prominently displaying a SWS plate at your property boundary so that it is readily visible from the road.

! SWS signs are provided free of charge.

Being a part of the SWS program may assist fire fighters to protect you and your neighbours' properties should a fire threaten.

If you have a pool, tank or dam with at least 3,000 litre capacity and wish to participate in the SWS Program, please contact your nearest NSW RFS Fire Control Centre.

For more information on what you can do to prepare for bush fire this season:

 **NSW Rural Fire Service Website**
www.rfs.nsw.gov.au
www.myfireplan.com.au

 **Your nearest NSW RFS Fire Control Centre:**

 **Bush Fire Information Line**
 1800 NSW RFS (1800 679 737)





PREPARE ACT SURVIVE
NSW RURAL FIRE SERVICE

Electricity, Gas supplies and Hazardous materials

The intent of electricity, gas and hazardous material measures is to locate these utilities and materials so as not to contribute to the risk of fire to a building.

Electricity

Location of electricity services should limit the possibility of igniting the surrounding bush land or the fabric of buildings. Where practicable, electrical transmission lines are underground. If overhead, electrical transmission lines are installed with short pole spacing (30m), unless crossing gullies, gorges, or riparian areas, then no part of a tree is closer to a power line than the distance set out in accordance with the specifications in ISSC3 Guideline for Managing Vegetation Near Power Lines.

Gas

Any reticulated or bottled gas should be installed and maintained according to the requirements of the relevant authorities and AS/NZS 1596:2014. All fixed gas cylinders are kept clear of all flammable materials to 10m and shielded on the hazard side. All above-ground pipes and connections to and from gas cylinders are metal, and polymer-sheathed flexible gas supply lines to gas meters adjacent to buildings are not permitted. Furthermore, if gas cylinders need to be kept close to the building, safety valves are directed away from the building and at least 2m away from any combustible material, so they do not act as a catalyst to combustion. Gas utilities should be positioned to not impede fire fighters accessing water supplies while undertaking suppression operations.

Hazardous Materials

Hazardous materials are any materials that can fuel the fire, such as leaf litter, grass, garden mulch and woodpiles. They can also be made up of solid combustibles or flammable liquids and gases such as petrol, kerosene, alcohol, LPG, natural gas, and acetylene. Vehicle, machinery, and other mechanical equipment that utilise fuels for operations can also be considered hazardous. The incorrect design and placement of carport and garages in residential developments could propagate fire towards the residential dwelling. Any liquids or fuels that are considered hazardous should be positioned away from the dominant Bush fire threat. If located in a building/structure, it should be a minimum of 6m away from any other building. Vegetation surrounding these locations shall be maintained to IPA standards and the construction standards shall minimise the impact of ember attack to ignite the structure.

Construction Requirements

Groundwork and Sub-structure construction phase

During the ground phase potential ignition sources of the subject development may include hot works, incorrect disposal of cigarette butts and hot exhausts from vehicles, electrical failures, and sparks from metal contact.

Groundwork and Sub-structure construction phase fire management plan should be developed. Preparation of the site should include mitigating fire ignition sources. This should include vegetation management such as slashing and mowing long grasses in and around the development site, car parking and access tracks. This is especially important during summer months where Rates of Spread of fire can significantly increase due to the prevailing weather condition.

Handheld fire extinguishers should be carried on each vehicle and on site for quick access and suppression of fires.

Where neither reticulated water nor an existing static water supply is available during the construction phase, a temporary 20,000 litre Static Water Supply within proximity of the development site shall be provided before the commencement of any construction works. This temporary supply will allow for the replenishment of attending fire services which will facilitate the rapid suppression of any potential ignitions. The temporary supply may be removed when the prescribed fire-fighting water supply is installed.

Ongoing Operations

Routine inspections of Bush fire safety systems and equipment generally occur annually and are supported by a Bush fire Plan. Ideally these inspections should occur moving out of the colder months in preparation for the Bush fire season. The most common types of inspections that are required are surface, near surface (grasses and debris) and elevated (shrub) fire fuel level accumulation in APZs, canopy separation reequipments in APZs, and maintaining building fire hygiene such as cleaning gutters and down pipes.

Developing and annually reviewing a Bush fire plan, no matter how big or small the development, is critical to the ongoing maintenance of the Bush fire Protection Measures identified within this report.

Construction Standards

Australian Standard 3959 "Construction of buildings in Bush fire-prone areas" provides for six (6) levels of building construction these being BAL - Low, BAL - 12.5, BAL - 19, BAL - 29, BAL - 40 and BAL - FZ. The Australian Standard 3959 specifies construction standards for buildings within various Bush fire Attack Levels as determined by the Planning for Bush fire Protection – 2019 document.

Bush fire Emergency / Survival Plan

No matter how big or small the development is within a Bush fire prone area, a Bush fire plan is critical to preparing the property in the event of a Bush fire. To ensure appropriate measures are taken, the worst-case scenario Bush fire behaviour should be used to determine the course of action.

There is extreme noise, smoke, heat, and wind during the passing of a Bush fire front under worst-case conditions. Vision, hearing, breathing, and communication are significantly affected during this period.

State Bush fire authorities have established kits to help residential and small property owners to develop appropriate plans to plan and prepare for Bush fire events. In NSW Bush fire survival Plans can be accessed from <https://www.rfs.nsw.gov.au/plan-and-prepare/bush-fire-survival-plan>.

The principal elements of the Bush fire survival Plans are:

- Know your risk.
- Know and understand the Bush fire alert levels.
- Access to 'Fires Near Me' app.
- Knowledge of Local radio, local ABC/emergency broadcaster frequency, and TV.
- Prepare yourself, your home and your family.
- Leave early or prepare to stay.
 - If leaving, when to leave, where will you go, how will I get there, what will I take, who will you call, what is your back-up plan.
 - If you stay, do you have all the equipment you need, what are the signal to start defending the

dwelling, what to do before, during and after the passing of the fire front, do all members of the household know what to do, check your equipment, develop action checklist, what is your back-up plan.

- Discuss all elements with your family and neighbours.

Furthermore, knowledge of escape routes (generally the public road system around your dwelling), refuges and location of any nearby Neighborhood Safer Places is critical knowledge prior to a Bush fire event.

A Bush fire emergency management and evacuation plans are prepared consistent with Australian Standard AS 3745:2010 Planning for emergencies in facilities. State agencies also have developed guidelines to facilitate the development of the documents and other Australian Standards are relevant for different development type. Bush fire emergency management and evacuation plans should be complemented with a Bush fire Management Plan (BMP).

A simple 4 step process can be undertaken to develop a basic Bush fire emergency survival plan:

DISCUSS

STEP 1

DISCUSS WHAT TO DO IF A BUSH FIRE THREATENS YOUR HOME

Many households find that having a discussion over dinner works best as everybody is together and focussed.

[Download the Step 1 discussion guide \(PDF, 985.3 KB\).](#)

PREPARE

STEP 2

PREPARE YOUR HOME AND GET IT READY FOR BUSH FIRE SEASON

There are simple things you can do around your home to prepare it for a Bush fire, like keeping the grass low and having a cleared area around your home.

[Download the Step 2 checklist \(PDF, 595.5 KB\).](#)

KNOW

STEP 3

KNOW THE BUSH FIRE ALERT LEVELS

If there is a fire in your area you will find its alert level on the NSW RFS website and in the 'Fires Near Me' app. You need to keep track of the alert level so you know what you should do.

[Download Step 3 \(PDF, 166.1 KB\).](#)



KEEP

STEP 4

KEEP ALL THE BUSH FIRE INFORMATION NUMBERS, WEBSITES AND THE SMARTPHONE APP

In a Bush fire, it's important that you stay up to date on conditions in your area.

[Download Step 4 \(PDF, 219.1 KB\).](#)

Bush fire Management Plan

No matter how big or small the development is within a Bush fire prone area, a Bush fire plan is critical to preparing the property in the event of a Bush fire. To ensure appropriate measures are taken, the worst-case scenario Bush fire behaviour should be used to determine the course of action.

State Bush fire authorities have established kits to help residential and small property owners to develop appropriate plans to plan and prepare for Bush fire events. These can be accessed by contacting your local fire authority.

For larger development such as industrial, commercial and developments that accommodate vulnerable people, more comprehensive emergency management requirements and procedures should be developed.

At a minimum, the Bush fire Management Plan should illustrate the Bush fire Protection Measures (location and type of hazard (vegetation), defendable space, access, water, and construction standards) that will be implemented as part of the development to reduce the risk from Bush fire to an acceptable level and should be clearly displayed within the property to ensure current occupants are aware of the Bush fire risk.

Furthermore, the BMP can provide information that assists in bush fire suppression operations, such as:

- 24/7 emergency contact details including alternative telephone contact.
- Location of site infrastructure and assets.
- Fire-fighting water supply plan.
- Site access and neighbour/ internal road plan.
- Identification of built, natural and cultural assets in and around the site.
- Emergency escape routes, refuges, and location of any nearby Neighbourhood Safer Places.
- Location of Fire Management Zone, specifically Asset Protection Zones.
- Location of hazards (Physical, Chemical and Electrical) that will impact on fire-fighting operations and procedures to manage identified hazards during fire-fighting operations.
- Aviation assets (helipads and aviation water supplies) and risks (powerlines).
- Fire history in and around the site, and
- Schedule of on-ground works and review and updating schedule.