

BUSHFIRE ASSESSMENT REPORT

Nevertire Solar Farm, Battery Energy Storage System

Mitchell Highway, NEVERTIRE, NSW, 2826



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Version Number	Modified By	Modifications Made	Date Modified	Status
1	SJ	Draft	26/09/2021	Completed
2	DSL	Final Draft	03/10/2021	Completed
3	DSL	Final	07/10/2021	Completed
4	DSL	Final	07a/10/2021	Completed
5	DSL	Update Site Layout	20/10/2021	Completed

Abbreviations and Acronyms

APZ	Asset Protection Zone
BAL	Bush fire Attack Level
BESS	Battery Energy Storage System
BFAR	Bush Fire Assessment Report
BFSS	Bush Fire Strategic Study
BPA	Bush fire Prone Area (Also Bush fire Prone Land)
BPMs	Bush fire Protection Measures
DPIE	Department of Primary Industries and Environment
EGP	Elliot Green Power
EP&A Act	<i>NSW Environmental Planning and Assessment Act 1979</i>
FFDI	Forest Fire Danger Index
ha	Hectare
HOC	Heat Of Combustion
IPA	Inner Protection Area
kJ/kg	Kilo Joules per Kilo gram
OPA	Outer Protection Area
MLRA	Multi-Level Risk Assessment
NCC	National Construction Code
PBP	Planning for Bush fire Protection
PHA	Preliminary Hazard Assessment
RF Act	<i>Rural Fires Act 1997</i>
RF Regs	<i>Rural Fires Regulations 2013</i>
RHG	Restricted Head Growth
SEED	Sharing and Enabling Environmental Data in NSW
SFR	Short Fire Run
SSD	State Significant Development

Executive Summary

BEMC Pty Ltd was engaged by Michelle Moodley on behalf of RPS to complete a Bush Fire Assessment Report (BFAR) utilising Method 2 assessment pathway from AS3959:2018 on the proposed Battery Energy Storage System (BESS) located at Mitchell Highway, Nevertire, NSW.

Development Consent for the Nevertire Solar Farm was originally issued by the Department of Planning and Environment (DPIE) on 5 July 2017 (Approval State Significant Development (SSD) 8072), and allows for the construction, upgrading and decommissioning of the project. Since development consent was granted, the project has been modified on three occasions to revise the development footprint (Mod-1) which was approved by DPIE on 13 October 2017; facilitate a subdivision and amend the site facilities layout (Mod-2) which was approved 7 May 2018 and use of an adjoining property for temporary access and parking during the construction phase (Mod-3) which was approved on 22 November 2018.

Further modification to the project for the addition of a BESS to be constructed to support and integrate with the solar farm. There is no suitable land available to locate a BESS on the allotment for which the original consent was granted. As such it is proposed to locate the BESS on a parcel of land immediately adjacent the solar farm (identified as Lot 38, DP755292) and the existing overhead transmission line easement. The proposed BESS will consist of up to 40 shipping container style battery energy storage packs using a lithium technology or similar. It will include battery storage containers, converters, ring main units, step-up transformers, HV underground feeders, connection to the Nevertire solar farm 22kV switchboard and associated roads, tracks, fences and control building. The BESS will have a capacity of up to 50 MW of power with energy storage of 100MWh which is 2 hours at capacity at full power rating.

As part of the modification application, Rural Fire Service (RFS) (dated 3rd September 2021, Ref: DA20210824003566-SEARS-1) have advised that a Bushfire Assessment Report, and the EIS shall identify the bush fire risk to the BESS and recommend mitigation measures to reduce the identified bush fire risk.

This report considers and assesses the bushfire construction and planning to determine compliance with the performance criteria in Planning for Bushfire Protection (2019).

The following key recommendations have been generated to meet PBP 2019 requirements.

Asset Protection Zone, Landscaping and Construction Standards

- Non-combustible fencing to be installed and located 10m from the BESS and related infrastructure.
- At the commencement of building works and in perpetuity, the 10m APZ around the external boundary fence shall be managed as an inner protection zone (IPA) as outlined within Appendix 4 of Planning for Bushfire Protection 2019, and NSW Rural Fire Service 'Standards for Asset Protection Zones'.
- The entire area within the fenced BESS compound shall be managed as an inner protection zone (IPA) as outlined within Appendix 4 of Planning for Bushfire Protection 2019, and NSW Rural Fire Service 'Standards for Asset Protection Zones'

Access

- Access from Mitchell Highway to the BESS compound shall be established.
- Fire trail access around the perimeter fence of the BESS compound is provided.

Water Supply

- A supply pipe from the existing static water tank associated with the control room shall be established and positioned outside the BESS compound to enable responding fire fighters to access this water supply. The location of the supply pipe shall be adequately sign posted for 'Static Water Supply' and complying with the static water provisions within Table 7.4a of PBP 2019.

Emergency Management Arrangements

- A Bush Fire Emergency Management and Operations Plan to be developed.

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Table 1 Planning for bushfire protection compliance (PBP 2019)
Section 8.3.1 – Buildings of Class 5 to 8 under National Construction Code (NCC) on bushfire prone lands

PERFORMANCE CRITERIA		SOLUTION	COMPLIANCE
Aims and Objectives of PBP	Afford buildings and their occupants protection from exposure to a bush fire	The perimeter trail can be located within the APZ to facilitate bush fire management for the site.	Made condition of consent – Refer to Chapter 4
	Provide for a defendable space to be located around buildings	A 10m APZ is provided inside and outside boundary fencing.	Made condition of consent – Refer to Chapter 4
	Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings	A 10m APZ is provided inside and outside boundary fencing. BESS equipped with an internal fire suppression system. A 30,000Lts water tank is provided. A perimeter trail is provided around the BESS compound.	Made condition of consent – Refer to Chapter 4
	Ensure that appropriate operational access and egress for emergency service personnel and occupants is available	A perimeter trail is provided around the BESS compound. The perimeter trail is located within the external APZ.	Made condition of consent – Refer to Chapter 4
	Provide for ongoing management and maintenance of BPMs	The BESS compound and external APZ will be maintained as an Inner Protection Zone (IPA) as outlined within Appendix 4 of Planning for Bushfire Protection 2019, and NSW Rural Fire Service 'Standards for Asset Protection Zones'. Maintenance of the APZ to IPA standards is also supported by the Bushfire Emergency Management and Operations Plan	Made condition of consent – Refer to Chapter 4
	Ensure that utility services are adequate to meet the needs of firefighters	A supply pipe from the existing static water tank associated with the control room shall be established and positioned outside the BESS compound to enable responding fire fighters to access this water supply. The location of the supply pipe shall be adequately sign posted for 'Static Water Supply' and complying with the static water provisions within Table 7.4a of PBP 2019. A perimeter trail is provided around the BESS compound.	Made condition of consent – Refer to Chapter 4
Specific Objective	A Minimum 10m Asset Protection Zone (APZ) for the structure and associated buildings and infrastructure protection during a bush fire and for occupant egress for evacuation	A 10m APZ is provided inside and external to a non-combustible boundary fence.	Made condition of consent – Refer to Chapter 4

	The APZ must be maintained to the standard of an Inner Protection Area (IPA) for the life of the development	The APZ will be maintained as an Inner Protection Zone (IPA) as outlined within Appendix 4 of Planning for Bushfire Protection 2019, and NSW Rural Fire Service 'Standards for Asset Protection Zones'.	Made condition of consent – Refer to Chapter 4
	Road access to the site and power, other services and fencing are excluded from the APZ	Road Access to the site (Mitchell Highway), other services and fencing are not included within the APZ.	Made condition of consent – Refer to Chapter 4
	Development of a Bushfire Emergency Management and Operations Plan	Bushfire Emergency Management and Operations Plan	Made condition of consent – Refer to Chapter 4

BUSHFIRE CERTIFICATION

The report has been endorsed by Duncan Scott-Lawson, BPAD level 3 certifier BPAD 47789. I certify that the proposed development design conforms to the relevant specifications and requirements of PBP 2019 and AS 3959-2018.

1 INTRODUCTION

EMC Pty Ltd was engaged by RPS Group to complete a Bush Fire Assessment Report (BFAR) on the proposed Battery Energy Storage System (BESS) development at Mitchell Highway, Nevertire, NSW, hereafter referred to as the 'site' (**Figure 1**).

Development Consent for the Nevertire Solar Farm was originally issued by the Department of Planning and Environment (DPIE) on 5 July 2017 (Approval State Significant Development (SSD) 8072). Elliot Green Power (EGP) propose a further modification for the addition of a BESS to be constructed to support and integrate with the solar farm. There is no suitable land available to locate a BESS on the allotment for which the original consent was granted. As such it is proposed to locate the BESS on a parcel of land immediately adjacent the solar farm (identified as Lot 38, DP755292) and the existing overhead transmission line easement. The proposed BESS will consist of up to 40 shipping container style battery energy storage packs using a lithium technology or similar. It will include battery storage containers, converters, ring main units, step-up transformers, HV underground feeders, connection to the Nevertire solar farm 22kV switchboard and associated roads, tracks, fences and control building. The BESS will have a capacity of up to 50 MW of power with energy storage of 100MWh which is 2 hours at capacity at full power rating.

To determine the planning and construction requirements a site assessment in accordance with Appendix 1 of PBP 2019 has been performed to determine the appropriate bush fire threat level, design, planning and construction standards required to comply with PBP 2019.

Site particulars are illustrated within **Figure 1**.

1.1 DESCRIPTION OF PROPOSED DEVELOPMENT

Table 2 Description of Proposed development

Boundaries	Agricultural land use in all directions.
Topography	Flat in all directions
Type of development	Battery storage system
Landscaping plan provided	No
Bush fire Prone Land	Yes – Warren Shire Council – Forest Fire Danger Index (FFDI) - 80

The proposed location of the development is provided in **Figure 1** with further development details provided in **Appendix 1**.

1.2 OBJECTIVES OF ASSESSMENT

This assessment has been undertaken in consideration of the *Environmental Planning and Assessment Act 1979*.

The report assesses to requirements of the development to meet the six objectives listed in section 1.1 of PBP 2019, which provide for the protection of human life and minimize impacts on property.

- Afford buildings and their occupants protection from exposure to a bushfire.
- Provide for a defendable space to be located around buildings.

- Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings.
- Ensure appropriate operation access and egress for emergency services personnel is available.
- Provide for ongoing management and maintenance of Bush fire Protection Measures (BPMs); and
- Ensure the utility services are adequate to meet the needs of firefighters.

1.3 SPECIFIC OBJECTIVES OF OTHER DEVELOPMENTS

There are other developments where bush fire provisions or requirements need to be applied, that align with the unique features of the development type.

In order to comply with PBP the following conditions must be met:

- Satisfy the aim and objectives of PBP outlined in Chapter 1;
- Consider any issues listed for the specific purpose for the development set out in this chapter; and
- Propose an appropriate combination of BPMs.

It is important to ensure that a defensible space is provided for the size and scale of the development. Proposed measures must operate in combination to minimise the impact of bush fire and ensure that access and services are adequate.

Whilst bush fire is not captured in the NCC for Class 5-8 buildings, the following objectives will be applied in relation to access, water supply and services, and emergency and evacuation planning:

- To provide safe access to/from the public road system for firefighters providing property protection during a bush fire and for occupant egress for evacuation.
- To provide suitable emergency and evacuation (and relocation) arrangements for occupants of the development.
- To provide adequate services of water for the protection of buildings during and after the passage of bush fire, and to locate gas and electricity so as not to contribute to the risk of fire to a building; and
- Provide for the storage of hazardous materials away from the hazard wherever possible.

1.4 METHOD 2 ASSESSMENT PATHWAY

The design fire methodology outlined in Appendix B of AS3959:2018 Detailed BAL Assessment provides the mathematical methodology and accepted inputs that the simplified BAL assessment Method 1 matrix was derived. Method 2 fire design model consists of accurately determining input into nested calculations within the modelling that provide increased accuracy in determining radiant heat flux and flame length.

Furthermore, Method 2 can consider the impact of Kataburn rate of spread, radiant heat shielding, and short fire runs have on the radiant heat exposure of a proposed development.

Understanding the knowledge gaps for bushfire prediction is required to enable accurate interpretation of bushfire modelling and fire engineering calculations used through the detailed assessment (Method 2). The gaps in knowledge include:

- Duration of the initial fire growth phase, fire spread on slopes, in complex terrain and extreme condition, fire spread around the entire perimeter, short-distance (wind-driven) spotting, characteristics of flames in different fuel types.

When interpreting the results of the detailed method, each of these elements are considered when determining the effect on the outputs for the calculations.

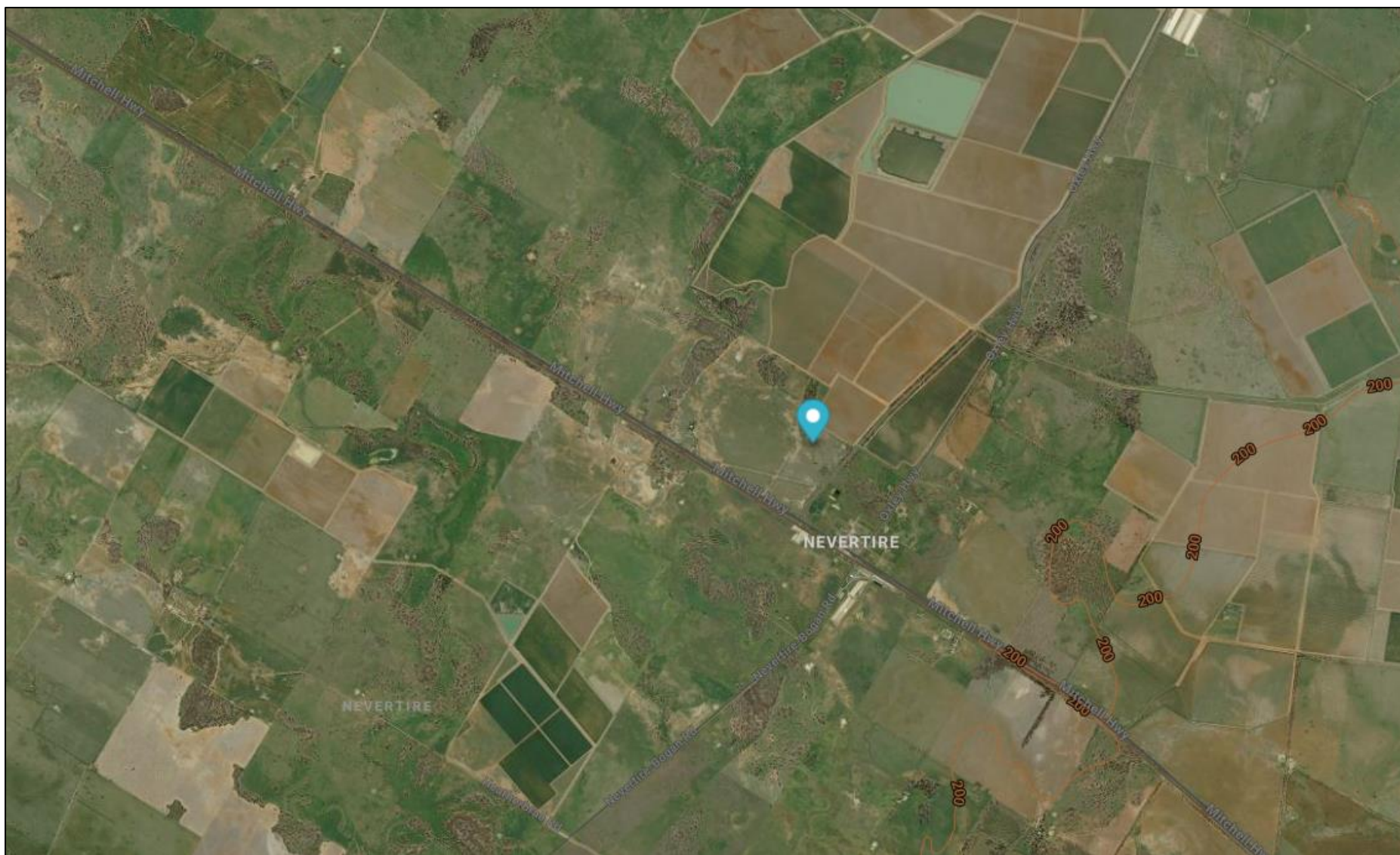


Figure 1 Site Location of BESS infrastructure proposal, Nevertire, NSW (SixMaps, 2021)

2 BUSH FIRE STRATEGIC STUDY

A Bush Fire Strategic Study (BFSS) has been prepared to inform the context of the assessment of the Bush Fire Assessment Report (BFAR) provided in **Table 3**. The level of information gathered and analysis within the BFSS depends upon the nature of development, scale of the proposal, the bush fire risk, and potential impact on the wider community and emergency management arrangements. This process provides an opportunity to assess if a proposed development is appropriate in the bush fire hazard context.

Table 3 Bush fire strategic study

Adjoining land	The proposed development and changing land use do not impact on the ability of adjoining landowners to implement Bush fire Protection Measures.
Surrounding infrastructure	The proposed development does not significantly impact on the pressures or flows of existing water supplies and does not impact on high voltage power supplies or natural gas lines.
Access and egress	The capacity of the existing road network will not be significantly affected by the proposed development during a bush fire event. The proposed development is not isolated in the event of a bush fire
Emergency services	The proposed development does not significantly impact on the ability of emergency service to plan, prepare, respond, or recover prior, during or after a bush fire event.
Land use assessment	The proposed development is a permitted use. The development is located to the east of solar panel infrastructure, the north-west of the village of Nevertire. The bush fire hazard is surrounding grasslands in all directions and light timbered country located immediately to the north. The proposed siting of the development within the lot is appropriate.
Bush fire landscape assessment	The potential fire behaviour and fire runs from the north-west will generate the greatest threat to the development. Fire progressing off the site is also a significant consideration. The highly disturbed landscape within the cultivated landscape will reduce available fuel loads and break the run of moderate and low intensity fires. Ember attack and radiant heat are the principal bush fire attack mechanism on this development.

This Bush Fire Strategic Study identifies that the proposed development meeting the broad aims and objectives and the specific objectives of other developments of PBP 2019. The proposed development provides staff/contractors the ability to evacuate, provides separation between the bush fire threat and building, will not significantly increase the spread of fire, or limit the ability of emergency services ingress while staff/contractors are looking to evacuate.

3 BUSHFIRE HAZARD ASSESSMENT

This section details the site assessment methodology in Appendix 1 of PBP2019. It provides detailed analysis of the vegetation, slope, exclusions, vegetation downgrades and shielding elements to provide the required Bush fire Protection Measures.

3.1 FIRE DANGER INDEX

Method 2 assessment considers the worst-case scenario for bushfire impacts and calculates fire behaviour determined from specific inputs. This assessment utilises Warren Shire Council area with a FFDI 80.

3.2 ASSESSMENT METHODOLOGY

The assessment of the vegetation, slope and other bushfire characteristics within and surrounding the site has been carried out with the aid of the following:

- Nearmap and sixmap aerial photograph Interpretation.
- Kogan 6*25 Laser distance finder.
- Photo Theodolite application supported by contour and terrain profiles.
- Sharing and Enabling NSW Environmental Data portal.
- Reference to regional vegetation community mapping, and
- Site assessment in September 2021.

Plates 1 – 5 depict the elements in and around the site that are considered within the bush fire hazard assessment. **Appendix 2** illustrated the bushfire engineering calculations performed.

3.3 VEGETATION ASSESSMENT

In accordance with PBP 2019, an assessment of the vegetation over 140m in all directions from the building was undertaken.

Vegetation considered a bushfire hazard was identified and classified based on available fuel loads for sub-formations provided through vegetation fuel monitoring project administered by the University of Wollongong, University of Melbourne and CSIRO Ecosystems Science and Bushfire Dynamics and Applications. The results of this research are commonly referred to as the '*NSW Comprehensive Fuel Loads*'.

3.3.1 Vegetation classification, exclusions, and downgrades

An analysis of the vegetation in and around the site has determined no vegetation exclusions or down grade are included in this assessment.

3.3.2 Predominant Vegetation Classification

Vegetation in and around the site is classified as *Western Peneplain Woodlands* and *unmanaged grasslands* in accordance with the '*NSW Comprehensive Fuel Loads*'.

3.4 SEPARATION ASSESSMENT

Measuring the distance between the proposed building envelope and bushfire threat (vegetation) provides one of the Bushfire Protection Measures (BPMs) to reduce the risk from bushfire attack. The land within the separation must conform to the standards of an Asset Protection Zones to be accepted within the separation areas.

3.5 SLOPE ASSESSMENT

This section details the site assessment methodology in Appendix 1 of PBP2019 to assess the effective slope (under classified vegetation) and site slope (slope between the vegetation and proposed development) within the 100m of the proposed building envelop.

3.5.1 Effective and Site Slope Assessment

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). The slope between the vegetation and the proposed building envelope is the site slope. When identifying the effective and site slopes, it may be found that there are a variety of slopes covering different distances. The effective slope is the slope under the vegetation which will most significantly influence the bush fire behaviour for each aspect.

The topography of the site and surrounds has been assessed to identify the maximum slope present under the classified vegetation (hazard). These values help determine the vegetation that possess bushfire threat and significantly influence fire behaviour.

3.6 SHIELDING

The shielding of an elevation shall apply to all the elements of the wall but shall not apply to subfloors or roofs. The construction requirements for a shielded elevation shall be not less than that required for BAL-12.5 unless the building has been assessed as being BAL-LOW. The reduced construction requirements do not apply where any elevation is BAL-FZ.

3.7 SHORT FIRE RUN AND RESTRICTED FIRE HEAD GROWTH

An analysis of the size and shape of the classifiable vegetation in and around the site has determined no Short Fire Run (SFR) or Restricted Head Growth (RHG) considerations within this assessment.

3.8 FLAME LENGTH

Weise and Biging (1996) research Byram's original equation relating fireline intensity to flame length overestimated flame length.

The 'trench effect' arises because of the geometry affects the flames and hot plume attaching to the bottom surface Drysdale *et al.* (1992). Edgar *et al.* (2015) reported the flame and hot plume flow characteristics depended on the inclination, with the hot plume separating from the surface at 10 and 20 degrees, although a distinctly laminar structure developed, and the hot plume attached to the surface at 30 degrees which gave rise to hotter and faster moving fire. Grumstrup *et al.* (2017), Drysdale and Macmillan (1992) and Wu *et al.* (2000) illustrate the plume commences a pronounced lean when slopes exceed 15° angle and ground attachment commences although detachment quickly from the surface.

Edgar *et al.* (2015) research supports Dold and Zinoviev (2009); Wu *et al.* (2000) of a threshold angle of inclination that demarcates the separation between turbulent and laminar flow regime that predominantly determine flame attachment to the ground. This threshold angle is around 24 to 26 degrees. Edgar *et al.* (2015b) reports the laminar flow, once established, was more stable within tunnels of greater inclination, indicating disruption of the laminar flow could be achieved at 20 degrees, although did not impact the laminar flow at 30 degrees. Edgar *et al.* (2016) illustrates the attachment of the plume for tunnel inclinations above 24° was associated with the development of a pressure deficit in the region immediately upslope of the heat source supporting the theory that the mechanism for flame attachment of the plume

arises due to an imbalance between the upslope and downslope entrainment of air into the plume heat source and is independent of the convective intensity of the plume. Edgar *et al.* (2016) reported distinctly different plume behaviour depending on whether the trench was inclined above or below the critical angle of 24°.

The contemporary research illustrates flame length ground attachment is not possible at slopes below horizontal and below 15 degrees and is not considered further within this assessment.

3.9 OTHER METHOD 2 INPUTS

Heat of Combustion

Heat of Combustion (HoC) is an important characteristic in the simulation of wildfires. It is frequently used in the assessment of fuel flammability and a key input to calculate fire-line intensity which provides for flame length calculations. Despite the variability of natural fuels HoC is considered a constant. Research since the development of the method 2 calculations illustrate that fuel moisture content has a significant impact on HoC and argue that lowering the current default heat of combustion of 18600 kJ/kg in forest fire behaviour models.

Flame Emissivity

AS3959:2018 indicates a nominal flame emissivity of 0.95 is justified as the bush fire flames under design fire weather scenarios are generally optically thick ($\epsilon \approx 1$). The predicted flame emissive power is extremely sensitive to flame temperature. The selection of the nominal flame temperature for calculation is critical to make sure that the construction standard determined with this flame temperature together with other input parameters can provide an adequate bush fire construction level.

Moisture Factor

Fuel moisture factor is only used in Marsden–Smedley and Catchpole (1995) fire model for Tussock Moorland and is default to 5. This input has no effect on fire modelling calculations in other vegetation.

Ambient temperature and Relative Humidity

The default value for ambient air temperature during worst-case scenario fire weather conditions defaults to 35°, converted to Kelvin is 308K. The default value for Relative Humidity is 25%. Worst case scenario fire weather conditions in NSW are generally from the North-west which have high temperatures and low relative humidity. For bush fire threats a from directions other than the north, north-west, and west the ambient temperature and relative humidity can significantly change, especially in coast environments.



Plate 1 Drone imagery of the proposed site (Elliot Green Power, 2021)



Plate 2 View from the east over the site to the west (Elliot Green Power, 2021)



Plate 3 View from the west over the site to the east (Elliot Green Power, 2021)



Plate 4 Lightly timber area to the north of the site (Elliot Green Power, 2021)



Plate 5 View from Nevertire village to the north-west (Elliot Green Power, 2021)

Figure 2 Bushfire Assessment

-  Vehicle Water
-  Category 7 Access
-  Asset Protection Zone
-  Proposed Development
-  140m Assessment Area
-  BESS Infrastructure
-  Existing solar development
-  Western Peneplain Woodlands
-  Unmanaged grasslands

SixMap Imagery



0 75 150 m



4 BUSHFIRE ASSESSMENT

This section assesses the Bushfire Protection Measures (BPMs) for the proposed development in consideration of the acceptable solutions required for each performance criteria within PBP 2019. **Appendix 3** provides detail concerning BPMs. It further provides compliance to the fire safety.

1. Proposed separation distances between the BESS and outer edge of the APZ acts as a defensible space.
2. Fire response plan incorporating safety measures to prevent the risk of external heat effects in the event of a bushfire.
3. Compliance with all applicable Australian Codes and Standards.
4. Demonstrate appropriate separation and isolation between battery cubicles, BESS and other infrastructure including gravel off-set areas around facility.
5. Adequate supply of firefighting water within proximity of BESS.

The proposed development will not lead to significant increase population or residential infrastructure on the site. Special provisions in accordance with section 8.3.5 of PBP 2019 apply to Solar Farm (and associated developments). The principle aims of these types of developments is to ensure the provision of safe egress to and from public road system, adequate services of water and consideration of the location of gas and electricity, suitable emergency and evacuation arrangements and location of hazardous materials.

In recognition of the characteristics of grass fires, the NSW RFS has developed relevant performance-based solutions which are outlined in table 7.9a PBP 2019 which can provide guidance on the appropriate BPMs to be implemented.

4.1 SETBACKS AND ASSET PROTECTION ZONES

The APZ on this site is wholly within the site boundaries and is not located on land >18 degrees slope, and there are no proposed building structures within the APZ. The ongoing maintenance of APZs are recognised under 100C of the *Rural Fires Act 1997* and is supported in 2.8(1)(d) of the *Biodiversity Conservation Act 2016*. Any clearing of vegetation within the site to allow the development to occur may require assessment under the *Biodiversity Conservation Act 2016*.

The requirement for Solar Farms (and associated developments) in PBP 2019 is based on providing suitable design, construction, and sufficient space to ensure that radiant heat levels do not exceed critical limit for firefighters and other emergency service personnel undertaking operations, including supporting or evacuating occupants.

At the commencement of building works and in perpetuity, a 10m APZ around, battery cubicles, BESS and other infrastructure including gravel off-set areas shall be managed as an Inner Protection Area (IPA) as outlined within Appendix 4 of Planning for Bushfire Protection 2019, and NSW Rural Fire Service 'Standards for Asset Protection Zones'.

A fire trail is included within the APZ. The provided 10m separation outside the boundary fencing of the BESS and associated infrastructure is sufficient to act as a defensible space and meets the bushfire planning requirements.

4.2 CONSTRUCTION STANDARDS

This section indicates the Bush fire Attack Level (BAL) construction requirements of the proposal which are to meet the performance criteria in PBP 2019. The performance criteria within PBP 2019 are:

- The proposed structures can withstand bush fire attack in the form of embers, radiant heat, and flame contact.
- APZ are maintained to the standard of an IPA.
- Access is adequate for emergency egress and firefighting ingress.

4.3 GROUND WORKS AND SUB-STRUCTURE CONSTRUCTION PHASE

During the construction phase potential ignition sources of the subject development may include hot works, incorrect disposal of cigarette butts and hot exhausts from vehicles over long grass.

The provision of BPMs and suppression assets should be considered during this stage of construction. Although a ground tank (dam) is located nearby, this type of water infrastructure is unreliable during periods of dry weather and is not considered an appropriate BPM. The provision of a temporary 10,000 litre Static Water Supply within proximity of the development site before the commencement of any construction works should be considered. 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 once the BPMs within a BFAR are implemented.

Vegetation control around access roads, parking areas and temporary assets such as building site office, should also be considered at temporary BPMs during this stage of construction.

4.3.1 Building Construction Standards

Australian Standard 3959 "Construction of buildings in bushfire-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 Bushfire Attack Levels as determined by PBP 2019 document.

4.3.2 Ongoing Operations

The potential bushfire/ grassfire related risks associated with the operational phase of the development include ignition caused by arcing from transmission lines and electrical shorts, hazards that could accelerate and intensify bushfires/ grassfires (e.g., transformer oil) and health risk associated with burning infrastructure.

The implementation of the recommendations of a BFAR will reduce the risk of bushfire to an acceptable level to allow the development to proceed.

Non-combustible fencing be installed within 10 metres of any structure, and gates shall be provided to provide emergency service access between lot boundaries. An APZ of 10m surrounding the entire development along the perimeter within the grassland hazards will result in a BAL-12.5 construction standard.

4.4 ACCESS

The performance criteria within PBP 2019 are:

- Firefighting vehicles are provided with safe, all-weather access to structures and hazard vegetation.
- The capacity of access roads is adequate for firefighting vehicles.
- There is appropriate access to water supply.

In the event of a serious bushfire threat to the proposed development, it will be essential to ensure that adequate ingress/ egress and the provision of defendable space are afforded in the design. Access requirements are provided in Appendix 3 of PBP 2019.

The Mitchell Highway exists to the south and provides access to the site. The Mitchell Highway is sealed, all-weather, two-way with adequate passing and grade for emergency service vehicles.

The site is flat, and establishment of a perimeter trail, passing and turning provisions shall be designed to accommodate emergency services vehicles. Gates should be installed along boundary fencing association with gaps in the landscaping features to allow emergency services to access neighbouring grasslands. Access shall be provided in accordance with Appendix 3 of PBP 2019.

The access from Mitchell Highway and around the BESS compound shall meet the following requirements:

- Minimum carriageway width of 4m.
- A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches.
- Property access must provide a suitable turning area in accordance with Appendix 3 of PBP 2019.
- Curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress.
- The minimum distance between inner and outer curves is 6m.
- The crossfall is not more than 10°.
- Maximum grades for sealed roads do not exceed 15° and not more than 10° for unsealed roads.
- The capacity of road surfaces and any bridges/ causeways is sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes); bridges and causeways are to clearly indicate load rating.

4.5 WATER SUPPLY

Reticulated water supply is not provided to the site, although it is noted that the site offers a ground tank (dam) that hold water. Although these assets could be used to facilitate suppression operations, they are not reliable during drought conditions and are commonly not suitable for drafting of water. Static water supply will need to be provided to provide water services for the protection of infrastructure. Table 5.3b of PBP 2019 provides water supply requirements for non-reticulated developments or where reticulated water supply cannot be guaranteed for occupied sties.

The requirement of water provisions in accordance with 8.3.5 is to ensure the availability of fire-suppression equipment (including water). A small water tank is provided within the BESS compound to facilitate the on-site water suppression system. A 30,000Lts static water supply is located adjacent to the control room. A supply pipe from the tank shall be established and positioned outside the BESS compound to enable responding fire fighters to access this water supply. The location of the supply pipe shall be adequately sign posted for '*Static Water Supply*'. Static water supply shall meet the following specifications:

- A connection for firefighting purposes is located within the APZ outside the BESS compound 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.
- 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.
- All exposed water pipes external to the building are metal, including any fittings.

4.6 OVERHEAD ELECTRICITY SERVICES

The performance criteria within PBP 2019 are:

- Location of electricity services limits the possibility of ignition of surrounding bush land or the fabric of buildings.

Electricity services have been found to contribute to bush fire ignition and spread, as well as impeding access during bush fire events. Where possible electricity should be placed underground. If above ground, maintenance of the vegetation around the transmission lines should be in accordance with the ISSC 3 Guideline for Managing Vegetation Near Power Lines. This guideline was established by the five NSW Network Operators under the Electricity Supply (General) Regulation 2001 and the Electricity Supply (Safety and Network Management) Regulation 2002. Landscaping and vegetation should be maintained to comply with Energy Australia 'Vegetation Safety Clearances' (NS179, April 2002).

4.7 GAS SERVICES

There are no gas supplies proposed for this development.

4.8 HAZARDOUS INDUSTRY

Special provisions in accordance with section 8.3.5 of PBP 2019 apply to Solar Farm (and associated developments) requires consideration of DPIE Hazardous Industry Planning Advisory Papers. A Preliminary Hazard Assessment (PHA) is being prepared in accordance with the Department's Hazardous Industry Planning Advisory Paper No. 6, 'Hazard Analysis' (HIPAP 6) and Multi-Level Risk Assessment (MLRA). The PHA consider the updated standards and guidelines, including but not limited to:

- NFPA 855, Standard for the Installation of Stationary Energy Storage Systems.
- AS 5139 Electrical Installations - Safety of Battery Systems for Use with Power Conversion Equipment.
- IEC 62897 Stationary Energy Storage Systems with Lithium Batteries - Safety Requirements.
- UL 9540 Energy Storage Systems and Equipment.
- UL 9540A Test Method.
- FM Global Property Loss Prevention Data Sheets 5-33, Electrical Energy Storage; and
- Ditch, Ben & Zeng, Dong. (2019). Development of Sprinkler Protection Guidance for Lithium Ion Based Energy Storage Systems (FM Global Research Technical Report).

The PHA within this bushfire Assessment Report focuses on the bushfire risk elements in accordance with DPIE Hazardous Industry Planning and Assessment Paper NO. 3, 2011 to identify bushfire hazards, analyses the effects on people and the environment and their probability of occurrence.

Fire hazards from the BESS is limited because only a small portion of materials within the construction that are flammable, and those components cannot self-support a significant fire.

The BESS shall be fitted with a complete and comprehensive fire detection and protection system. It shall comply with the Australian Standards and the National Construction Code (NCC). This will include a SCADA integrated fire control system with the following:

- Smoke detection system
- Fire detection system
- Battery and other equipment temperature monitoring system
- A fire protection buffer around the inside of the perimeter fence.
- A steel water tank to the RFS requirements

This reduction in fire fuels and fire suppression equipment will suppress the 'rate of spread' of a fire. Ensuring the fire does not spread from the compound to the surrounding landscape is the principal protection requirement.

The ignition sources of this development could be:

- Above ground powerlines and power sources.
- Arc flash from power sources.
- Build-up of dry fire fuels in areas that generate heat.
- Location of infrastructure in relation to BPMs within the development.

The implementation of appropriate design and BPMs will result in risk levels that do not preclude development approval from a bushfire management perspective. Appropriate design and regular maintenance of infrastructure, Fire Management Zones (APZs) and fuel loads (Landscaping) shall be undertaken to verify the safety systems established to mitigate bushfire risk. The NC Clean Energy Technology Centre indicated in the United States *The International Association of Fire Fighters* (IAFF) and International Renewable Energy Council (IREC) partnered to create an online training that should be provided to the local NSW RFS brigades and staff www.iaff.org/pvsafetytraining.

Some developments are considered by their very nature to be hazardous, as much for their ability to start bush fires as their susceptibility to bush fire impacts. New developments of this nature should be avoided on bush fire prone land. However, where hazardous industries are proposed, in preparation of a bushfire assessment, the bushfire specific assessment utilising the *DPIE Hazardous Industry Planning and Assessment Papers* (HIPAPs) should be considered.

This study provides details of all credible fire hazards and the associated fire prevention and mitigation measures for the development. The bush fire assessment must address the appropriate protection measures to be provided commensurate with the bush fire hazards and associated risks. Care should also be taken to ensure that such facilities do not impact on existing developments.

Table 4 DPIE Hazardous Industry Planning and Assessment Papers

HIPAP	Bush fire considerations
Industry Emergency Planning Guidelines	Evacuation and emergency management arrangements prior to and during bushfire events within the NSW RFS district shall be included in the facilities emergency management arrangements. This will include: • Bush fire decision triggers. • action require at each decision trigger. • responsibilities to implement the actions.
Fire Safety Study Guidelines	This bush fire assessment report forms one element in the safety assurance process. The application of the recommendations within this report will mitigate the risk of a bushfire impacting on the site to acceptable levels.
Risk Assessment	This bush fire assessment report forms one element in the risk assessment process. The application of the recommendations within this report will mitigate the risk of a bushfire impacting on the site to acceptable levels.
Risk Criteria for Land Use Planning	The land use and siting of this development is appropriate for bush fire protection requirements.
Hazard Audit Guidelines	Annual review of the bushfire protection measures recommended within this report shall be included in annual audit reviews. Specific attention shall be afforded to: • Ensuring any future installed/established landscaping features comply with bush fire requirements. • Asset Protection Zones are maintained to the required distances and fire fuel loads, removing the ability for vegetation creep over time. • Retrofitting of any buildings is completed the required BAL construction level. • Review of bush fire emergency management arrangements
Guidelines for Hazard Analysis	This bush fire assessment report forms one element in the hazard analysis process. The application of the recommendations within this report will mitigate the risk of a bushfire impacting on the site to acceptable levels.
Construction Safety Studies	The Construction Safety Study identifies all hazards which are specific to demolition, construction and commissioning activities associated with proposed development. This analysis is outside the requirements of bush fire planning.
HAZOP Guidelines	The HAZOP process is used to identify potential hazards and operational problems in terms of plant design and human error. This analysis is outside the requirements of bush fire planning.
Safety Management System Guidelines	Evacuation and emergency management arrangements prior to and during bushfire events within the NSW RFS district shall be included in the facilities Safety Management System (SMS)
Land Use Safety Planning	This bush fire assessment report forms one element in the land use safety planning process. The application of the recommendations within this report will mitigate the risk of a bushfire impacting on the site to acceptable levels.
Route Selection	These guidelines provide an overall integrated framework for the assessment of road transport routes for the transportation of hazardous materials. This analysis is outside the requirements of bush fire planning.
Hazards-Related Conditions of Consent	The application of the recommendations within this report will mitigate the risk of a bushfire impacting on the site to acceptable levels.

4.9 LANDSCAPING AND VEGETATION MANAGEMENT

It is essential that any landscaping be included in any bushfire assessment to ensure appropriate BPM are incorporated into the design elements of the development.

A layout plan illustrates the 10m wide APZ with a fire trail exterior to a non-combustible boundary fence. All Landscaping features within the compound shall comply with Appendix 4 of PBP 2019.

4.10 EMERGENCY MANAGEMENT AND BUSHFIRE SURVIVAL PLANS

A Bush Fire Emergency Management and Operations Plan is required to be developed. This document will include detailed measures to prevent or mitigate bushfires, including:

- Igniting 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.
- Bushfire Emergency Management procedures.

The document will 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 notify local NSW RFS Fire Control.

5 CONCLUSION AND RECOMMENDATIONS

It is clear from this investigation and assessment that the site constitutes Bushfire risk. In accordance with the provisions of PBP 2019, the recommendations outlined within this assessment will substitute as appropriate actions to reduce the risk of damage and/or harm in the event of a bushfire event and meet the requirements of the planning panel.

This Bush Fire Assessment Report found the land surrounding the proposed development supports vegetation consistent with a grassland. The vegetation that forms a bush fire threat exists in all direction on and surrounding the site.

The following key recommendations have been generated to meet PBP 2019 requirements.

APZ, Landscaping and Construction Standards

- Non-combustible fencing be installed and located 10m from the BESS and related infrastructure.
- At the commencement of building works and in perpetuity, the 10m APZ around the external boundary fence shall be managed as an Inner Protection Area (IPA) as outlined within Appendix 4 of Planning for Bushfire Protection 2019, and NSW Rural Fire Service 'Standards for Asset Protection Zones'.
- The entire area within the fenced BESS compound shall be managed as an Inner Protection Area (IPA) as outlines within Appendix 4 of Planning for Bushfire Protection 2019, and NSW Rural Fire Service 'Standards for Asset Protection Zones'

Access

- Access from Mitchell Highway to the BESS compound shall be established.
- Fire trail access around the perimeter fence of the BESS compound is provided.

Water Supply

- A supply pipe from the static water tank associated with the control room shall be established and positioned outside the BESS compound to enable responding fire fighters to access this water supply. The location of the supply pipe shall be adequately sign posted for 'Static Water Supply' and complying with the static water provisions within Table 7.4a of PBP 2019.

Emergency Management Arrangements

- A Bush Fire Emergency Management and Operations Plan to be developed.

Finally, the implementation of the adopted measures and recommendations forwarded within this report are based on a thorough assessment under the Planning for Bushfire Protection 2019 to manage the risk caused by bushfire to people, property, and public safety. The recommended bushfire protection measures will contribute to the amelioration of the potential impact of any bushfire upon the development estate, but they do not and cannot guarantee that the area will not be affected by bushfire at some time.

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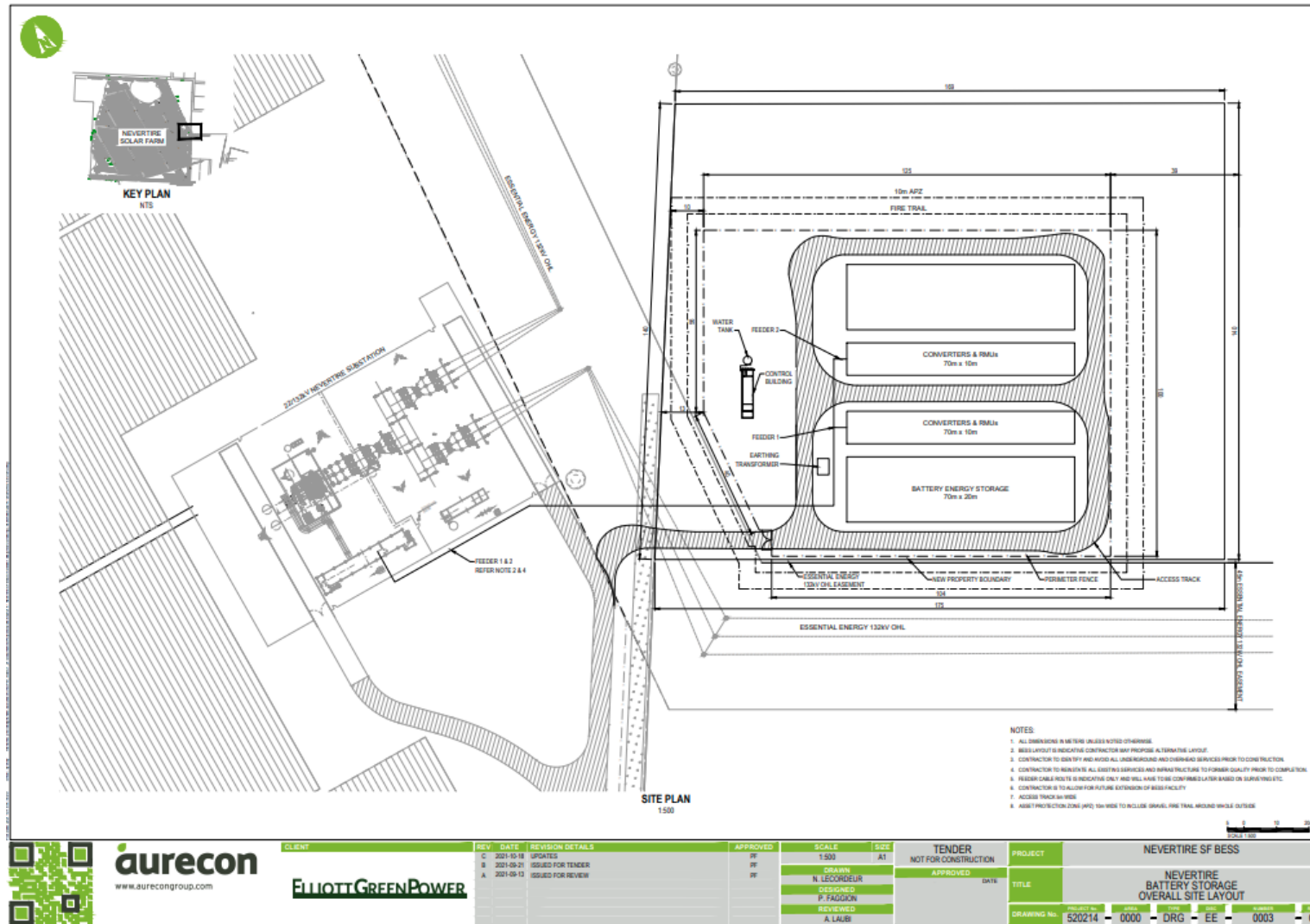
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APPENDIX 1 SITE LAYOUT PLANS





APPENDIX 2 METHOD 2 OUTPUTS

		NBC Bushfire Attack Assessment Report V4.1	
		AS3959 (2018) Appendix B - Detailed Method 2	
Print Date: 1/10/2021		Assessment Date: 1/10/2021	
Site Street Address: BESS, Nevertire			
Assessor: Duncan Scott-Lawson; BEMC			
Local Government Area: Warren		Alpine Area: No	
Equations Used			
Transmissivity: Fuss and Hammins, 2002			
Flame Length: RFS PBP, 2001/Vesta/Catchpole			
Rate of Fire Spread: Noble et al., 1980			
Radiant Heat: Drysdale, 1985; Sullivan et al., 2003; Tan et al., 2005			
Peak Elevation of Receiver: Tan et al., 2005			
Peak Flame Angle: Tan et al., 2005			
Run Description: Transect 1			
<u>Vegetation Information</u>			
Vegetation Type: Western Penneplain Woodlands			
Vegetation Group: Semi-arid Woodlands			
Vegetation Slope: 0 Degrees		Vegetation Slope Type: Level	
Surface Fuel Load(t/ha): 11.9		Overall Fuel Load(t/ha): 14.5	
Vegetation Height(m): 2		Only Applicable to Shrub/Scrub and Vesta	
<u>Site Information</u>			
Site Slope: 0 Degrees		Site Slope Type: Level	
Elevation of Receiver(m): 2.4		APZ/ Separation(m): 10	
<u>Fire Inputs</u>			
Veg./Flame Width(m): 100		Flame Temp(K): 1090	
<u>Calculation Parameters</u>			
Flame Emissivity: 95		Relative Humidity(%): 25	
Heat of Combustion(kJ/kg): 18600		Ambient Temp(K): 316	
Moisture Factor: 5		FDI: 100	
<u>Program Outputs</u>			
Level of Construction: BAL 40		Peak Elevation of Receiver(m): 4.57	
Radiant Heat(kW/m2): 33.65		Flame Angle (degrees): 49	
Flame Length(m): 11.02		Maximum View Factor: 0.515	
Rate Of Spread (km/h): 1.43		Inner Protection Area(m): 10	
Transmissivity: 0.859		Outer Protection Area(m): 0	
Fire Intensity(kW/m): 10698			
<u>BAL Thresholds</u>			
BAL-40: BAL-29: BAL-19: BAL-12.5: 10 kW/m2: Elevation of Receiver:			
Asset Protection Zone(m): 9	12	18	26 42 2.4

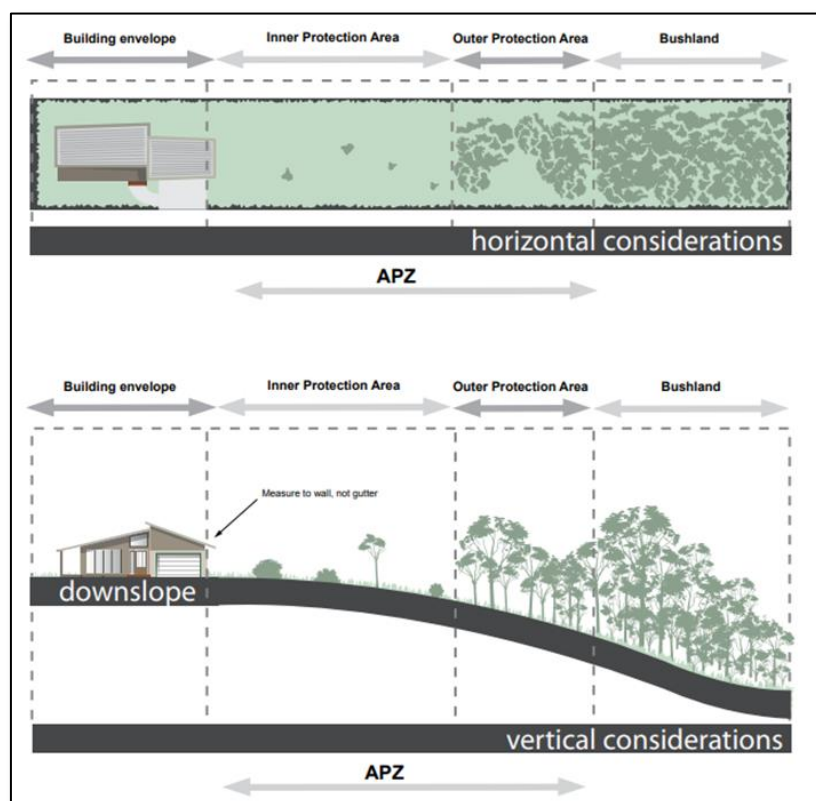
APPENDIX 3 BUSH FIRE PROTECTION MEASURES

Asset Protection Zones

An APZ is an area surrounding a development that is managed to reduce the bushfire 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 bushfire 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 signposted to ensure community is aware that the area is to be maintained for Bush fire protection purposes, as indicated 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 bushfire.
- 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.

Landscaping and vegetation management

In choosing plants for landscaping consideration should be given to plants that possess properties, which help to protect buildings. If the plants themselves can be prevented from ignition, they can improve the defence of buildings by:

- Filtering out wind-driven burning debris and embers.
- Acting as a barrier against radiation and flame, and
- Reducing wind forces.

Consequently, landscaping of the site should consider the following:

- Meet the specifications of an Inner Protection Area (IPA) detailed in PBP 2019.
- Priority given to retaining or planting species which have a low flammability and high moisture content.
- Priority given to retaining or planting species which do not drop much litter in the bushfire season, and which do not drop litter that persists as ground fuel in the bush fire season, and
- Create discontinuous or gaps in the vegetation to slow down or break the progress of fire towards the dwellings.

Specific landscaping commitments from the project include the following features:

- Setbacks which wrap around three sides of the development for bushfire management.
- A combination of hard and soft landscaping.
- An intensive area of planting centred on a contoured garden mound on the southern boundary of the site to provide an effective screening of the development from future residential development, and
- A selection of plants suitable to the landscape objectives based on native species.

Consideration should be given to vegetation fuel loads present on site with particular attention to APZs. Careful thought must be given to the type and physical location of any proposed site landscaping. Inappropriately selected and positioned vegetation has the potential to 'replace' any previously removed fuel load.

Bearing in mind the desired aesthetic and environment sought by site landscaping, some basic principles help minimise the chance of such works contributing to the potential hazard on site.

Whilst it is recognised that fire-retardant plant species are not always the most aesthetically pleasing choice for site landscaping, the need for adequate protection of life and property requires that a suitable balance between visual and safety concerns be considered.

It is essential that any vegetation and landscaped areas and surrounds are subject to ongoing fuel management and reduction to ensure that fine fuels do not build up.

Access Requirements

In the event of a serious bushfire 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.

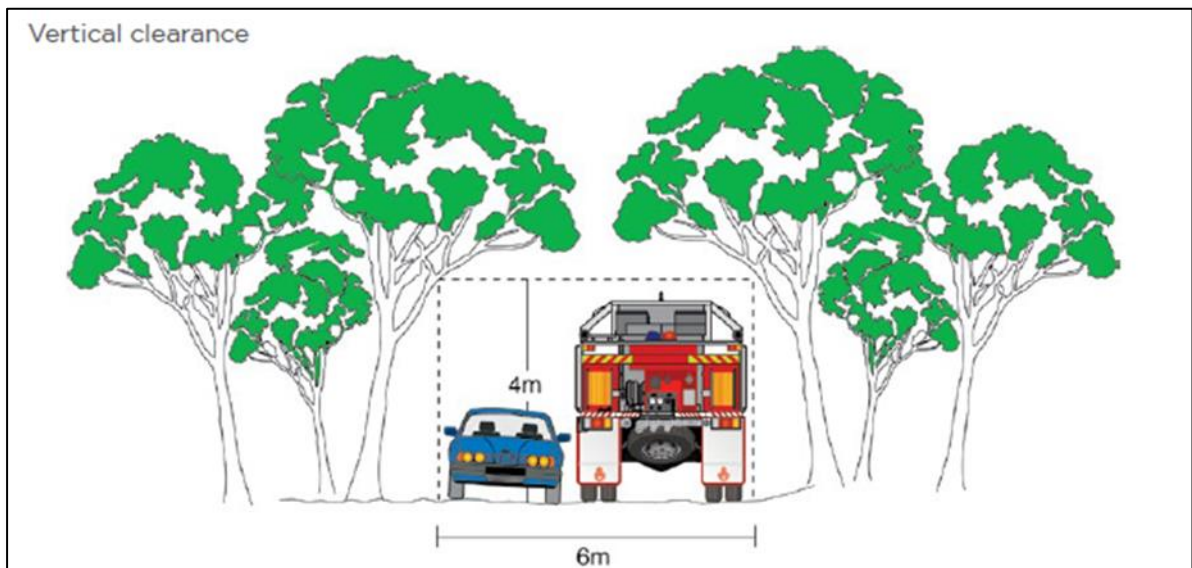
Local Area Traffic Management (LATM)

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

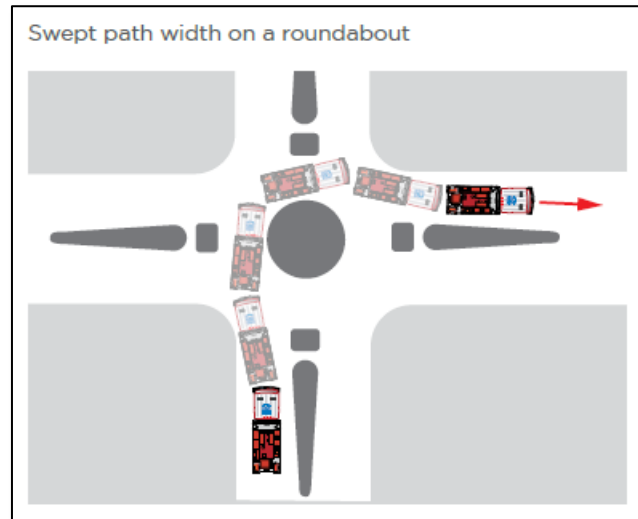
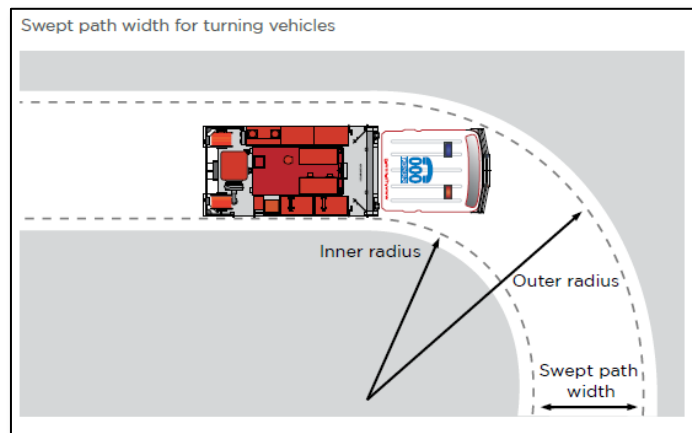
An unobstructed clearance height of 4 metres should be maintained above all access ways including clearance from building construction, archways, gateways/doorways, and overhanging structures (e.g., ducts, pipes, sprinklers, walkways, signs and beams). This also applies to vegetation overhanging roads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



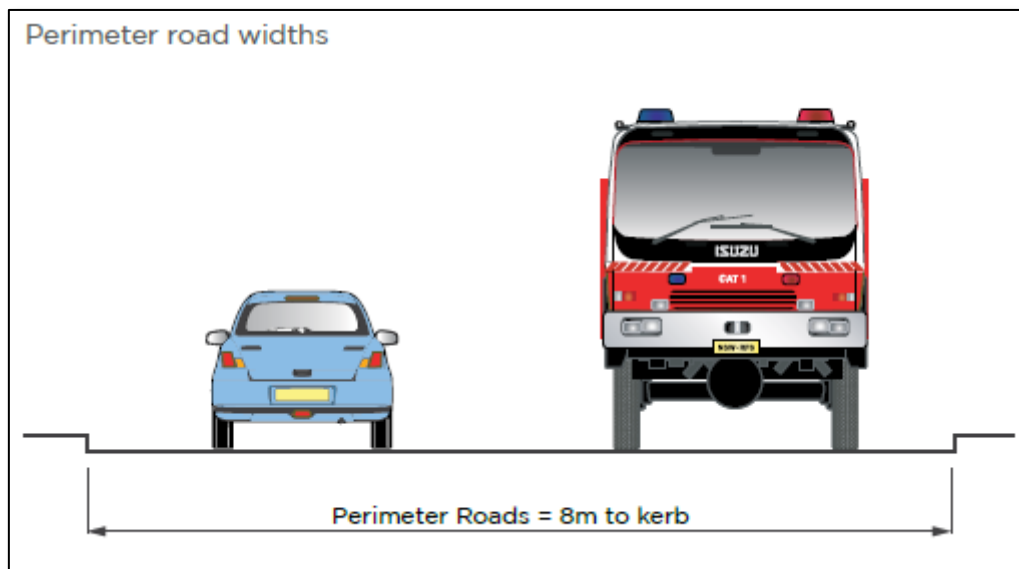
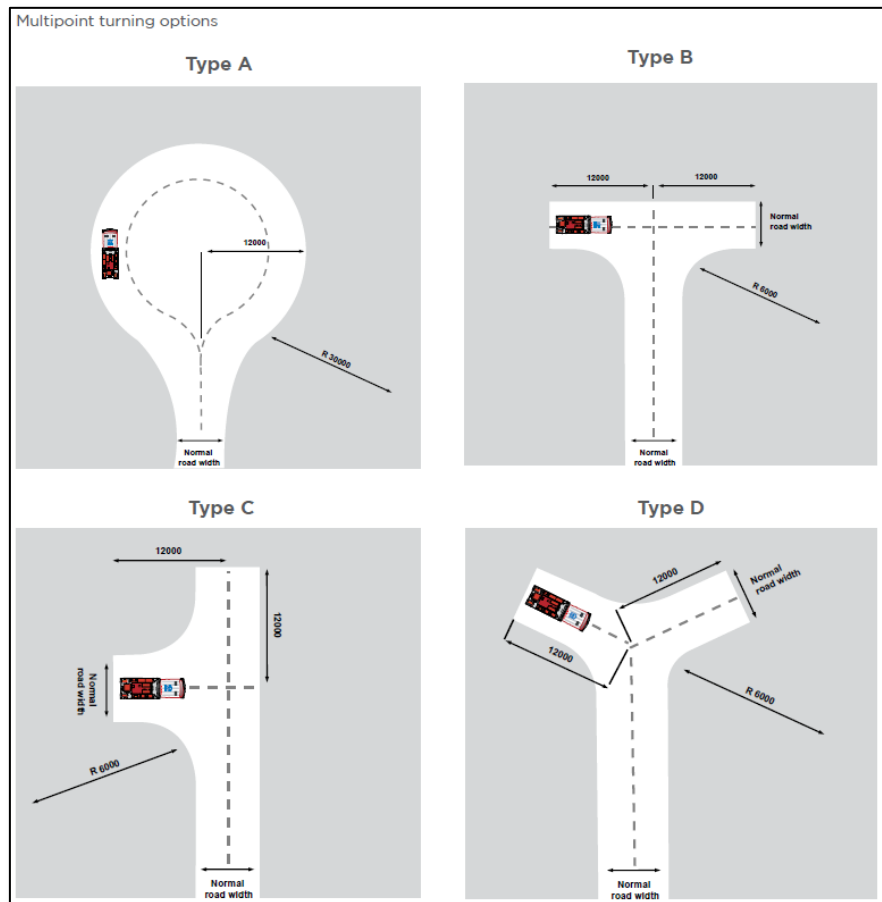
Vehicle Turning Requirements

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.



Non-perimeter roads 5.5 metres wide - parking is provided outside of the carriageway width, and hydrants are located clear of parking areas.

Water Supply

Intent of water measures is to provide adequate services of water for the protection of buildings during and after the passage of a bush fire.

Where reticulated water supplies are provided fire hydrant spacing, design, flow, pressures, and sizing comply with Australian Standard AS 2419.1:2005 and all above-ground water service pipes external to the building are metal, including and up to any taps.

Reticulated water supply to urban subdivisions shall use a ring main system for areas with perimeter roads.

Hydrant services should be located outside the carriageway and parking bays to permit traffic flow and access. Transporting and setup of standpipes within the carriageway will stop traffic flow. Hydrant services should be located on the side of the road away from the bush fire threat where possible.

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 appliance 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, valves, 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.

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, and 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.

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. 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.

In location where reticulated water is available, temporary fire hoses should be considered as a preventative measure that can be removed with the prescribed fire-fighting water supply is installed.

Where reticulated water is not available a temporary 10,000 litre Static Water Supply within proximity of the development site 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

The routine inspection intervals of bush fire safety systems and equipment general occur annually and are supported by a Bushfire plan. Ideally these inspections should occur moving out of the colder months in preparation for the bushfire 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 bushfire plan, no matter how big or small the development, is critical to the ongoing maintenance of the Bushfire Protection Measures identified within this report.

Construction Standards

Australian Standard 3959 "Construction of buildings in bushfire-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 Bushfire Attack Levels as determined by the Planning for Bushfire Protection – 2018 document.

Any future alterations, extension to structures, even if they are complying, should consider the appropriate bushfire construction standards at that time. The below table provides the AS3959 BAL construction requirements for residential developments in NSW.

Bushfire Management Plan

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

State bushfire authorities have established kits to help residential and small property owners to develop appropriate plans to plan and prepare for bushfire 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.

A bushfire 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. Bushfire emergency management and evacuation plans should be complemented with a Bushfire Management Plan (BMP).

At a minimum, Bushfire Management Plan should illustrate the Bushfire 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 bushfire to an acceptable level and should clearly displayed within the property to ensure current occupants are aware of the bush fire risk.

Furthermore, BMP can provide information that assists in wildfire 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.