



Hybrid Planning Permit | Attachment 5

*Bushfire Risk Assessment Report & Mitigation Plan*



# **Hepburn Solar Farm**

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## **Bushfire Risk Assessment Report & Mitigation Plan**

**November 2020**

Cover image – courtesy of Studio Aton

## Document history and date

Revision	Date	Description	By	Review	Approved
V1	22/5/2020	First draft	M. Potter	G. Taylor	G. Taylor
V2I	4/11/2020	Document finalised following client feedback.	M. Potter	G. Taylor	G. Taylor
V3	9/3/2021	Additional information provided	M Potter	G Taylor	G Taylor

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*Where the term “**Bushfire prevention and mitigation related activities**” (or words to that effect) are used, this is to be defined as the clearance of vegetation in accordance with the Victorian State Government guidelines, including clearing and maintenance of existing fire breaks and/or fire access for fire fighters under electricity pylons and properties that have been constructed to Australian Standard AS3959 and/or the National Construction Code.*

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## Glossary of Terms & Abbreviations

Within the National Framework of fire risk mitigation, the fire protection industry has placed fire outcomes into four main themes and areas of focus. These areas are:

- **Prevention:** Prevention activities aim to minimise the occurrence of bushfires, particularly those of human origin, occurring during periods of extreme weather conditions.
- **Preparedness:** Preparedness actions are undertaken in anticipation of fires. Effective preparedness arrangements are implemented to improve bushfire response performance.
- **Response:** Bushfires are suppressed and managed to reduce the risk to human life, communities, essential and community infrastructure, industries, the economy and the environment. The protection of human life will be assigned priority over all other considerations.
- **Recovery:** Returning community, economic and business activities to a healthy state that result in a sustainable and economically viable community.

The bushfire risk assessment will largely deal with prevention, preparedness and response.

The following terms, abbreviations and acronyms have been used throughout this report:

Term	Meaning
APZ	Asset Protection Zone – utilises extensive fuel management to provide the highest level of protection to human life, property, key community assets and critical infrastructure. The goal of this aggressive fuel treatment is to reduce radiant heat and ember attack in the event of a bushfire.
AS 3959 - 2018	Australian Standard 3959 – 2018 Construction of Dwellings in Bushfire Prone Areas.
Bushfire	An unplanned fire in vegetation, including grassfires.
Bushfire Attack Level (BAL)	Means the bushfire attack level as defined in AS3959-2018 <i>Construction of Buildings in Bushfire Prone Areas</i> as a “means of measuring the severity of a building’s potential exposure to ember attack, radiant heat and direct flame contact, using increments in radiant heat expressed in kilowatts per metre squared, and the basis for establishing the requirements for construction to improve protection of building elements from attack by bushfire”.
Bushfire Hazard	Materials that can fuel a fire.
Bushfire Prone Vegetation	Means continuous vegetation including grasses and shrubs but not including maintained lawns, parks and gardens, nature strips, horticultural areas, vineyards and orchards.



Term	Meaning
Bushfire Risk	The probability of a bushfire starting and spreading, but it can also be used to describe the likelihood of an asset, such as a building, being damaged or destroyed by a bushfire.
CFA	Country Fire Authority Victoria.
Defendable Space	An area of managed vegetation around an asset likely to be at risk from bushfire that protects it from direct flame contact and intense radiant heat, as well as providing an area where firefighters can defend the asset.
FFMVic	Forest Fire Management Victoria.
Fine Fuel	Dead plant matter less than 6mm in diameter
FRC Pty Ltd	Fire Risk Consultants Pty Ltd, also known as the “Consultants”.
Fuel Break	Synonymous with “firebreak”; any natural or constructed change in fuel characteristics, which affects fire behaviour so that fires burning into them can be more readily controlled. Fuel breaks will not stop a major bushfire but provide a fire control line from which to suppress a fire.
Fuel Structure	The quantity and type of fuel at different heights above the ground usually separated into surface, near surface, elevated and bark. Canopy fuels may also be expressed
Hazard Reduction	Reducing fuel loads in any given area. Generally by burning, mechanical, manual or chemical means.
Managed Vegetation	Combustible material that is permanently maintained in a minimal fuel state. Generally mechanically treated in an APZ.
Minimum Fuel Condition	A condition to where fine fuels are minimised to the extent that the passage of a fire will be prevented or severely restricted. This generally requires the removal of dead fine fuel and the control of live fuel, breaks in the continuity of any fuel, maintenance of a high moisture content in vegetation, or replacement of vegetation with roads, tracks, paths etc.
OFH	Overall Fuel Hazard (Hines, et al 2010). Classes used to quantify OFH are Low, Moderate, High, Very High and Extreme
VFRR	Victorian Fire Risk Register

## Executive Summary

Fire Risk Consultants was engaged to undertake a bushfire risk assessment and provide recommendations on mitigation strategies to reduce bushfire risk at the proposed Hepburn Solar Farm development at Leonards Hill.

The development site is located south of the Daylesford town centre in Leonards Hill. The Solar Farm is located within the Hepburn Shire Council footprint.

This report provides a detailed assessment of the bushfire risk across the site with analysis of fires originating from both within and external to the property. The description and assessment of bushfire risk is not confined to the property, rather it considers the wider landscape bushfire potential.

The primary consideration for all fire mitigation and suppression efforts in Victoria is the preservation of life and property. This analysis will better inform developers and property owners to make sound decisions regarding bushfire risk management and assisting them to prevent, prepare and respond to bushfires.

The information provided in the risk assessment summarises the identified risks and makes mitigation recommendations that are intended to provide a greater level of protection to the development, the surrounding property owners and the community generally.

Our recommendations complement existing works by the Hepburn Shire Council in the local area, such as the implementation of the roadside slashing program during the pre-summer fire preparedness activities.

Other recommendations in the areas of static water storage, emergency preparedness, training, fire coverage during construction and pre Fire Danger Period works are all made as part of this report. Breaking up the vegetation with fire access tracks and areas of managed vegetation (low overall fuel hazard) will significantly reduce the ability for a fire to ignite and or spread through the property.

The bushfire risk associated with the construction and operation of the Hepburn Solar Farm can be mitigated to an acceptable level with the implementation of sound bushfire mitigation strategies.

However, it is also worth noting that despite the implementation of recommendations to reduce the bushfire risk we should not underestimate bushfires on Code Red fire danger days where fire behaviour may be such that despite all mitigation works, the site, infrastructure and personnel can be impacted.

Solar farms are not fundamentally more of a bushfire risk than any other form of development in a rural setting. The proposed Hepburn Solar Farm will not significantly increase bushfire risk in the landscape or preclude emergency service operations.



# 1 Introduction

Fire Risk Consultants Pty Ltd (FRC) has been engaged by Hepburn Wind to provide a report that assesses the bushfire risks and recommends mitigation strategies to reduce potential impacts of bushfires to life, property and environmental assets as part of the proposed Hepburn Solar Farm development.

The Hepburn Solar Farm is proposed to be constructed alongside the existing Wind Farm in Leonards Hill. Leonards Hill is south of Daylesford in central Victoria. The surrounding area is a mix of farmland with forest and plantations dominating the landscape.

While the weather and topography in an area cannot be modified, a reduction in the fuels will reduce the flame height and intensity of a fire. The grassland fuels will be the significant factor in bushfire behaviour and spread. Grassland vegetation is very responsive to weather changes (in particular wind) and can spread very quickly under strong wind conditions.

The report adopts the primary bushfire management objective which is to reduce the impact and consequences of bushfire on people, property and the environment, with the protection of human life the highest priority.

The evaluation of all environmental, social and economic considerations associated with the construction and operation of solar farms has not been considered. The general objective of this assessment is to make recommendations that will guide management actions to mitigate bushfire risks.

There are many factors that can influence the risk of bushfires; as such the Bushfire Risk Assessment has taken into consideration:

- The role of key stakeholders and their legislative responsibilities
- Best practice management and policy responses
- The current context and existing risk factors
- The elements of a proposal that may increase bushfire risk
- The elements of a proposal that may aid or hinder suppression operations.

In this context the objectives for this report are to:

- Maximise the potential for safe management of bushfires
- Reduce the likelihood of human caused ignitions
- Introduce mitigation strategies and actions
- Ensure levels of bushfire preparedness match the risk
- Assist and guide management actions and operational works plans
- Increase community understanding of bushfires as it relates to the proposed Solar Farm.

In Victoria, bushfire safety is considered a shared responsibility between the fire services, the Victorian and local Government, communities and individuals. All parties are responsible for preparing prior to the fire season in order to protect themselves, their interests and their neighbours from the impact and effect of bushfires.

## 2 Bushfire Environment

### 2.1 Bushfires in Australia

The continent of Australia is one of the most fire prone areas in the world. In particular, south east Australia regularly experiences devastating bushfires which impact on lives, property and the environment.

The rate a bushfire can spread is a direct result of the weather, fuel hazard (including dryness, quantity and arrangement) and the topography in which the fire is burning. The only one of these three factors that it is possible to modify is the fuel.

Extreme fire conditions can occur in Australia when dry Winters and Springs allow bushfire fuels to become very dry.

Victoria's bushfire risk is the result of several factors that increase the likelihood and consequences of fire. These factors include large areas of the state comprising highly flammable dry eucalypt forest, native and introduced grassland, protracted droughts and an increasing population in bushfire prone areas.

Victoria is incredibly fire prone, with a history of catastrophic bushfires such as Black Friday (1939), Ash Wednesday (1983), Central Victorian grassfires (1985), Alpine Fire (2003), Great Divide Fire (2006) and most recently, Black Saturday (2009). Historically, there have been several significant fires in central Victoria.

Fires can be expected to move quickly under the influence of strong, gusty north westerly winds. These fires can then move rapidly in a different direction when the subsequent south-westerly wind change arrives. Fires that start under these conditions can reach a very high intensity, even in areas of relatively low fuel loads and can be difficult to control until the weather conditions abate.

The intensity of a bushfire is directly linked to its destructiveness and how difficult it is to control. As the intensity increases so does the difficulty of containment and effective suppression. Very high intensity fires with flame heights greater than 10 metres are generally uncontrollable.

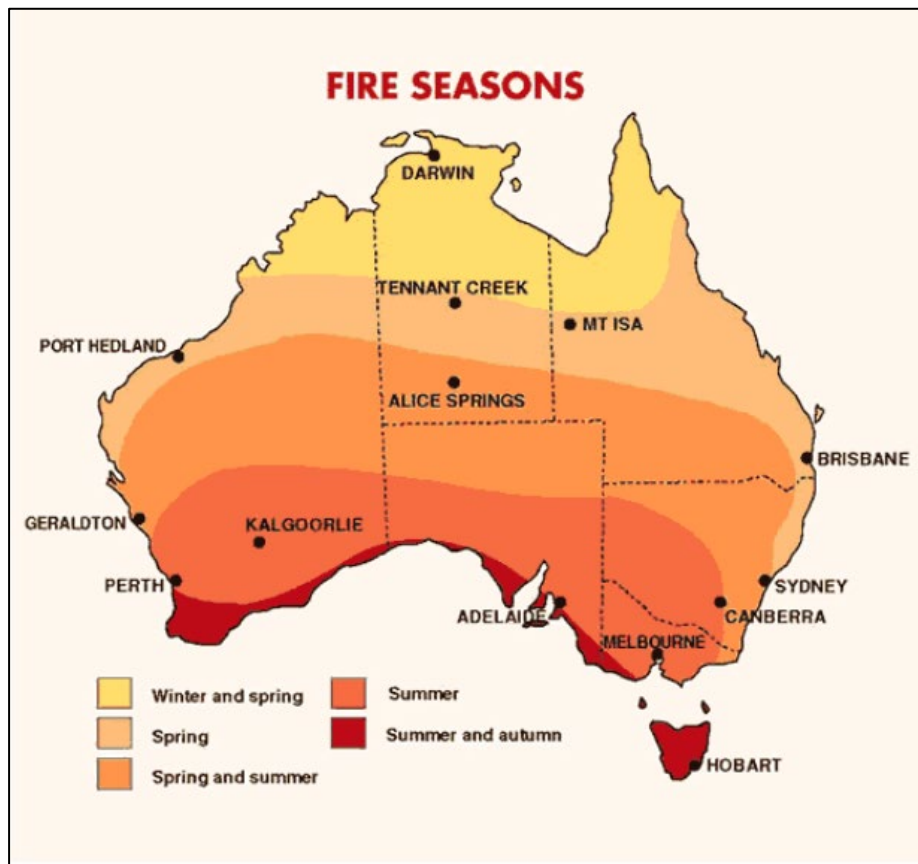


Figure 1 - Bushfire seasons in Australia. (Sourced from Bureau of Meteorology)

## 2.2 Bushfire Fuels

Bushfire intensity is a function of the heat content of the fuel, the quantity of fuel and the rate of spread of the bushfire. Quantity and distribution of fine fuels are the main factor influencing bushfire behaviour. Larger fuels (e.g. logs) during a bushfire do not contribute significantly to the spread of a bushfire.

Fine fuels (less than 6mm in thickness) available to a bushfire are fuels such as grass, leaves, dead pine needles and twigs that ignite readily and are consumed rapidly when dry. Fine fuel load measured as an overall fuel hazard has therefore been used as a convenient measure of the underlying bushfire hazard in areas dominated by woody vegetation.

Overall fuel hazard is assessed by combining all the fuel sources, these fuel sources are categorised into four layers with differing effects on fire behaviour. These layers are:

**Surface fine fuels:** leaves, bark, small twigs and other fine fuel lying on the ground. These fuels provide the horizontal continuity that allows a bushfire to spread.

**Near surface fine fuels:** grasses, low shrubs, bracken etc. up to about .5 m above the ground surface. Fuels in this layer will burn when the surface fuel layer burns and will increase bushfire intensity.

**Elevated fuels:** larger shrubs and small saplings with most of the fuel closer to the top of this layer and a clear gap between them and the surface fuels. These interact with the two-layer fuel layers to further increase bushfire intensity. They also contribute to the vertical continuity of fire that allows fire to 'climb' into the tree canopy.

**Bark fuels:** flammable bark on trees, saplings and large bushes from ground level to the canopy. Loose fibrous bark on string-bark eucalypts, and candle bark on some gums can generate large amounts of embers which can start spot fires ahead of the main fire front.

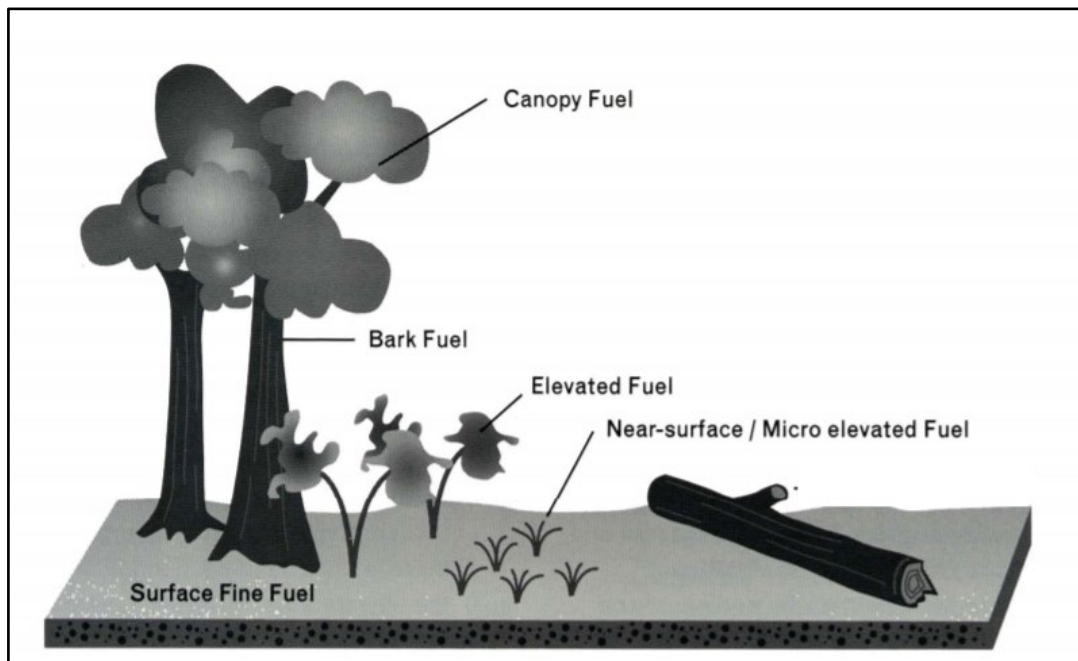


Figure 2 - Overview of fuel layers

## 2.3 Access and Egress

The ability to quickly access and safely move around the site is important for emergency services during suppression operations and for the quick and efficient movement of vehicles during any evacuation procedures.

Consideration for access and egress must include:

- Suitability for heavy (emergency) vehicles all year round
- Access during potential congestion periods
- Ability to turn around
- Access to water
- Secondary escape route/s.

An effective road and track network can:

- Improve bushfire response times, which increase the likelihood of bushfires being suppressed in minimal time and to a minimal area
- Improve firefighter safety, by providing a safer platform from which firefighters can prepare for and fight bushfires

- Provide greater protection for assets
- Improve the speed of evacuation of the area, if required.

## **2.4 Weather**

The main weather factors affecting fire behaviour are the long-term climate trends and daily weather conditions such as temperature, relative humidity, wind speed and wind changes.

The Project site is subject to the same conditions that are experienced across Victoria where elevated fire danger periods are dominated by a northerly air flow followed by a cool south westerly wind change.

On high fire risk days, the combination of strong winds (generally northerly and then westerly or south westerly after the wind change), high temperatures and low humidity increase the likelihood of bushfires with extreme fire intensity and unpredictable fire behaviour.

Bushfires starting on days of extreme fire weather will generally be very unpredictable and almost impossible to contain.

The nearest Bureau of Meteorology automated weather station is located at Ballarat. This is approximately 27 kilometres to the west of the proposed development site.

## **2.5 Topography**

Bushfires travel upslope much faster than they travel on flat land and corresponding reductions in speed apply downslope. North facing slopes are drier than south facing slopes, and fuels on north facing slopes will ignite and burn more easily than those on south facing slopes. Areas upslope of an approaching fire are considered highly dangerous.

The influence of slope and other topographical features can affect fire behaviour in a significant way. As the Project site is located along a ridgeline, the topography will most likely affect bushfire behaviour.

## **2.6 Bushfire History**

Victoria has experienced many devastating bushfires owing to the hot dry conditions that characterise summer. Bushfires can occur from October through to April, but historically the most devastating have occurred in January and February.

The 2019 / 2020 season has been significant in Victoria with many bushfires impacting throughout the eastern half of the State. Damaging fires in East Gippsland and North East Victoria killed 5 people and destroyed over 300 homes.

The information available through DELWP indicates that the most recent bushfire that threatened this area was in 2009. The bushfire burnt to the south of the Daylesford township. Other bushfires occurred to the west of the site in the 70s and 80s. Fire history is shown in Figure 3.

This history indicates that the area surrounding the proposed Solar Farm is at risk from bushfires and mitigation measures are required.

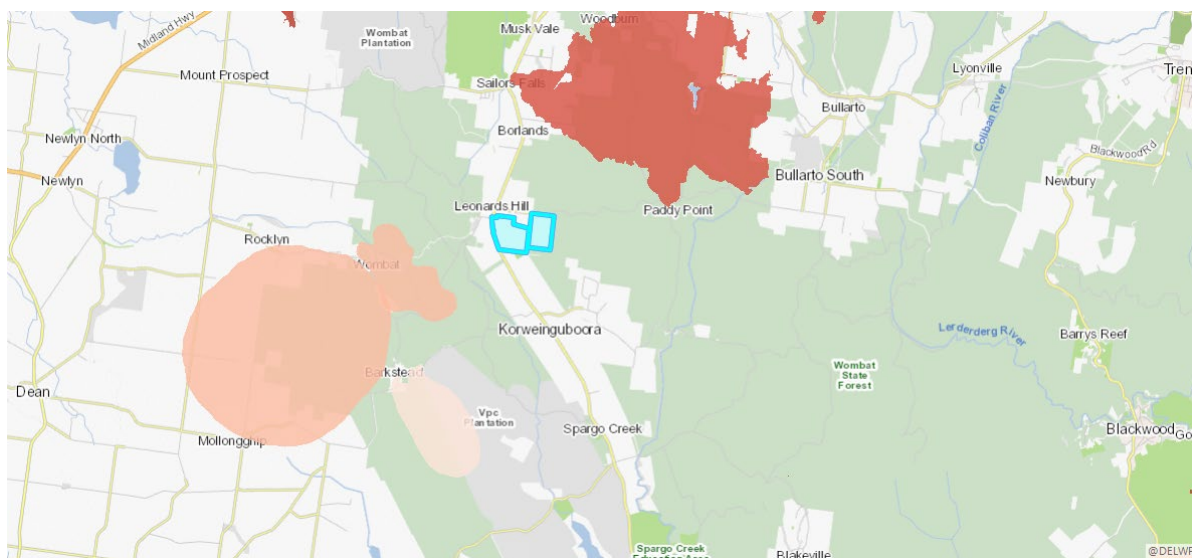


Figure 3 - Bushfire history near the proposed Solar Farm

### 3 Key existing documents

Bushfires burn across public and private land and managing bushfire risk is an ongoing and shared responsibility between government and private landholders.

To ensure best practice is applied to the risk assessment, a number of existing policies and strategic documents from various agencies and Council (CFA, FFMVic and Hepburn Shire Council) have been considered. These documents address a range of issues and factors and provide guidance on how bushfire risk can be assessed and/or managed.

#### 3.1 Municipal Fire Management Plan

The Hepburn Shire municipal footprint is covered by a Municipal Fire Management Plan. The plan identifies fire history since 1944. Whilst the area of Leonards Hill is not mentioned within as a location at risk, it does identify the location of Musk which is just to the north of Leonards Hill. The area of Daylesford South and Musk is considered an extreme risk. It would be expected that the area of Leonards Hill would experience similar bushfire conditions to the areas to the north including Musk and Daylesford South.

The Victorian Fire Risk Register analysis has not identified the area of Leonards Hill as an at risk location. This would likely be as a result of the VFRR processes rather than the risk posed to the location of Leonards Hill.

#### 3.2 CFA Guidelines

CFA has released a publication *Guideline for Renewable Energy Installation (February 2019)* to provide the renewable energy industry guidance on the planning, construction and operation of renewable energy facilities.

The *CFA Guideline for Renewable Energy Installations 2019* does not provide information in relation to the risk posed by solar farms. Rather, it provides guidance on the treatments that should be implemented to reduce the risk posed to firefighters, the community and the asset generally. It can be implied from these guidelines that there are risks associated with bushfires entering the Solar Farm and there is a potential for fires to originate within a solar farm and impact on neighbouring properties.

How this proposal meets the CFA Guidelines is outlined within Appendix 3.

### **3.3 DELWP Guidelines**

DELWP has developed the *Solar Energy Facilities – Design & Development Guidelines August 2019* as the primary guide to assist solar farm developers in the planning, development and operation of these facilities across Victoria

The Guideline provides an overview of the policy, legislative and statutory planning arrangements for solar energy facility projects in Victoria. The document references the above mentioned CFA Guidelines and Clause 13.02-1 - Bushfire planning of the Victorian Planning Scheme.



Figure 4 - DELWP Solar Energy Facilities – Design and Development Guideline 2019



## 4 The Legislative Framework

This section reviews relevant legislation, planning policy and strategic bushfire management planning frameworks to understand the regulatory and planning context for bushfire prevention and response at the proposed Hepburn Solar Farm.

### 4.1 State Legislation

The *Emergency Management Act 1986* and *Emergency Management Act 2013* provide the emergency management framework for Victoria.

The *Country Fire Authority Act 1958* relates to fire prevention and suppression in the county area of Victoria (private property outside the metropolitan fire district) with CFA responsible for the suppression of fire in this area. The Act provides for the CFA to declare the Fire Danger Period (FDP) in individual municipalities and Total Fire Ban by weather districts. These declarations impose restrictions on the lighting of fire and activities that may cause a fire. The Act also authorises municipalities to issue fire protection notices to landholders for fire hazard removal. This Act applies to the Project site.

Section 43 of the *Country Fire Authority Act 1958* states '*it is the duty of every municipal council and public authority to take all practical steps (including burning) to prevent the occurrence of fires on, and minimise the danger of the spread of fires on and from – any land vested in it or under its control or management: and any road under its care and management*'.

Each municipality that has a bushfire risk appoints a Municipal Fire Prevention Officer.

The *CFA Act 1958* authorises Municipal Fire Prevention Officers to issue Fire Prevention Notices on owners or occupiers of private properties to complete fire management works. A Municipal Fire Prevention Officer may enter private land to remove fire hazards if they are not treated within the time frame or manner stipulated on the Fire Prevention Notice.

The Municipal Fire Prevention Officers also acts as the executive officer of the Municipal Fire Management Planning Committees, responsible for producing a Municipal Fire Management Plan.

The Municipal Fire Prevention Officers is also responsible for issuing permits to burn during the Fire Danger Period.

The Hepburn *Municipal Emergency Management Plan 2018* recognises bushfire as an extreme risk to people, economy, environment and infrastructure across the Shire area.

The *Forests Act 1858* identifies the Secretary of DELWP responsible for the prevention and suppression of fire across all National parks, State forests and protected public land. This Act imposes fire regulations all year on public land. This Act applies to the Arthurs Seat State Park abutting the Project site.

Victoria Police prosecute offences relating to fire pursuant to the *Country Fire Authority Act 1958*, the *Crimes Act 1958* and the *Summary Offences Act 1966*.

Although not explicit, the onus is on individual owners and occupiers of land to ensure their properties are free of fire hazards that may put the lives and property of other people at risk.

Changes have been proposed to the emergency management structure and planning processes at the State, Regional and Municipal levels with Emergency Management Victoria (EMV) leading reforms in Victoria. The *Emergency Management Legislation Amendment Act 2018* (EMLA Act) was passed through Parliament in August 2018, and will establish a new integrated, comprehensive and coordinated framework for emergency management planning. A Program Office has been set up by EMV to support the implementation of the new arrangements by 1 December 2020, when the legislation will take full effect. The reforms will be implemented in phases at the State, Regional, and Municipal levels. An Inter-Departmental Committee (IDC) has been established to support the implementation of these critical reforms, with stakeholders across State and local government (Municipal Association of Victoria and Local Government Victoria), responder agencies and relief and recovery organisations. Key deliverables to be in place by this date include:

- State emergency management planning guidelines
- State Emergency Management Plan
- Regional emergency management planning guidelines
- Regional emergency management plans
- Draft municipal emergency management planning guidelines (to be issued once the municipal phase takes effect).

## **4.2 Fire Management Policy & Planning**

The *Emergency Management Act 1986* and *Emergency Management Act 2013* provide the emergency management framework for Victoria and the Emergency Management Manual Victoria contains emergency-related policy and planning documents for Victoria, including the arrangements for State, Regional (Victorian State Government regions) and municipal fire management planning. The Victorian Government is currently reviewing these arrangements.

*Safer Together: A new approach to reducing the risk of bushfire in Victoria* (Victorian Government 2015)<sup>1</sup> outlines the approach to reducing bushfire risk in Victoria through land, fire and emergency management agencies working with communities to reduce the risk of bushfire.

Currently, Regional Emergency Management Planning Committees prepare Regional Emergency Management Plans and Municipal Emergency Management Planning Committees) and Municipal Emergency Management Plans. These cover all emergencies.

Where fire is a risk in the area, these committees establish Regional Strategic Fire Management Planning Committees and Municipal Fire Management Planning Committees as subcommittees to prepare integrated Regional Strategic Fire Management Plans and Municipal Fire Management Plans respectively.

These plans engage all agencies with a role in fire management and outline responsibilities.

CFA develops Community Information Guides - Bushfire (formerly known as Township Protection Plans) for communities deemed to be at risk of bushfire or grassfire.

The *Emergency Management Act 2013* includes responsibilities for the prevention of, response to and recovery from emergencies at the State, Regional and Municipal levels. It does this through setting up structures to deal with emergencies and assigning roles and responsibilities to organisations and individuals.

The structures for fire management planning are defined in the Emergency Management Manual Victoria Part 6 Municipal Emergency Management Planning Arrangements - Guidelines for Committees. The diagram below indicates these structures:

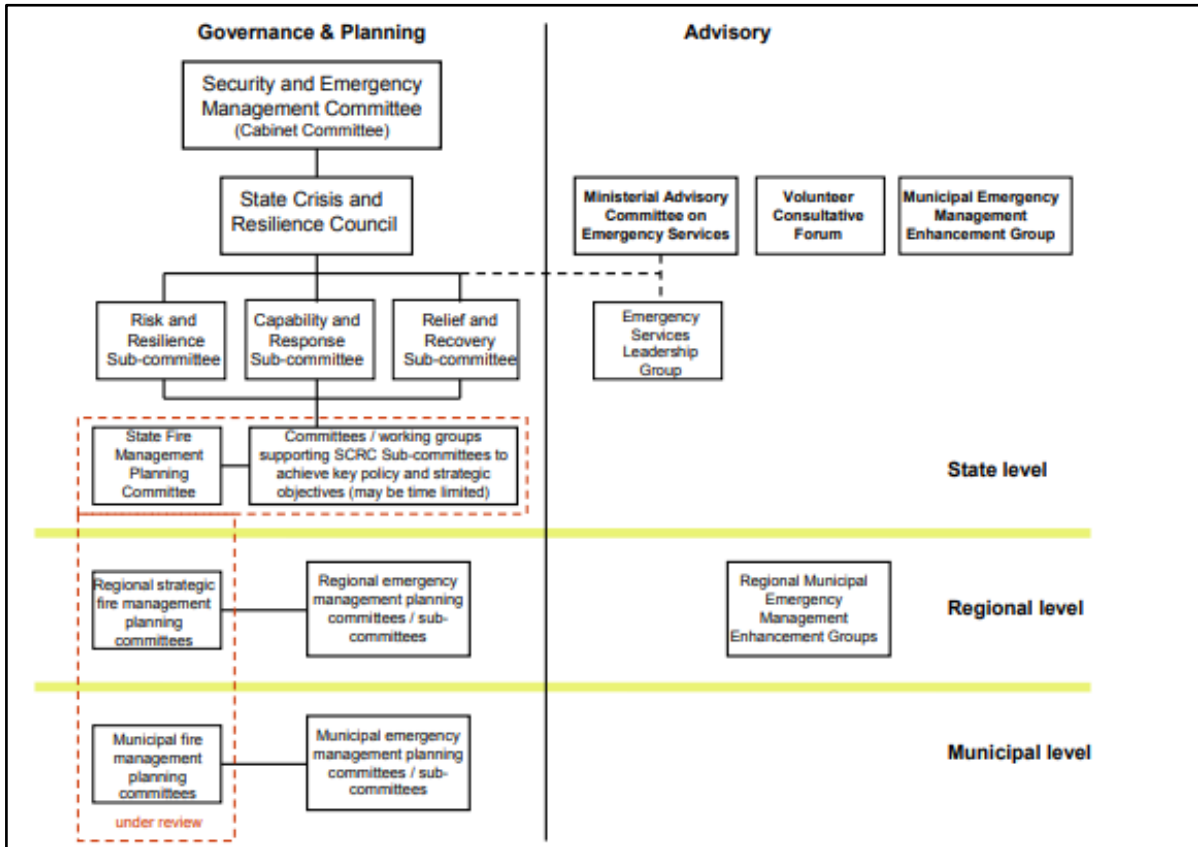


Figure 5 - An overview of the State’s emergency management and planning and committee structure

### 4.3 Victorian Planning Scheme

The Victorian Planning Scheme Clause 13.02-1S Bushfire planning sets out policy objectives and strategies for managing bushfire risk in Victoria.

This report has utilised the key policy and planning arrangements in place to guide the process to determine the level of bushfire risk associated with the proposed project. This includes Clause 13.02-1S Bushfire planning. The objective of Clause 13.02-1S is to strengthen the resilience of settlements and communities to bushfire through risk-based planning that prioritises the protection of human life.

Clause 13.02-1S arrangements are aimed at reducing the future risk associated with land use developments with the fire management planning processes reducing the risk to the community created by previous land use decisions.

Clause 13.02-1S has introduced, amongst a range of things, a clear statement that the primacy of life is a key Planning Scheme focus. When the clause was introduced into the Planning Scheme it introduced strategies to better identify, assess and manage bushfire hazards through the planning process.

The objectives for Settlement Planning as outlined within the Clause 13.02-1S policy are:

- Directing population growth and development to low risk locations, being those locations assessed as having a radiant heat flux of less than 12.5 kilowatts/square metre under AS 3959:2018 Construction of buildings in bushfire-prone areas (Standards Australia, 2018).
- Ensuring the availability of, and safe access to, areas assessed as a BAL-LOW rating under AS 3959:2018 Construction of buildings in bushfire-prone areas (Standards Australia, 2018) where human life can be better protected from the effects of bushfire.
- Ensuring the bushfire risk to existing and future residents, property and community infrastructure will not increase as a result of future land use and development.
- Achieving no net increase in risk to existing and future residents, property and community infrastructure, through the implementation of bushfire protection measures and where possible reducing bushfire risk overall.
- Assessing and addressing the bushfire hazard posed to the settlement and the likely bushfire behaviour it will produce at a landscape, settlement, local, neighbourhood and site scale, including the potential for neighbourhood-scale destruction.
- Assessing alternative low risk locations for settlement growth on a regional, municipal, settlement, local and neighbourhood basis.
- Not approving any strategic planning document, local planning policy, or planning scheme amendment that will result in the introduction or intensification of development in an area that has, or will on completion have, more than a BAL-12.5 rating under AS 3959:2018 Construction of buildings in bushfire-prone areas (Standards Australia, 2018).

A detailed 13.02 assessment has been included as part of this report and is located in section 8.

## 5 The Bushfire Risk Assessment Framework

### 5.1 Bushfire Risk Assessment Overview

The risk assessment process involves identifying, analysing, evaluating and treating the identified risks.

Bushfire risk assessment is a function of the likelihood of an adverse event occurring and the consequence of the event. The bushfire risk assessment assists the developer and property owner to understand its potential risks and to develop mitigation actions.

The key considerations that have been assessed in developing this plan include;

- A fire occurring on the solar farm and spreading internally within the site
- A fire occurring on the solar farm and spreading externally impacting neighbouring properties
- A fire occurring on adjacent lands and entering the site

The overall risk assessment process requires a consistent approach and the methodology has been developed and found in the AS/NZS ISO 31000:2009 as incorporated into the *National Emergency Risk Assessment Guidelines* (NERAG):

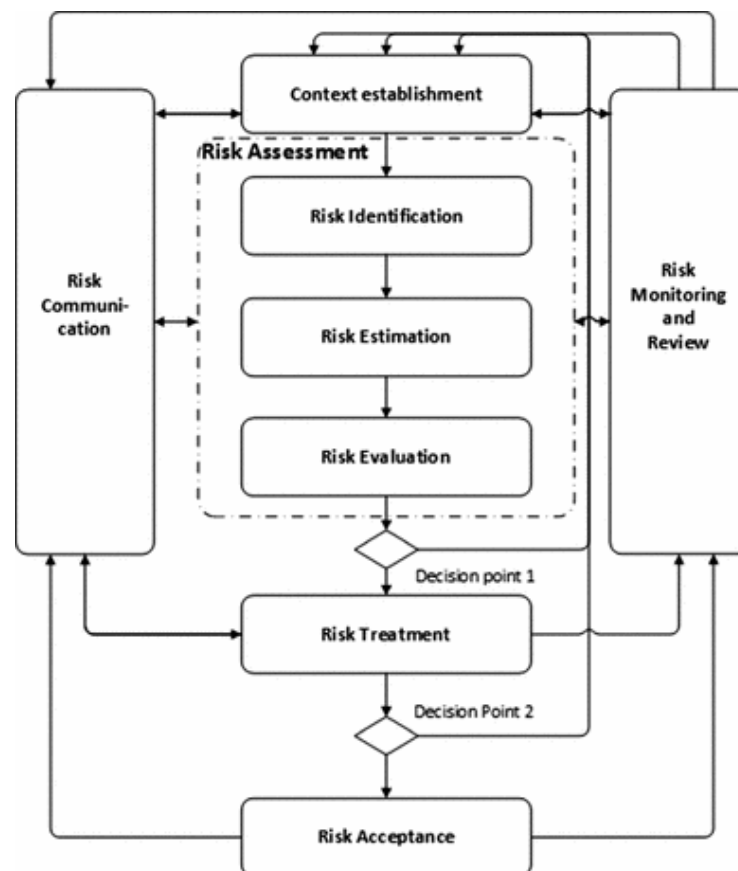


Figure 6 - Overview of AS/NZS ISO 31000-2009 risk management process

Benefits of the project to reduce bushfire risk include:

- An awareness of existing bushfire risks at the proposed site
- An appreciation of the increasing bushfire risks we face as a community that must be addressed
- Identify opportunities to work collaboratively with other stakeholders to reduce bushfire risk across a broader landscape
- Alignment with Stage Government policy through the adoption of the protection of life as the highest priority and a coordinated approach to bushfire risk mitigation and initiatives
- Justify the investment in resources, systems and process to lower the consequence of bushfires impacting Hepburn Solar Farm staff, assets and surrounding properties is appropriate
- Determine the suitability of the nominated Shelter-in-Place buildings
- Updates to existing Emergency Management Plan (including Bushfire response procedures)
- Improving process around business continuity and essential services.

## **5.2 Bushfire Risk Assessment Outputs**

### **5.2.1 Bushfire Risk Assessment Matrix**

The Bushfire Risk Assessment Matrix has been developed utilising all available information to define the bushfire likelihood and consequence. It acknowledges that a level of bushfire risk is already present in the landscape and defines practical actions to reduce risk. Some strategies to reduce bushfire risk identified by FRC do not sit under the control of the Hepburn Solar Farm developers. The bushfire risk assessment matrix is shown in section 8.4 of this report.

Likelihood is the chance that something might happen (level of probability). The assessment of likelihood includes reviewing the potential fire frequency and ability for the fire run to reach the site and nominated shelter in place building. The outputs of the likelihood assessment are expressed as Almost Certain, Possible, Likely or Unlikely.

Consequence determines the level of impact and for the risk assessment we have defined it as the threat and vulnerability of the site.

- Threat – the risk assessment defines the bushfire threat to the particular asset by assessing it as the Bushfire Attack Level (BAL) for the site and shelter in place area
- Vulnerability - the vulnerability of the site is assessed into five classes:
  - The asset, landscaping, plantings and maintenance
  - Access and egress for evacuation and emergency services
  - Water supply including presence of an adequate / specified water supply and pumping equipment
  - Building suitability to resist ember attack / preparedness against fire
  - Human behaviours to respond including policies, procedures and plans.

### **5.2.2 Bushfire Mitigation Operational Schedule**

The Bushfire Mitigation Operational Schedule (BMOS) details the annual mitigation works to be performed at the Solar Farm. A key part of any bushfire risk assessment and mitigation plan is the annual implementation of a designated works plan to take active steps to reduce bushfire risk.

The Hepburn Solar Farm Bushfire Risk Assessment & Mitigation Plan provides the primary guidance for the development for the BMOS. The BMOS supports the risk assessment and mitigation plan and is an operationally based document that assists in guiding on ground management to reduce and mitigate the impacts of bushfire.

BMOS's are reviewed annually, in time for recommendations to be considered and actioned with the endorsement of Management to be implemented for the following bushfire season.

The Hepburn Solar Farm BMOS is an operationally based document that if implemented prior to each fire season is declared can significantly reduce bushfire risk. Bushfires can have a long-lasting impact on lives, property, social settings and critical infrastructure. Managed appropriately, the impact from unplanned fire events can be reduced.

### **5.2.3 Bushfire Response Plan**

The bushfire response plan will be a guiding document (to be updated annually) to aid the Hepburn Solar Farm in the preparedness and response for a bushfire emergency.

It will articulate what actions and arrangements should occur and identify the roles and responsibilities of members to assist in the management of the emergency response.

This document can be shared with other stakeholders and response agencies (e.g. CFA, FFMVic, Police and Ambulance Victoria) to assist with planning and responding to bushfires.

### **5.2.1 Bushfire Risk Assessment Recommendations**

This report provides recommendations for consideration by the developer of Hepburn Solar Farm to mitigate bushfire risk and comply with the CFA Guideline.



## 6 Fires in Solar Farms

### 6.1 Worldwide examples

As part of the detailed research conducted in relation to fires in solar farms across the world FRC was able to conclude that the instance of fires in photovoltaic is extremely low. There are many management actions that can be taken during construction and operation of the solar farm to mitigate bushfire risk and fire risk generally.

A lot of the information on the risk of PV solar power related to rooftop installations and was therefore not relevant to the fire risk of larger-scale power plants. Information on the risk of rooftop PV installations is not included in this document.

Several isolated examples exist of fires in solar farms across the world. A brief summary is provided below of each incident and some of the learnings:

#### **Thomas Fire, California (US)**

<https://wattsupwiththat.com/2019/03/09/solar-energy-may-have-caused-californias-wildfires/>

The Thomas Fire that commenced in December 2017 was California's largest wildfire at the time. It burnt more than 280,000 acres more than 1,000 structures.

Local residents blamed the cause of the fire on an exploding transformer in the electricity grid at nightfall, resulting from the transfer of the power source from solar energy to conventional energy. Apparently, this cannot be done gradually and incrementally. The author understands that the risk of similar fires occurring can now be mitigated through the use of battery storage.<sup>1</sup>

#### **Brigalow Fire, Queensland (Australia)**

<https://reneweconomy.com.au/brigalow-solar-farm-caught-up-in-queensland-bush-fires-50604/>

During a period of heightened bushfire activity in Queensland in September 2019, a fire occurred at the Brigalow solar farm, in Yarranlea near Pittsworth, which was under-construction.

The Queensland Fire and Emergency Services (QFES) said a grass fire started just after 9am "as the result of a rubbish fire" at the solar farm site. A spokesperson for QFES said *'While we won't know the actual cause of the fire for some time, we know the location of the start. It was within the laydown area, which is where the materials that will be used on the solar farm are deposited and stored until use. It did not start in an operational or 'under construction' part of the solar farm.'*

#### **California Valley Solar Ranch, California (US)**

<https://www.bloomberg.com/news/articles/2019-06-19/-avian-incident-knocks-out-84-of-massive-california-solar-farm>

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<sup>1</sup> Gunnedah Solar Farm Bushfire Risk Assessment Report by Eco Logical Australia Pty Ltd  
Report prepared for Pitt & Sherry (Operations) Pty Ltd, 5 April 2018  
<https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSD-8658%2120190410T050245.694%20GMT> v

The California Valley Solar Ranch (CVSR) is a 250 megawatt (MWAC) photovoltaic power plant in the Carrizo Plain, northeast of California Valley. It is utilizing high-efficiency, crystalline PV panels.

A fire removed 84% of the generating capacity from service in June 2019 when poles and cables were damaged by an 'avian incident'. The incident did not damage the solar panels at the power plant, but distribution poles and cables need to be replaced, according a regulatory filing Wednesday from owner Clearway Energy Inc.

There is no information about what the 'avian incident' involved.

#### **Kyocera Power Plant (Japan)**

<https://www.pv-magazine.com/2019/09/09/japans-largest-floating-pv-plant-catches-fire-after-typhoon-faxai-impact/>

information was available about a PV power plant, Kyocera's 13.7 MW floating project at the Yamakura Dam, catching alight in September 2019 after a cyclone cause the power panels to pile up, with a concentrated heat build-up.

The panels were damaged by 120mph winds the typhoon brought to the coastal city of Chiba. Firefighters said the blaze may have been generated by the strong heat produced by panels stacking up. The contact between loose panels and those that remained moored to mounting structures overheated the modules, creating the conditions for a fire.

However, the fire did not spread because the power plant floated on water.

There are some references relating to the risk of fire igniting in PV installations and mitigation strategies.

## ***6.2 Key learnings – Installation testing and operation***

PV installations should be constructed of fire-resistant materials. All electrical components should be manufactured in material that does not allow self-combustion and ignition and should self-extinguish. In addition, the electrical equipment should be fitted with over current protection devices and isolation switches along with earth leakage protection devices.<sup>2</sup>

The fire ignition risk of the PV installation generally relates to faults in the electrical components, which may cause arc faults, short circuits, ground faults and reverse currents.<sup>3</sup> These faults can be caused by:

- incorrect connecting of the inter module connectors
- corroded inter module connectors caused from incorrect storage of modules on site
- electrical connections on isolators / DC combiners

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<sup>2</sup> Gunnedah Solar Farm Bushfire Risk Assessment Report by Eco Logical Australia Pty Ltd  
Report prepared for Pitt & Sherry (Operations) Pty Ltd, 5 April 2018  
<https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSD-8658%2120190410T050245.694%20GMT>

<sup>3</sup> ibid

- miss match of inter module connectors causing insufficient electrical connections.

All the above issues are caused during the installation process but are standard issues that should be picked up during the DC testing phases of the installation before commissioning.

Weak points in the electricity grid are placed under stress during a change in voltage between PV generated power and conventional power, such as between day and night. These weak points in the grid have been believed to cause fires when under stress (*refer to California Thomas Fire, suspected to have been ignited from an exploding transformer.*)<sup>4</sup> Battery storage at solar farms will assist to preventing sudden changes in voltage, providing a less variable and more consistent energy supply.<sup>5</sup>

The Queensland Government proposed the use of qualified electricians during the installation of PV panels on projects larger than 100 kW as a regulatory requirement, but this was rejected by the industry as they believed it added significantly to the cost. The industry appeal was upheld by the Queensland's Supreme Court.<sup>6</sup>

Remote sensing systems to enable a quick response to fire ignitions also assist to reduce the instance of fire ignitions leading to fire.<sup>7</sup>

The risks to firefighters<sup>8</sup> from a fire in a PV installation are principally:

- The risk of electrocution – as the PV panels cannot be turned 'off'. The risk is exacerbated by the use of water in firefighting
- The risk of toxic fumes from burning plastics and other materials.

However, Professor Blakers, director of ANU's centre for sustainable energy systems, says of proposed ACT solar farms, that they would pose no chemical risks to nearby residents. 'The cells would be damaged in fire, but don't burn themselves and there are no toxic chemicals.'<sup>9</sup>

Regarding the same proposal, the ACT Emergency Services Agency said solar panels bring some risk of ignition and electrocution, but fire was more likely to come from surrounding vegetation.

"With electricity infrastructure, there is always a risk of electrocution, but this can be mitigated by strategies such as isolation switches and covering the panel.

"As part of ensuring appropriate response capability, fire service crews would be expected to undertake on site familiarisation with any new commercial solar facility following construction".

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<sup>4</sup> <https://wattsupwiththat.com/2019/03/09/solar-energy-may-have-caused-californias-wildfires/>

<sup>5</sup> <https://www.energy.vic.gov.au/batteries-and-energy-storage>

<sup>6</sup> <https://www.energymatters.com.au/renewable-news/supreme-court-queensland-solar-farms/>

<sup>7</sup> [https://www.dpti.sa.gov.au/\\_data/assets/pdf\\_file/0005/548789/3.2.2\\_EPS\\_Pty\\_Ltd\\_Robertstown\\_Solar\\_Farm\\_Report\\_and\\_Attachments.pdf](https://www.dpti.sa.gov.au/_data/assets/pdf_file/0005/548789/3.2.2_EPS_Pty_Ltd_Robertstown_Solar_Farm_Report_and_Attachments.pdf)

<sup>8</sup> <https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSD-8658%2120190410T050245.694%20GMT>

<sup>9</sup> <https://www.canberratimes.com.au/story/6152076/solar-farms-will-cut-bushfire-risk/>

## 7 Site Assessment & Observations

To enable a detailed assessment of risk, the following elements have been assessed that will inform the detailed understanding of the risk associated with the proposed Solar Farm.

### 7.1 Location

The site is located approximately 9 kilometres south of Daylesford. It is located adjacent to the Ballan Daylesford Road in Leonards Hill. Large Public Land Reserves surround the site along with Plantations to the north and south.

The site can be accessed from the south through Ballan or the north through Daylesford.



Figure 7 - Location of Hepburn Solar Farm (green)

### 7.2 Topography

The land identified for the Solar Farm is undulating. As the area is along a ridgeline there are steep slopes to the east and west of the site. If a bushfire burns through the private land along the ridgeline it will not be heavily influenced by the undulating slopes. It would be expected for a bushfire to burn quickly up the steep slopes and generate ember attack that would impact private land.

### 7.3 Vegetation

The predominant vegetation on and surrounding the site is grassland associated with farming activities. Further to the east and west is forested areas that are associated with Public Land.

There are small patches of shelter belt trees surrounding the site. Plantations exist to the south and north of the site.

Bushfire fuel present within the proposed development site can be classified as Class G Grassland under *AS3959:2018 Construction of buildings in bushfire prone areas*. Further to the east and west, the vegetation would be classified as Class A Forest.

Table 2.3 of AS 3959 allows for all bushfire fuel present in Australia to be classified into one of 7 fuel types. These are:

**Type A** Forest

**Type B** Woodland

**Type C** Shrubland

**Type D** Scrub

**Type E** Mallee / Mulga

**Type F** Rainforest

**Type G** Grassland

Bushfire fuel is classified based off type, structure, height and the dominant species present.

### 7.4 Adjoining Land Use

The land use surrounding the proposed site is a mixture of agricultural land and forests.

Information provided indicates that this is unlikely to change in the future. Farming operations will strongly influence the bushfire risk within the local area as various practices will result in higher or lower levels of fuel. It can be assumed that the risk fluctuates through the fire danger period depending on the status of the various farming practices.

### 7.5 Weather

The nearest Automatic Weather Station (AWS) is located at Ballarat. The relevant data is available below.

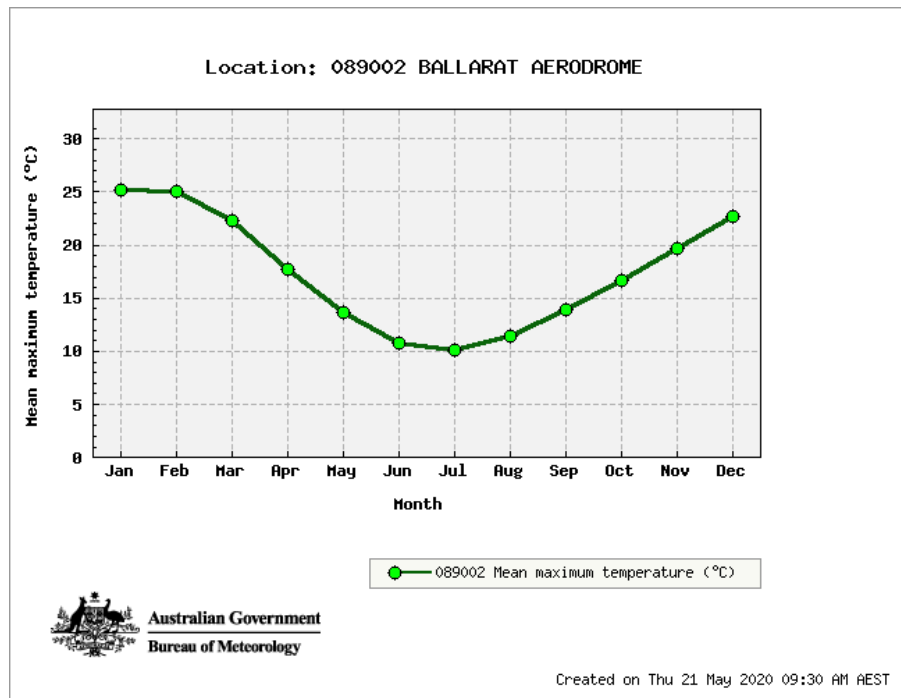


Figure 8 - Ballarat AWS - mean maximum temperature

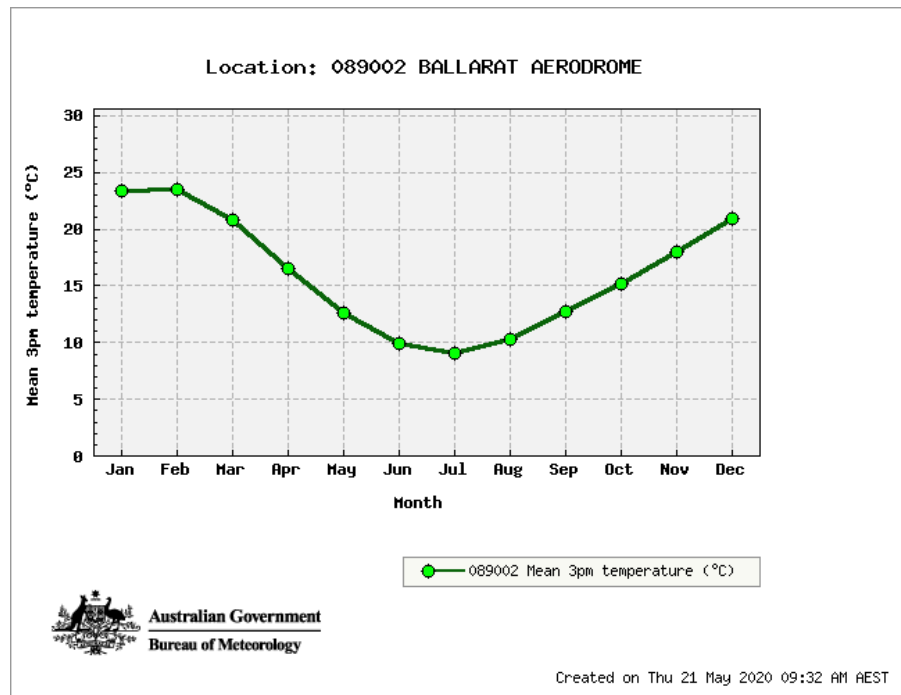


Figure 9 - Ballarat AWS - mean 3pm temperature

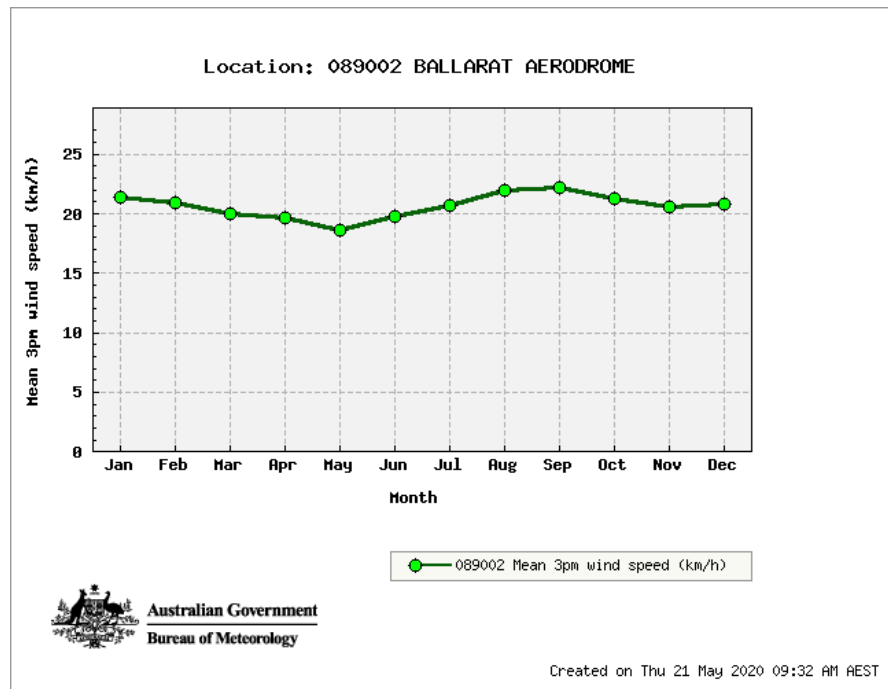


Figure 10 - Ballarat AWS - mean wind speed

The following table summarises the long term data indicating the type of weather conditions that can be expected throughout the year in the vicinity of the Hepburn Solar Farm. It is acknowledged that the weather station is some distance from the site and there are elevation differences and this information is to be used as a guide.

Statistic Element	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean maximum temperature (Degrees C) for years 1908 to 2020	25.2	25.1	22.3	17.7	13.7	10.8	10.1	11.4	13.9	16.7	19.7	22.7	17.4
Highest temperature (Degrees C) for years 1957 to 2020	42	44.1	37.9	32.2	26.1	21.6	19.1	23	27.9	33.4	37.3	43.5	44.1
Mean number of days $\geq$ 30 Degrees C for years 1957 to 2020	8	6.8	2.9	0.2	0	0	0	0	0	0.1	1.6	4.2	23.8
Mean number of days $\geq$ 35 Degrees C for years 1957 to 2020	2.3	1.2	0.4	0	0	0	0	0	0	0	0.1	0.8	4.8
Mean number of days $\geq$ 40 Degrees C for	0.2	0.1	0	0	0	0	0	0	0	0	0	0.1	0.4



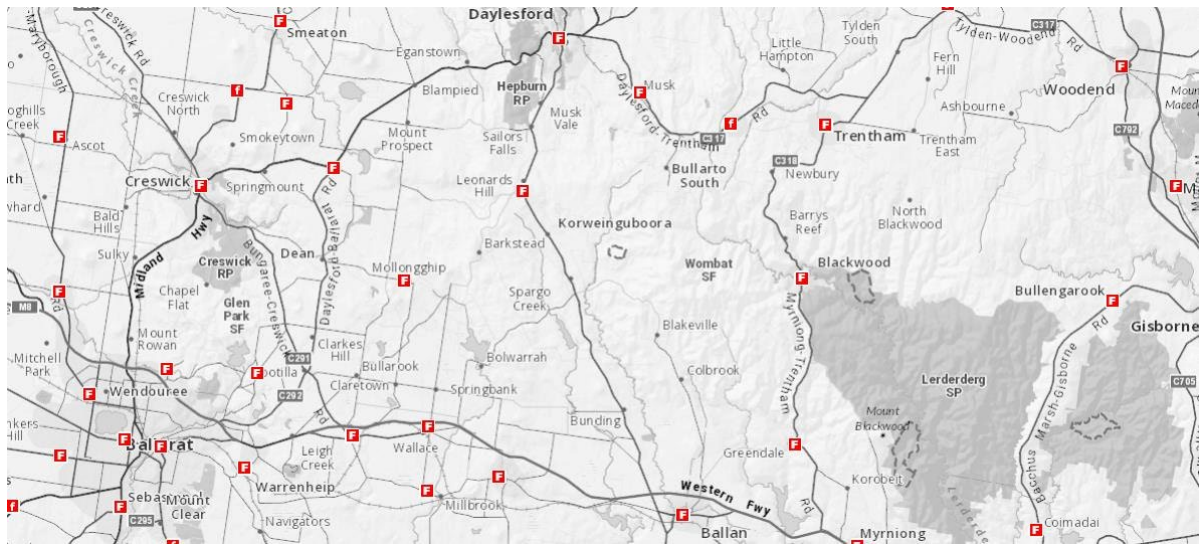
years 1957 to 2020													
Mean rainfall (mm) for years 1908 to 2020	39.4	43.4	41.9	51.1	64.6	62.5	66.4	74	71.1	65.7	55.5	50.1	686.9
Maximum wind gust speed (km/h) for years 1978 to 2020	100	93	97	113	87	91	117	93	115	97	106	106	117
Mean 3pm temperature (Degrees C) for years 1908 to 2010	23.4	23.5	20.8	16.5	12.6	9.9	9.1	10.3	12.7	15.2	18	20.9	16.1
Mean 3pm relative humidity (%) for years 1908 to 2010	42	44	48	57	69	76	75	70	63	59	54	47	59
Mean 3pm wind speed (km/h) for years 1957 to 2010	21.4	20.9	20	19.6	18.6	19.8	20.7	22	22.2	21.3	20.6	20.8	20.7

Figure 11 - Ballarat AWS - summary weather data

The data available from the Bureau of Meteorology indicates this area is typical of south east Australian weather patterns in that the months of January and February are traditionally very hot and dry. The area is also prone to cold winters and numerous frost events during June, July and August.

## 7.6 CFA Firefighting Resources

In the country area of Victoria, outside of Metropolitan Melbourne, CFA has an extensive network of fire stations containing firefighting appliances. Figure 12 shows the location of the nearest fire stations to the site.



**Figure 12 - Location of CFA fire stations within close proximity to the site**

All brigades within the surrounding landscape are fully volunteer. Response times to the site will be governed by current fire activity in the district, volunteer availability and the condition of the road network.

## **7.7 Access and Egress**

Access and egress is suitable for emergency vehicles to and from the site. The road network is sufficient to allow a person to travel away from the bushfire threat on a planned route in the event of a fire.

Access to the proposed development site is provided from the Ballan-Daylesford Road. There are two options available to access or egress the site to either the north to Daylesford or to the south to Ballan.

## **7.8 Water supply**

The availability of an onsite water supply enables firefighters to quickly fill their appliances rather than having to source water from further away. This increases their effectiveness when protecting infrastructure and other assets.

Hepburn Wind Farm currently has several dams on the property and a static water supply of approximately 10,000 litres is located at the main entrance to the site. This static water was provided for the Wind Farm development.

To support any future firefighting operations to protect the Solar Farm an additional 50,000 litres is to be provided in a tank that meets CFA requirements at the entrance to the Solar Farm.

## 8 Bushfire Risk Assessment

The property could potentially be threatened by accidental fire (actions by staff, visitors and residents on property) deliberate ignition (arson) or lightning. A fire on the property will be fueled by the grassland vegetation. The existing Emergency Management Plan for the Wind Farm outlines the following as potential ignition sources:

- Overhead lines
- Lightning strike
- Turbine fire
- Switchyard or transformer fire
- Bushfire, grass or hay fire.

The greatest potential for high intensity, difficult to suppress, fast moving bushfires are when bushfires start on high fire danger days, in areas of dry fuels with high overall fuel hazards with forecast northerlies and southwest wind changes.

The grassland fuels will be the dominating factor contributing to fire behavior surrounding the proposed Solar Farm. If the bushfire threatens the Solar Farm from a distance it is likely to produce embers that will start numerous fires in the grassland surrounding the Solar Farm.

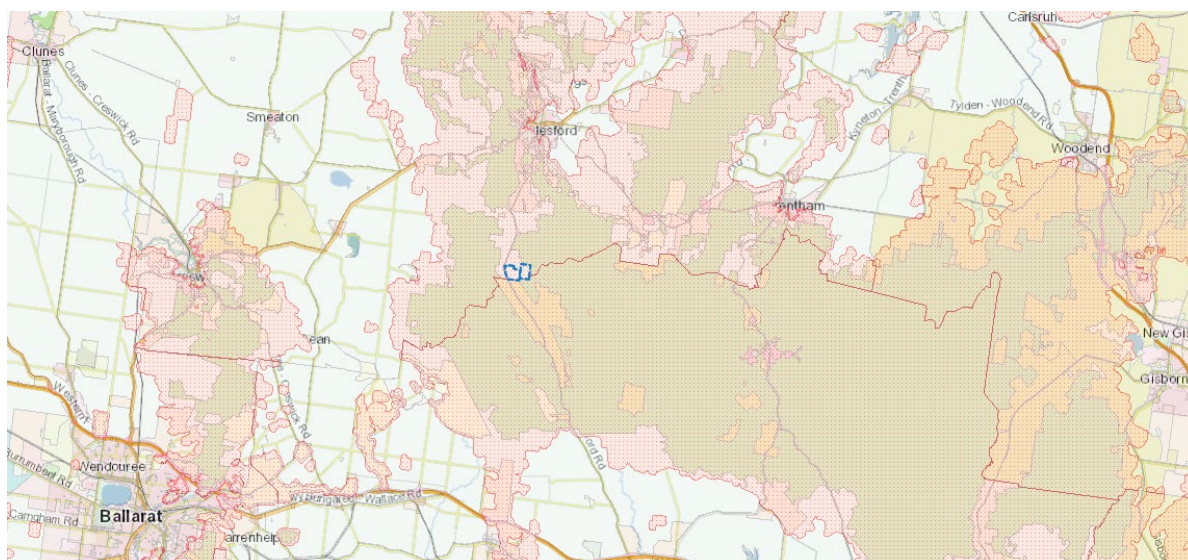
The potential for large bushfires to develop and move through the landscape around the proposed development is significant because of the continuous forest surrounding the property and wider area.

The following analysis of bushfire risk is informed by Clause 13.02 of the Victorian Planning Scheme.

### 8.1 Landscape Assessment

The landscape surrounding the proposed solar farm is dominated by forested areas. The area includes the Wombat State Forest, Hepburn Regional Park and large parcels of Plantations. The cleared land to the north and south of the proposed Solar Farm is primarily used for farming and would likely be managed during the fire danger period. The cleared land between the forested areas is approximately 1 – 1.2 kilometres wide.

There is no doubt that this area is at extreme risk from bushfire. This is reflected by the Bushfire Management Overlay covering the entire area.



**Figure 13 - Bushfire Management Overlay surrounding the site**

Both assessments (Figure 14 and 15) have identified the traditional bushfire risks that would be present in Victoria. The influence of the north westerly followed by the south westerly change often influences major fires in this area.

Figure 14 outlines the potential fire scenarios that exist within close proximity to the site. As the predominant vegetation immediately surrounding the site is grassland, it would be expected that fast running grass fires would be the likely impact mechanism. As explained previously, the primary threat is from the north west or south west. At the 1 km level, the potential for a fire to impact on the site from the east is present but this would be expected to occur primarily during severe drought and would be a lower intensity bushfire when compared to the north west and south west aspects.



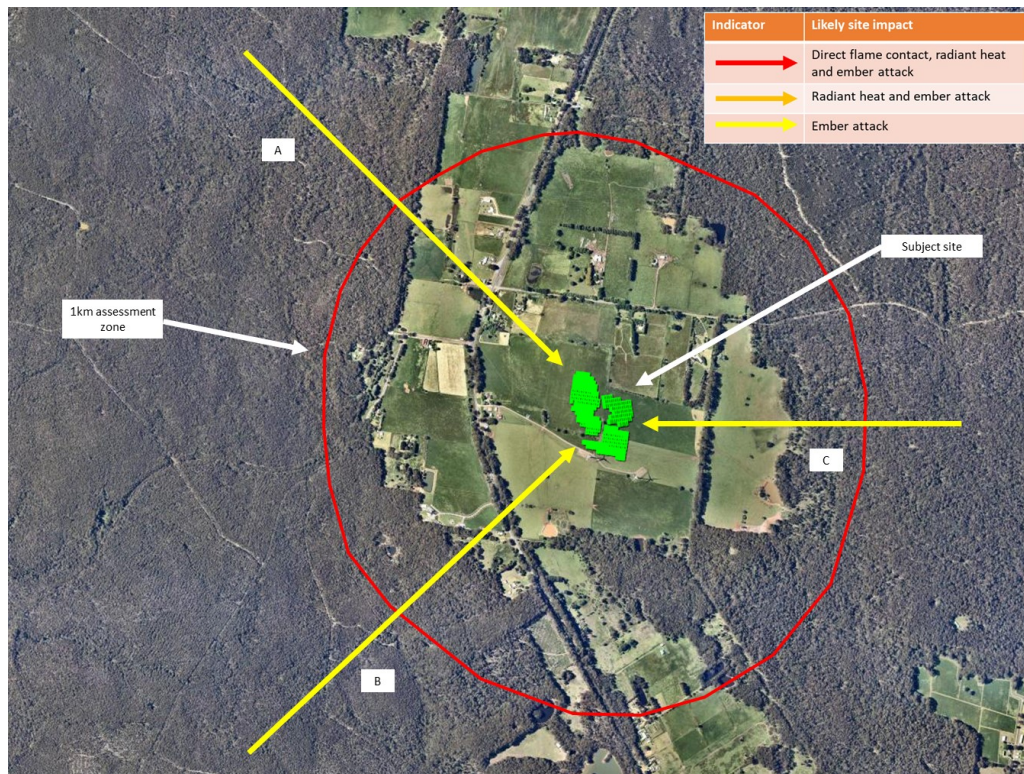


Figure 14 - Landscape assessment - 1 kilometre

Figure 15 outlines the landscape risk assessment based on a distance of 20 kms from the proposed site. This assessment outlines clearly the potential for long running bushfires from either the north west or south west. Due to the type of vegetation and topography it would be expected that on days of elevated fire danger conditions, bushfires would be uncontrollable and destructive.

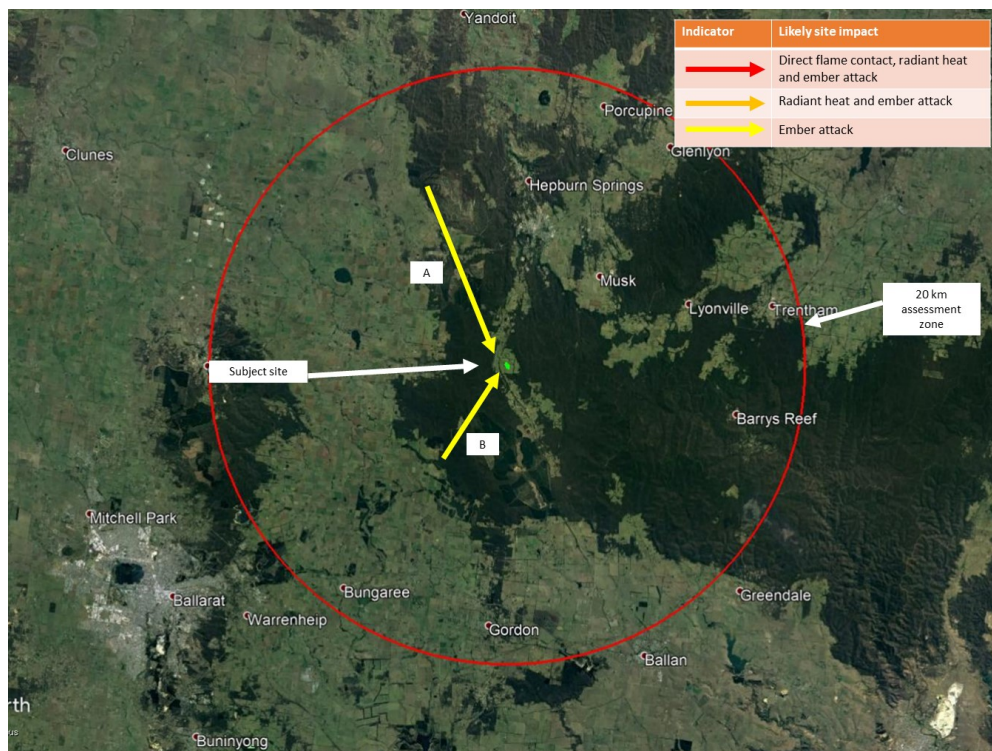


Figure 15 - Landscape assessment - 20 kilometres

In summary, the likely scenarios are outlined in the following table:

Scenario reference	Description	Consequence (high, medium, low)
Scenario A	<p>Both the 1 and 20 kilometre assessments have identified the dangers of a bushfire approaching under a north westerly influence. The vegetation to the north west of the site is dominated by forested areas and on elevated fire danger days, suppression efforts would have limited effect on controlling a bushfire.</p> <p>There is a cleared area that consists of grassland between the forest to the north west and the proposed Solar Farm. This distance is approximately 800 metres.</p> <p>It can be assumed due to the clearance to the north west that the Solar Farm will be impacted by embers. Any radiant heat will be generated by flames that originate from the embers landing around the facility. Due to the separation distance between the Solar Farm and the forest, the radiant heat generated by a bushfire in the forest will not impact on the Solar Farm.</p>	High

<b>Scenario B</b>	This scenario involves a bushfire burning under a south westerly wind influence towards the Solar Farm. The cleared farmland surrounding the proposed Solar Farm will provide a level of protection. This protection will limit the level of radiant heat that would impact on the Solar Farm. It is likely that the primary attack method from the bushfire will be through embers.	High
<b>Scenario C</b>	During periods of drought or low rainfall periods, there is the potential for a bushfire to approach the Solar Farm from the east. Due to the size of the Wombat State Forest, a bushfire that is bunting within the area for an extended period may under an easterly influence threaten the Solar Farm. Once again, due to the separation distance from the Forest to the Solar Farm, ember attack will be the primary attack mechanism.	Low

Figure 16 - Likely bushfire scenarios

## 8.2 Possible Ignition Sources

Bushfires can originate from both human activity and natural causes.

Lightning is the predominant natural source of fire ignitions in Australia, accounting for about half of all ignitions in Australia. Fires of human origin currently account for the remainder and are classified as accidental or deliberate. Fires lit deliberately can be the result of arson or may be designed to achieve a financially beneficial outcome. Some farming practices use fire to manage vegetation recovery or control unwanted pest species.

Deliberately and accidentally lit fires are more prevalent near populated areas and have a disproportionately higher risk of infrastructure impact. Arsonists place people and property at serious and unnecessary risk, particularly when igniting fires on extreme fire weather days.

There is no information or evidence to suggest that the site is subject to arson or increased ignition risk from lightning.

There are potential ignition sources from electrical infrastructure failure and subsequent fire spread. Failures within inverters, switchboards and overheating components may lead to combustion and potential ignition of adjacent vegetation.

As outlined previously, the existing Emergency Management Plan that relates to the Wind Farm has identified and implemented control measures relating to:

- Overhead lines
- Lightning strike
- Turbine fire
- Switchyard or transformer fire
- Bushfire, grass or hay fire.



### 8.3 Clause 13.02 Assessment

This assessment has been completed in support of the application to develop the Hepburn Solar Farm.

Bushfire hazard type	Description	Likely scenario/s	Considerations
<b>Landscape conditions</b>	The landscape hazard up to 20 kilometres from the site identifies large tracts of forest vegetation. There are also large plantations to the north west and south west of the proposed site.	<p>A bushfire that starts either to the north west or south west of the site has the ability to travel long distances. Any bushfires that start 10 – 20 kilometres from the site would likely be on a wide front when it reaches the Solar Farm.</p> <p>The cleared area surrounding the Solar Farm will provide a level of protection by reducing or eliminating radiant heat. The most likely attack mechanism will be from embers.</p>	<p>Perimeter roads to be established and maintained during the fire danger period.</p> <p>Defendable space to be created around the Solar Farm and Sub-station for a distance of 10 metres. This may also include the perimeter road.</p> <p>Where possible, engage with adjoining landowners in the event that fuel loads increase during the fire danger period to work with them to reduce fuels on adjoining land.</p> <p>Ensure the Ballan Daylesford road is treated in accordance with the Municipal Fire Management Plan (3m slash behind the fence posts).</p> <p>Install a mineral earth break inside the site boundary adjacent to the Ballan Daylesford Road with a width of 3 metres. Maintain this during the Fire Danger Period.</p> <p>Bushfire response plan to be developed and implemented to guide the actions taken by Solar Farm staff.</p> <p>Provision of firefighting water supply.</p>
<b>Local conditions</b>	<p>Within one kilometre of the site the predominant vegetation is grassland. There is a main road to the west of the site.</p> <p>The grassland is associated with farming activities.</p>	<p>It is likely for a bushfire starting locally to be caused by farming machinery or occur along the Ballan-Daylesford Road. A bushfire starting within close proximity to the Solar Farm is likely to impact on a very narrow front if still burning under a north westerly influence.</p> <p>A bushfire that burns rapidly to the west of the site and then is influenced by a south westerly change would impact on the site in multiple areas.</p>	<p>Perimeter roads to be established and maintained during the fire danger period.</p> <p>Where possible, engage with adjoining landowners in the event that fuel loads increase during the fire danger period to work with them to reduce fuels on adjoining land.</p> <p>On days of elevated fire danger, ensure staff are aware of the importance of early notification to emergency services of a bushfire in the local area.</p> <p>In this scenario, evacuation is likely to no longer be an option for those who are located at the Solar Farm. The design should incorporate a cleared area that can be considered a ‘safer location’.</p> <p>Bushfire response plan to be developed and implemented to guide the actions taken by Solar Farm staff.</p> <p>Due to the rapid approach of the bushfire, a dedicated firefighting water supply along with the ability for trained staff to extinguish small fires should be provided.</p>

Bushfire hazard type	Description	Likely scenario/s	Considerations
Neighbourhood conditions	<p>Within close proximity to the site, roadside vegetation exists along with grassland.</p>	<p>Fires starting along roadsides adjoining the property could support fire spread into the Solar Farm. As this is located to the west of the property the fire will likely reach the site.</p>	<p>Perimeter roads to be established and maintained during the fire danger period.</p> <p>Where possible, engage with adjoining landowners in the event that fuel loads increase during the fire danger period to work with them to reduce fuels on adjoining land.</p> <p>On days of elevated fire danger, ensure staff are aware of the importance of early notification to emergency services of a bushfire in the local area.</p> <p>In this scenario, evacuation is likely to no longer be an option for those who are located at the Solar Farm. The design should incorporate a cleared area that can be considered a 'safer location'.</p> <p>Due to the rapid approach of the bushfire, a dedicated firefighting water supply along with the ability for trained staff to extinguish small fires should be provided.</p>
The site for the development	<p>The site is currently grassland and utilised for farming activities and two existing wind turbines. If construction occurs during the Fire Danger Period, consideration will need to be given to managing vegetation.</p> <p>Ongoing, vegetation will be present under the solar panels and along roadsides.</p>	<p>During construction phase, fires could start and spread if the vegetation is not managed during this period.</p> <p>Post construction, fires could travel through vegetation that has accumulated under the solar panels or along roadsides.</p>	<p>Internal roads to be established to allow for the movement of firefighting resources and to act as internal fire breaks.</p> <p>Manage the vegetation under the panels and in other cleared areas during the fire danger period. In particular, do not allow vegetation accumulation to occur at the base of the solar panel support structures.</p> <p>Ensure during construction that occurs during the fire danger period, vegetation management is a priority activity. Implement a hot works system and consider limiting other high risk activities including smoking.</p> <p>On days of elevated fire danger, ensure staff are aware of the importance of early notification to emergency services of a bushfire in the local area.</p> <p>Due to the rapid approach of the bushfire, a dedicated firefighting water supply along with the ability for trained staff to extinguish small fires should be provided.</p> <p>During the construction phase and prior to the installation of the permanent water tanks ensure firefighting water is made available during the fire danger period.</p>

Settlement Planning objective	Discussion	Achieved
Directing population growth and development to low risk locations, being those locations assessed as having a radiant heat flux of less than 12.5 kilowatts/square metre under AS 3959-2009 Construction of Buildings in Bushfire-prone Areas (Standards Australia, 2009)	<p>Due to the nature of the development and the land size required, positioning the facility in a remote and isolated area is important. As the vegetation surrounding the location of the Solar Farm is grassland for approximately 800 metres in all directions, the ability to ensure the facility is not exposed to more than 12.5 kW/m2 is achievable.</p> <p>Vegetation management program will be implemented to ensure that any future revegetation programs do not increase the exposure levels.</p>	✓
Ensuring the availability of, and safe access to, areas assessed as a BAL-LOW rating under AS 3959-2009 Construction of Buildings in Bushfire-prone Areas (Standards Australia, 2009) where human life can be better protected from the effects of bushfire.	Once the Solar Farm is constructed, due to the network of roads and cleared areas for equipment required to support the Solar Farm, along with the vegetation management requirements, the majority of the site will achieve a BAL LOW rating. Only areas within 150 metres of forest will be more than BAL Low.	✓
Ensuring the bushfire risk to existing and future residents, property and community infrastructure will not increase as a result of future land use and development.	<p>The risk to the property, infrastructure and surrounding areas will reduce through the placement of perimeter roads, increased requirements for vegetation management and the provision of firefighting water supply.</p> <p>With the cleared areas and ongoing maintenance requirements, the risk will not increase in the future.</p>	✓
Achieving no net increase in risk to existing and future residents, property and community infrastructure, through the implementation of bushfire protection measures and where possible reducing bushfire risk overall.	<p>The bushfire safety design measures will ensure that there is no net increase in bushfire risk to the property or surrounding areas.</p> <p>The bushfire protection measures include:</p> <ul style="list-style-type: none"> <li>• Perimeter roads and cleared areas maintained during the fire danger period.</li> <li>• Vegetation maintenance under and around the solar panels and other infrastructure.</li> <li>• Firefighting water supply strategically located across the site.</li> <li>• Bushfire mitigation plan</li> <li>• Bushfire Response Plan</li> <li>• Staff training</li> <li>• First response firefighting equipment on site during the fire danger period</li> <li>• Familiarisation visits offered to local fire brigades</li> <li>• Management of ignition sources through hot works permit system and limiting smoking to certain areas.</li> </ul>	✓
Assessing and addressing the bushfire hazard posed to the settlement and the likely bushfire behaviour it will produce at a landscape, settlement, local, neighbourhood and site scale, including the potential for neighbourhood-scale destruction.	The landscape and local bushfire hazards have been assessed. Due to the Forest in all directions of the site, it is expected for significant amounts of embers to attack the site. To offset this, vegetation management during the Fire Danger Period is critical.	✓
Assessing alternative low risk locations for settlement growth on a regional, municipal, settlement, local and neighbourhood basis.	There are no other low risk locations available.	✓

Settlement Planning objective	Discussion	Achieved
Not approving any strategic planning document, local planning policy, or planning scheme amendment that will result in the introduction or intensification of development in an area that has, or will on completion have, more than a BAL-12.5 rating under AS 3959-2009 Construction of Buildings in Bushfire-prone Areas (Standards Australia, 2009).	The Solar Farm will not be exposed to more than BAL 12.5.	✓

## 8.4 Bushfire Risk Assessment Matrix


RISK TO	Cause	Likelihood	Justification	Consequence	Justification	Risk Rating	Strategy to Lower Risk
<b>LIFE</b>							
Hepburn Solar Farm on-site staff & contractors.	Loss of life /injury due to entrapment in the Solar Farm in a major fire event	Possible	<p>Fire behaviour could be unpredictable due to the varying fuel quantities and the influence of natural features. Direct attack firefighting may be difficult and may entrap fire-fighters.</p> <p>An internal track network at some locations which may lead to confusion.</p> <p>In the event of smoky conditions in the Solar Farm, people's sense of direction could be affected.</p> <p>The level of training may be insufficient for Solar Farm staff and contractors to undertake firefighting duties.</p>	Major	While entrapment may only be possible, if it does occur there is potential for loss of life.	HIGH	<p>Solar Farm staff complete bushfire behaviour and suppression training.</p> <p>A site induction outlining the risks to visitors and contractors and provides an overview of the emergency management plan.</p> <p>Detailed maps are available for people who are not familiar with the site.</p> <p>All internal roads and tracks are maintained in a state which will support the movement of people and vehicles around the site including signage.</p> <p>Local CFA Brigades are invited to undertake an annual inspection to become familiar with access and egress to the sites, access difficulties for larger appliances, areas restricted to smaller fire appliances.</p> <p>In the event of a fire on the site, CFA &amp; FFMVic reinforce safe work practices SOPs at all briefings with the support of Solar Farm personnel.</p> <p>Solar Farm management include within the site emergency management plan details surrounding when the Solar Farm will be closed to non-essential personnel. Consideration be given to removing all personnel on Code Red days.</p> <p>During the Fire Danger Period, all employees and contractors carry firefighting equipment along with communications devices.</p> <p>Water supply will be provided strategically across the Solar Farm for the purposes of supporting any firefighting requirements.</p> <p>Undertake vegetation management surrounding the Solar Farm to create defensible space. This can include the perimeter road.</p>

RISK TO	Cause	Likelihood	Justification	Consequence	Justification	Risk Rating	Strategy to Lower Risk
<b>LIFE</b>							
Neighbours: Surrounding the Solar Farm primarily located on adjoining farms.	Loss of life/injury due to smoke or fire escaping the Solar Farm	Possible	<p>There is a risk that a bushfire may start in the Solar Farm and spread into adjoining land and threaten surrounding homes.</p> <p>Due to the age of the adjoining properties, they are unlikely to achieve any level of bushfire safety construction.</p>	Major	Fatalities possible under elevated FDIs if residents leave too late or if properties are unprepared.	HIGH	<p>Solar Farm management engage with CFA to encourage residents to prepare Bushfire Survival Plans as per CFA standard practice and prepare themselves for bushfire.</p> <p>Solar Farm management engage with adjoining landowners to ensure they are aware of pre-summer fire prevention and preparedness activities.</p> <p>Surrounding properties to adequately prepare for fire.</p> <p>The road layout for the Solar Farm where possible will be utilised to limit bushfire spread and support suppression activities. Consider a perimeter road that provides separation between the Solar Farm activities and the adjoining land.</p> <p>On-site risk reduction strategies including no smoking, limitations on hot works during elevated fire danger days and other measures to reduce the potential for a fire to start on the property.</p>

## 8.5 Bushfire Mitigation Operational Schedule

Hepburn Solar Farm

BUSHFIRE MITIGATION OPERATIONAL SCHEDULE



Location: HSF		Date:			Inspecting Staff:	
Mitigation Task	Annual timing	Date Completed	Task ID	Responsible department	Comments	
Vegetation Management						
Ensure grassland within the solar farm is maintained at <100mm	Sep-Dec		1			
Maintain 10 metres defensible space	Sep-Dec		2			
Removal of vegetation from drainage lines to prevent these lines acting as a wick to other areas.	Sep-Dec		3			
General grounds maintenance prepared for fire danger season e.g. grass mowed, dead grass removed, leaf litter removed and gardens prepared	Sep-Dec		4			
Dangerous fuels and other items e.g. leaf litter, gas bottles and chemicals removed away from buildings	Sep-Dec		5			
Health Safety and Welfare						
All staff familiar with policies, procedures and their responsibilities during a bushfire emergency	Sep-Dec		6			
Policy and Procedures						
Emergency Management Plan reviewed and updated	Sep-Dec		7			
Bushfire Response Plan reviewed and updated	Sep-Dec		8			
Site familiar with policy for closure on forecast Code Red Fire Danger Days	Sep-Dec		9			
Planning						
Daily fire danger rating is distributed and publicised across the Solar Farm during the FDP	Sep-Dec		11			
Risk assessment for evacuation or shelter in place during Bushfires and other emergencies completed	Sep-Dec		12			
Training						
Staff completed training in Emergency Management	Sep-Dec		13			
Staff attended annual bushfire emergency response drills	Sep-Dec		14			
Managers attended Introductory Incident Management training	Sep-Dec		15			
Designated staff have attended Basic Wildfire Awareness course	Sep-Dec		16			
Plant and Equipment						
All bushfire fighting equipment tested, fire water tanks full and operational e.g. fire extinguishers and fire hose reels	Sep-Dec		17			
All bushfire fighting communications and warning systems are tested and operational e.g. alarms, PA, radios, BMS groups, other systems	Sep-Dec		18			
Access and Egress						
CFA Fire fighting appliances have defined emergency access and egress areas including turn around areas (if required)	Sep-Dec		19			
Inspect access roads and tracks (drainage, surface conditions and vegetation) identify and implement maintenance as required	Sep-Dec		20			
Infrastructure						
Inspect gates to ensure locks are in place and functioning	Sep-Dec		21			
Clear gutters, roof surfaces/valleys, external decks and verandas clear of leaf litter/dead plant material accumulation	Sep-Dec		22			
External building components should be free of combustible material and are to be painted and sealed, window and external vent screens serviceable	Sep-Dec		23			

## 8.6 Bushfire Response Plan

The Hepburn Wind Farm has an existing Fire Management Plan that provides mitigation activities and operational procedures. To achieve the requirements of the relevant policies and guidance, a detailed Bushfire Response Plan (BRP) will be developed that will form part of the Fire Management Plan. The BRP will as a minimum enable a shared understanding of how key staff will respond to bushfire events either on the site or in the surrounding area.



The aim of this plan is to document preparedness, response and recovery requirements for the Hepburn Solar Farm in order to minimise the impact of bushfires in, or threatening the area, reducing the fire threat to life, property and the environment.

The BRP outlines the background, context and general management arrangements for responding to bushfire emergencies on site, ranging from a single incident to more complex major emergencies. It helps provide a general understanding of the resource and access challenges for responding to emergencies and details general arrangements that can be utilised to support existing processes and procedures for response.

The BRP also outlines activities to be undertaken by staff at the different levels of a bushfire emergency including:

- On days of Total Fire Ban;
- Code Red fire danger rating;
- When there is a fire in the local area;
- When a bushfire is threatening or impacting on the site; and
- During the period immediately after a bushfire has impacted on the site

## 9 Recommendations

### 9.1 Recommendations for the Construction Phase

Adherence to the CFA publication *Guideline for Renewable Energy Installation (February 2019)* which provides the renewable energy industry guidance on the planning, construction and operation of renewable energy facilities is recommended.

Additional recommendations include:

1. Ensure all activities undertaken during the Fire Danger Season are appropriate under the Hepburn Shire by laws and CFA legislation.
2. Ensure all Staff, Contractors and site visitors are informed of fire response procedures that follow identified legislative requirements, policies and procedures.
3. Ensure that all works undertaken during the fire danger season have appropriate permits.
4. Facilitate communication with landowners, relevant stakeholders and the community regarding bushfire prevention.
5. Establish a primary contact person for the community to contact Hepburn Wind with fire concerns, questions or issues.
6. Ensure all contractors:
  - a. Are appropriately briefed and understand their legal obligations in relation to managing bushfire risks.
  - b. Have appropriate procedures, safe work practices, contingency plans, MSDSs for operation of all equipment, chemicals, flammable materials that may contribute to bushfires.
  - c. Have appropriate suppression equipment available on site.
7. Provide appropriate bushfire training for contractors and staff.
8. Establish an Asset Protection Zone (APZ) around each structure, including any temporary office and/or workshop.
9. Ensure all building construction is in line with relevant legislation including AS 3959
10. Ensure appropriate bunding in areas where there is potential for flammable fuels and oils to leak.
11. Ensure all access roads and tracks are identified and meet CFA standards for emergency vehicle access.
12. Consider appropriate signage to be placed through the site to guide visitors and emergency services personnel during emergencies.
13. Establish emergency assembly areas as part of the site's evacuation plans.
14. Consider security fencing around panels and the substation to prevent public access.
15. Install an additional static water supply of 50,000 litres for firefighting purposes located on the eastern side of the Solar Farm adjacent to the existing turbine.

## **9.2 Recommendations for the Operational Phase**

Adherence to the CFA publication *Guideline for Renewable Energy Installation (February 2019)* which provides the renewable energy industry guidance on the planning, construction and operation of renewable energy facilities is recommended.

Additional recommendations include:

16. Consider fire detection systems, in built fire protection systems, remote alarms and notification systems within the energy storage facility.
17. Consider remote shut down possibilities of Solar Farm operations during high bushfire risk days, actual bushfires or reported faults.
18. Undertake regular inspections and maintain records of all solar installations, substations, and power lines (including easements).
19. Develop a Bushfire Mitigation Operational Schedule to record all “annual” fire danger season preparedness activities and prevention works.
20. Develop a Bushfire Response Plan under the Emergency Management Plan for the site.
21. Ensure suitable firefighting equipment is available onsite or readily accessible (as per Bushfire Response Plan).
22. Ensure staff and contractors are trained in firefighting equipment and have appropriate personal protective clothing.
23. Ensure the maintenance of grassland within the Solar Farm area is kept at a nominal height of <100mm during the Fire Danger Period. This can be undertaken via mechanical means or grazing.
24. Ensure all access roads and tracks are maintained to meet CFA standards for emergency vehicle access.
25. Ensure landscaping on site is undertaken with bushfire risk considered. Species selected and planted should not increase the fire risk.
26. Install an additional static water supply of 50,000 litres for firefighting purposes located on the eastern side of the Solar Farm adjacent to the existing turbine.
27. Provide defendable space of 10 metres surrounding the Solar Farm.

## **9.3 Recommendations to Assist Bushfire Operations**

Adherence to the CFA publication *Guideline for Renewable Energy Installation (February 2019)* which provides the renewable energy industry guidance on the planning, construction and operation of renewable energy facilities is recommended.

Additional recommendations include:

28. Liaise with the local CFA Brigades and Groups to familiarise them with Hepburn Wind operations, infrastructure and the Bushfire Response Plan.
29. Provide a liaison to support incident management during bushfires.
30. Respond to instructions and follow all advice from Fire Agency personnel during incidents.
31. Shut down the solar farm in the event of a reported fire either on the site or in the local area.

## 10 Conclusion

Bushfire has shaped the Australian environment for millions of years, more recently, with increasing human settlement we have seen fire as a risk to our life, livelihoods and communities.

The losses from bushfires have been significant and cost Australians billions of dollars and sadly many lives when their destructive forces are combined with severe droughts and catastrophic weather events.

The analysis of bushfire risk has identified that the key risk to the proposed Hepburn Solar Farm site and surrounding area is from bushfires burning in the adjoining Public Land areas. Whilst there are large areas of grassland surrounding the Solar Farm, the ember attack from the bushfires and subsequent grassfires in and around the Solar Farm facility will have the potential to be destructive.

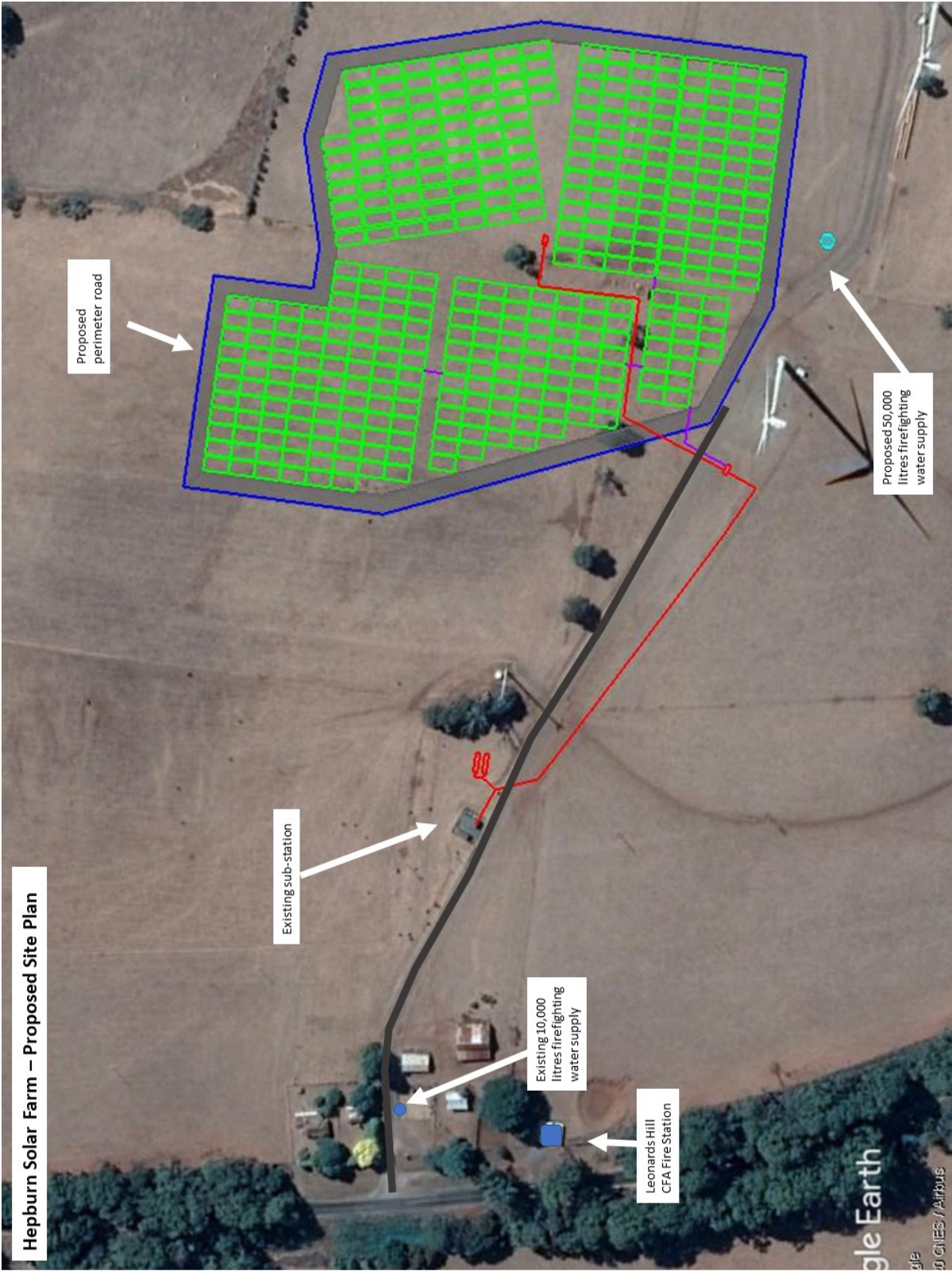
Losses from bushfires can be reduced by implementing mitigating actions that will reduce bushfire ignition and potential spread through the landscape. Fuel management is a fundamental component to achieve this, by removing or reducing the available fuel then we can reduce the fire spread and impacts.

The assessment of this risk has identified proposed solutions that will lower the risk to the Solar Farm and surrounding communities to a reasonable level. The key focus for the Solar Farm operators will be for treatments that prevent a fire entering the site, prevent a fire from starting on the site and in the event that a fire does start, prevent it from leaving the site.

The objective of all bushfire management activities in Victoria is to reduce the impact and consequences of bushfire on people, property and the environment, with the protection of human life the highest priority. In Victoria, bushfire safety is considered a shared responsibility between the fire services, the Victorian Government and local government, communities and individuals. All parties are responsible for preparing prior to the fire season in order to protect themselves and their interests from the impact and effect of bushfires

The potential bushfire risks posed by the construction and operation of the Hepburn Solar Farm development can be effectively managed by the implementation of the recommended fuel reduced areas inside and around the perimeter of the solar farm in conjunction with the other detailed recommendations.

Appendix A – Proposed Site Plan



## Appendix B – Compliance with CFA Guidelines

The table below demonstrates how the standards in the CFA Guideline have been achieved through the design response and ongoing mitigation treatments for the Proposal.

Item from CFA Guidelines for Renewable Energy Installations	Compliance	Comment
1. Development of installation		
1.1 The Country Fire Authority (CFA) has a statutory responsibility under The CFA Act (1958) for (the more) effective control of the prevention and suppression of fires in the country area of Victoria. For renewable energy installations, CFA's involvement may be required in relation to planning permit approval, the assessment of dispensations under the Building Act and Regulations, and/or the provision of written advice in relation to dangerous goods storage and handling.	✓	CFA consultation has occurred as part of the preparation for a Planning Permit application. It is unlikely that consultation will be required under the Building Act. Advice provided by CFA explains that any application under the Dangerous Goods (storage and handling) Regulations can be undertaken following the Planning Permit being issued.
1.1.1 All design requirements need to take into consideration all the relevant Australian Standards.	✓	In the context of bushfire safety, the water tanks will be installed in accordance with AS 2419.
1.1.2 In the planning context, CFA's involvement may be via referral from a municipal council (responsible authority) for CFA's consideration and comment. If this occurs, this document is a guide as to the conditions CFA is likely to include in response to council's referral. The conditions prescribed in this guideline should be incorporated by the applicant in the planning permit application.	✓	CFA has been consulted through the development of this report. Ongoing engagement will occur with CFA.
1.1.3 Dangerous Goods Written Advice - Where the facility includes battery storage, CFA's responsibility may include the provision of written advice under Regulations 54 and 55 of the Dangerous Goods (Storage and Handling) Regulations 2012. This advice will be issued by the State Infrastructure and Dangerous Goods Unit.	✓	A Battery is included as part of the Proposal. Engagement with CFA will occur under the Dangerous Goods (Storage and Handling) Regulations 2012 following the Planning Permit process.
1.1.4 Any building on Site is required to comply with the National Construction Code. If a development has a building that will be over 500m <sup>2</sup> , and dispensations are requested, the local delegated CFA fire safety officer will handle such applications.	✓	The Proposal does not propose the construction of any buildings that are larger than 500m <sup>2</sup> .

Item from CFA Guidelines for Renewable Energy Installations	Compliance	Comment
<p>1.1.5 Any new development needs to ensure that the design of plans and infrastructure installations consider the requirements of the Victorian Occupational Health and Safety Act 2004 (OHS Act) and the Occupational Health and Safety Regulations (2017).</p> <p>Section 28 of the OHS Act, states the following in relation to the duty of designers:</p> <p>“A person who designs a building or structure or part of a building or structure who knows, or ought reasonably to know, that the building or structure or the part of the building or structure is to be used as a workplace must ensure, so far as is reasonably practicable, that it is designed to be safe and without risks to the health of persons using it as a workplace for a purpose for which it was designed.”</p> <p>Owners/occupiers have obligations under the OHS Act to ensure the health and safety of people ‘so far as is reasonably practicable’. This legislation requires consideration of risk control measures and safe systems of work, which for renewable energy installations may relate to the development of systems and activities for:</p> <ul style="list-style-type: none"> <li>• Housekeeping</li> <li>• Security (monitoring, alarms, etc)</li> <li>• Undertaking hot works</li> <li>• Ignition source control</li> <li>• Vehicle, plant and equipment maintenance requirements.</li> </ul>	✓	<p>The bushfire risk assessment has also considered mitigation treatments that will reduce the risk to workers or visitors at the Site.</p> <p>Examples of mitigation are:</p> <ul style="list-style-type: none"> <li>• Onsite firefighting capability will only be conducted after the completion of relevant training.</li> <li>• Hot Works Permit system will be implemented.</li> <li>• Ignition source control including the management of smoking will be implemented.</li> <li>• An induction process will be implemented that ensures all visitors and contractors understand the emergency management arrangement including bushfire response.</li> </ul>
<p>1.1.6 To enable CFA to provide timely and accurate advice, the following information is required to be provided at the planning and design stage:</p> <ul style="list-style-type: none"> <li>• Details of the facility, its operation, size and type</li> <li>• Details of any buildings on-Site, their floor area, class and use (e.g. inverter plant room, substation, maintenance shed, office)</li> <li>• Details of any battery, diesel or other dangerous goods storage/handling, including the class identification, quantity, type (bulk or packaged) and location</li> <li>• Details of the proposed fire protection system for the Site and design standards.</li> </ul>	✓	<p>This report outlines the requested information including a description of the Proposal, Site plan, locations of Solar Farm infrastructure and the layout of firefighting water supply.</p>



Item from CFA Guidelines for Renewable Energy Installations	Compliance	Comment
2. Planning, design and construction		
<p>2.1 The design team should consult with CFA as a key stakeholder early in the planning and design phase to ensure that CFA can consider the implications of the design on emergency response. Plans for the facility can be forwarded to CFA for consideration prior to a consultation meeting. Documentation is to be submitted to <a href="mailto:firesafetyreferrals@cfa.vic.gov.au">firesafetyreferrals@cfa.vic.gov.au</a>.</p> <p>Where any proposed facility design does not or is unable to meet the requirements of this guideline, designers are to contact CFA's State Infrastructure and Dangerous Goods Unit for design review and advice.</p>	✓	The required level of consultation has occurred with CFA.
<p>2.1.1 The construction and commissioning phases of facility development pose challenges for effective risk management. During construction of any renewable energy installation, Site occupiers must:</p> <ul style="list-style-type: none"> <li>• Develop an Emergency Management Plan for the construction and commissioning phases</li> </ul>	✓	The Proponent has committed to developing an Emergency Management Plan for the construction and commissioning phases.
<ul style="list-style-type: none"> <li>• Ensure that appropriate permits have been issued for work during the Fire Danger Period, and that any conditions on permits are adhered to</li> <li>• Adhere to restrictions on Total Fire Ban or days of high fire danger (refer to <a href="http://www.cfa.vic.gov.au">www.cfa.vic.gov.au</a>)</li> <li>• Carry fire extinguishers or firefighting equipment in vehicles</li> <li>• Carry emergency communications equipment</li> <li>• Ensure vehicles keep to tracks whenever possible</li> <li>• Restrict smoking to prescribed areas and provide suitable ash and butt disposal facilities.</li> </ul>	✓	The Proponent has committed to ensure that all relevant permits are in place. The Emergency Management Plan and other management policies will ensure that the requirements specified are incorporated into daily activities.
Construction phase		

Item from CFA Guidelines for Renewable Energy Installations	Compliance	Comment
<p>The fire protection measures contained within this guideline should be installed during the construction phase. This will ensure that the Site has appropriate fire protection during this phase.</p> <p>CFA requires that the emergency information container be:</p> <p>2.3.7 Painted red and marked 'EMERGENCY INFORMATION' in white contrasting lettering not less than 25mm high</p> <p>2.3.8 Located at all vehicle access points to the facility, installed at a height of 1.2m - 1.5m</p> <p>2.3.9 Accessible with a fire brigade standard '003' key.</p>	✓	<p>The static water supply will be installed at the commencement of the construction phase.</p> <p>An emergency information container will be installed that includes the following:</p> <ul style="list-style-type: none"> <li>• Emergency contact details.</li> <li>• Site Plan.</li> <li>• Safe operation specifications for the solar farm and battery storage.</li> </ul>
<b>2.4 Fire Brigade Site Familiarisation and Exercises</b>		
<p>2.4.1 Prior to commissioning the facility, operators should offer a familiarisation visit and explanation of emergency service procedures to CFA and other emergency services. Information in relation to the specific hazards and fire suppression requirements of the Site should be provided to CFA during this visit. Contact with the local CFA district to arrange local brigade contact. Refer to <a href="https://www.cfa.vic.gov.au/contact/#district">https://www.cfa.vic.gov.au/contact/#district</a></p>	✓	<p>The requirement to regularly engage with CFA will be outlined within the Emergency Management Plan and its sub plan, the Bushfire Response Plan.</p> <p>The construction project plan will include the requirement to engage with CFA prior to final commissioning.</p>
<p>2.4.2 A schedule for ongoing Site familiarisation to account for changing personnel, Site infrastructure and hazards should be developed in conjunction with the local CFA brigade.</p>	✓	<p>The Bushfire Response Plan will outline the requirement to engage with CFA to offer Site familiarisation opportunities.</p>
<p>2.4.3 An annual emergency exercise should be conducted at the Site, with an invitation extended to the local CFA brigade to participate.</p>	✓	<p>The Bushfire Response Plan will outline the requirement to conduct annual exercises and to invite CFA.</p>
<b>2.5 Training for Facility Staff</b>		
<p>2.5.1 Site and operational risks and hazard</p>	✓	<p>The Bushfire Response Plan will outline the types of training required to effectively and safely respond to bushfires. The Site will also meet its OH &amp; S obligations by providing relevant training.</p>
<p>2.5.2 Site emergency management roles, responsibilities and arrangements</p>	✓	<p>The Bushfire Response Plan will outline the types of training required to effectively and safely respond to bushfires. The Site's Emergency Management Plan will outline additional training required to respond to all identified events.</p>
<p>2.5.3 The use of any firefighting equipment where there is an expectation for staff to undertake first aid firefighting</p>	✓	<p>The Bushfire Response Plan will outline the types of training required to effectively and safely respond to bushfires.</p>

Item from CFA Guidelines for Renewable Energy Installations	Compliance	Comment
2.5.4 The storage, handling and emergency procedures for dangerous goods on-Site	✓	Following the final design, if dangerous goods are stored on-Site, relevant training will be provided to staff in accordance with the organisations OH & S obligations.
2.5.5 The location of first-aid facilities and application of first aid equipment	✓	The Emergency Management Plan will outline the location of first aid facilities and ensure trained staff are on-Site to administer first aid if required.
3.1 Access		
3.1.1 A four (4) metre perimeter road should be constructed within the ten (10) metre perimeter fire break.	✓	A 4 metre wide perimeter road is provided around the entire Site. This is located within a 10 metre perimeter fire break.
3.1.2 Roads are to be of all-weather construction and capable of accommodating a vehicle of 15 tonnes.	✓	The roads will be of all weather construction and capable of accommodating vehicles of up to 15 tonnes.
3.1.3 Constructed roads should be a minimum of four (4) metres in trafficable width with a four (4) metre vertical clearance for the width of the formed road surface.	✓	The roads will be at least 4 metres in width and will be provided with a 4 metre vertical clearance. There are no plans to plant vegetation alongside roads.
3.1.4 The average grade should be no more than 1 in 7 (14.4% or 8.1°) with a maximum of no more than 1 in 5 (20% or 11.3°) for no more than 50 metres.	✓	All roads will meet the specified requirements.
3.1.5 Dips in the road should have no more than a 1 in 8 (12.5% or 7.1°) entry and exit angle.	✓	All roads will meet the specified requirements.
3.1.6 Incorporate passing bays at least every 600m which must be at least 20m long and have a minimum trafficable width of 6m. Where roads are less than 600m long, at least one passing bay is to be incorporated.	✓	The constructed roads will incorporate passing bays as required.
3.1.7 Road networks must enable responding emergency services to access all areas of the facility.	✓	The Solar Farm is surrounded by a perimeter road and the separation of the solar panels provides the ability to access all areas of the site.
3.1.8 The provision of at least two (2) but preferably more access points to the Site, to ensure safe and efficient access to and egress from areas that may be impacted or involved in fire. The number of access points should be informed through a risk management process.	✓	The Site is provided with a main entrance however access is available through adjoining properties due to the surrounding area consisting of farming operations.
3.2 Firefighting water supply		

Item from CFA Guidelines for Renewable Energy Installations	Compliance	Comment
3.2.1 The static water storage tank shall be of not less than 45,000 litres effective capacity. The static water storage tank(s) must be an above-ground water tank constructed of concrete or steel. The location and number of tanks should be determined as part of the Site's risk management process and in consultation with a CFA delegated officer.	✓	The Site is being provided with a 50,000 litre static water supply located adjacent to the existing turbine. This is in addition to existing water supplies located near the site entrance.
3.2.2 The static storage tanks shall be capable of being completely refilled automatically or manually within 24 hours.	✓	The static storage tanks will be capable of being refilled within 24 hours through the use of water cartage contractors.
3.2.3 The hard-suction point shall be provided, with a 150mm full bore isolation valve (Figure 1) equipped with a Storz connection, sized to comply with the required suction hydraulic performance. Adapters that may be required to match the connection are 125mm, 100mm, 90mm, 75mm, 65mm Storz tree adapters (Figure 2) with a matching blank end cap to be provided.	✓	The outlets will conform with the CFA guidelines and will be provided with the appropriate outlets.
3.2.4 The hard-suction point shall be positioned within 4m to a hardstand area and provide clear access for fire personnel.	✓	A hard stand area will be provided at the tank in accordance with the CFA guideline.
3.2.5 An all-weather road access and hardstand shall be provided to the hard-suction point. The hardstand shall be maintained to a minimum of 15 tonne GVM, 8m long and 6m wide or to the satisfaction of the relevant fire authority.	✓	The tanks will be located adjacent to the main access road and appropriate hard stand will be provided so that a firefighting appliance that is accessing the water supply does not block the perimeter road.
3.2.6 The road access and hardstand shall be kept clear at all times.	✓	The operations plan will include the requirement to keep road access and hardstand areas cleared at all times.
3.2.7 The hard-suction point shall be protected from mechanical damage (i.e. bollards) where necessary.	✓	Bollards will be installed to protect the tank outlet.
3.2.8 Where the access road has one entrance, a 10m radius-turning circle shall be provided at the tank.	✓	The tanks is located on a through road.
3.2.9 An external water level indicator is to be provided to the tank and be visible from the hardstand area.	✓	An external water level indicator will be provided at the tank.
3.2.10 Signage (Figure 3) shall be fixed to each tank.	✓	Signage in accordance with the CFA guideline will be provided at the tank. This will include the following:  <b>Fire Water</b> <b>50,000 litres</b>

Item from CFA Guidelines for Renewable Energy Installations	Compliance	Comment
3.2.11 Signage (Figure 4) shall be provided at the front entrance to the Site, indicating the direction to the static water tank and being to the satisfaction of a CFA delegated officer.	✓	Directional signs will be placed around the property in the event that the water supply cannot be sighted from the entrance. In addition, a Site plan showing the location of the water supply will be available within the emergency information container.
3.3 Dangerous Goods Storage and Handling		
3.3.1 The requirements of the relevant Australian Standards must be complied with, e.g. (DR) Australian Standard 5139: Electrical installations – Safety of battery systems for use with power conversion equipment; Australian Standard 3780: The storage and handling of corrosive substances; and Australian Standard 1940: The storage and handling of flammable and combustible liquids.	✓	In the event that Dangerous Goods are stored on Site, engagement with CFA will occur under the Dangerous Goods (storage and Handling) Regulations 2012.
3.3.2 Signage and labelling compliant with the Dangerous Goods (Storage and Handling) Regulations 2012, and the relevant Australian Standards is to be provided.	✓	In the event that Dangerous Goods are stored on Site, engagement with CFA will occur under the Dangerous Goods (storage and Handling) Regulations 2012.
3.3.3 All dangerous goods stored on-Site must have a current safety data sheet (SDS). Safety data sheets must be contained in the Site's emergency information book, in the emergency information container.	✓	In the event that Dangerous Goods are stored on Site, engagement with CFA will occur under the Dangerous Goods (storage and Handling) Regulations 2012.
3.3.4 Appropriate material (including absorbent, neutralisers, equipment and personal protective equipment) for the clean-up of spills is to be provided and available on-Site.	✓	In the event that Dangerous Goods are stored on Site, engagement with CFA will occur under the Dangerous Goods (storage and Handling) Regulations 2012.
4. Site Operation		
4.1 Operation and Maintenance of Facilities		
4.1.1 Maintenance and repair activities that involve flame cutting, grinding, welding or soldering (hot works) are to be performed under a 'hot work permit' system or equivalent hazard or risk management process.	✓	A hot works permit system and other ignition controls will be put in place at the Site. This will be managed through relevant policies and procedures, staff training, visitor and contractor induction and the requirement to have a water supply available during hot works.
4.2 Fuel/Vegetation Management		
4.2.1 Grass is to be maintained at below 100mm in height during the declared Fire Danger Period.	✓	The vegetation on Site will be managed during the fire danger period. All grass will be maintained at below 100mm in height.

Item from CFA Guidelines for Renewable Energy Installations	Compliance	Comment
4.2.2 A fire break area of ten (10) metres width is to be maintained around the perimeter of the facilities, electricity compounds and substations. This area is to be of non-combustible mulch or mineral earth.	✓	A 10 metre wide fire break is provided and will be maintained during the fire danger period. The 10 metre wide fire break includes a 4 metre wide road.
The fire break area must commence from the boundary of the facility or from the vegetation screening (landscape buffer) inside the property boundary. The fire break must be constructed using either mineral earth or non-combustible mulch such as crushed rock.	✓	As the fire break is incorporated with the road, some locations will require the fire break to be no more than 10 metres from the boundary fence. Where this occurs, the grass will be maintained to less than 100 mm during the fire danger period.
The fire break must be vegetation free at all times.	✓	The fire break will be free from vegetation at all times.
No obstructions are to be within fire break area (e.g. no stored materials of any kind).	✓	The Solar Farm design has ensured sufficient space is available for the storage of equipment and other materials away from the fire break.
4.2.3 Adhere to restrictions and guidance during the Fire Danger Period, days of high fire danger and Total Fire Ban days	✓	The Solar Farm operators will ensure all legislative obligations are complied with including appropriate permits during the fire danger period.
4.2.4 All plant and heavy equipment is to carry at least a 9-litre water stored-pressure fire extinguisher with a minimum rating of 3A, or firefighting equipment as a minimum when on-Site during the Fire Danger Period.	✓	All plant and equipment will carry at least a 9 litre water extinguisher with a minimum rating of 3A during the fire danger period.
4.2.5 There is to be no long grass or deep leaf litter in areas where plant and heavy equipment will be working.	✓	Vegetation surrounding the work areas will be managed during the fire danger period to less than 100mm.
6. Siting for Solar Facilities		
6.1.1 Solar facilities are to have a 6 metre separation between solar panel banks/rows.	✓	Spacing between the banks of Solar Panels is greater than 8 metres. Further information is available in the Site Plan.
6.2 Operation and maintenance of solar facilities		
6.2.1 Solar farm operators must provide specifications for safe operating conditions for temperature and the safety issues related to electricity generation, including isolation and shut-down procedures, if Solar Panels are involved in fire. This information must be provided within the content of the emergency information book.	✓	Within the emergency information box at the Site entrance, information will be provided that outlines the safe operating conditions and isolation and shut down procedures.
6.3 Fuel/Vegetation Management at Solar Facilities		

Item from CFA Guidelines for Renewable Energy Installations	Compliance	Comment
6.3.1 Solar arrays are to have grass vegetation maintained to 100mm under the array installation or mineral earth or non-combustible mulch such as stone.	✓	Vegetation under the solar arrays will be managed to a maximum of 100 mm during the fire danger period.
6.3.2 Where practicable, solar energy installations can be Sited on grazed paddocks. In this case, vegetation is to be managed as per the requirements of this guideline, or as informed through a risk management process.	✓	The Site for the Proposal is located on what is currently a grazed paddock. Through the provision of access roads and other infrastructure, the grassland will be reduced significantly. The Solar Farm operators will utilise the most efficient method to manage the vegetation under the solar arrays.
<b>7 Battery installations</b>		
<b>7.1 Siting of Battery Installations</b>		
7.1.1 Containers/infrastructure for battery installations are to be located so as to be directly accessible to emergency responders (e.g. provided with a suitable access road).	✓	The battery storage area is located adjacent to a dedicated emergency access entrance to the Site.
7.1.2 Adequate ventilation of the battery container/storage area is to be provided where required under (DR) Australian Standard 5139 Electrical Installations – Safety of battery systems for use with power conversion equipment; the manufacturer's requirements and/or SDS for battery storage.	✓	Ventilation will be provided to the battery storage area in accordance with DRAS 5139 2019.
7.1.3 Containers/infrastructure for battery installations are to be provided with appropriate spill containment/bunding that includes provision for fire water runoff.	✓	The battery storage area will be designed and constructed to ensure that the fire water runoff is contained.
<b>7.2 Operation and Maintenance of Battery Installations</b>		
7.2.1 Battery installations that contain dangerous goods may have to comply with the requirements of the Dangerous Goods Act 1985; the Dangerous Goods (Storage and Handling) Regulations 2012; and relevant Australian Standards.	✓	In the event that Dangerous Goods are stored on Site, engagement with CFA will occur under the Dangerous Goods (storage and Handling) Regulations 2012.
7.2.2 Battery storage manufacturers must provide specifications for safe operating conditions for temperature and the effects on battery storage if involved in fire. This information must be provided within the content of the emergency information book.	✓	Safety information relating the battery storage infrastructure will be provided within the emergency information containers.



Item from CFA Guidelines for Renewable Energy Installations	Compliance	Comment
7.2.3 Battery installations are to be kept free of extraneous materials and combustible materials of all kinds. Regular inspections and housekeeping is to be conducted to ensure materials do not accumulate.	✓	The operations plan for the Site will include the requirement to regularly inspect and undertake appropriate housekeeping within the battery storage area.
7.2.4 Battery installations are to be serviced/maintained as per the manufacturer's requirements.	✓	Maintenance will be undertaken as specified by the manufacturers and will be outlined within the Site operations plan.
7.3 Fuel/Vegetation Management at Battery Installations		
7.3.1 Containers/infrastructure for battery installations must be clear of vegetation for 10 metres on all sides, including grass. CFA requires non-combustible mulch such as stone or mineral earth within this 10-metre area.	✓	The battery storage area will be provided with an Asset Protection Zone for a distance of 10 metres which will have no combustible vegetation.