Maffra Solar Energy Facility and Battery Energy Storage System

Risk Management Plan

November 2022

FIRE RISK Consultants

Cover photo –View of the Maffra Solar Energy Facility site (Fire Risk Consultants)

Document history and date

Revision	Date	Description	By	Review	Approved
V1 - DRAFT	30/10/2022	Initial draft following assessment of available information and site visit.	M Potter	G Taylor	G Taylor
V2 - Final	10/11/2022	Minor changes following client feedback.	M Potter	G Taylor	G Taylor

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Any fire safety work, including but not limited to planned burning, back burning and/or fire suppression, on any property or building is specifically excluded from this report.

*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.*

Contents

1 Introduction

Fire Risk Consultants have been engaged by BNRG to develop a Risk Management Plan (RMP) for the proposed Maffra Solar Energy Facility and Battery Energy Storage System (BESS) located at Lot 13 Maffra-Briagolong Road, Maffra. The development encompasses an area of approximately 12.2 Hectares on a property that is currently utilised for stock grazing. The proposal is to construct a 4.9MW Solar Energy Facility with a 5.504MW BESS.

The site is located approximately four kilometres to the north of Maffra and 14 kilometres from Briagolong. The main access to the property is from Maffra-Briagolong Road with a secondary access point located along the southern boundary of the property and also from Maffra-Briagolong Road.

This RMP is required to achieve compliance with the CFA Guideline - *Design Guidelines and Model Requirements: Renewable Energy Facilities 2022* (CFA Guideline). The CFA Guideline outlines the purpose and need for a Risk Management Plan (RMP). The client has engaged with CFA prior to the preparation of this plan, and they will be reengaged once the plan has been approved by the design team. The RMP has been developed to provide sufficient information for CFA to make an informed decision. It is expected for the Planning Permit to require a Fire Management Plan (FMP) and Emergency Management Plan (EMP) as per the requirements of the CFA Guidelines.

The RMP has been prepared following an assessment of the site and analysis of supplied information from the client in relation to the design, commissioning and operation of a Solar Energy Facility and BESS. As per the CFA Guideline, this report also aligns with NSW Planning's *Hazardous Industry Planning Advisory Paper 2: Fire Safety Study Guidelines (2011)*. The various requirements outlined within the Advisory Paper have been included within this report where it relates to the proposal.

2 Project Overview

This development includes a Solar Energy Facility and Battery Energy Storage System (BESS) that when completed will have a capacity of approximately 4.9MW with a BESS capacity of 5.504MW.

When completed the project will deliver:

- A Solar Energy Facility spread over approximately 12.2 hectares.
- Battery Energy Storage System located near the main entrance.
- Access roads around and through the site.
- Static water supplies for firefighting purposes for both the Solar Energy Facility and the BESS.

3 Existing conditions assessment

3.1 Site description and location

The Solar Energy Facility site is approximately 12.2 hectares and includes a BESS and other associated infrastructure. The development is occurring within a larger property that is mainly used for grazing purposes. The remaining areas of the property include grazing areas, vegetation protected areas and farming property infrastructure. Figure 1 outlines the location of the Solar Energy Facility and BESS in relation to the surrounding landscape.

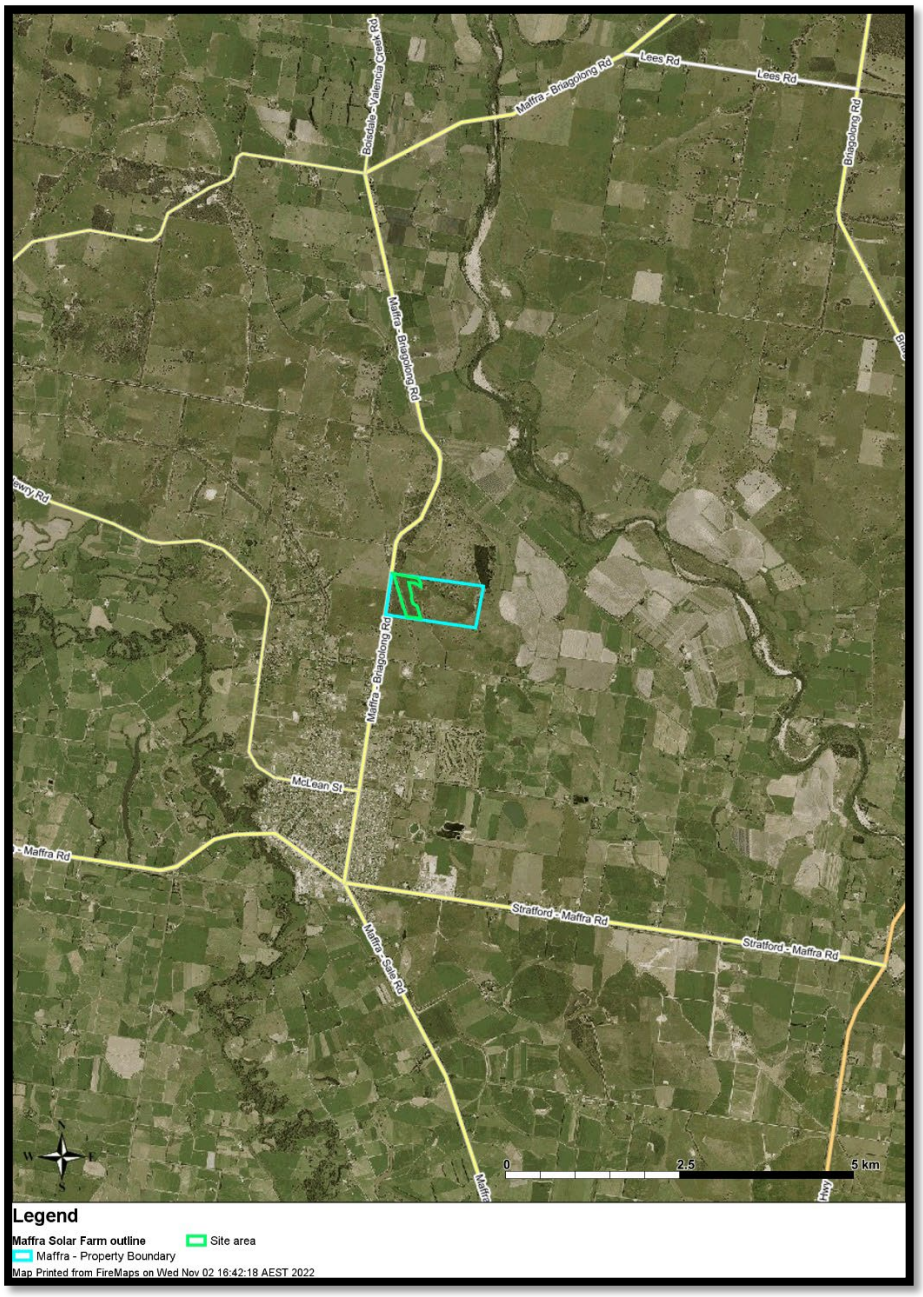


Figure 1 – Maffra Solar Energy Facility and BESS - site and surrounds

The property itself consists of a blue gum plantation adjacent to Maffra-Briagolong Road that was planted in 1990. Grazing has occurred under the tree canopy with very little fuel loads present. This vegetation is classified as Class A Forest only due to the canopy density. If the canopy density was less than 30%, the classification would be reduced to Class B Woodland.

The vegetation along Maffra-Briagolong Road is within a narrow strip of roadside and is a mixture of managed undergrowth and areas where the grasses are unmanaged. There is a managed area between the roadside vegetation and the Blue Gum Plantation.

3.2 Risk indicators

The following information has been obtained and provides relevant information that informs the analysis of risk. This information is primarily related to the existing bushfire risk that exists on the property and in the surrounding area.

3.2.1 Bushfire Management Overlay

The Bushfire Management Overlay (BMO) is a Planning Overlay that is provided within the relevant municipalities Planning Scheme. It is reliant on areas of a municipality being identified as at risk from bushfire.

The criteria to determine if a BMO should be implemented includes:

- Criteria 1: Vegetation type and size
    - Forest, woodland, scrub, shrubland, mallee and rainforest vegetation that is 4 hectares or more in size.
- Criteria 2: Ember buffer
    - A 150m buffer is applied from the edge of vegetation identified in Criteria 1.
- Criteria 3: Extreme risk inclusions
    - Areas that fire authorities have advised may be subject to extreme landscape bushfires.

Figure 2 outlines the location of the BMO in relation to this development. The BMO is largely driven by the existing Blue Gum Plantation that was planted in 1990. This area has very little undergrowth and will unlikely support increased bushfire behaviour due to its separation from other vegetation.

The BMO location is also driven by the row of trees that runs along the access track on the western side of the development. These trees have been conservatively assessed as Class B Woodland. Due to the stock grazing activities in this area, the grassland vegetation under the tree canopy is well maintained and is likely to stay this way.

Figure 2 - Bushfire Management Overlay surrounding the development site

3.2.2 Bushfire Prone Area

Bushfire Prone Areas (BPA) are areas that are subject to, or likely to be subject to, bushfires. The Minister for Planning has determined that specific areas are designated BPAs for the purposes of the building control system. Specific bushfire construction standards apply in designated bushfire prone areas in Victoria.

These bushfire construction requirements are aimed at improving bushfire protection for residential buildings. The creation of the BPA map fulfils one of the 67 recommendations made by the Victorian Bushfires Royal Commission.

A minimum construction standard applies to new residential buildings, schools, childcare centres, hospitals, aged care facilities, industrial buildings and associated buildings in designated Bushfire Prone Areas.

Landowners are required to build to a minimum Bushfire Attack Level of 12.5 in these areas as outlined within AS3959:2018 *Building in bushfire prone areas*. The entire project area is within a BPA. The existence of the BPA will trigger the need to respond to Clause 13.02 of the Planning Scheme. Refer to Section 4.1.

3.2.3 Municipal Fire Management Plan[1]

The Wellington Municipal Fire Management Plan (MFMP) identifies that the major bushfires that have occurred over the previous 10 years have been predominantly in the forested areas of the municipality. This is consistent with the available data provided by DELWP (see Figure 3) that indicates that bushfires have not historically progressed into the grassland areas to the north of Maffra.

The MFMP risk assessment indicates that the risk to the Maffra interface is medium. This risk is driven by the potential for a bushfire to approach the Maffra interface from the north. The MFMP identifies the following treatment programs that manages this risk:

- Community Ed/Engagement, CFA
- Community Ed/Engagement, Wellington
- Fire Ready Victoria, CFA
- Burns Program - DELWP/PV

The above treatments are aimed at maintaining the risk to a medium level. No further treatments are proposed within the MFMP for this area.

[1] Wellington Municipal Fire Management Plan - https://assets-global.website-files.com/6021ed7c89cc1c1c01fccf29/6021ed7c89cc1c18ccfcd884_Municipal-Fire-Management-Plan.pdf

3.2.4 Safer Together assessment[2]

The Regional Bushfire Management Strategy was developed to reflect the region's unique environments and communities. The strategy was developed through a regional planning process that was guided by the knowledge and priorities of experts, stakeholders and community members from the Gippsland Region.

The Gippsland Bushfire Management Strategy 2020 is the result of an analysis of bushfire risk across the Region. The Strategy has identified the large areas of the Region where forested areas are interfaced with private land including residential dwellings. Due to the low population in the immediately surrounding area, this locality within Gippsland has not been identified as having a level of bushfire risk.

3.2.5 Bushfire history

An analysis of bushfire history in the area surrounding the proposed Maffra Solar Energy Facility and BESS indicates bushfire activity to the north and north west within the Alpine ranges. Smaller bushfires have occurred historically to the south east and west of the development.

It is uncommon for bushfires burning within the Public Land to the north to spread into the farming properties to the north of the project site. According to the data provided by DELWP (see Figure 3), this property has not been impacted by bushfires in the past.

It is likely that the mix of the road network, increased access opportunities for firefighters and the influence of the Macalister Irrigation District results in bushfires not spreading for long distances when the bushfire enters the private land to the south of the Alpine ranges. Fires that start within the grassland areas will likely be heavily influenced by the varying vegetation types, the surrounding road network and the presence of residential properties. Firefighters will have multiple opportunities to either contain or suppress bushfires in this type of landscape.

3.2.6 Surrounding vegetation

Often areas that can contribute to bushfire risk are contained within Public Land reserves or Plantations. Apart from the very small Plantation areas adjacent to Maffra-Briagolong Road, there is a lack of forested areas that will elevate the bushfire risk for this development. The Alpine Ranges which are dominated by Public Land is approximately 13 kilometres to the north west of this development.

The two small Plantation areas are approximately 2.8 hectares and 3 hectares in size. It is not expected for a bushfire burning through these areas to achieve its maximum intensity due to the small size of the vegetation. The surrounding landscape is associated with market gardens, grazing properties and crop growing. The fragmented and varying vegetation will likely slow or stop a bushfire spreading depending on the fire danger conditions at that time.

The presence of the Macalister Irrigation District (MID) in the surrounding landscape will also contribute to a reduction in bushfire behaviour. Large areas of the landscape to the east and west

[2] Gippsland Bushfire Management Strategy 2020 - https://www.safertogether.vic.gov.au/__data/assets/pdf_file/0028/493534/DELWP_BushfireManagementStrategies_2020_Gippsland_rr.pdf

of the development are within the MID. Several farming properties will likely access water supplies which results in large areas of the landscape during summer retaining crops or grasses that have a high moisture content and would unlikely support bushfires.

The MID has been in place since the 1920s and the reliance on this system is increasing due to the increasing presence of market gardens. It is highly likely that this landscape influence will be retained for the life of the project.

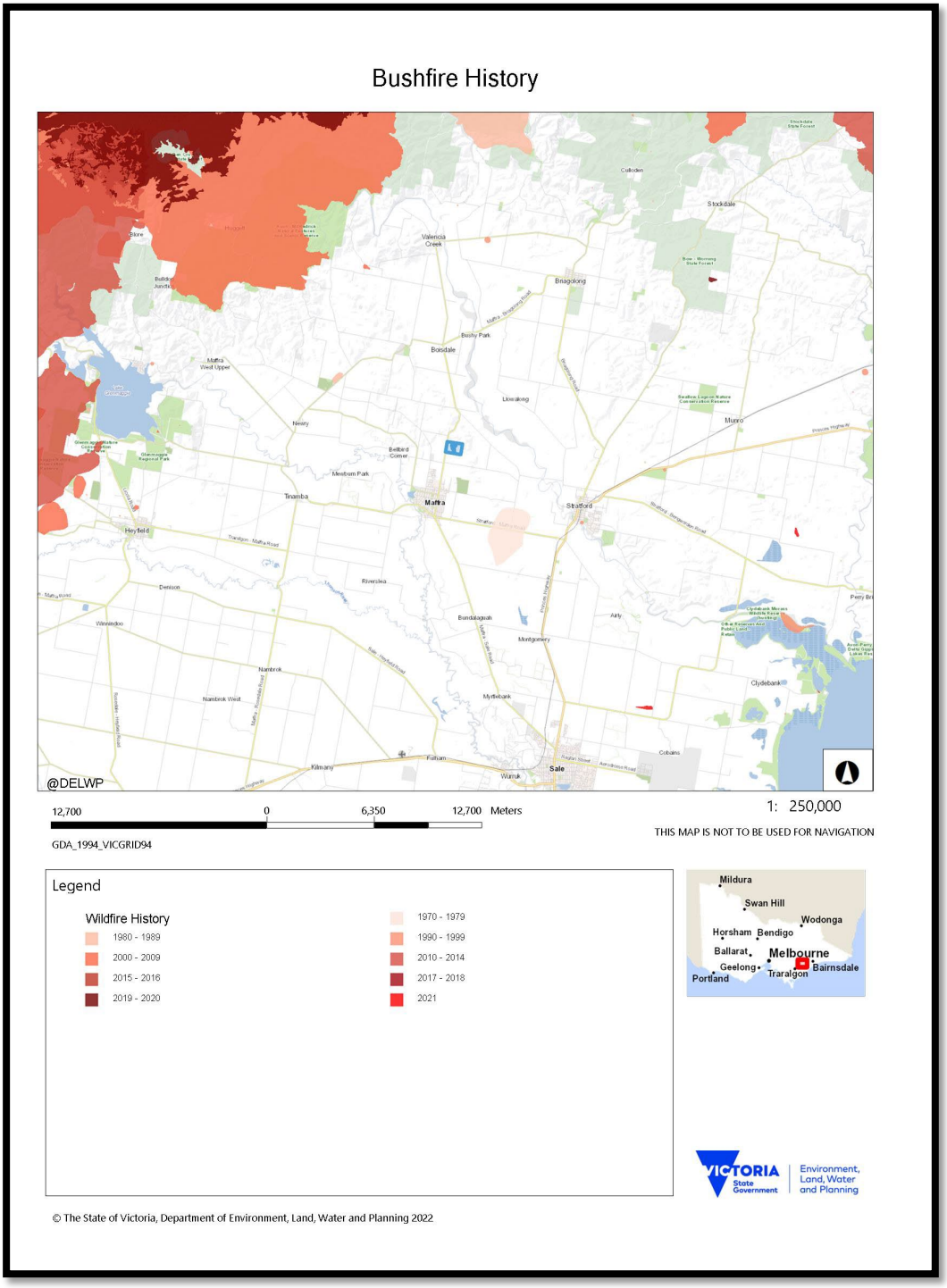


Figure 3 - Bushfire history

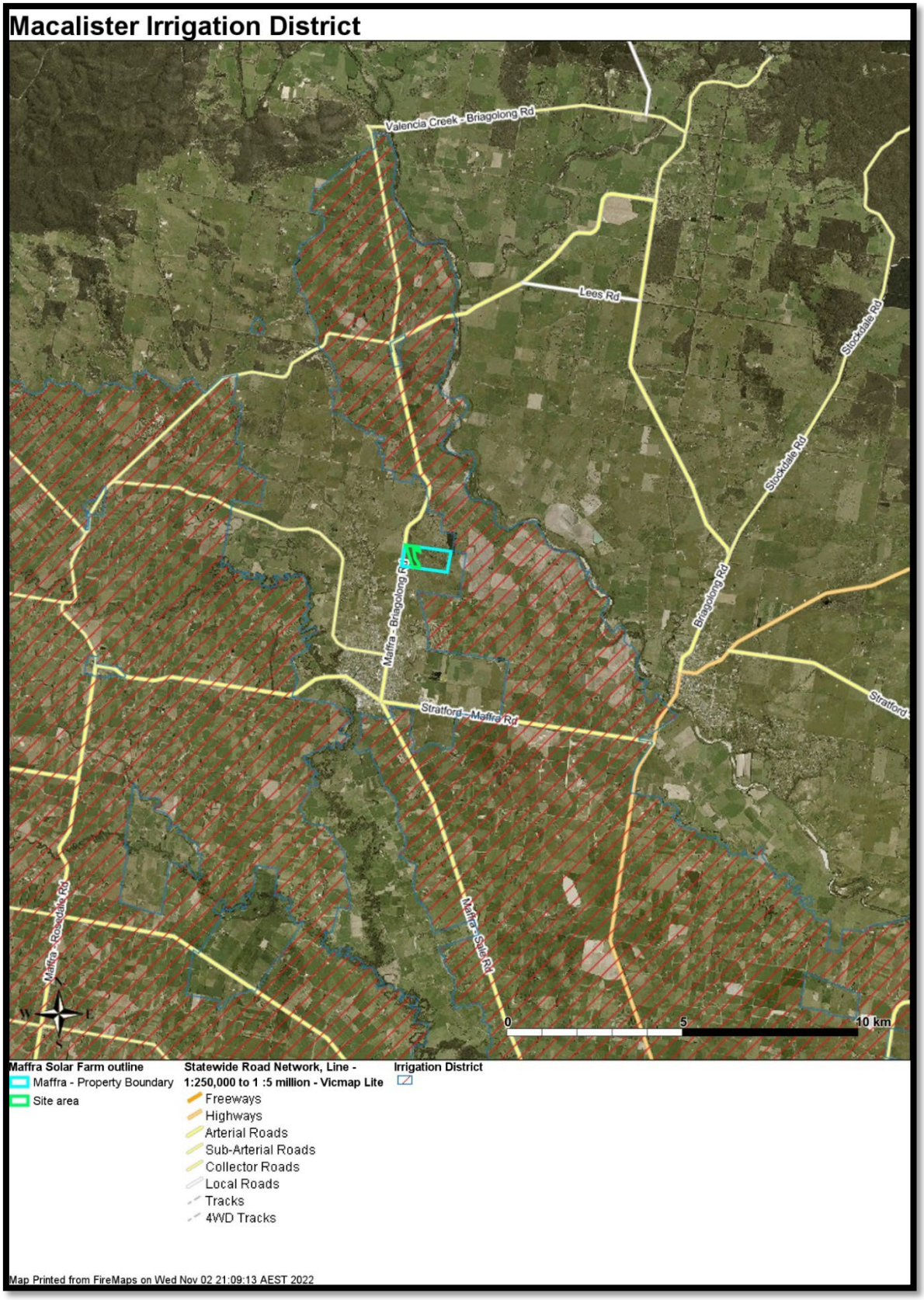


Figure 4 – Macalister Irrigation District in relation to the Maffra Solar Energy Facility

4 Risk assessment process

To effectively assess the fire risk associated with the proposal, this report is structured to assess risk using the following frameworks:

- Clause 13.02 – Bushfire Planning –Wellington Planning Scheme[3]
- Assessment against the requirements of the CFA Guideline *Design Guidelines and Model Requirements: Renewable Energy Facilities 2022*
- Risk assessment that meets section 5 of the CFA Guidelines.

The risk assessment provides the opportunity to combine all of the information together and make any additional recommendations that may be required to reduce risk to an acceptable level.

4.1 Clause 13.02 – Bushfire planning assessment

Clause 13.02 of the Wellington Planning Scheme plans to strengthen the resilience of settlements and communities and prioritise protection of human life through several objectives. However, it should be noted the Proposal does not introduce new settlements into the landscape. The assessment has been undertaken within the context of a Solar Energy Facility and BESS.

4.1.1 Bushfire hazard assessment

Elevated bushfire behaviour in south east Australia is often dominated by strong and gusty north westerly winds followed by a south westerly change that normally occurs in the afternoon or early evening. These conditions have historically caused the loss of life and property and are usually associated with elevated fire danger warnings issued by the fire agencies.

Table 1 below outlines the hazard assessment relating to the proposed development. Figures 5 and 6 provide an overview of the likely bushfire scenarios within the surrounding area. The assessment has identified the presence of the north westerly and south westerly bushfire impacts. It is acknowledged that bushfires may approach from other directions however the treatment of the risk from these aspects will be sufficient to offset bushfire approach from other directions.

[3] https://planning-schemes.app.planning.vic.gov.au/Wellington/ordinance/13.02

Table 1 - Assessment against Clause 13.02

Bushfire hazard type	Conditions	Likely Scenario	Considerations
The site for the development	The Solar Energy Facility will be required to comply with conditions that will specify the vegetation on the property to be managed during the fire danger period. Small native vegetation plots will be retained. During construction, there is a risk of a fire igniting and spreading through unmanaged vegetation.	There is the potential for a fire to start during the construction phase as this would be considered the higher risk activity when compared to the operations phase. Failure to follow hot work procedures during the fire danger period could result in ignitions occurring. A bushfire starting on the property is unlikely once the project moves into the operations phase. The maintenance of vegetation on the property during the fire danger period will limit a fires ability to spread. The creation of a fire break on the development boundary will limit a bushfires ability to leave the property. The isolated patches of native vegetation are small and are not seen as contributing to the bushfire risk.	During the construction phase, all vegetation within 100 metres of the works areas that are within the property boundary (excluding the vegetation protection areas) are to be managed during the fire danger period so that the grassland is always less than 100mm in height. A hot works management procedure will be established prior to construction commencing and will clearly outline bushfire prevention treatments. Where the native vegetation areas that are being retained are within 100 metres of the works, a firefighting resource will be available onsite during the fire danger period. The firefighting resource will be a 'slip on' type unit (ute) with a firefighting pump and water supply on the rear tray. When the fire danger conditions are elevated (Catastrophic), the Emergency Management Plan will outline procedures to close the site during the construction phase.
Neighbourhood (400 metres) and local conditions (one kilometre)	The surrounding landscape within 400 metres is predominantly farming properties with isolated areas of blue gum	A bushfire approaching from the north west will likely involve the blue gum plantations and this may generate embers. A bushfire from the south west has the ability to travel a	The provision of perimeter fire breaks will assist with slowing or stopping the bushfire from entering the property. This along with the management of vegetation during the fire danger period will limit the ability of a bushfire to burn through the

	plantation. The Maffra Briagolong Road is a key north south barrier to the west of the development site.	short distance due to the presence of residential priories to the south west of the development and the Maffra township.	development.
Landscape conditions (10 kilometres)	The landscape surrounding the development site consists of small areas of Plantation and grassland areas associated with farming activities. To the south west the landscape is highly fragmented and includes the Maffra township. To the north the landscape is influenced by the Macalister Irrigation District and large farming properties. Beyond the 10 kilometre assessment area is large forested areas associated with Public Land.	The likely bushfire behaviour which will result in the greatest intensity and risk to the development will be from the north west where fast running grassfires could occur. This hasn't occurred historically, and this is probably due to the Macalister Irrigation District and the type of farming activities that occur in the surrounding landscape that retains high moisture content within the vegetation. Bushfires approaching from the south west are likely to have only travelled a short distance due to the presence of residential developments and other infrastructure that results in a highly fragmented landscape.	The perimeter fire breaks, surrounding road network and farming activities will support the bushfire slowing or stopping as it approaches the development. The requirement to maintain all vegetation on the property will also reduce the ability for a bushfire to start new fires on the property from embers.

4.1.2 Bushfire Hazard Landscape Assessment

Figure 5 and 6 outlines the outcome of the bushfire hazard landscape assessment. The assessment identifies the two likely scenarios that may occur in relation to the Solar Energy Facility and BESS. Both scenarios are consistent in that the likely bushfire impact on the development is from either the north west or south west. Table 2 provides a description of each of the scenarios contained within Figure 5 and 6.

Table 2 - Bushfire scenarios

Scenario	Description
A	A bushfire that approaches from the north west is likely to be under elevated bushfire conditions. Traditionally a north westerly wind influence is associated with elevated fire danger days. The bushfire will be influenced by the availability of fuel and due to the Macalister Irrigation District and the highly fragmented vegetation associated with farming properties to the north, the bushfire is likely to be a low intensity fire. The landscape offers several areas to prevent its spread further south including the road network and farming properties including market gardens. If the bushfire enters the blue gum plantations to the north and west then it will be expected for embers to develop and these will likely start additional fires in and around the development.
B	A bushfire that approaches under a south westerly wind influence usually occurs late in the day after a north westerly wind has been influencing the weather conditions. The wind change can occur after a bushfire has been burning for some time under the north westerly influence. Depending on the location of the bushfire, the entire western and southern side of the Solar Energy Facility can come under threat at the same time. Due to the short distance for a fire to approach from this aspect, it is considered as having a lower potential to impact on the development. The residential properties and the Macalister River will significantly influence bushfire behaviour which will likely result in a lower intensity fire.

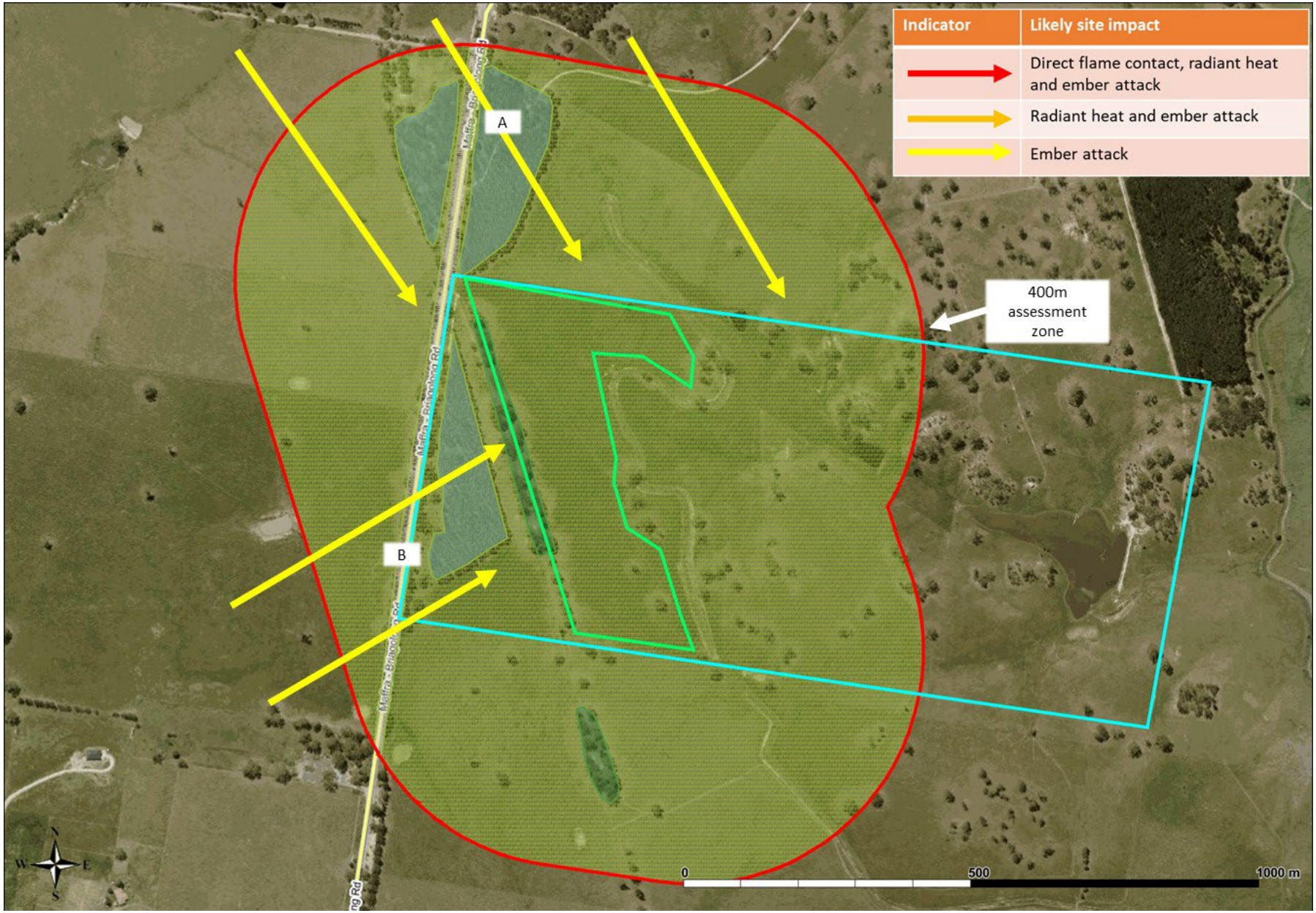


Figure 5 – 400 metre landscape assessment

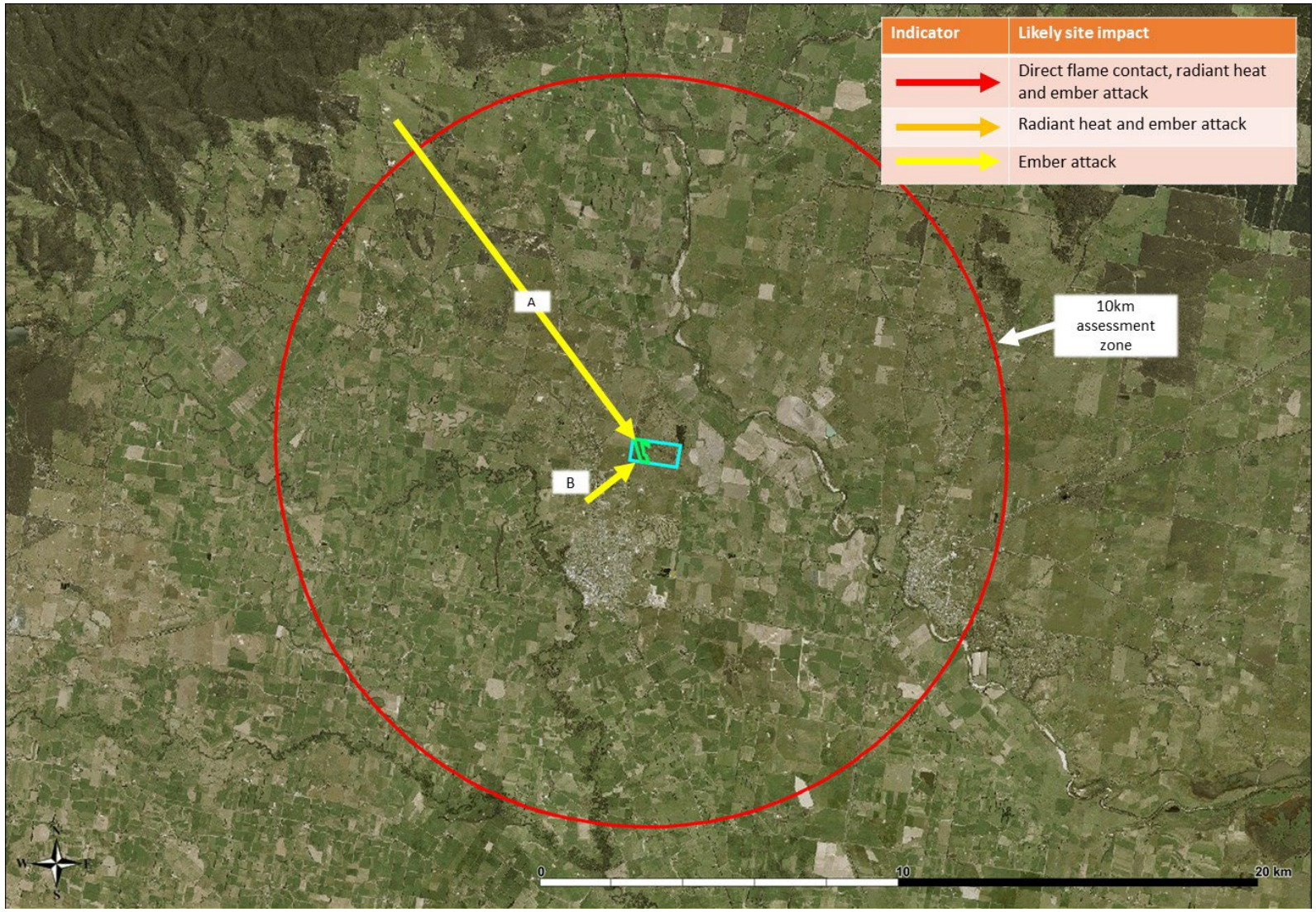


Figure 6 - 10 kilometre landscape assessment

Clause 13.02 Settlement Objectives are primarily related to settlement development of which it could be argued that a Solar Energy Facility and BESS does not meet these definitions. Regardless, an assessment of the project has been undertaken against the Settlement Objectives to allow for a detailed consideration of the project against the Clause 13.02 Policy.

Table 3 - Response to Clause 13.02 - Settlement Objectives

Settlement planning objectives	Project response	Achieved (✓ or ×)
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).	This project does not promote population growth and will only have people onsite during the construction phase and when undertaking maintenance during the operations phase. Most of the development will be exposed to less than 12.5 kW/m² with only a small number of solar panels potentially being exposed to slightly higher radiant heat levels. These radiant heat levels have been assessed based on unmanaged grassland areas in the adjoining paddocks which is highly unlikely to occur due to the surrounding areas being used for stock grazing. Based on the additional controls and that the only infrastructure exposed to slightly more than 12.5 kW/m² are Solar Panels, it has been determined that this objective has been achieved.	✓
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.	The development itself will create areas that can be considered as achieving BAL LOW under AS3959. These areas are in the central area of the property. Other areas that would meet the BAL LOW requirements includes the Maffra and Briagolong communities. The main area within Maffra is the main shipping area that would be considered as a safer location if a bushfire was threatening the local area.	✓
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.	The Solar Energy Facility and BESS will be provided with a range of protection measures that will ensure the bushfire risk to existing and future surrounding properties will not increase. These measures include: • Fire break including an access road around the entire perimeter of the development. • Requirement to maintain vegetation on the entire site to a maximum of 100mm during the fire danger period. • Provision of static water supply to support firefighting operations for both the Solar Energy	✓

	Facility and the BESS. • The BESS includes a range of detection systems that will identify faults early and commence shut down activities if required. In relation to vegetation on the property, the development will see a reduction in the amount of fuel and require the ongoing management of this for the life of the project.	
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.	This development through the increased management of vegetation on the property and creation of perimeter fire breaks, will reduce the risk to the surrounding landscape when compared to the existing risk. The development will introduce an ignition risk that is greater than what is currently there, however, the controls imposed by the CFA Guideline and other treatments will ensure this new risk is managed for the life of the development.	✓
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 bushfire risk has been assessed at the landscape level. This has identified the possibility of a bushfire to approach from the north west and limited potential from the south west. The surrounding landscape that is heavily influenced by the Macalister Irrigation District ensures that the vegetation is highly fragmented and will result in lower bushfire intensities. This development will not change the current expected bushfire behaviour in the landscape, it will likely reduce the risk in the surrounding areas due to the area now being a managed landscape with reduced vegetation.	✓
Assessing alternative low risk locations for settlement growth on a regional, municipal, settlement, local and neighbourhood basis.	This site has been chosen due to its ability to connect to electricity infrastructure. It is also a low risk site and whilst there are small areas of vegetation within close proximity, these areas will not support elevated bushfire intensities.	✓
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	The development will achieve a less than BAL 12.5 rating when assessed against AS3959 apart from a small area on the western edge. This will be achieved due to the separation between the adjoining properties and the Solar Farm through the provision of a fire break.	✓

completion have, more than a BAL-12.5 rating under AS 3959-2009 Construction of Buildings in Bushfire-prone Areas (Standards Australia, 2009).		

4.1.3 Assessment against Clause 13.02 summary

The assessment against Clause 13.02 has identified that the development is within an area where bushfires may occur. The bushfire activity is likely to be influenced by the surrounding farming properties and the presence of the Macalister Irrigation District. It is not expected for the landscape conditions to influence bushfire behaviour as it approaches the development.

The site layout and design is aimed at minimising the impact of the low intensity bushfires and to ensure the development does not increase the bushfire risk to the surrounding landscape. As it is required to achieve the requirements outlined within the CFA Guidelines as a minimum, this will ensure that the settlement planning objectives are achieved.

The development will likely reduce the risk to the surrounding properties and provide a managed area within the landscape.

4.2 Analysis against CFA Guideline

CFA have produced Guidelines that outline their requirements to address fire risk within renewable energy installations. Section 5 of the Guidelines outlines the process to analyse risk to enable the identification of hazards that may or can cause fires.

The CFA Guideline also specifies model requirements for renewable energy installations. Prior to the risk assessment being undertaken, it is important to assess the Solar Energy Facility and BESS project against these requirements. This will increase the effectiveness of the risk assessment.

The following table provides the model requirements from CFA's Guideline and how this project addresses the specific areas.

Table 4 - Response to CFA Guideline

Model requirement	Compliance	Comments
Section 3 – consulting with CFA		
Early consultation, prior to the development of the planning permit application, ensures that CFA can effectively consider emergency response implications.	✓	CFA has been consulted (6/10/2022) on the project and ongoing consultation will continue to occur through the development of the Fire Management Plan and Emergency Management Plan once the Planning Permit has been issued. This Risk Management Plan has been developed to support the consultation with

		CFA to demonstrate how the fire risk is being managed.
Section 4 – Planning Applications		
Planning applications must address all relevant aspects of fire safety, including landscape and bushfire hazards, and hazards to and from the proposed technologies.	✓	This RMP forms part of the Planning Permit application and includes all fire related considerations relating to a Solar Farm and BESS.
Section 6- Facility Location and Design		
Section 6.1 – Facility Location		
Planning applications for all renewable energy facilities proposed in high-risk environments must address the following, in addition to providing an assessment against policy at Clause 13.02-1S (Bushfire Planning):	✓	This RMP includes an assessment against Clause 13.02 within Section 4.1.
a) The impact of any ignitions arising from the infrastructure (solar panels, wind turbines, battery energy storage systems, electrical infrastructure) on nearby communities, infrastructure and assets.	✓	This report considers the impact and the likelihood of fires that leave the property. The Clause 13.02 assessment has considered this and has also been addressed within the risk assessment in Section 5.
b) The impact of bushfire on the infrastructure (eg. ember attack, radiant heat impact, flame contact).	✓	This report considers the impact of bushfire on the infrastructure. The Clause 13.02 assessment considered this and has also been addressed within Section 5.
c) Assessment of whether the proposal will lead to an increase in risk to adjacent land and how the proposal will reduce risks at the site to an acceptable level.	✓	The Clause 13.02 assessment has considered this and determined that the project will likely reduce the risk in the landscape from bushfire. The requirements including managing vegetation on the property during the fire danger period and the perimeter fire break supports the reduction of risk.
Section 6.2 – Facility Design		
Section 6.2.1 – Emergency vehicle access		

All facilities		
a) Construction of a four (4) metre perimeter road within the perimeter fire break.	✓	A four metre wide perimeter road is being provided within the fire break.
b) Roads must be of all-weather construction and capable of accommodating a vehicle of fifteen (15) tonnes.	✓	The Access Roads constructed for this development will be designed, constructed and maintained to achieve this requirement.
c) 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.	✓	All Access Roads will be a minimum of four metres wide.
d) 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 fifty (50) metres.	✓	The site is mainly flat with only small slopes present. There are no roads that will require assessment of the grade.
e) Dips in the road should have no more than a 1 in 8 (12.5% or 7.1°) entry and exit angle.	✓	The site is mainly flat with only small slopes present. There are no roads that will require assessment of dips.
f) Roads must incorporate passing bays at least every 600 metres, which must be at least twenty (20) metres long and have a minimum trafficable width of six (6) metres. Where roads are less than 600 metres long, at least one passing bay must be incorporated.	✓	Passing bays have been included within the design of the Access Roads for the site.
g) Road networks must enable responding emergency services to access all areas of the facility, including fire service infrastructure, buildings, and battery energy storage systems and related infrastructure.	✓	The BESS and substation are located near Maffra-Briagolong Road which will be the access road that the fire brigade will use. Access Roads are provided to these areas and across the development. The road network also includes a main access road through the middle of the Solar Panels in addition to a perimeter access road.
h) The provision of at least two (2) but preferably more access points to the facility, to ensure safe and efficient access to and	✓	The development is provided with the main entrance to the north of the development with a secondary access available to the south

egress from areas that may be impacted or involved in fire. The number of access points must be informed through a risk management process.		of the development.
Section 6.2.2 Firefighting Water Supply		
All Facilities		
a) Water access points must be clearly identifiable and unobstructed to ensure efficient access.	✓	Static water supplies for the Solar Energy Facility will be located where possible at the property entrances or at other strategic locations around the site. The final location of static water supplies will be determined in conjunction with CFA.
b) Static water storage tank installations must comply with AS 2419.1-2005: Fire hydrant installations – System design, installation and commissioning.	✓	The static water tanks will be located within tanks that comply with AS2419.1:2015.
c) The static water storage tank(s) must be an above-ground water tank constructed of concrete or steel.	✓	The static water tanks will be above ground.
d) The static water storage tank(s) must be capable of being completely refilled automatically or manually within 24 hours.	✓	Site management will have an arrangement with a local water carrier to ensure static water supplies are refilled within 24 hours. This will be addressed within the Emergency Management Plan.
e) The static water storage tanks must be located at vehicle access points to the facility and must be positioned at least ten (10) metres from any infrastructure (solar panels, wind turbines, battery energy storage systems, etc.).	✓	A static water tank will be located at the property entrance near Maffra – Briagolong Road.
f) The hard-suction point must 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.	✓	The static water tanks will be provided with a hard suction point and adapters that will allow for the typical firefighting appliances to access the water supplies.

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.		
g) The hard-suction point must be positioned within four (4) metres to a hardstand area and provide a clear access for emergency services personnel.	✓	The hard suction points will be accessible by firefighting appliances.
h) An all-weather road access and hardstand must be provided to the hard-suction point. The hardstand must be maintained to a minimum of 15 tonne GVM, eight (8) metres long and six (6) metres wide or to the satisfaction of the CFA.	✓	This has been included within the design.
i) The road access and hardstand must be kept clear at all times.	✓	This requirement will be specified within site procedures and the Emergency Management Plan.
j) The hard-suction point must be protected from mechanical damage (eg. bollards) where necessary.	✓	Bollards will be provided that protects the static water tanks outlets from mechanical damage.
k) Where the access road has one entrance, a ten (10) metre radius turning circle must be provided at the tank.	✓	There are no dead ends within the development.
l) An external water level indicator must be provided to the tank and be visible from the hardstand area.	✓	This has been included within the design.
m) Signage (Figure 3) indicating 'FIRE WATER' and the tank capacity must be fixed to each tank.	✓	This has been included within the design.
n) Signage (Figure 4) must be provided at the front entrance to the facility, indicating the direction to the static water tank.	✓	Signage will be provided at all property entrances that shows the location of the closest static water supply to that location.

Solar Energy Facilities		
a) The fire protection system for solar energy facilities must incorporate at least one (1) x 45,000L static water tank for every 100ha. For example, a 500ha site requires a minimum of five (5) x 45,000L static water tanks.	✓	The development size requires one static water tank (45,000 litres) that will be located at the main entrance. This will be in addition to the 288,000 litre water tank being provided to protect the BESS.
b) A fire water tank must be located at the primary vehicle access point to the facility, and elsewhere in consultation with CFA.	✓	This has been included within the design.
c) Fire water must be provided to cover buildings, control rooms, substations and grid connections, in consultation with CFA.	✓	This has been included within the design.
d) Additional fire protection systems or equipment required under any Australian Standards for dangerous goods must be provided as prescribed.	✓	The Lithium Ion battery system includes a dangerous good that is a Class 9. The refrigerant within the system is also considered a dangerous good. The quantity of dangerous goods is low and will comply with the Dangerous Goods (Storage and Handling) Regulation requirements. The BESSs are provided with smoke detection and a gas suppression system. They also include sensors that will detect more than 20 fault types and more than 20,000 fault points. The BESS containers are also provided with bunds to collect the refrigerant in the event of a failure. There is no additional fire protection systems or equipment required.
Battery Energy Storage Systems		
1) For facilities with battery energy storage systems, the fire protection system must include as a minimum:		
b) Where no reticulated water is available, a fire water supply in static storage tanks, where:		
i. The fire water supply must be of a quantity no less than	✓	A static water supply of 288,000 litres will be provided near the BESS. This will likely be

288,000L or as per the provisions for Open Yard Protection of AS 2419.1-2005 flowing for a period of no less than four hours at 20L/s, whichever is the greater.		stored in the same tank as the 45,000 litre static water supply provided for the protection of the Solar Farm.
ii. The quantity of static fire water storage is to be calculated from the number of hydrants required to flow from AS 2419.1-2005, Table 3.3.	✓	This has been calculated and the site requires 288,000 litres for the protection of the BESS.
iii. Fire hydrants must be provided and located so that every part of the battery energy storage system is within reach of a 10m hose stream issuing from a nozzle at the end of a 60m length of hose connected to a fire hydrant outlet.	✓	The BESS area is small, and this requirement is easily achieved.
iv. The fire water supply must be located at vehicle entrances to the facility, at least 10m from any infrastructure (electrical substations, inverters, battery energy storage systems, buildings).	✓	The static water supply will be located near the main entrance and within close distance to the BESS.
v. The fire water supply must be reasonably adjacent to the battery energy storage system and shall be accessible without undue danger in an emergency. (Eg., Fire water tanks are to be located closer to the site entrance that the battery energy storage system).	✓	This will be included within the design to the satisfaction of CFA.
vi. The fire water supply must comply with AS 2419.1-2005: Fire hydrant installations - Section 5: Water storage.	✓	This will be included within the design to the satisfaction of CFA.
Substations		
Fire water must be available to substations.	✓	The substation is located adjacent to the BESS and near the property entrance where a 45,000 litre static water supply is located along with the 288,000 litres for the BESS. There are sufficient water supplies in the area

		to support firefighting activities.
Section 6.2.4 – Fire Breaks		
A fire break must be established and maintained around:		
a) The perimeter of the facility, commencing from the boundary of the facility or from the vegetation screening inside the property boundary.	✓	The solar panels are set back from all perimeter boundaries. Within this space will be a fire break and access road. Other areas outlined within the site plan will be managed as specified in section 8.1 of the CFA Guideline.
b) The perimeter of control rooms, electricity compounds, substations and all other buildings onsite. The width of fire breaks must be a minimum of 10m, and at least the distance where radiant heat flux (output) from the vegetation does not create the potential for ignition of on-site infrastructure.	✓	All infrastructure is protected by the provision of a 10 metre wide fire break.
Battery Energy Storage Systems		
A fire break must be established and maintained around battery energy storage systems and related infrastructure.	✓	A fire break of 10 metres has been included in the design. The surrounding areas include a works area, substation and solar panels and will also be maintained.
Section 6.2.5 – Design Specific to Facility Type		
Solar Energy Facilities		
Solar energy facilities are to have a minimum six (6) metre separation between solar panel banks.	✓	This has been included within the design.
Battery Energy Storage Systems		
1) The design of the facility must incorporate:		
a) A separation distance that prevents fire spread between battery containers/enclosures and: • Other battery containers/enclosures.	✓	The BESS layout will comply with the manufacturer's specifications which requires certain distances to be maintained between the BESS enclosures. As a minimum the layout is associated with four packs located close to each other with a

• On-site buildings. • Substations. • The site boundary. • Any other site buildings. • Vegetation.		2.4 metre separation between other packs. A walkway is available between the packs of a minimum of 900 mm. Further information is available at the Sungrow website.
b) A fire break around the battery energy storage system and related infrastructure, of a width of no less than 10m, or greater where determined in the Risk Management Plan. Fire breaks must be non-combustible, constructed of concrete, mineral earth or non-combustible mulch such as crushed rock. *The width must be calculated based on the ignition source being radiant heat of surrounding vegetation, including landscaping.*	✓	A fire break of 10 metres is being provided around the entire perimeter of the battery facility This is supported by the vegetation management requirements in and around the Solar Farm along with the perimeter road. The BESS area is also supported by the surrounding road network and the requirement to manage the vegetation under the Solar Panels.
c) A layout of site infrastructure that: i. Considers the safety of emergency responders. ii. Minimises the potential for grassfire and/or bushfire to impact the battery energy storage system. iii. iii. Minimises the potential for fires in battery containers/enclosures to impact on-site and offsite infrastructure.	✓	The BESS is located near the main entrance and is provided with effective separation from the surrounding farming areas. To the east of the BESS area are the solar panels where the fuel will be managed during the fire danger period.
2) Battery energy storage systems must be:		
a) Located so as to be reasonably adjacent to a site vehicle entrance (suitable for emergency vehicles).	✓	This has been included within the design.
b) Located so that the site entrance and any fire water tanks are not aligned to the prevailing	✓	The main entrance is of sufficient distance from the BESS to enable access to the property without being impacted by smoke.

wind direction (therefore least likely to be impacted by smoke in the event of fire at the battery energy storage system.)		Once on the property there are several staging locations that will ensure firefighters will not need to enter the smoke plume. The secondary access point also provides the ability to approach the BESS area from the south if required.
c) Provided with in-built detection and suppression systems. Where these systems are not provided, measures to effectively detect and/or suppress fires within containers must be detailed within the Risk Management Plan.	✓	The BESS will be provided with detection and suppression systems. The smoke detection system and the gas suppression system will be connected to the site monitoring system so that the operators are notified of any activations. The gas suppression system is a Novec1230 system that will likely suppress fires involving electrical equipment and other combustibles. It is designed to activate when the temperature within the Pack reaches 170°C. In addition, the BESS is provided with gas detectors that can identify when the LEL has reached 10%. When this is triggered, the monitoring system will automatically shut down the BESS and activate the exhaust system. The BESS is provided with a dry sprinkler system that can be utilised by firefighters to assist with cooling the internal areas of the Pack. The system is fitted with sprinkler heads that can deliver water to all parts of the Pack.
d) Provided with suitable ember protection to prevent embers from penetrating battery containers/enclosures.	✓	The battery enclosure is designed to prevent spider and other insects from entering the unit. This will also prevent embers from entering the enclosure.
e) Provided with suitable access roads for emergency services vehicles, to and within the site, including to battery energy storage system(s) and fire service infrastructure.	✓	Driveway access will be provided within and around the BESS area.
f) Installed on a non-combustible surface such as concrete.	✓	The battery area and the supporting infrastructure are being stored on a non-combustible surface which will be maintained.
g) Provided with adequate ventilation.	✓	The batteries are stored with sufficient ventilation around and between the pack of containers. They are also designed to provide

		ventilation within the enclosures to maintain the required internal temperatures.
h) Provided with impact protection to at least the equivalent of a W guardrail-type barrier, to prevent mechanical damage to battery containers/enclosures.	✓	There will be various protection systems installed including bollards to ensure the battery enclosures and other infrastructure are protected from damage from vehicles and other equipment.
i) Provided with enclosed wiring and buried cabling, except where required to be above-ground for grid connection.	✓	This has been included within the design.
j) Provided with spill containment that includes provision for management of fire water runoff.	✓	The detailed site design will include the provision for containing fire water runoff. There is sufficient space on the property to ensure the fire water is contained. The fire water containment system will be designed to store at least 288,000 litres of fire water.
Section 7 – Facility Construction and Commissioning		
Section 7.1.4 – Emergency Management		
An Emergency Management Plan must be developed for the construction and commissioning phase of the facility.	✓	An Emergency Management Plan will be developed for both the construction and operations phase.
Section 8 – Facility Operation		
Section 8.1 – Vegetation and Fuel Management		
Facility operators must undertake the following measures during the Fire Danger Period:		
a) Grass must be maintained at or below 100mm in height during the declared Fire Danger Period.	✓	This requirement will be included within the Fire Management Plan and will occur within the fire management area outlined within the site plan.
b) Long grass and/or deep leaf litter must not be present in areas where heavy equipment will be working, during construction or operation.	✓	This requirement will be included within the Fire Management Plan.
c) Restrictions and guidance must be adhered to during the Fire	✓	This requirement will be included within the Fire Management Plan.

Danger Period, days of high (and above) fire danger and Total Fire Ban days (refer to www.cfa.vic.gov.au).		
d) All vehicles and heavy equipment must carry at least a nine (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.	✓	This requirement will be included within the Fire Management Plan.
Section 8.2 – Maintenance		
All Facilities		
Inspection, maintenance and any required repair activities must be conducted for all infrastructure, equipment and vehicles at the facility. Maintenance must be in line with any relevant Australian Standards and the manufacturer's requirements.	✓	This requirement will be included within the Fire Management Plan.
Section 8.4 Facility and System Monitoring		
All Facilities		
Appropriate monitoring for facility infrastructure must be provided, to ensure that any shorts, faults or equipment failures with the potential to ignite or propagate fire are rapidly identified and controlled, and any fire is notified to 000 immediately.	✓	In addition to the detection and suppression systems, the site will be provided with a SCADA system that will monitor the day to day operations of the batteries and associated infrastructure. The system includes a range of sensors that will detect more than 200 faults. The system is preprogramed to send alert messages and includes: • Over temperature • Under temperature • Under voltage warning • Power off fault • Voltage and current changes. These alerts are automatically transmitted to a monitoring centre. There are appropriate

		levels of back up communication systems installed in the event of power failures or other events that may interrupt the communications connections. The site is also provided with CCTV cameras that will enable the operators to check the site if the detection or suppression system is activated.
Section 9 – Fire Management Planning		
All Facilities		
A Fire Management Plan must be developed for the facility, in conjunction with CFA, before commissioning of the facility.	✓	A Fire Management Plan will be developed prior to the commissioning of the BESS. This Plan will be provided to CFA for their consideration and feedback.
Section 10 – Emergency Management Planning		
All Facilities		
An Emergency Management Plan must be developed specific to the facility, in conjunction with CFA, prior to commissioning of the facility.	✓	An Emergency Management Plan will be developed prior to the commissioning of the BESS. This Plan will be provided to CFA for their consideration and feedback.
Section 10.2.1 – Developing an Emergency Information Book		
All Facilities		
An Emergency Information Book must be developed and available to emergency responders. Emergency Information Books must be located in Emergency Information Containers, provided at each vehicle entrance the facility.	✓	An Emergency Information Book will be provided at the site entrances in a container that is protected from weather.

5 Risk Assessment

5.1 Introduction

The risk assessment process involves identifying, analysing, evaluating and treating the identified risks. The overall risk assessment process requires a consistent approach and follows *AS ISO 31000:2018 Risk management – Guidelines* as incorporated into the National Emergency Risk Assessment Guidelines (NERAG). Figure 1 provides an overview of the risk assessment process as outlined within *AS ISO 31000:2018 Risk management – Guidelines*.

Risk management is the process of recognising risk and developing methods to both minimise and manage the risk. This requires the development of a method to identify, prioritise, treat (deal with), control and monitor risk exposures.

A risk assessment is a function of the likelihood of an adverse event occurring and the consequence of the event. A comprehensive risk assessment will identify potential risks and consequences and therefore assist with the development of mitigation actions.

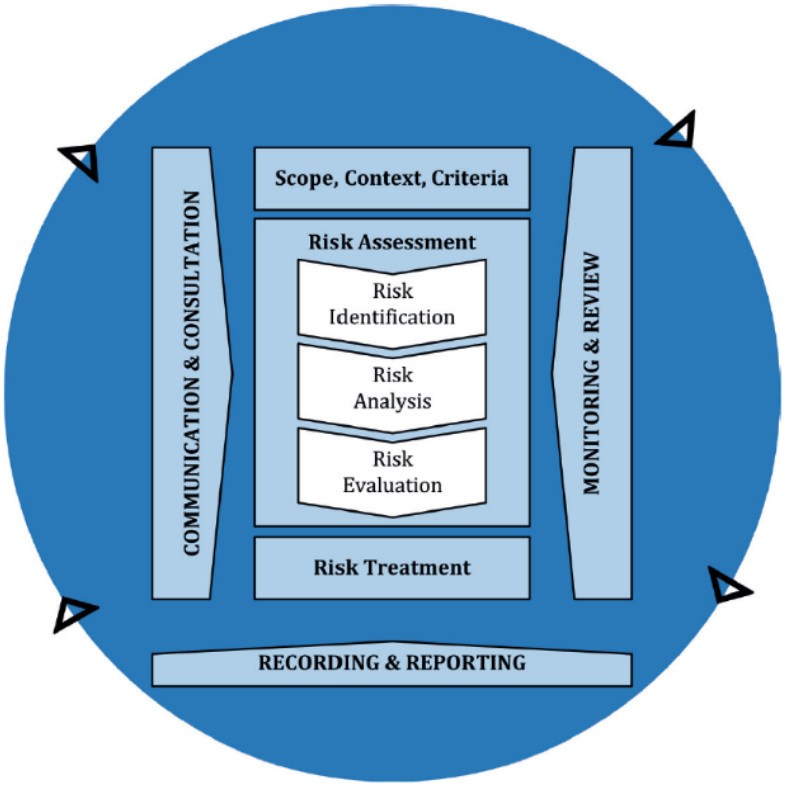


Figure 7 - Overview of AS/NZS ISO 31000-2018 risk management process

This report seeks to follow the steps outlined within the risk management guideline along with the process outlined within NERAG. The outcome of this assessment is a detailed understanding of hazards, the likelihood and consequence of a hazard becoming an emergency, and the treatments identified to manage this risk.

5.2 Context

The assessment of fire risk is a key requirement imposed on the development by CFA through the Planning Permit. The CFA Guideline outlines the types of hazards that may need to be considered in relation to Solar Farm and BESS infrastructure at the design, construction and operation phases.

5.3 Analysis of fire risk

Solar Farm and BESS infrastructure is largely acknowledged as having limited potential to cause fires and is considered reasonably safe. There have been fires previously and these have been considered during the assessment of risk outlined within this report.

It is important the assessment of risk considers the various stages of the project including construction and the operation phase.

5.3.1 Assessment of fire risk during construction

The construction phase includes various stages including site works, construction of footings and the installation of the solar panels and battery units. This stage also includes the commissioning of the technology and other systems including fire protection systems. This ensures the relevant connectivity is installed to ensure that all alerts and system messages are transmitted to an appropriate monitoring location.

A recent fire that occurred at the Victorian Big Battery[4] installation on the outskirts of Geelong has been assessed and reports are available that outlines what occurred and how system manufacturers and installers should be considered in the future. This fire occurred during the commissioning phase of the unit. In summary, the isolation of the unit whilst it contained a charge was considered an incorrect process[5].

5.3.2 Assessment of fire risk during operations

The operations phase follows the commissioning stage of the project, and the role of maintenance becomes critical to ensure that the system operates as it was designed, for the life of the development. The ongoing maintenance of the infrastructure and development is critical to ensure the ongoing management of fire risk.

[4] https://victorianbigbattery.com.au/wp-content/uploads/2022/01/VBB-Fire-Independent-Report-of-Technical-Findings.pdf

[5] https://esv.vic.gov.au/wp-content/uploads/2021/09/VBB_StatementOfFindings_FINAL_28Sep2021.pdf

All the system components are to be considered as critical as they all are contributing to the ongoing safe operations. The system components including monitoring connectivity, fire protection systems, vegetation management, site access controls, battery and other safety systems.

5.4 Risk identification

Through discussions with the client, review of various documentation and the consideration of previous fire history that involved Solar Farms and BESS infrastructure, the following hazards have been identified:

Figure 8 - Hazard identification and description

Hazard	Description
Electrical hazards causing a fire	Electrical faults and/or hazards can be a key cause of fire in Solar Farm and BESS infrastructure. BESS hazards including battery faults, overcharging, rapid discharge, loss of remote monitoring systems, internal short circuits and overheating. These causes can result in thermal runaway occurring. Solar Panel hazards include faulty wiring and connections.
Fire causing spread to adjoining infrastructure on the property	A fire that has started in the development may spread to adjoining infrastructure or surrounding facilities. Rapid escalation of the fire size and complexity can create issues for onsite staff and contractors, firefighters and the community.
Fire causing offsite impacts	Any fire on the property that can spread to adjoining properties most likely through vegetation connectivity, on bushfire risk days can start fires in the surrounding landscape that can threaten the community.
Offsite fire impacting on the site	A bushfire burning through the surrounding landscape can enter the property and threaten the infrastructure by potentially starting new fires.
Dangerous Goods	The BESS have dangerous goods that incudes the Lithium Ion and refrigerant.
Fire water runoff	In the event of a fire, firefighters will respond and use water to either extinguish or cool the surrounding area until the infrastructure is deemed safe.
Staff and firefighters	The response to a fire by staff, contractors or firefighters can be dangerous due to the various safety hazards associated with a fire in this type of infrastructure.

The above list may not be exhaustive however it is believed that it will allow the assessment of most hazards that may be encountered in a development of this type.

5.5 Risk analysis

The analysis of risk requires the consideration of the likelihood and consequence of an event occurring and measuring this against a predetermined matrix to enable the consideration of each risk both individually and collectively.

For this assessment, a 3 x 3 matrix has been developed that enables the effective consideration of risk and to enable a comparison between the outcome of the hazard assessment.

5.5.1 Likelihood

An assessment of the likelihood of a fire occurring at this development including the potential to impact on people and other infrastructure/property is a key part of the risk assessment. The following will be considered during the assessment of an event occurring:

- Potential for an unplanned fire to occur
- Potential for this ignition to develop and exhibit significant fire behaviour
- Potential for that fire to destroy assets
- Potential for people to be affected or threatened
- The potential for it to develop into a major fire.

Recommendations for mitigation actions in the area may be determined by a number of approaches depending on the level of assessed risk. Strategies to lower risk are provided to ensure the risk is managed to an acceptable level.

An assessment of likelihood considers factors such as:

- Sources of ignition
- Use of the property and/or surrounding area
- History of ignitions within similar infrastructure
- Ability to spread from the property.

Table 5 - Likelihood table

Likelihood scale frequency	Description
Very Likely	Almost certain and will definitely occur, and /or high level of recorded incidents, or there is a strong likelihood that the event will occur.
Likely	High probability it may occur; and/or some recorded incidents.
Unlikely	It is not expected to occur, but it is not impossible.

5.5.2 Consequence

Consequence refers to the potential damage that could result from a fire occurring in relation to people and assets. In assessing the possible consequences, the assessment considers a variety of hazard, exposure and vulnerability factors including:

- The likely number of people at the facility
- The proximity of other assets
- The location of surrounding properties and the type of activities
- Response capability if an event occurred.

The consequence scale refers to the potential impacts which could occur should a fire occur.

Table 6 - Risk assessment consequence table

Consequence scale	Description
Major	• Significant consequences that may include long term closure of the site, major damage or effect. • Loss of life and/or significant injuries that cause disability. • Major offsite impacts causing destruction of other assets or life loss.
Moderate	• Moderate loss of property with the facility operating again in the short term. • Medical treatment may be required but no fatalities or long term affects. • Localised damage that can be rectified. • Some environmental impact with short to long-term effects.
Minor	• Minor or negligible consequences or effects. • Isolated damage to property with no ongoing impact on operations. • First aid injuries with no hospitalisations required. • Impact on the environment with short term effects.

The risk rating table is used to combine likelihood and consequence to obtain a risk score. The risk score is used to aid decision making by determining which areas are at the greatest risk of a fire starting and spreading through the estate. Actions can be prioritised using this method to determine where risk mitigation works will occur.

Table 7 - Risk rating table

RISK RATING TABLE			
	CONSEQUENCE		
	Minor	**Moderate**	**Major**
LIKELIHOOD	Minor or negligible consequences or effects. Isolated damage to property with no ongoing impact on operations. First aid injuries with no hospitalisations required. Impact on the environment with short term effects.	Moderate loss of property with the facility operating again in the short term. Medical treatment may be required but no fatalities or long term affects. Localised damage that can be rectified. Some environmental impact with short to long-term effects.	Significant consequences that may include long term closure of the site, major damage or effect. Loss of life and/or significant injuries that cause disability. Major offsite impacts causing destruction of other assets or life loss.
Very Likely: Almost certain and will definitely occur, and /or high level of recorded incidents, or there is a strong likelihood that the event will occur.	Medium	Very High	Extreme
Likely: High probability it may occur; and/or some recorded incidents.	Medium	High	Very High
Unlikely: It is not expected to occur, but it is not impossible.	Low	Medium	High

The outcomes of the risk assessment are used to inform the recommendations. These are aimed at providing guidance to management to reduce the fire risk at the property.

5.5.3 Risk analysis worksheets

The following worksheets have assessed the hazards identified in section 5.4 and results in a risk classification along with strategies to lower risk if it is deemed required. The initial assessment of risk is based on the information that has been supplied to date. The development of additional strategies to lower risk are made as either there was no information provided that identified the treatment or further clarity is required to considered.

Table 8 - Risk assessment - Electrical hazards causing a fire

RISK	Electrical hazards causing a fire
CAUSE	Electrical faults and/or hazards can be a key cause of fire in Solar Farm and BESS infrastructure. Hazards including battery faults, overcharging, rapid discharge, loss of remote monitoring systems, internal short circuits and overheating. Solar Panel hazards include faulty wiring and connections. In response to the hazards, thermal runaway may occur which is where the battery is not able to cool itself and emits flammable gases which may ignite if they come in contact with an ignition source.
LIKELIHOOD	Likely
JUSTIFICATION	There are some examples of fires within BESS technology that indicates that when faults occur, they can escalate into a thermal runaway event. Solar Farms have also experienced fire events and are usually as a result of faulty wiring or connections. The BESS and Solar Farm technology will comply with the CFA Guidelines which ensures that the technology meets the relevant Standards and Codes. The chosen battery technology has been tested and meets the requirements of UL9540A. The BESS and other infrastructure will be maintained as per the manufacturers specifications.
CONSEQUENCE	Moderate
JUSTIFICATION	The consequence of an electrical hazard causing a fire is limited due to the various risk treatments that are required by the CFA Guideline including: • Non-combustible surface that won't support fire spread through vegetation accumulation • Monitoring system that will send alerts to the monitoring centre • Compliance with UL9540A • Appropriate separation between battery containers and other infrastructure • Within the BESS a smoke detection and fire suppression system connected to a Fire Indicator Panel that will alert the monitoring centre • Solar Farm layout that ensures there is separation provided across the development.
RISK RATING	High

STRATEGY TO LOWER RISK	The requirements outlined within the response to the CFA Guideline will be sufficient to ensure the risk doesn't increase beyond medium. The additional requirements include:
	• Development of Emergency Management Plan that includes in addition to that required by CFA:
	  ○ A system to communicate effectively between the monitoring centre and the onsite staff and contractors.
	  ○ Provision of 24/7 contact details for the fire brigade to contact in the event of an emergency or threat of an emergency.
	• Developing a procedure that requires a technician to be deployed to the site when the site monitoring communications are down.

	• The site monitoring system will indicate the early stages of a fault or emergency event and provides the ability to commence shut down procedures remotely from the site.
RESIDUAL RISK	Medium (unlikely/moderate)

Table 9 - Risk assessment - Fire causing spread to adjoining infrastructure on the property

RISK	Fire causing spread to adjoining infrastructure on the property
CAUSE	A fire that has started in a single battery unit or a connection within the Solar Farm may spread to adjoining batteries, facilities or other infrastructure. Rapid escalation of the fire size and complexity can create issues for onsite staff and contractors, firefighters and the community.
LIKELIHOOD	Unlikely
JUSTIFICATION	The monitoring systems that will be installed will send alerts to the monitoring station. These include smoke detection and fire suppression systems and the day to day monitoring system. These systems are monitored 24/7 and when a faut or activation is detected, they operator will have a range of options available including shut down, respond a technician, or access the CCTV cameras to check on the site. The battery system is provided with a detailed operating manual that outlines the likely cause of an alert and how the operators are to respond. This also includes the procedures to follow if a smoke detector or the fire suppression system is activated. The site procedures will include a provision that ensures all alerts are addressed within two hours of activation. This will also include an immediate response to any smoke detector or fire suppression system activation. Upon activation of the fire protection systems, the monitoring centre will determine an appropriate response that may include: • Notify the on-call technician to attend the site. • Call 000 and report the activation to the fire brigade in addition to notifying the on call technician to attend. These procedures will be included within the Emergency Management Plan and reviewed by CFA. The battery system enclosure is non-combustible and will provide a level of protection if a fire does occur inside the enclosure. If a fire occurs in an adjoining area of the site, the same enclosures will provide a level of protection. The majority of the infrastructure that supports the BESS and the Solar Farm has low quantities of combustible materials.
CONSEQUENCE	Minor
JUSTIFICATION	The consequence of a fire affecting adjoining areas of the plant is likely to be minor. The various protection systems, separation between the infrastructure and early notifications and other treatments will ensure that early intervention can occur.
RISK RATING	Low
STRATEGY TO LOWER RISK	Due to the low rating, no additional strategies are required to be implemented beyond compliance with the CFA Guideline as outlined in Section 4.
RESIDUAL RISK	Low

Table 10 - Risk assessment - Fire causing offsite impacts

RISK	Fire causing offsite impacts
CAUSE	Any fire on the property that can spread to adjoining properties most likely through vegetation connectivity, on bushfire risk days can start fires in the surrounding landscape that can threaten the community.
LIKELIHOOD	Unlikely
JUSTIFICATION	The compliance with CFA Guidelines requires a range of mitigation strategies implemented including: • Provision of a fire break and additional managed area between the fire break and the boundary fence. • The battery systems are contained within the metal cabinets and any fire activity will mostly stay within the cabinets. • All solar panels are setback at least 20 metres from the boundary fence. • The monitoring system provides for early notification of a fault and will have the ability to remotely shut down the site if required. In addition to the CFA Guideline requirements, the small patches of vegetation that is being retained on the property are disconnected from each other by areas that will be maintained to less than 100mm during the fire danger period.
CONSEQUENCE	Minor
JUSTIFICATION	The Clause 13.02 assessment has identified the limited risk for a fire to spread from the site into the surrounding landscape. The creation of a fire break on the property and the low fuel loads in the surrounding landscape will reduce the potential for a fire to leave the property.
RISK RATING	Low
STRATEGY TO LOWER RISK	The site Emergency Management Plan will include a procedure for contacting the Municipal Fire Prevention Officer (MFPO) if the vegetation on adjoining properties becomes a fire risk. The MFPO may, following an assessment issue a Notice requiring the vegetation to be managed. Any vegetation growth on the property will be managed and removed. During the fire danger period, additional inspections will occur to ensure that all weeds and other vegetation is removed from the fire break and other areas.
RESIDUAL RISK	Low

Table 11 - Risk assessment - Offsite fire impacting on the site

RISK	Offsite fire impacting on the site
CAUSE	A bushfire burning through the surrounding landscape can enter the property and threaten the infrastructure by potentially starting new fires.
LIKELIHOOD	Unlikely
JUSTIFICATION	The Clause 13.02 assessment has identified the low risk landscape which has been supported by the review of the MFMP and other bushfire strategies. The risk within the surrounding landscape is influenced by the presence of the Macalister Irrigation District which results in large areas that are maintained with high moisture content to support various framing activities. The provision of a firebreak and other managed areas will limit the ability for a bushfire to impact on the property. The assessment in accordance with AS3959 has identified small areas of the western edge of the development where the infrastructure could be impacted by more than 12.5 kW/m². However, the majority of the development is located within areas that will experience less than 12.5 kW/m².
CONSEQUENCE	Major
JUSTIFICATION	The ability for a bushfire to generate the radiant heat levels indicated above is rare as it requires conditions to result in a fire danger index of FDI100. However, if it occurs it could cause some damage on the infrastructure that may result in site closure until the panels and other infrastructure are replaced. It is highly unlikely that the BESS area will experience this level of radiant heat. It is highly unlikely for flame contact to impact on the development infrastructure from a bushfire in the surrounding landscape.
RISK RATING	High
STRATEGY TO LOWER RISK	Within the Fire Management Plan ensure the following is included: • When either an extreme or catastrophic day is forecast, ensure all vegetation maintenance activities are up to date. The Emergency Management Plan will include additional requirements on the site operators to ensure that when the weather is forecast to be extreme or catastrophic, additional monitoring will occur and strategies implemented if a bushfire is reported in the surrounding area.
RESIDUAL RISK	Low

Table 12 - Risk assessment - dangerous goods

RISK	Dangerous goods
CAUSE	Dangerous goods within the BESSs may either leak or ignite and cause a health and safety risk to the occupants and/or responding firefighters. The dangerous goods on the property relates to the lithium-ion that is stored within the battery packs. There is approximately 6,000 kgs per battery pack of lithium-ion which results in approximately 48,000 kgs across the BESS area. The liquid cooling system utilises a coolant that is not classified as a dangerous good.
LIKELIHOOD	Unlikely
JUSTIFICATION	The battery packs are provided with several sensors that produces numerous alerts that are transmitted to a monitoring centre. The alerts will activate a response that is tailored to each of the alerts. This may include the dispatch of a technician to the site or shutting the BESS off. The battery packs are also fitted with a gas, smoke and thermal detectors that upon activation, will also trigger pre determined processes. This includes the review of the onsite CCTV monitoring system.
CONSEQUENCE	Minor
JUSTIFICATION	Following the assessment of dangerous goods quantities, the amount of lithium-ion triggers the requirement for placarding, manifest and a review of fire protection by CFA in accordance with the Dangerous Goods (Storage and Handling) Regulations. It is highly unlikely for the BESS to ignite from either a fire internally or from a bushfire. The battery pack is designed to prevent dust and insects from entering the enclosure. This design also limits the potential for embers to enter the battery pack resulting from a bushfire.
RISK RATING	Low
STRATEGY TO LOWER RISK	In accordance with the Dangerous Goods (Storage and Handling) Regulations (2012), the fire brigade's views must be sought if the quantities have exceeded the fire protection amounts listed in Schedule 2 as is the case for the Lithium-Ion. As noted earlier the fire brigade (CFA) has been consulted in respect to the Dangerous Goods in relation to the Proposal. Further consultation to confirm the outcomes of this assessment will occur prior to construction and will be ongoing throughout the life of the Proposal. The Emergency Management Plan will include details of the hazards associated with dangerous goods and appropriate procedures in response to this RMP and other response arrangements to Dangerous Goods related emergencies.
RESIDUAL RISK	Low

Table 13 - Risk assessment - Fire water runoff

RISK	Fire water runoff
CAUSE	In the event of a fire involving the BESS, firefighters will respond and use water to either extinguish or cool the surrounding area until the infrastructure is deemed safe.
LIKELIHOOD	Unlikely
JUSTIFICATION	As outlined in previous assessments, the risk of a large fire is very low and unlikely. This is due to the separation between various areas of the BESS and the extensive use of non-combustible materials. The smoke detection system that is monitored 24/7 will also alert technicians and if required, the fire brigade to the site early. The site has available areas where the fire water can be contained prior to it being collected by an authorised company. The final BESS design will include consideration of fire water runoff and ensure appropriate provision is made in the site layout and design.
CONSEQUENCE	Minor
JUSTIFICATION	Due to the remoteness and size of the site, there are a number of options available to contain fire water runoff and ensure that is not able to enter waterways or areas off site.
RISK RATING	Low
STRATEGY TO LOWER RISK	Fire water runoff design considerations will be included within the final design and CFA will be consulted.
RESIDUAL RISK	Low

Table 14 - Risk assessment – Staff and firefighters

RISK	Staff and firefighters
CAUSE	The response to a fire by staff, contractors or firefighters can be dangerous due to the various safety hazards associated with a fire in this type of infrastructure.
LIKELIHOOD	Likely
JUSTIFICATION	There is the potential for firefighters and/or staff and contractors to be present during an emergency event and not being familiar with the site. The CFA Guideline does suggest a variety of controls for the management of the site through the Emergency Management Plan and how CFA interacts with the site if they are called to a fire. The potential for a fire to occur whilst a low risk, if it does occur, there is the potential for a firefighter to arrive who is unfamiliar with property and the technology installed.
CONSEQUENCE	Moderate
JUSTIFICATION	The provision of an Emergency Information Container that will include the Emergency Management Plan, site plans and contact details for technical specialists will ensure responding firefighters seek information prior to entering the property.
RISK RATING	High
STRATEGY TO LOWER RISK	The arrangements for monitoring the Fire Indicator Panel through the operators monitoring centre will ensure that an informed decision can be made following an assessment of the alerts being received. In all cases a technician will be dispatched to the site to review the alert at the BESS. Any faults that are sent to the monitoring centre will be assessed and a technician deployed to make an initial assessment. The Emergency Management Plan will include a requirement to engage with the responding firefighters early to ensure they are aware that a technician is on their way and that entry to the site can wait until they arrive unless there is a life or property protection emergency. The Emergency Information Container that is required by the CFA Guidelines will provide detailed contact information for responding firefighters to seek specialist advice prior to accessing the property. The manufacturers specification outlines the requirement to install appropriate warning signage around the BESS to alert people to the safety risks.
RESIDUAL RISK	Medium

6 Conclusion

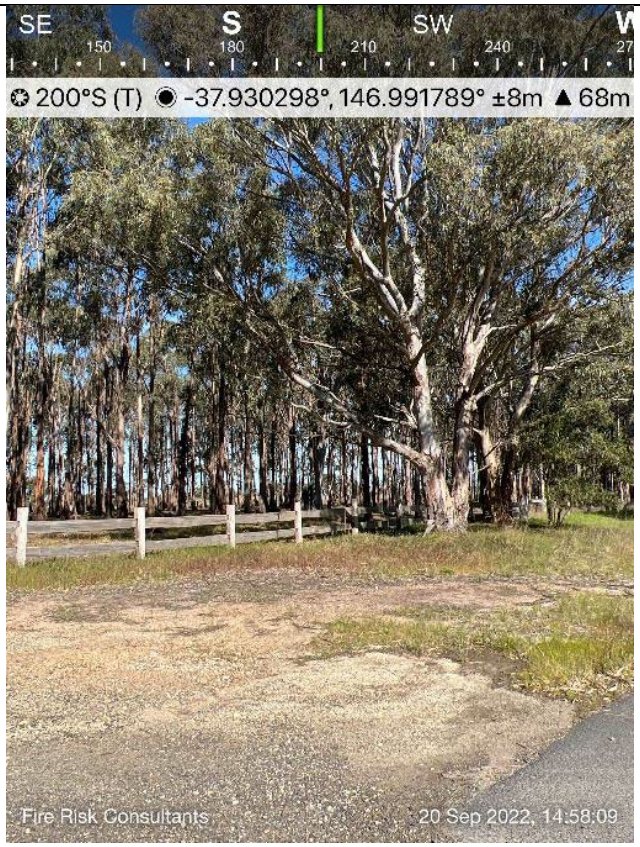
The assessment of risk for the Solar Energy Facility has identified that this development can occur safely providing the requirements outlined within this Risk Management Plan are implemented. This report has determined that the surrounding landscape presents a low risk to the development and there are various treatments in place that will limit a bushfires ability to spread rapidly.

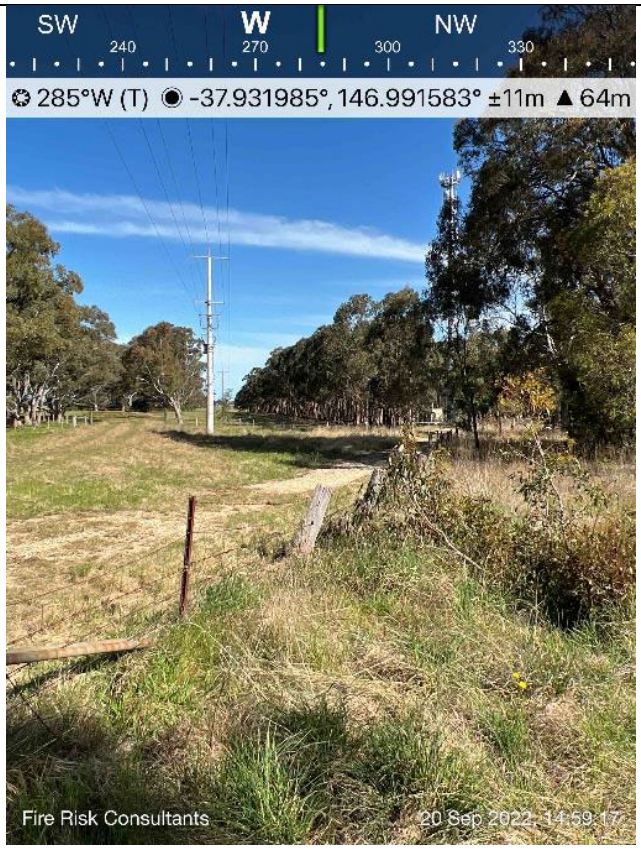
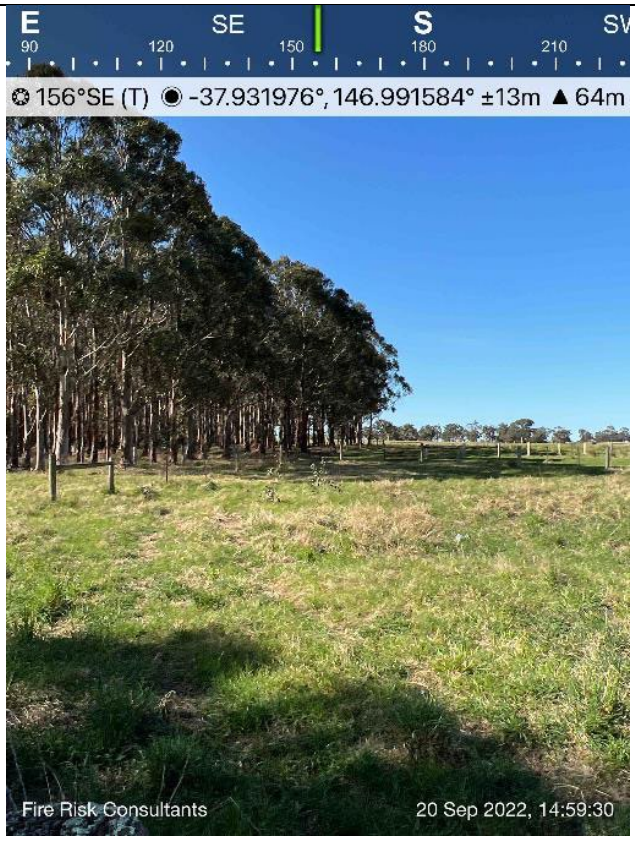
The layout has been designed in accordance with the CFA Guideline. The additional requirements following the Planning Permit approval will further strengthen the management of fire risk on the site including the development of a Fire Management Plan and Emergency Management Plan that meets the requirements of the CFA Guideline.

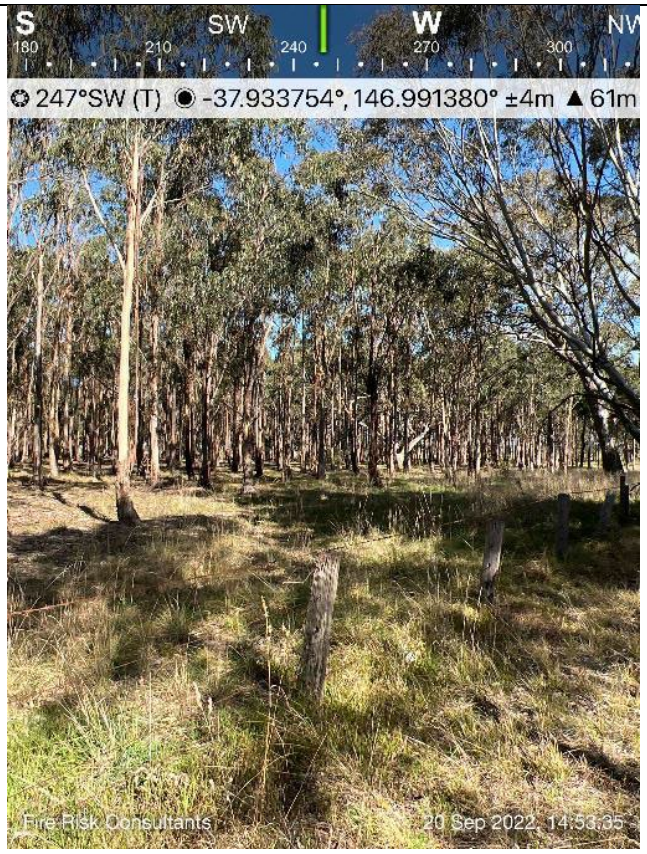
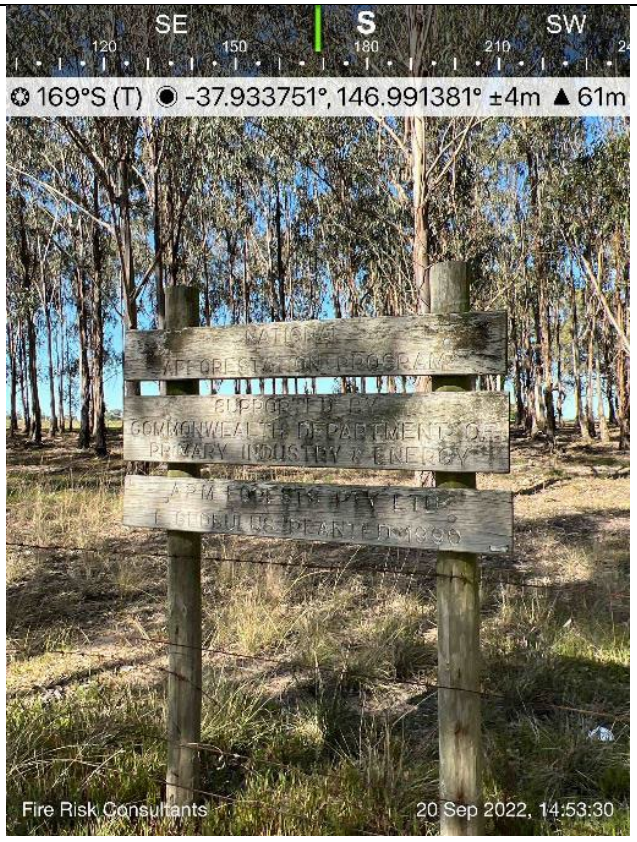
The assessment of fire history in relation to Solar Farms and BESS infrastructure identifies limited examples of where these systems have caused fires. There is no doubt that a Solar Farm and BESS development can present fire risks if not designed, constructed, commissioned and operated effectively. The importance of following design requirements and committing to the ongoing maintenance of the system is critical to reduce fire risk.

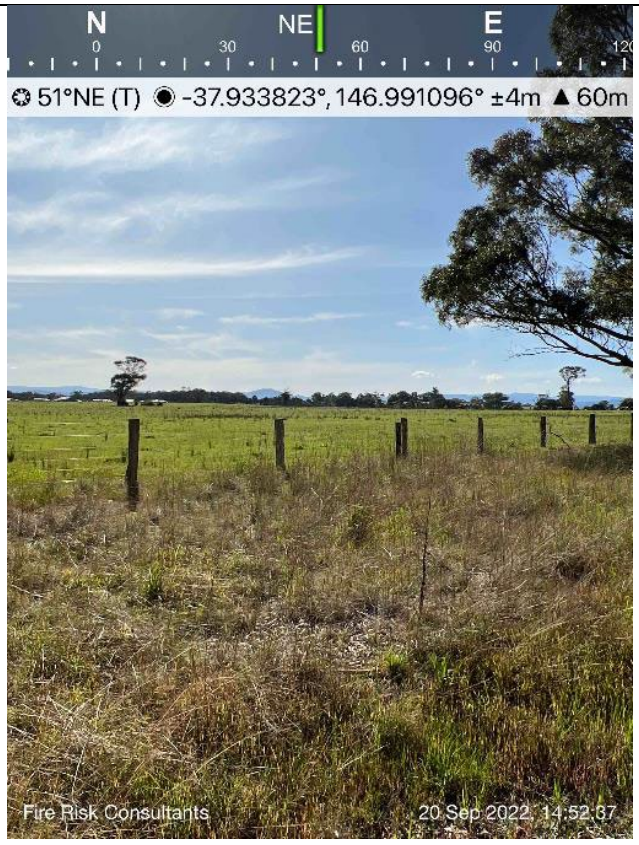
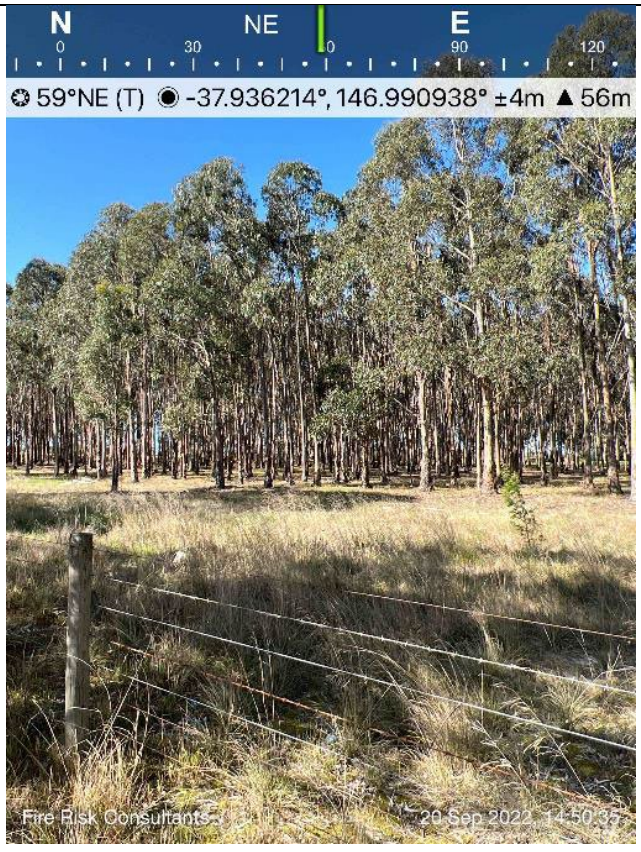
The results of this assessment should provide confidence that the operator of the Solar Farm will introduce systems, procedures and maintenance programs to ensure fire risk is managed.

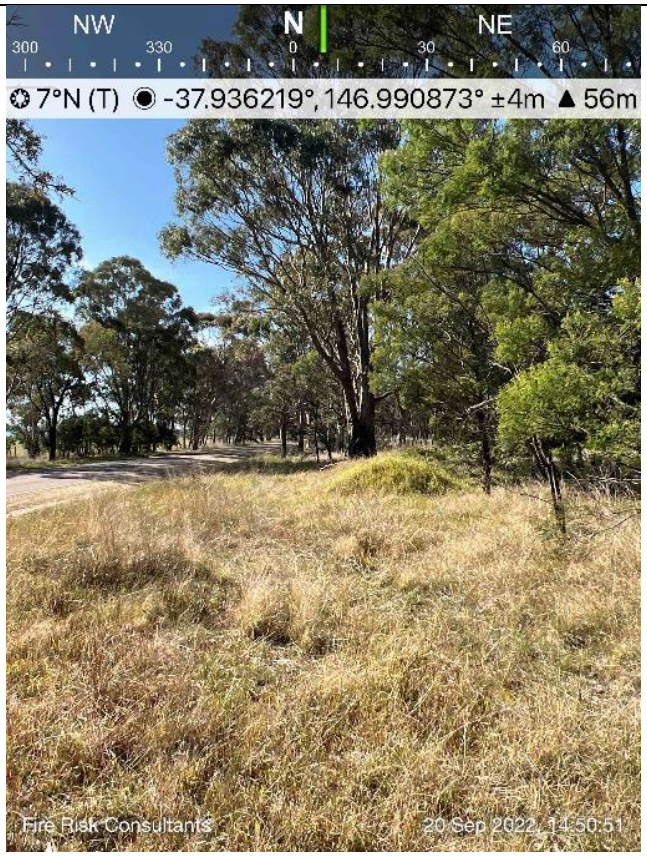
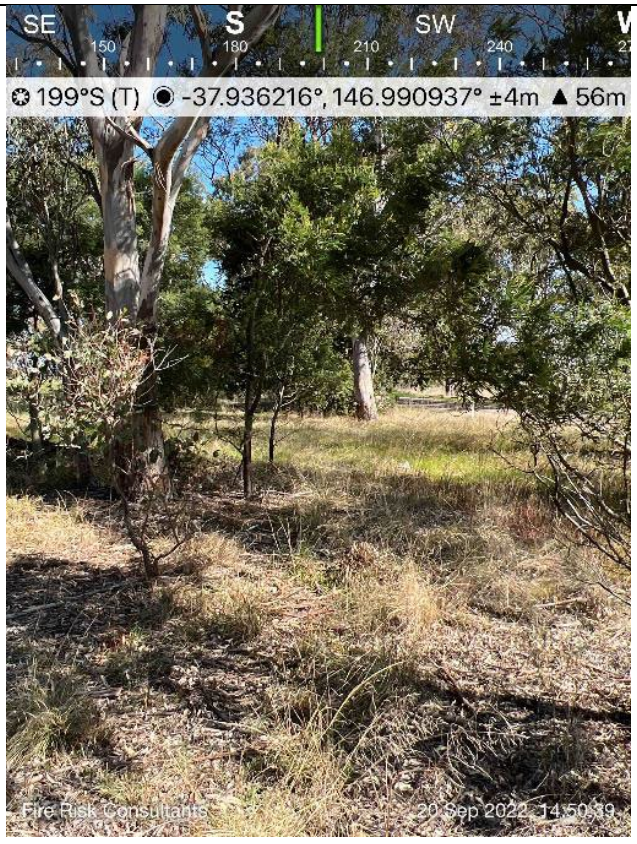
Appendix 1 – Site photos

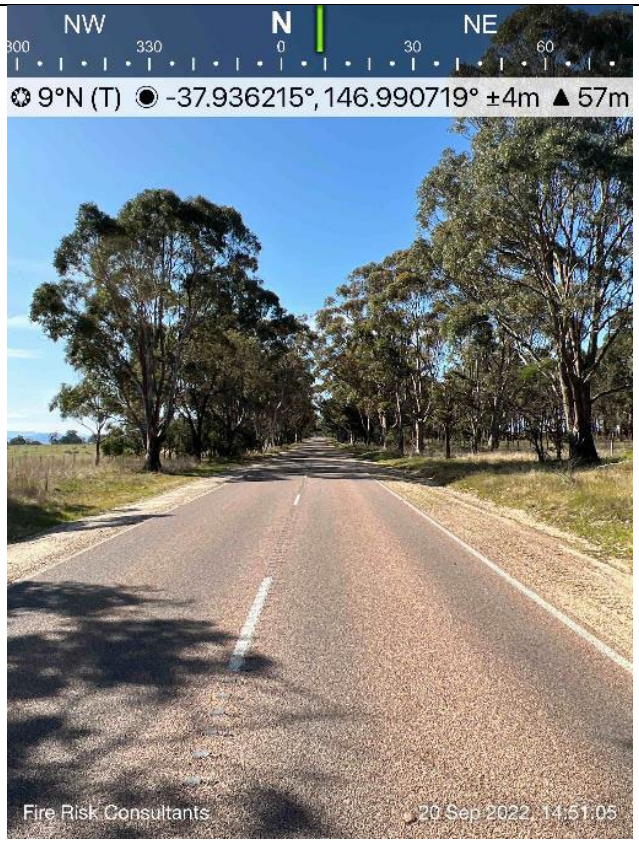
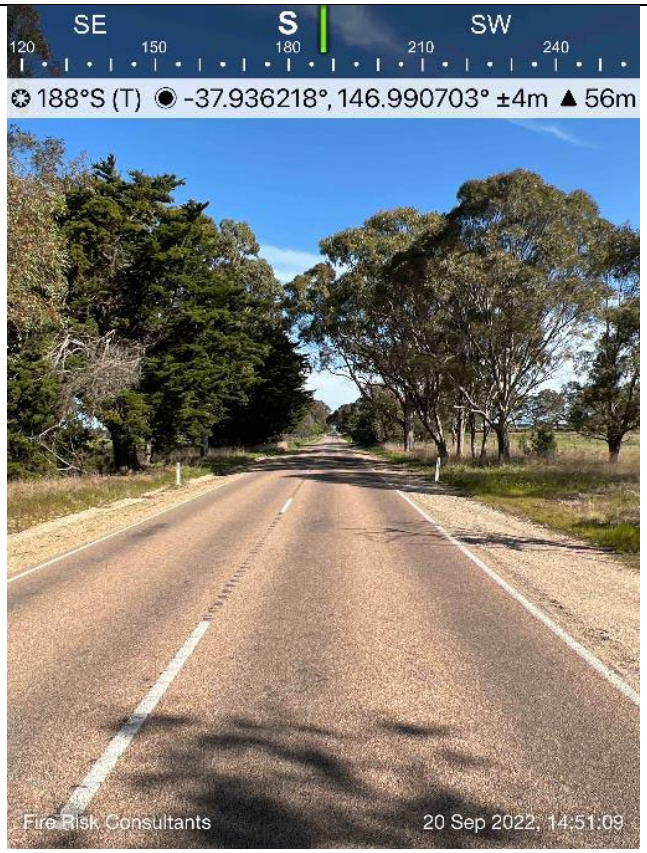
1 Looking south towards one of the small plantation areas.	
2 Example of a plantation area with very little vegetation on the ground.	

3 Existing powerline easement	
4 Southern edge of the northern plantation. Lack of undergrowth can be seen in the photo.	

5 Typical plantation to the west of the development.	
6 Signage indicating the plantation was planted in 1990.	

7 Typical vegetation in the surrounding paddocks.	
8 Typical plantation vegetation.	

9 Typical roadside vegetation.	
10 Typical vegetation on the roadside.	

11 Looking north along Maffra-Briagolong Road.	
12 Looking south along Maffra-Briagolong Road.	

13 Typical vegetation to the south west of the development site.