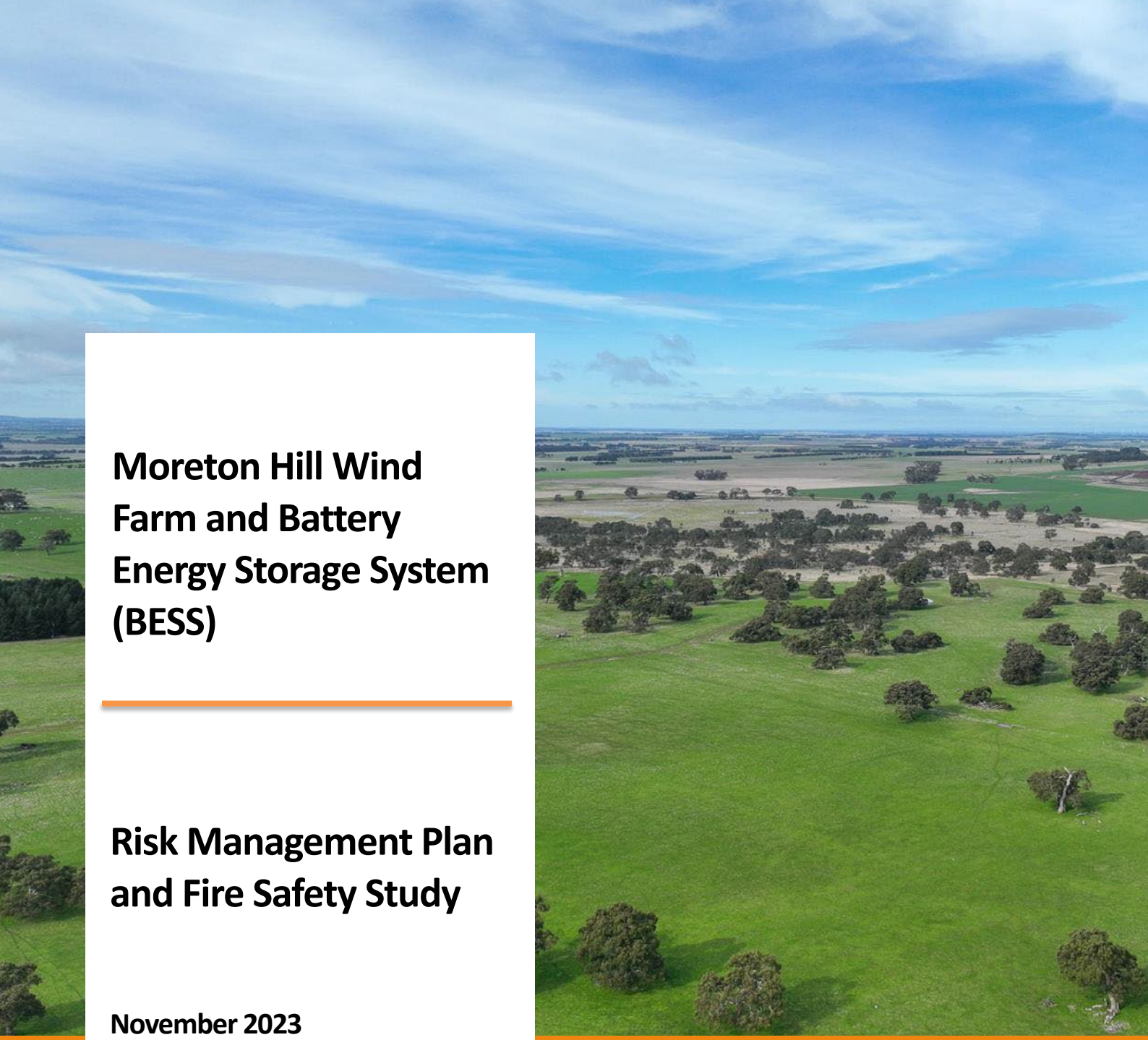


Moreton Hill Wind Farm and Battery Energy Storage System (BESS)

Risk Management Plan and Fire Safety Study

November 2023

FIRE RISK Consultants

Cover photo – View of the typical landscape within and surrounding the proposed Moreton Hill Wind Farm and BESS. (Fire Risk Consultants)

Document history and date

Revision	Date	Description	By	Review	Approved
V0.1 - DRAFT	1/8/2023	Initial draft following assessment of available information and detailed site visit.	M Potter & FRC Project Team	FRC Review Team	G Taylor Managing Director
V1.0	9/8/2023	Updated following client feedback.	M Potter & FRC Project Team	FRC Review Team	G Taylor Managing Director
V2.1	4/10/2023	Updated following changes to site layout.	M Potter & FRC Project Team	FRC Review Team	G Taylor Managing Director
V2.2	6/11/2023	Updated following minor changes.	M Potter & FRC Project Team	FRC Review Team	G Taylor Managing Director

Fire Risk Consultants
PO Box 12, Glengarry VIC 3854
0487 790 287
www.fireriskconsultants.com.au

Disclaimer and Information Statement

This report is issued by Fire Risk Consultants Pty Ltd and the information in this report is current as at the date of publication. Any Bushfire Emergency Plan or Bushfire Response Plan is current only at the date of issue as it is up to you to maintain the Australian Standard AS3959:2018 (or equivalent) and AS3745:2018 (or equivalent) for the property and/or building. Failure to maintain the property and/or building to these standards may compromise an insurance policy if currently covering any of your assets or those of any third party that may be consequentially affected due such failure. If not insured, and if you are seeking insurance, this report may not influence the decision of any insurer not to offer cover. To the extent permitted by law, Fire Risk Consultants Pty Ltd will not be held liable for any claims, demands, costs or expenses for any personal injury, property damage or death arising out of failure by you to maintain the property and/or building to AS3959:2018 (or equivalent) and AS3745:2018 (or equivalent).

The information and/or the recommendations contained in this report have been compiled and based on the information, records, data and any other sources of information supplied by you. Whilst we have exercised all due care and skill in compiling the report, you should confirm the accuracy and reliability of the information and material we have relied upon in producing the report. The information contained in the report is confidential and you should only read, disclose, re-transmit, copy, distribute or act in reliance on the information as you are authorised to do so. This report may also contain information, systems or data which is the property of Fire Risk Consultants Pty Ltd and Fire Risk Consultants Pty Ltd has in no way waived or altered in any way its ownership right, or provided consent for use by the report recipient, unless expressly provided in the report.

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 Executive Summary

The Moreton Hill Wind Farm and BESS project proposes to develop up to 62 Wind Turbine Generators (WTG) and a Battery Energy Storage System (BESS) and associated infrastructure approximately 6 kilometres to the south east of Skipton in western Victoria.

The project covers approximately 6,200 hectares of private land between the townships of Pittong, Skipton, Bradvale and Linton. The project is within both the Corangamite and Golden Plains Shires.

To assess the risk of fire in relation to the Wind Farm Site, this Risk Management Plan (RMP) has been developed to consider fire risk associated with bushfire and a fire starting within the proposed infrastructure. The RMP follows the guidance provided by CFA in their *Design Guidelines and Model Requirements: Renewable Energy Facilities 2022* (CFA Guideline). It also includes the assessment of bushfire risk in accordance with Clause 13.02-1S of the Corangamite and Golden Plains Planning Schemes.

The assessment of bushfire risk has identified a landscape that is consistent with much of south west Victoria. The surrounding landscape has experienced large bushfires in the past. Whilst the area of the proposed wind energy facility and BESS has not been impacted by large bushfires, there is no doubt that bushfires can occur under elevated fire danger conditions in this landscape. The assessment of bushfire risk in this report has resulted in recommendations for a range of mitigation treatments that align with the CFA Guideline.

This report contains an assessment of fire risk within the Wind Energy Facility (WEF) including the wind turbine nacelle, office compound and the BESS, and identifies the low risk associated with these types of development. This low risk in addition to the mitigation treatments outlined within the CFA Guideline, ensures a high level of fire safety in a WEF and BESS.

The outcome of the risk assessment has recommended a range of mitigations to manage fire risk including:

- Installation of static water supply tanks spread across the WEF and the BESS area that complies with the CFA Guidelines and *AS2419.1:2005 Fire hydrant installations* (AS2419.1).
- Provision of fire breaks around the base of the wind turbines, BESS, substation and the operations and maintenance area.
- Installation of smoke detection and fire suppression systems within the nacelle.
- Installation of fire safety systems within the BESS enclosures that is based on the manufacturer specifications and results of the UL9540A test.
- Provision of access tracks including overtaking bays.
- Ongoing maintenance programs for the life of the project in accordance with the relevant Standards or manufacturer specifications.

The outcome of the risk assessment has indicated that the project can occur in this landscape and not increase the risk of fire to surrounding communities, farming assets and other infrastructure.

2 Introduction

Fire Risk Consultants have been engaged to develop an RMP for the proposed Moreton Hill Wind Farm and BESS located between the townships of Pittong, Skipton, Bradvale and Linton. The Wind Energy Facility (WEF) consists of up to 62 wind turbine generators, a BESS and associated infrastructure including a site substation, access tracks, underground cabling, overhead lines and underground transmission powerlines that will connect to the Berrybank terminal station. The proposed Moreton Hill WEF and BESS is within both the Corangamite and Golden Plains Shires in south-western Victoria.

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). CFA engagement will occur once the plan has been approved by the project design team. The RMP has been developed to provide sufficient information for CFA to make an informed decision on fire risk related matters. It is expected that the Planning Permit will require a Fire Management Plan (FMP) and Emergency Management Plan (EMP) in accordance with 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 Wind Energy Facility. 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.

3 Project Overview

The proposed Moreton Hill Wind Farm (the project) comprises up to 62 wind turbines and associated permanent and temporary infrastructure, including:

- Hardstand areas, with several temporary hardstand areas of 90 metres x 320 metres and permanent hardstand areas of 75 metres x 50 metres around each wind turbine.
- Access tracks.
- Creation of several access points from the public roads leading to the wind turbines.
- Four permanent anemometry masts.
- Substation.
- Battery Energy Storage System.
- Site compounds.
- Approximatley 14 kilometres of underground transmission line (220kV) that provides a connection to the Berrybank Terminal Station.
- Temporary infrastructure including construction compounds, wind turbine component laydown areas and, concrete batching plants.
- An operations and maintenance facility to provide office, storage and maintenance facilities.

4 Existing conditions assessment

4.1 Site description and location

The Wind Energy Facility is spread over approximately 6,200 hectares and is in south-west Victoria between the townships of Skipton and Linton. The project involves the construction, commissioning and operation of up to 62 wind turbine generators (see Figure 1), BESS and associated infrastructure.

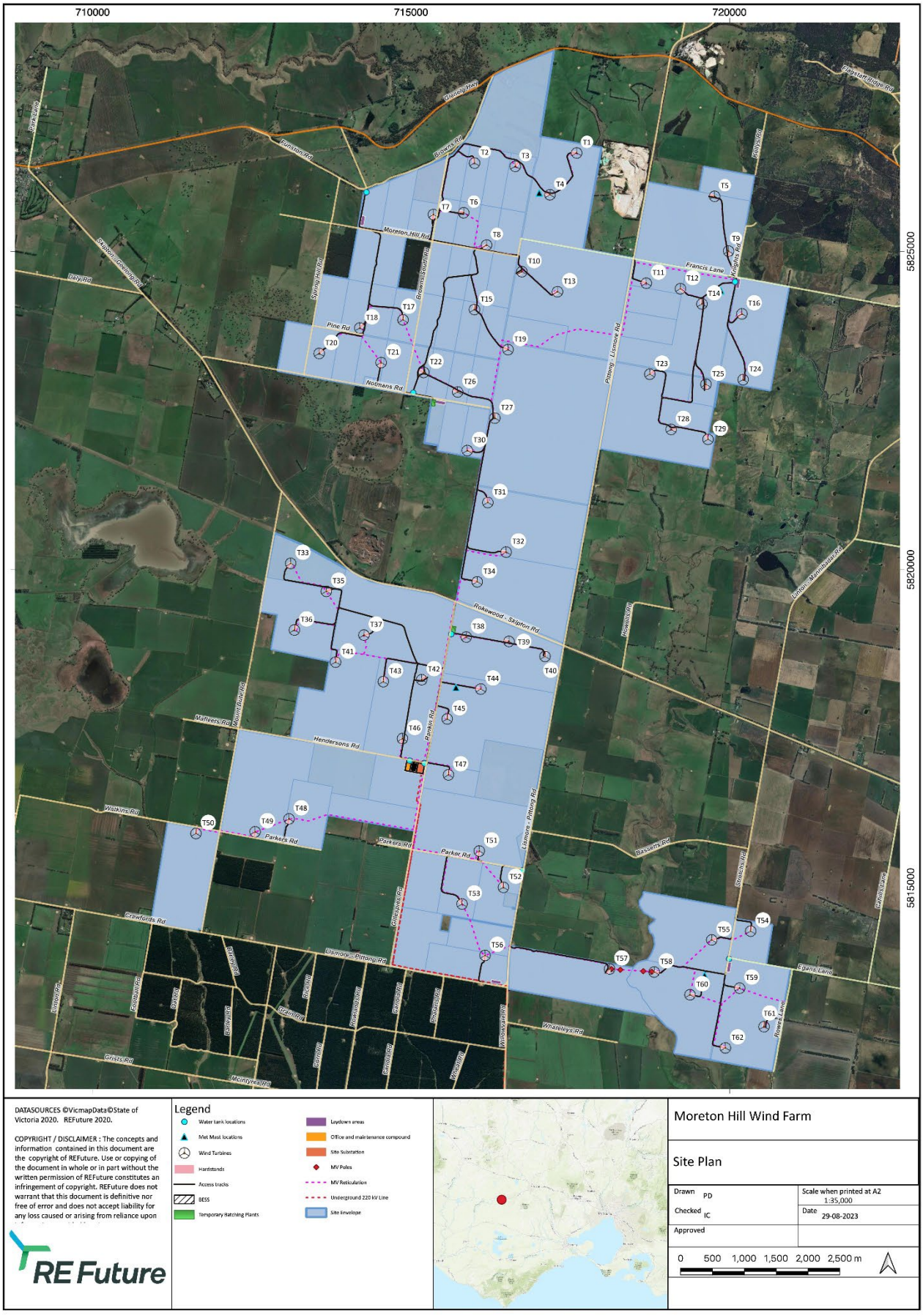


Figure 1 - Overview of the Moreton Hill Wind Farm (supplied by RE Future)

4.2 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 bushfire risk that exists in the surrounding area.

4.2.1 Bushfire Management Overlay

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

The criteria[1] to determine if a BMO should be implemented includes the identification of vegetation that may include forest, woodland, scrub, shrubland, mallee and rainforest vegetation that is 4 hectares or more in size. Once this is confirmed, a 150 metre buffer is applied from the edge of vegetation. Fire authorities also have the ability to advise locations that may be subject to extreme landscape bushfires.

Figure 2 outlines the location of the BMO in relation to this Wind Farm Site. The BMO has not been updated following the removal of Plantations that were in place when the BMO was mapped. The area that this relates to is to the south of Moreton Hill Road. Most of the landscape that is covered by the BMO in this area is no longer a Plantation and is utilised for farming activities with grassland being the dominant vegetation.

The proposed Wind Farm has ensured that the WTG, substation or the BESS are not located within areas where the bushfire risk is elevated. It is acknowledged that the proposed plan outlines the placement of WTGs within the BMO but these areas have been largely cleared.

The fragmentation of the BMO and the limited connection between the areas is unlikely to support an elevated landscape risk assessment outcome. There are several landscape features that will likely slow or stop bushfires spread. These include changes in vegetation types and the surrounding road network.

[1] https://www.planning.vic.gov.au/__data/assets/pdf_file/0027/447921/Fact-sheet-Bushfire-mapping-methodology-and-criteria.pdf

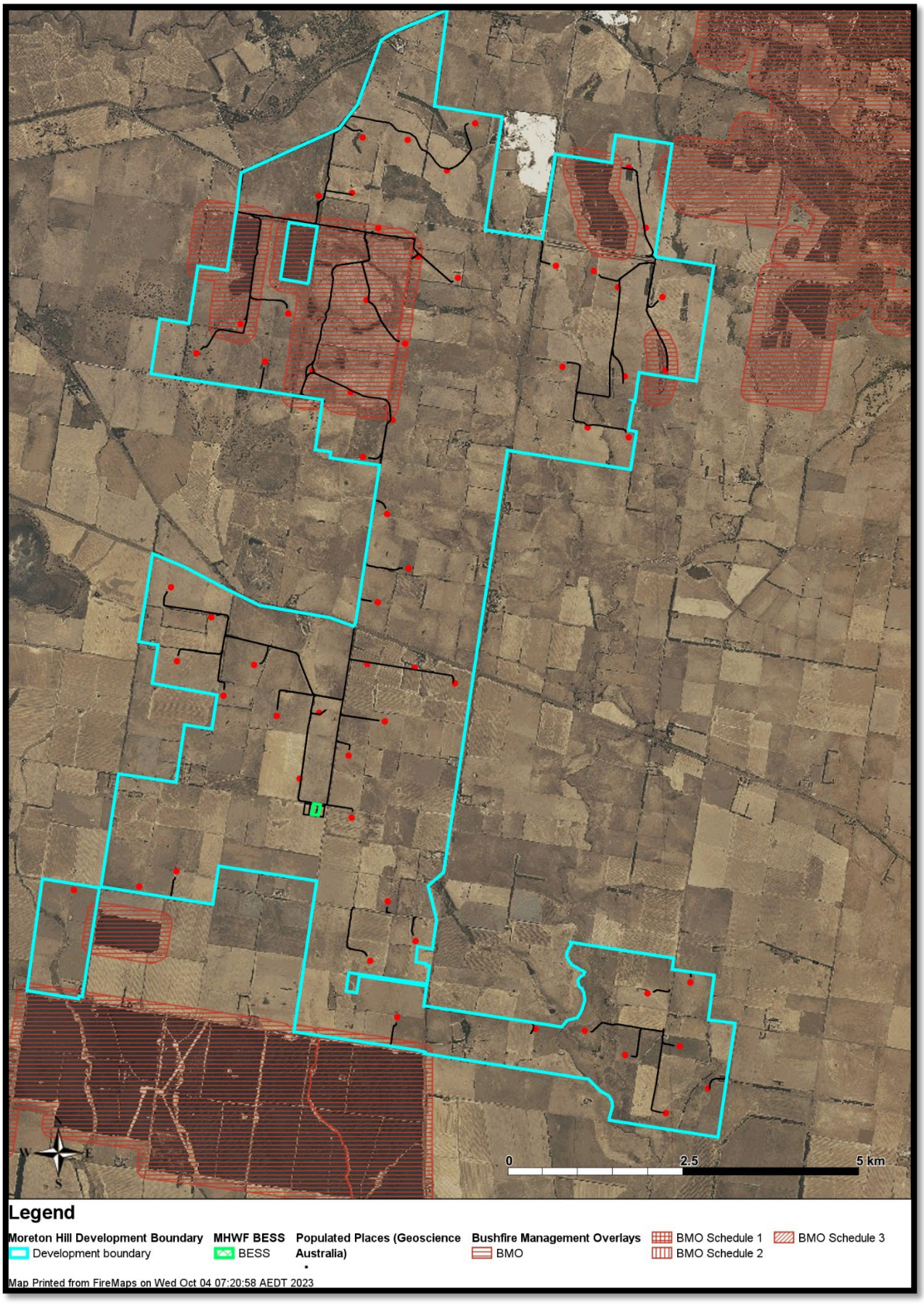


Figure 2 - Location of Bushfire Management Overlay (red) in relation to the Proposed WEF

4.2.2 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. The entire Wind Farm Site is located within a Bushfire Prone Area.

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 that occurred following the 2009 Black Saturday bushfires.

Whilst the control's purpose is for the improvement in residential construction, it is also a trigger for other controls including an assessment against Clause 13.02 of the Planning Scheme. Refer to Section 5.1.

4.2.3 Municipal Fire Management Plan

As the project is located across two municipalities (Corangamite and Golden Plains) and that a large component of the bushfire hazard is located to the north within the Pyrenees Shire, the assessment of the municipal fire management planning arrangements has included all three areas.

The three plans that have been considered are:

- Otway District Strategic Fire Management Plan 2021-24 (Shires of Corangamite, Colac Otway and Surf Coast)[2]
- Golden Plains Shire Municipal Fire Management Sub Plan[3]
- Municipal Fire Management Plan 2018 – 2021 Pyrenees Shire[4]

Figure 3 outlines the location of the Wind Farm in relation to the three surrounding municipalities.

The project is located at the northern end of the Corangamite Shire and the Otway District Strategic Fire Management Plan which covers this area does not specifically mention this location. The Plan recognises the presence of farming properties and that these are considered a lower risk when compared to forested environments. The Plan does not outline any additional treatments required in this area other than the ongoing treatments including fire prevention inspections, roadside vegetation management and community education.

The Golden Plains Fire Management Plan outlines the Linton area and the elevated risk due to the mix of forested vegetation and residential areas. Bushfires in the area surrounding Linton would likely not cause issues due to the north westerly and south westerly wind patterns that are usually associated with elevated fire danger days. It is an important consideration for the project to limit

[2] https://www.corangamite.vic.gov.au/files/assets/public/documents/plans-amp-strategies/emergency/strategic-fire-management-plan-otway-district-2021-2024-final.pdf

[3] https://www.goldenplains.vic.gov.au/sites/default/files/2023-05/Golden%20Plains%20Shire%20MFMP%20-%20FINAL%202023%20-%202026%20V1.pdf

[4] https://www.pyrenees.vic.gov.au/files/assets/public/council-publications/2018.12.12-pyrenees-shire-municipal-fire-management-plan-2018-21-v1.03.pdf

the possibility of bushfires that may be caused by the WEF to impact on the residential areas to the north west under a south westerly wind

The Plan that outlines the management of the north westerly bushfire hazard is the Pyrenees Municipal Fire Management Plan. The Wind Farm Site is not located within the Pyrenees Shire, but the hazard influences the overall bushfire risk of the project. In describing the landscape, the Plan states:

South of the Shire are extensive open grassed farmlands which are used for cropping and raising stock.

The landscape is dominated by farming properties and extensive areas of grassland and cropping. The risk of fast running grassfires is elevated during the Fire Danger Period.

All three Plans outline the importance of the Glenelg Highway as a strategic fire break and that this is maintained by the relevant Road Manager. This includes the management of excessive fuel loads and regular slashing of parts or all of the roadside.

The Plans also outline that several roads within the surrounding landscape have been identified as Fire Breaks. The listed roads have been allocated a treatment being either grazing, burning or slashing. This detail is available within the relevant Plan.

The existing strategic fire break network provides a network of fuel managed areas that may either slow or stop a bushfires spread. The likely bushfire approaches from the north western or south western aspects are likely to be influenced by the presence of the strategic fire breaks.

The Plans also outline several treatments that are provided to address bushfire risk across the municipalities. The treatments include:

- Community education programs
- Fire Danger Period advisory signs
- Neighbourhood Safer Places (Linton)
- Private property planning
- Municipal Fire Prevention Notices
- Fuel hazard reduction

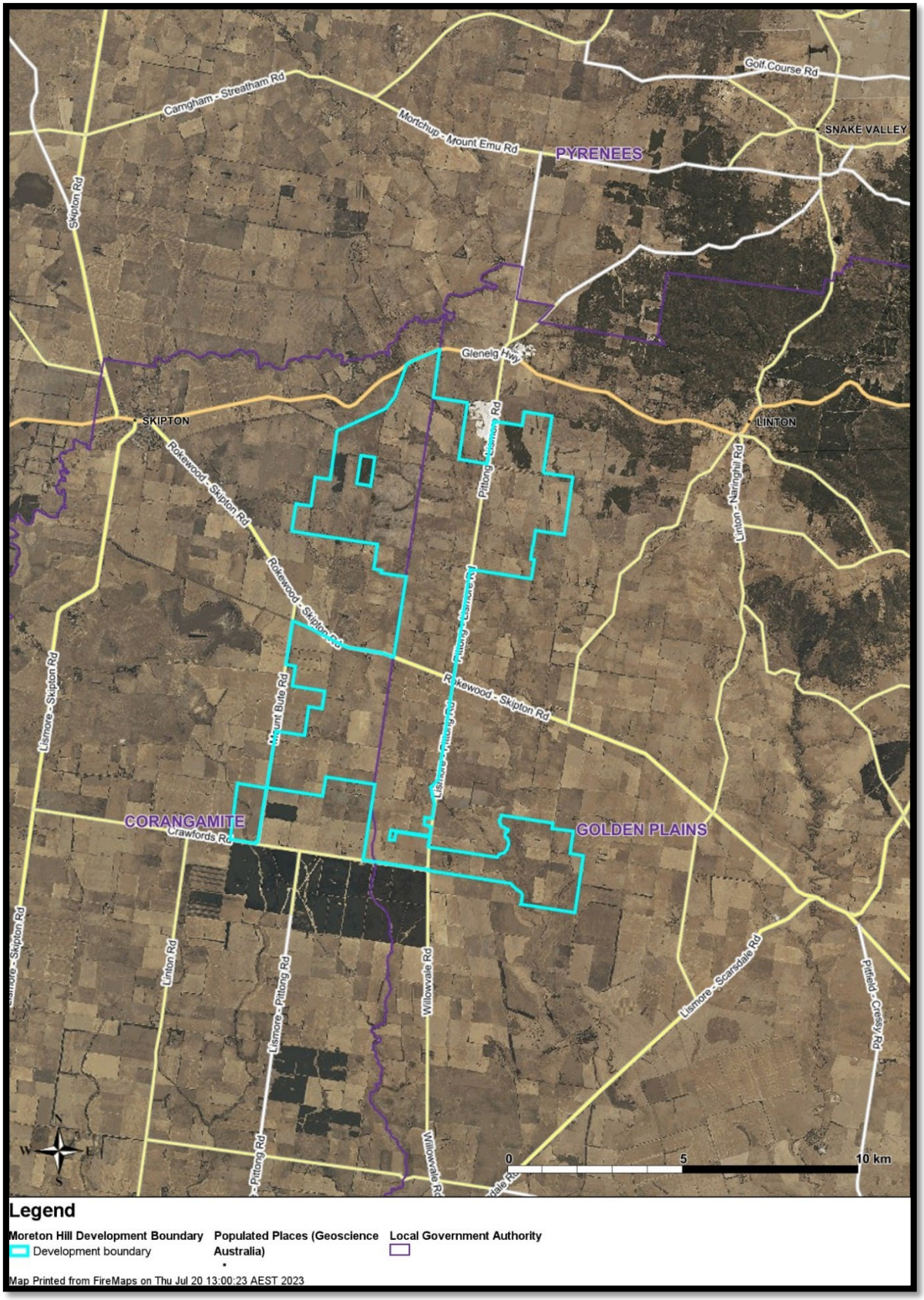


Figure 3 - Overview of municipalities surrounding the project site.

4.2.4 Safer Together assessment[5]

The Safer Together project delivered by the Victorian State Government has developed strategies for the various Regions of Victoria. The Barwon South West Bushfire Management Strategy was developed to reflect the region's unique environments and communities and includes the location for the Moreton Hill Wind Farm. 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 Region.

The Barwon South West Bushfire Management Strategy 2020 is the result of an analysis of bushfire risk across the Region. The Strategy indicates the threat of grassfires, however it does not provide any additional strategies to reduce the risk other than those already undertaken.

4.2.5 Bushfire history

An analysis of bushfire history in the area surrounding the proposed Wind Farm indicates some bushfire activity. According to the data provided by DEECA (Figure 4), there has been no impact on the project footprint. Some smaller bushfires have occurred however it appears that rapid intervention has kept the fires to a small size.

The larger fires in the surrounding landscape are typical of a north westerly influence followed by a south westerly wind change. Under elevated fire danger conditions, large bushfires can travel large distances through the grass fuels and under a south westerly wind change, turn the eastern flank into the fire front. These types of fires would likely travel rapidly but with less intensity when compared to bushfires in forested areas.

The landscape to the east of the Wind Farm Site due to the prevalence of forested areas has experienced regular bushfire activity. These areas would also experience regular fuel reduction burning activities within the Public Land properties. The western area of Victoria, including the surrounding landscape, also experiences regular roadside burning programs by CFA Brigades.

[5] Barwon South West Bushfire Management Strategy 2020 - https://www.safertogether.vic.gov.au/__data/assets/pdf_file/0024/493530/DELWP_BushfireManagementStrategies_2020_BarwonSouthWest_rr.pdf

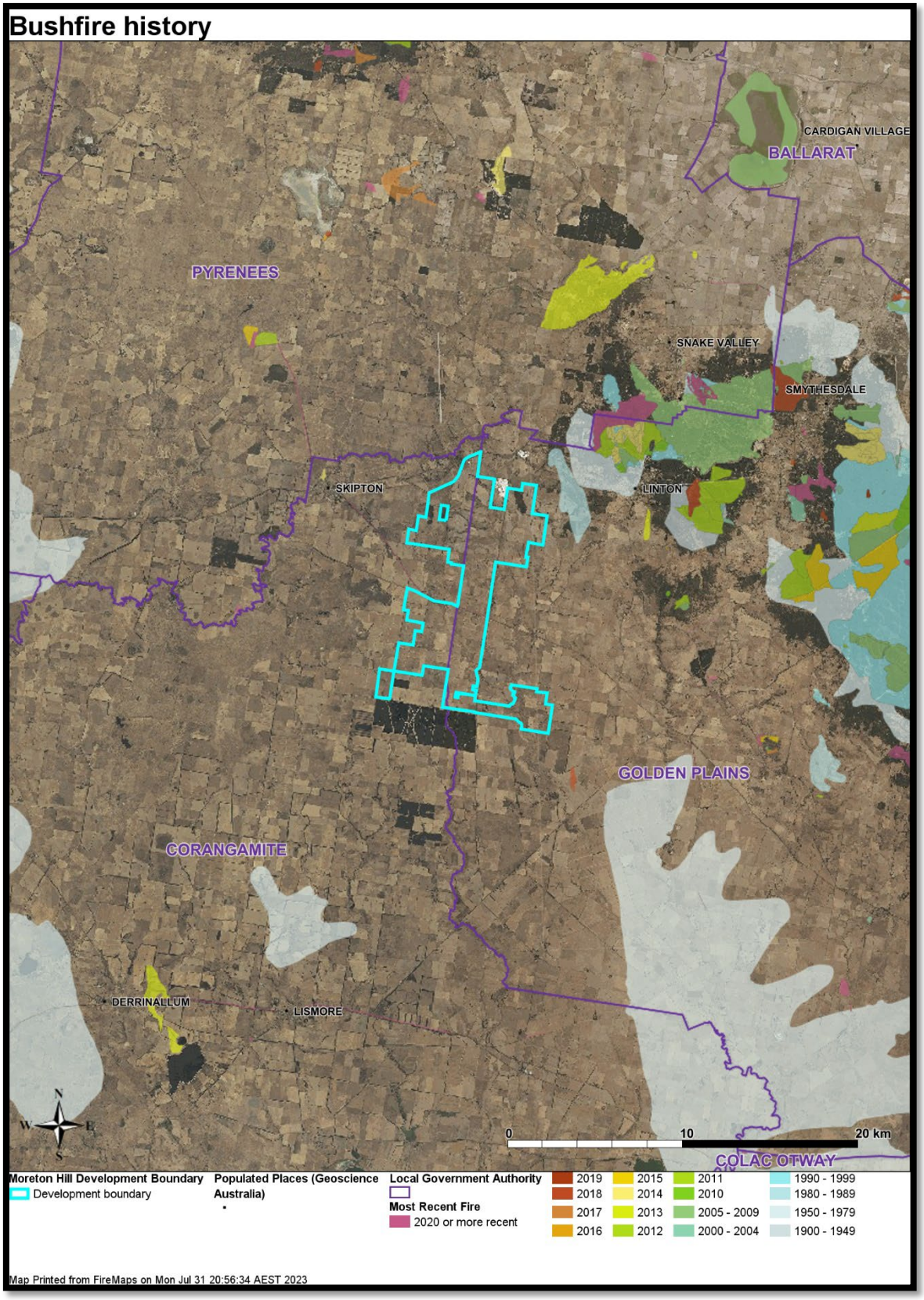


Figure 4 - Bushfire history surrounding the Moreton Hill WEF

5 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 -1S – Bushfire Planning
- 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 bring the information gained from the above processes or information together and if required, make any additional recommendations. All recommendations are aimed at reducing the risk to an acceptable level.

5.1 Clause 13.02-1S – Bushfire planning assessment

Clause 13.02-1S of the 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 proposed WEF does not introduce new settlements into the landscape. The assessment has been undertaken within the context of a Wind Energy Facility and BESS. Clause 13.02 – 1S is the same for both Golden Plains and Corangamite Shires.

5.1.1 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 Wind Farm Site. Figures 8 and 9 provide an overview of the likely bushfire scenarios within the surrounding area. The assessment has identified the presence of the north west and south west likely bushfire impacts. This is supported by the Municipal Fire Management Plans outlined within Section 4.2.3.

Table 1 - Assessment against Clause 13.02

Bushfire hazard type	Conditions	Likely Scenario	Considerations
The site for the development	Once completed, the WEF and BESS will be required to comply with conditions as specified within the CFA Guideline that includes the management of vegetation around the base of the turbine towers and surrounding the BESS and other infrastructure during the fire danger period. During construction, there is a risk of a fire igniting and spreading through unmanaged vegetation. During the construction phase, the properties surrounding the construction area will continue to be used for farming activities including stock grazing. The Wind Farm Site site is separated into various areas by roads.	A bushfire starting on the property is a possibility in particular during the construction phase due to the increased number of people working on the project and the operating machinery. Bushfires that are started by lightning, arson or other human caused events could burn through the WEF and threaten the surrounding properties and the BESS. The access track network and vegetation management requirements around the turbine towers, BESS and other infrastructure will limit bushfire spread under elevated fire danger conditions. During construction, any work that is occurring near unmanaged grassland has the potential to start a bushfire and leave the property.	During the construction phase of the WEF and BESS, where possible, all vegetation within 100 metres of works areas (where achievable) is to be managed during the fire danger period with all grassland less than 100mm in height. When the fire danger conditions are elevated (Catastrophic), the Emergency Management Plan will outline procedures to close the site during the construction phase and limit maintenance operations unless critical. The CFA Guideline requires the provision of vegetation management surrounding the base of the turbine towers, the BESS area and other infrastructure. The access roads will be established during the construction phase and maintained for the life of the project. These access roads will likely assist with bushfire containment under lower fire danger conditions.
Neighbourhood (400 metres) and local conditions (one kilometre)	Within one kilometre of the Wind Farm Site, the surrounding landscape is predominantly grassland that is used	Under strong wind conditions a bushfire can travel quickly across the landscape. Grassfires are heavily influenced by the quantity of	The provision of access roads throughout the WEF will assist with containing bushfires and providing increased accessibility to the landscape.

Bushfire hazard type	Conditions	Likely Scenario	Considerations
	for agricultural purposes. There is an area of plantations to the south of the Wind Farm Site that will likely contribute to short distance spotting. The surrounding road network provides access and egress opportunities for emergency services and in some cases, these are maintained as fire breaks.	fuels within the paddocks and the wind strength. Roadsides will contribute to bushfire spread due to the unmanaged fuels and the presence of trees that will likely generate short distance ember attack. The nature of the farming properties results in a highly fragmented landscape where some areas are considered as containing reduced fuel or other areas have elevated fuels due to cropping.	The managed areas will also significantly limit the chances of a bushfire starting at the towers and BESS.
Landscape conditions (10 kilometres)	The landscape surrounding the Wind Farm Site consists of primarily grassland vegetation. There are small areas of forests and Plantations to the south and east of the Wind Farm Site.	The likely bushfire behaviour will involve fast running grass fires that will have varying intensities and will be heavily influenced by changes in vegetation types and other landscape features including dwellings, managed areas and roadways. The grass fire can approach from any direction, but the greatest risk is from the north west or south west aspects.	The protection of the WEF and BESS infrastructure from bushfire impact is required by the CFA Guideline. The provision of access roads will increase the ability for firefighters to access the areas surrounding the WEF.

5.1.2 Bushfire Hazard Landscape Assessment

Figures 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 Wind Energy Facility. Both scenarios are consistent in that the likely bushfire impact on the Wind Farm Site 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	Bushfires burning under a north westerly wind influence will burn through predominantly grassland fuels. These fuels will be varied due to the different farming practices, private, municipal and state roads and residential properties. Traditionally a north westerly wind influence is associated with elevated fire danger days. Other landscape features including the surrounding fire breaks listed within the Municipal Fire management plans and roadside management undertaken by adjoining landowners will provide opportunities to slow or stop bushfires spreading in the local area. It is likely for the new track network to provide additional areas where bushfire spread may be interrupted depending on the fire danger conditions.
B	A bushfire that approaches under a south westerly wind influence usually occurs 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 Wind Energy Facility can come under threat at the same time. This type of bushfire behaviour is consistent with large grassfires that have occurred in the past in the surrounding landscape. The presence of the Plantation to the immediate south of the Wind Farm Site and other treed areas throughout the landscape will likely contribute to the generation of embers. The fragmented vegetation that is associated with farming activities will influence bushfire behaviour. The road network will also contribute to slowing or stopping the bushfire spreading.

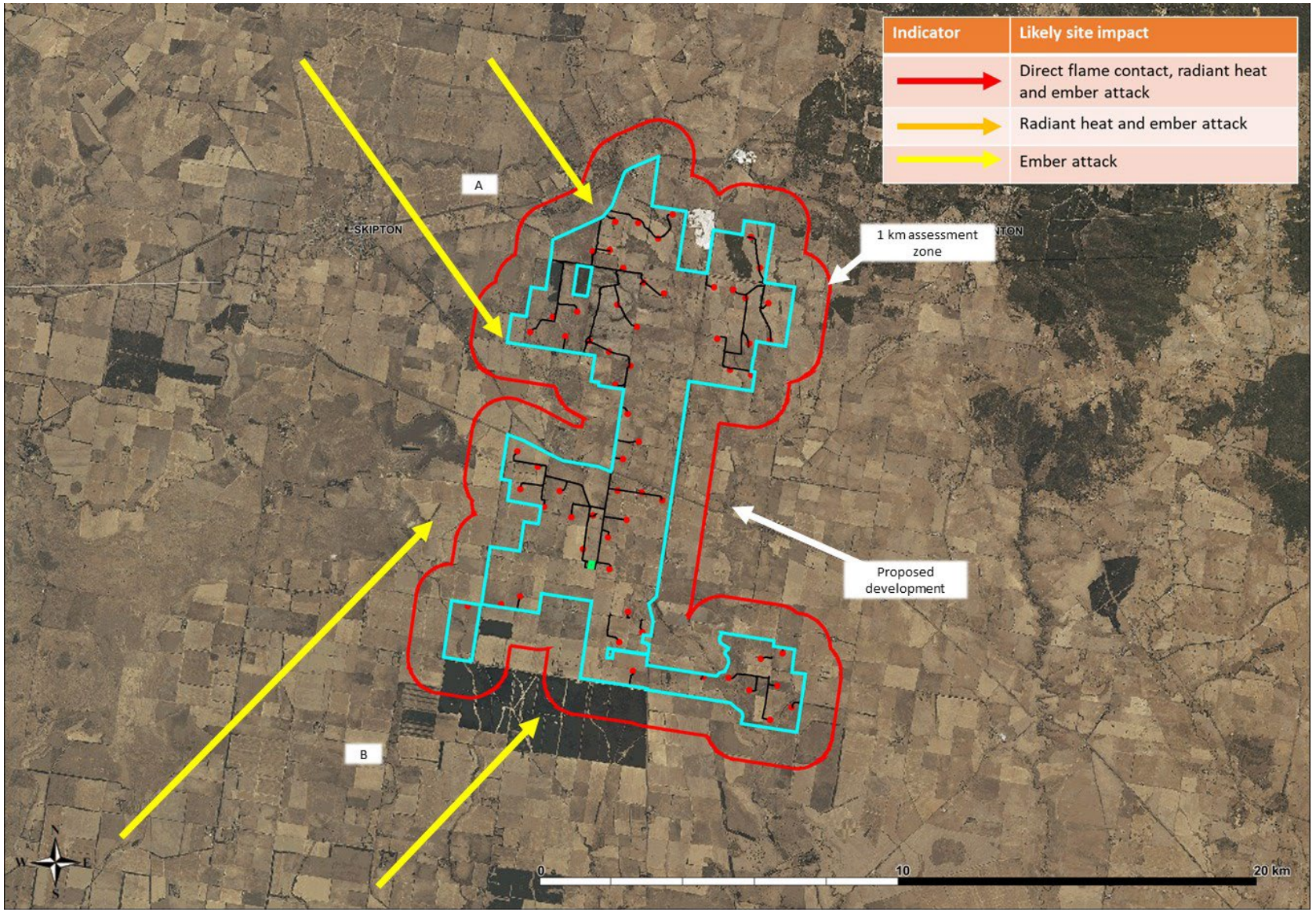


Figure 5 – One kilometre landscape assessment

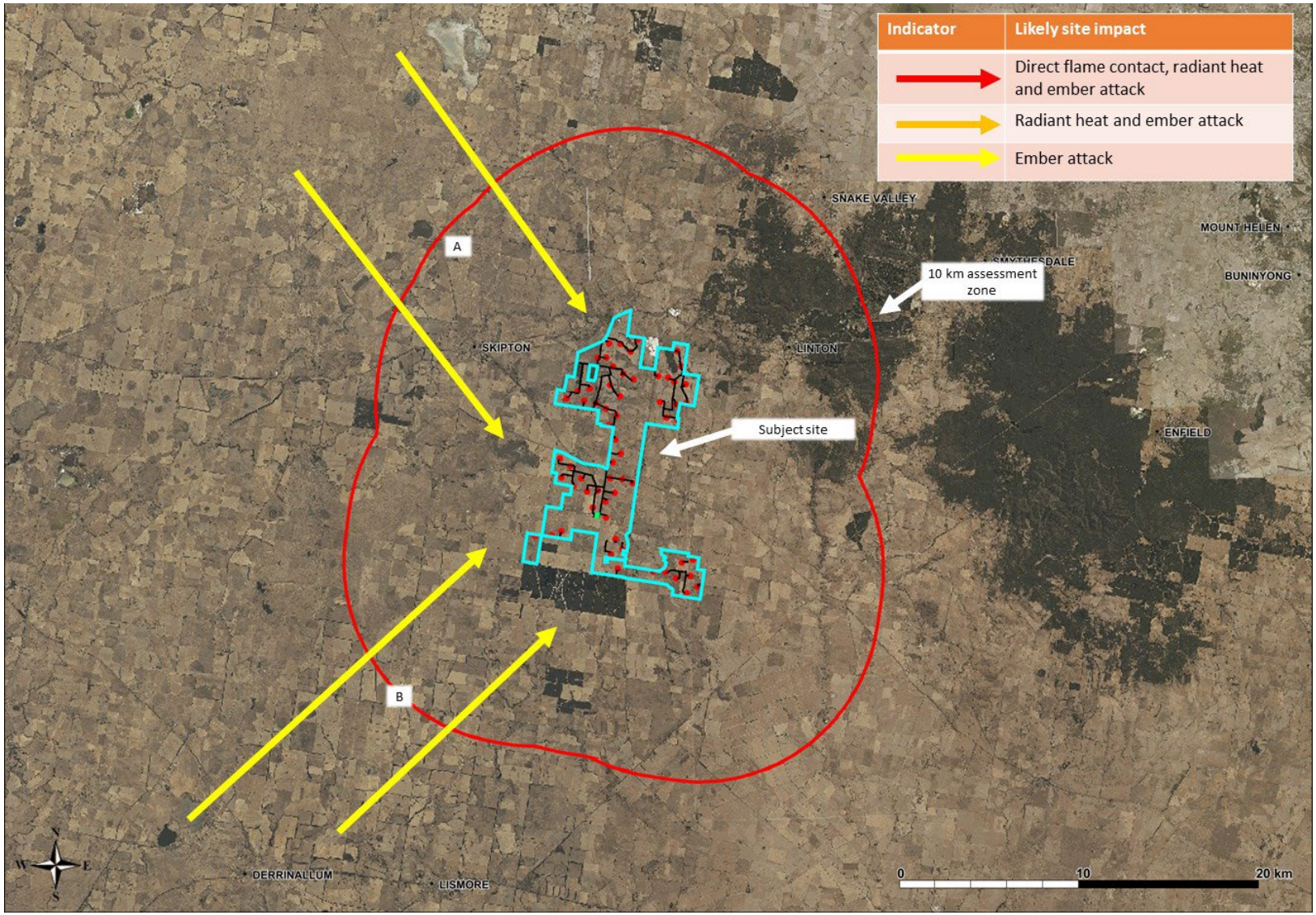


Figure 6 - 10 kilometre landscape assessment

Clause 13.02 Settlement Objectives are primarily related to settlement development of which it could be argued that a Wind 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. The design has ensured that the location of the infrastructure will be in low risk areas.	✓
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 Wind Farm project will result in areas that will achieve a Bushfire Attack Level (BAL) Low rating when assessed against AS3959. This will include the BESS, substation and compound areas. Depending on the location of a bushfire in the surrounding landscape, there are several travel routes available to leave the area and travel to an area deemed to be BAL LOW. These locations would include Skipton and Linton. There is a Neighbourhood Safer Place in located within Linton. The identification and travel routes to the various locations that meet the BAL LOW requirements will be addressed within the Emergency Management Plan that is developed for the Wind Energy Facility and BESS.	✓
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 Wind 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: • Asset Protection Zone surrounding the base of each Turbine Tower, the BESS area, substation and other works areas. • A fire detection (smoke/heat) and suppression (gas) system will be installed within the high risk electrical cabinets in the wind turbine	✓

Settlement planning objectives	Project response	Achieved (✓ or ×)
	nacelle, with the details/design of this system to be determined in consultation with CFA. • BESS design considerate of fire risk and provided with suitable monitoring systems with the aim of preventing fires. • Access road network to be developed and maintained to allow for access to each of the towers. • Provision of static water supplies to support firefighting operations at the BESS and throughout the WEF.	
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.	The fire protection measures required by the CFA Guideline ensures that there is no net increase in risk to existing and future residents. The site for the Wind Energy Facility and BESS has been chosen to ensure separation from existing dwellings is achieved.	✓
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 potential for long bushfire runs to occur from the north west and south west aspects. This project will not change the current expected bushfire behaviour in the landscape, it will likely reduce the risk in the surrounding areas due to the addition of an access track network and management around the base of the turbines, BESS and other works areas.	✓
Assessing alternative low risk locations for settlement growth on a regional, municipal, settlement, local and neighbourhood basis.	The project including a Wind Energy Facility and the BESS is required to occur in remote locations. This area has been chosen due to the low number of dwellings in the surrounding landscape. The CFA Guideline requirements ensures the management of risk is occurring that reflects the landscape bushfire risk.	✓
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	The Wind Farm Site will achieve a less than BAL 12.5 rating when assessed against AS3959 through the provision of Asset Protection Zones around the infrastructure.	✓

Settlement planning objectives	Project response	Achieved (✓ or ×)
have, more than a BAL-12.5 rating under AS 3959-2009 Construction of Buildings in Bushfire-Prone Areas (Standards Australia, 2009).		

5.1.3 Assessment against Clause 13.02 summary

The assessment against Clause 13.02 has identified that the Wind Farm Site is within an area where the landscape bushfire risk is influenced by the potential for grassfires in the surrounding landscape. These grassfires have the potential to travel long distances depending on the weather conditions being experienced. However, the proposal has been designed to limit both the potential impact on the Wind Energy Facility and the BESS and the potential for fires to leave the property and enter the surrounding landscape. As the project is required to achieve the requirements outlined within the CFA Guidelines as a minimum, this will ensure that the settlement planning objectives are achieved.

5.2 Analysis against CFA Guideline

CFA has produced Guidelines that outline their requirements to address fire risk within renewable energy installations. Section 5 of the Guideline 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 Wind 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 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

Model requirement	Compliance	Comments
		with CFA to demonstrate how the fire risk is proposed to be 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 has been developed to enable the developer to demonstrate how they propose to manage the risk of fire in relation to the project.
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 5.1. The assessment has identified the potential for bushfires to approach the Wind Farm Site from either the north west or south west.
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 6.
b) The impact of bushfire on the infrastructure (e.g. 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 6.
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 there will be no increase in bushfire risk because of the project. The requirements including managing vegetation around the base of the turbine towers and BESS area, detection and suppression systems installed within the wind turbine nacelle and provision of access roads supports the management of bushfire risk.

Model requirement	Compliance	Comments
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.	✓	As outlined within the CFA Guideline, this is not required due to the nature of Wind Energy Facilities.
b) Roads must be of all-weather construction and capable of accommodating a vehicle of fifteen (15) tonnes.	✓	The Access Roads constructed for this project will be designed, constructed and maintained to ensure they can support the movement of vehicles up to 15 tonnes.
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 will be included within the design of the Access Tracks 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	✓	The proposed access roads will provide direct access to the base of all wind turbines, BESS area and other works areas. Other infrastructure is located

Model requirement	Compliance	Comments
storage systems and related infrastructure.		adjacent to Public Roads and accessible by emergency service vehicles. The access tracks being developed as part of this project is approximately 128 kilometres.
h) The provision of at least two (2) but preferably more access points to the facility, to ensure safe and efficient access to and egress from areas that may be impacted or involved in fire. The number of access points must be informed through a risk management process.	✓	As the project is a Wind Energy Facility, there are numerous access points located throughout the Wind Farm Site. The BESS will be provided with dual access/egress points.
Wind Energy Facilities		
Constructed roads developed during the construction phase of facilities must be maintained post-commissioning and throughout the operational life of the facility, to allow access to each turbine for maintenance and emergency management purposes.	✓	The access roads developed for the construction phase will be retained throughout the life of the project. This will provide access for maintenance activities along with emergency vehicle access if required.
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 Wind Energy Facility and BESS 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 finalised in consultation with CFA. A proposed layout is included within Appendix B that outlines 8 x 45,000 litre water tanks spread across the project.
b) Static water storage tank installations must comply with AS 2419.1-2005: Fire hydrant installations – System design, installation and commissioning.	✓	The static water supply will be located within tanks that comply with AS2419.1:2015.

Model requirement	Compliance	Comments
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.).	✓	Static water tanks will be located at the entrances to the access roads constructed for the wind turbine project. They will be located at least 10 metres from all infrastructure.
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. 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 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.
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.	✓	The tanks will be provided with access to allow firefighting appliances to access the hard suction point.

Model requirement	Compliance	Comments
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 to protect 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.	✓	Turning provisions will be provided at the base of each wind turbine that will enable firefighting appliances to safely turn around.
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.
Wind Energy Facilities		
a) The fire protection system for wind energy facilities must incorporate at least one static fire water storage tank of at least 45,000L effective capacity at each site entrance.	✓	Following an assessment of the project, 8 x 45,000 litre static water tanks will be supplied as outlined in Appendix B. The tanks proposed adjacent to the BESS area are in addition to the water supplies required for the BESS area.
b) Additional static fire water storage tanks of at least 45,000L effective capacity must also be incorporated in facility design. The number and location of tanks is to be determined through a comprehensive risk management process (Risk Management Plan), in consultation with CFA.	✓	There have been no additional static water tanks identified for the WEF area. Additional water supplies will be provided for the substation and BESS area, and these are outlined in further sections.

Model requirement	Compliance	Comments
c) Fire water must be provided to cover buildings, control rooms, substations and grid connections, in consultation with CFA.	✓	Static water supplies will be provided at key infrastructure locations. The final decision will be determined in consultation with CFA.
d) Nacelles must be equipped with automatic fire detection, alarm and fire suppression systems.	✓	A fire detection (smoke/heat) and suppression (gas) system will be installed within the high risk electrical cabinets in the nacelle, with the details/design of this system to be determined during consultation with CFA. The systems will be monitored 24/7 by the onsite monitoring system and if activated, an alert will be sent to the site operator. The Emergency Management Plan will include procedures for alerting the CFA to a fire.
e) Additional fire protection systems or equipment required under any Australian Standards for dangerous goods must be provided as prescribed.	✓	There is no infrastructure proposed within the Wind Energy Facility that will include dangerous goods. If the substation, workshop areas or other parts of the project proposes to utilise equipment that includes a product that is deemed to be a dangerous good, an assessment will be undertaken in accordance with the Dangerous Goods (Storage and Handling) Regulations.

Model requirement	Compliance	Comments
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:	✓	Static water supplies in storage tanks will be provided.
i. The fire water supply must be of a quantity no less than 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.	✓	The BESS layout is being determined and the provision of water supplies will be in accordance with the provisions of AS2419.1.
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. *(E.g., For battery installations with an aggregate area of over 27,000m2, 4 hydrant outlets are required to operate at 10L/s for four hours, which equates to a minimum static water supply of 576kL.)*	✓	The BESS area will be provided with water supplies that conforms with AS2419.1.
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.	✓	Fire hydrants will be located around the site to enable coverage to be 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 water supply will be at least 10 metres from any infrastructure.

Model requirement	Compliance	Comments
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).	✓	The static water supply and booster assembly will be located adjacent to the main entrance to the BESS area.
vi. The fire water supply must comply with AS 2419.1-2005: Fire hydrant installations - Section 5: Water storage.	✓	The water supply will comply with the requirements outlined within Section 5. This will as a minimum include: • Appropriate overflows and air gaps • Large and small bore connections • Tank contents indicator • Appropriate signage • Access opening and ladders
Substations		
Fire water must be available to substations.	✓	A 45,000 litre static water supply will be located at the substation. This may be in conjunction with the BESS area water supply.
Section 6.2.4 – Fire Breaks		
A fire break must be established and maintained around:		
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 will be provided with a 10 metre wide fire break including: • Substation • Static water supplies
Wind Energy Facilities		

A fire break must be established and maintained around the base of wind turbines.	✓	All wind turbines will be provided with a fire break of 10 metres around the base of the turbine tower to ensure they will not exceed a radiant heat exposure where the infrastructure is likely to ignite. It is also acknowledged that the site operators through their regular inspection program will engage with landowners if the surrounding landscape becomes unmanaged through the life of the project.
Battery Energy Storage Systems		
A fire break must be established and maintained around battery energy storage systems and related infrastructure.	✓	A fire break will be provided surrounding the BESS compound. The fire break will extend from the edge of the perimeter driveway to the BESS area fence.
Section 6.2.5 – Design Specific to Facility Type		
Wind Energy Facilities		
a) Wind turbines must be located no less than 300 metres apart.	✓	This has been included within the design.
b) Wind turbines must be provided with automatic shut-down, and the ability to be completely disconnected from the power supply in the event of fire.	✓	This requirement has been included within the project specifications. The SCADA system will be designed to enable either onsite operators or remotely operating to shut down a single or multiple wind turbines.
c) Installed weather monitoring stations must be notified to the Civil Aviation Safety Authority (CASA) as per CASA Advisory Circular AC 139-08, v2.0, March 2018 (as for all structures 110m or more above the ground).	✓	The permanent weather masts being installed as part of the project. They will all be marked as per the CASA requirements.
d) All guy wires and monitoring towers must be clearly marked, even where marking is not required by CASA.	✓	This will be undertaken during the project.
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. • On-site buildings. • Substations. • The site boundary. • Any other site buildings. • Vegetation. *Separation must be at least the distance where the radiant heat flux (output) from a battery energy storage system container/enclosure fully involved in fire does not create the potential for ignition of these site elements.*	✓	The site design will be in accordance with the manufacturer's specifications. The manufacturer design specifications have been tested against international standards. Appropriate separation will be provided to enable effective firefighting operations to occur and to limit the potential for fire spread between battery packs.
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.*	✓	Surrounding the BESS area will be a perimeter access road that is within a 10m fire break. The remainder of the vegetated areas within the BESS compound will be maintained during the fire danger period.
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	✓	The site layout has been designed to ensure safe and effective access for firefighters and minimises the potential for grassfires to impact on the area.

impact on-site and offsite infrastructure.		
2) Battery energy storage systems must be:		
a) Located so as to be reasonably adjacent to a site vehicle entrance (suitable for emergency vehicles).	✓	Emergency vehicle access is available to the site.
b) Located so that the site entrance and any fire water tanks are not aligned to the prevailing wind direction (therefore least likely to be impacted by smoke in the event of fire at the battery energy storage system.)	✓	The static water supply will be located adjacent to the main entrance. This provides effective access for firefighters.
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 packs will be installed as per the manufacturer's specifications. Where detection and suppression systems are recommended, these will be installed. All BESS technologies are provided with multiple sensors and alerts that will detect if a fault is occurring. Procedures will ensure that upon detection of faults, the battery will be shut down immediately until it has been checked by an operator.
d) Provided with suitable ember protection to prevent embers from penetrating battery containers/enclosures.	✓	The BESS packs will be designed to prevent embers from penetrating into the packs.
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.	✓	Access is provided to the BESS area and the fire hydrant systems.
f) Installed on a non-combustible surface such as concrete.	✓	The BESS packs will be installed on a non-combustible surface.
g) Provided with adequate ventilation.	✓	The battery packs are provided with ventilation systems that meet the manufacturers specifications.

h) Provided with impact protection to at least the equivalent of a W guardrail-type barrier, to prevent mechanical damage to battery containers/enclosures.	✓	Impact protection will be provided around the BESS area.
i) Provided with enclosed wiring and buried cabling, except where required to be above-ground for grid connection.	✓	This will be included within the design.
j) Provided with spill containment that includes provision for management of fire water runoff.	✓	Suitable spill containment will be provided around the equipment that holds dangerous goods. In most cases the equipment itself is manufactured with its own bunding. A fire water runoff basin will be provided within the BESS property. This area will enable fire water to be captured and if required, to be disposed of.
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 for the areas surrounding the terminal station, BESS and the operations and maintenance area.
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 Danger Period, days of high (and above) fire danger and Total Fire Ban days (refer to www.cfa.vic.gov.au).	✓	This requirement will be included within the Fire Management Plan.
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 Wind Energy Facility and BESS. The system includes a range of sensors that will detect faults and report them to the monitoring centre. 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.
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 Wind Energy Facility and 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 Wind Energy Facility and 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 housed within an Emergency Information Container and located at strategic sites across the Wind Farm Site. The final location and number of Emergency Information Containers will be determined in conjunction with CFA.

6 Risk Assessment

6.1 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 – Guideline*s 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.

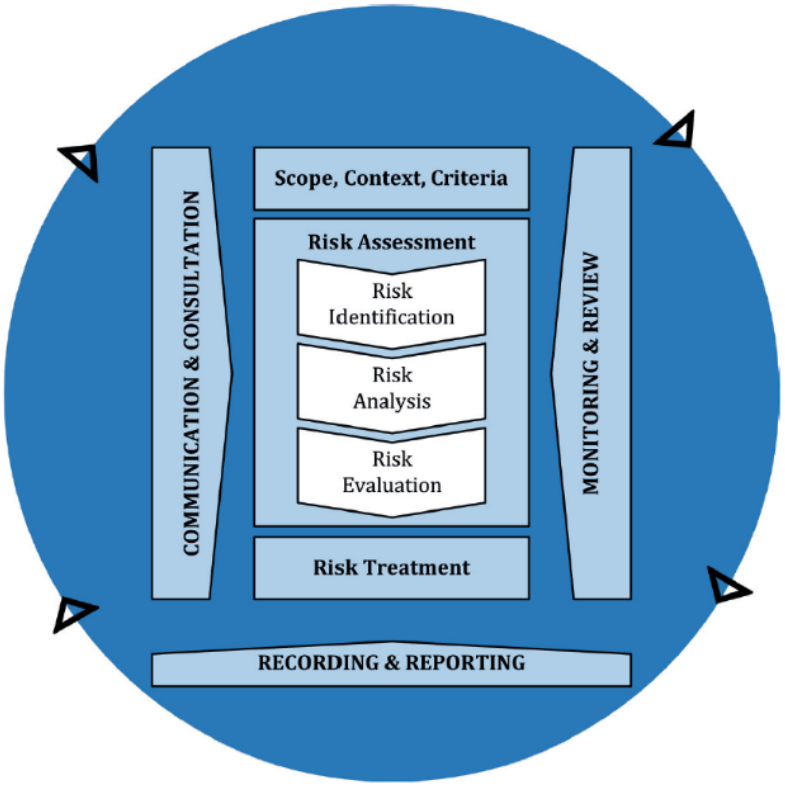


Figure 7 - Overview of AS/NZS ISO 31000-2018 risk management process

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.

6.2 Context

The assessment of fire risk is a key requirement imposed on the development by CFA through their Guidelines. The CFA Guideline outlines the types of hazards that may need to be considered in relation to Wind Energy Facilities and BESS systems at the design, construction and operations phases.

6.3 Analysis of fire risk

Wind Energy Facility and BESS infrastructure is largely acknowledged as having limited potential to cause fires. There have however 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 operations phase.

6.3.1 Assessment of fire risk during construction

The construction phase includes various stages including site works, construction of footings and the installation of the turbine towers. 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.

The location of the project could mean that construction is occurring on elevated fire danger days. There is a risk of both causing a fire or being impacted by a fire.

6.3.2 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 project. The ongoing maintenance of the infrastructure and development is critical to ensure the ongoing management of fire risk.

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

6.4 Risk identification

Through discussions with the client, review of various documentation and the consideration of previous fire history that involved wind energy facilities, the following hazards have been identified:

Table 5 - Hazard identification and description

Hazard	Description
Electrical hazards causing a fire	Electrical faults and/or hazards can be a key cause of fire in the Wind Energy Facility and BESS infrastructure. BESS hazards including battery faults, overcharging, rapid discharge, loss of remote monitoring systems, internal short circuits and overheating. Hazards include faulty wiring and connections. An outcome of these faults can include 'thermal runaway'.
Fire causing spread to adjoining infrastructure on the property	A fire that has started in the Wind Farm Site may spread to adjoining infrastructure or surrounding areas within the facility. Rapid escalation of the fire size and complexity can create issues for on site staff and contractors, firefighters and the community.
Fire causing off-Site 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.
Off-Site 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 dangerous goods that are stored within the BESS, substation and inverters may leak and either ignite or require clean up by either on site staff, contractors or firefighters.
Fire water runoff	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. The fire water may be contaminated and if not contained may create environmental issues.
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 project of this type.

6.5 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 risk matrix has been developed that enables the effective consideration of risk and to enable a comparison between the outcome of the hazard assessment.

6.5.1 Likelihood

An assessment of the likelihood of a fire occurring at this project 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 6 - Likelihood table

Likelihood scale frequency	Description
Almost certain	The event Is expected to occur in most circumstances. (75%-99%). Has occurred frequently at the location.
Likely	The event will probably occur in most circumstance (50% - 75%). Has occurred frequently in the company.
Possible	The event should occur at some time. Likely to occur sometime (25% - 50%). Has occurred many times in the industry, but not in the company.
Unlikely	The event could occur at some time. Unlikely but possible (10% - 25%). Has occurred once or twice in the industry.
Rare	The event may occur only in exceptional circumstances. Assumed it may not be experienced (0% - 10%). Unheard of in the industry.

6.5.2 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 7 - Risk assessment consequence table

Consequence scale	Description		
	People	**Environment**	**Plant/Equipment**
Catastrophic	Multiple fatalities	Permanent widespread ecological damage. Toxic release off-site with detrimental effect. Likely EPA prosecution	Massive widespread equipment damage (i.e. plant/equipment write-off) ($1M +).
Major	Single fatality or permanent disability	Heavy ecological damage with costly restoration. Off-site release contained with outside assistance and little detrimental impact.	Multiple equipment replacements ($200 000 - $1M).
Moderate	Major injuries - Incapacitations or requiring time off work	Major but recoverable ecological damage. On-site release contained with outside assistance.	Equipment level replacement /repair ($50 000 - $200 000).
Minor	Significant injuries - Medical treatment, non-permanent injury	Limited but medium term damage. On-site release immediately contained	Component level replacement /repair ($10 000 - $50 000).
Insignificant	Slight injuries- First Aid Treatments (cuts/ bruises)	Short term damage. Low financial loss, negligible environmental impact	Slight Damage (< $10 000).

The risk rating table (**Table 8**) 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 Wind Farm Site. Actions can be prioritised using this method to determine where risk mitigation works will occur.

Table 8 - Risk matrix

				Impact Score				
				1	2	3	4	5
				Insignificant	Minor	Moderate	Major	Catastrophic
Fire Risk Consultants Risk Assessment Matrix			People	Slight Injuries- First Aid Treatments (cuts/bruises)	Significant Injuries - Medical Treatment, non-permanent injury	Major Injuries - Incapacitations or requiring time off work	Single Fatality or Permanent Disability	Multiple Fatalities
			Environment	Short term damage / Low financial loss, negligible environmental impact	Limited but medium term damage / On-site release immediately contained	Major but recoverable ecological damage / On-site release contained with outside assistance	Heavy ecological damage with costly restoration / Off-site release contained with outside assistance and little detrimental impact	Permanent widespread ecological damage / Toxic release off-site with detrimental effect / Likely EPA prosecution
			Plant / Equipment	Slight Damage (< $10 000)	Component level replacement /repair ($10 000 - $50 000)	Equipment level replacement /repair ($50 000 - $200 000)	Multiple equipment replacements ($200 000 - $1M)	Massive widespread equipment damage (ie plant/equipment write-off) ($1M +)
Likelihood	A	Almost Certain	The event Is expected to occur in most circumstances / 75%-99% / Has occurred frequently at the location	Low (5)	Moderate (10)	Very High (18)	Extreme (23)	Extreme (25)
	B	Likely	The event will probably occur in most circumstance / 50% - 75% / Has occurred frequently in the company	Low (4)	Moderate (9)	Very High (17)	Very High (20)	Extreme (24)
	C	Possible	The event should occur at some time. Likely to occur some time / 25% - 50% / Has occurred many time in the industry, but not in the company	Low (3)	Moderate (8)	High (13)	Very High (19)	Very High (22)
	D	Unlikely	The event could occur at some time. Unlikely but possible / 10% - 25% / Has occurred once or twice in the industry	Low (2)	Low (7)	High (12)	High (15)	Very High (21)
	E	Rare	The event may occur only in exceptional circumstances. Assumed it may not be experienced / 0% - 10% / Unheard of in the industry	Low (1)	Low (6)	Moderate (11)	High (14)	High (16)

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.

6.5.3 Risk analysis worksheets

The following risk analysis worksheets have assessed the hazards identified in Section 6.4 and results in a risk classification that correspond with strategies to lower risk if it is 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 be considered.

Table 9 - Risk assessment - Electrical hazards causing a fire

RISK	Electrical hazards causing a fire
CAUSE	Electrical faults and/or hazards can be a cause of fire in Wind Turbines and BESS systems. Hazards may include faults, loss of remote monitoring systems, internal short circuits and overheating. The substation due to the presence of electrically charged equipment may, due to a fault or other cause catch fire. Within a BESS, faults can lead to thermal runaway which will create suppression difficulties.
LIKELIHOOD	Likely
JUSTIFICATION	There is a history of fires within Wind Energy Facilities including electrical substations/terminal stations. Available data does not indicate that this is widespread. Modern wind turbine nacelles are fitted with smoke detection and suppression systems and other safety systems to either prevent a fault from occurring or to automatically commence shut down procedures if required. They will also send alerts to site operators. Fires usually occur within the Nacelle which is located at the top of the tower and is where the turbine is located. These areas are difficult to access and rely on trained technicians being available. The turbine and associated equipment will be maintained as per the manufacturer's specifications. There are examples of fires within BESS technology that indicates that when faults occur, they can escalate into challenging events including thermal runaway. To offset the likelihood of a fault within the BESS that creates a flammable atmosphere in and around the BESS, escalates to a fire, or a fire that affects adjacent infrastructure, the following mitigation treatments are included: • Cooling systems that maintain the temperature of the battery packs during day-to-day operations. • Safety systems that send alerts to the monitoring centre if a sensor is activated. • Barriers between each of the battery module bays within each BESS designed to reduce the possibility of thermal runaway from spreading to adjoining battery units. • Separation distances between individual battery packs and other infrastructure in accordance with manufacturer installation guidelines. • The BESS will be installed by qualified and competent people in accordance with the manufacturer's specifications to relevant Australian Standards and including compliance with UL9540A – Energy Storage System Requirements.
CONSEQUENCE	Moderate
JUSTIFICATION	A fire is unlikely to occur in more than one turbine due to the separation between the towers. A loss of a single turbine will not significantly impact on business operations. Due to the remoteness of the infrastructure, they will unlikely cause issues that will impact on surrounding people or property.

	If the multiple layers of protection fail or are not able to suppress the fire, then it is highly likely for the entire nacelle to be destroyed in the fire. This is a highly unlikely scenario. The multiple layers include: • Smoke detection and fire suppression system. • Monitoring systems that detect faults. • Electrical system manufactured and installed in accordance with the relevant Standards. The consequence of a fire within a BESS has been assessed as likely only impacting on the pack where the fire originated. It is unlikely for a fire to spread to other packs.
RISK RATING	High

STRATEGY TO LOWER RISK	The requirements outlined within the response to the CFA Guideline will be sufficient to ensure the risk is maintained at a reduced level. Other requirements that will further reduce the risk include:
	• Development of an Emergency Management Plan that includes in addition to that required by CFA and AS3745:
	  ○ A system to communicate effectively between the monitoring centre and the onsite staff and contractors.
	  ○ Provision of 24/7 technical expert 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 10 - 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 starts within Wind Energy Facility may spread to adjoining infrastructure. A fire that has started within a component with the BESS may spread to adjoining infrastructure.
LIKELIHOOD	Unlikely
JUSTIFICATION	A fire that starts within a wind turbine nacelle may drop burning materials to the ground and depending on the weather conditions, may spread to an adjoining turbine tower or other infrastructure. Due to the separation between the infrastructure this is highly unlikely to occur. The risk of fire spreading to adjoining infrastructure within the BESS and to adjoining infrastructure with the Wind Energy Facility is unlikely due to the design of the components within the BESS, and the mitigation features incorporated into the design.
CONSEQUENCE	Minor
JUSTIFICATION	The consequence of a fire affecting adjoining areas of the Wind Farm Site is likely to be minor due to the provision of fire breaks around the base of the turbine towers, surrounding the BESS, substation and operations and maintenance area. The existing road network along with the proposed access roads will assist with slowing or stopping fire spread between the turbine towers and other infrastructure.
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. These strategies include: • Development of an Emergency Management Plan • Development of a Fire Management Plan that outlines the required performance and maintenance of all fire mitigation and management initiatives. • Provision of access tracks and fire breaks around the Wind Energy Facility and BESS. • 24/7 monitoring of the system that will alert operators to any faults or events that may lead to a fire. This will result in immediate shut down of the system.
RESIDUAL RISK	Low

Table 11 - Risk assessment - Fire causing offsite impacts

RISK	Fire causing offsite impacts
CAUSE	Any fire within the WEF and BESS may spread to adjoining properties most likely through vegetation connectivity. These types of fires would occur on elevated fire danger days during the summer months.
LIKELIHOOD	Unlikely
JUSTIFICATION	The compliance with CFA Guidelines requires a range of mitigation strategies implemented including: • Provision of a fire break surrounding the Wind Energy Facility and BESS infrastructure. • Static water supplies for firefighting purposes are scattered through the Wind Farm Site and at the BESS. • The monitoring system provides for early notification of a fault and will have the ability to remotely shut down the site if required.
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 fire breaks surrounding the wind turbines, BESS, substation and operations and maintenance area will reduce the potential for a fire to leave the infrastructure. Under elevated fire danger conditions there is the potential for a fire that is caused by site operations to leave the site. This fire would have started outside the vegetation managed areas. Depending on the level of vegetation management in the surrounding landscape, the fire could spread and become uncontrollable quickly. This fire will be influenced by the various existing fire management activities including roadside vegetation management, personal property preparation, firefighting appliances and equipment and activities undertaken by agencies responsible for fire management. The consequence of this type of fire would be the same as a fire caused by other practices in the surrounding landscape. The surrounding landscape is well managed due to farming operations. This will assist with reducing the potential for bushfires to leave the site and impact on the surrounding community.
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 is unmanaged and 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 breaks and other critical areas.
RESIDUAL RISK	Low

Table 12 - Risk assessment - Offsite fire impacting on the site

RISK	Offsite fire impacting on the site
CAUSE	A bushfire burning through the surrounding landscape can occur and threaten the infrastructure by potentially starting new fires.
LIKELIHOOD	Unlikely
JUSTIFICATION	The Clause 13.02 assessment has identified the surrounding landscape as having the potential for supporting a bushfire. It identifies major fires that have occurred in the surrounding landscape. The municipal fire management planning process does not identify this area as having a significant impact on property survivability due to the lack of vegetation that would support large scale ember impact. The provision of a firebreak and other managed areas will limit the ability for a bushfire to impact on the property.
CONSEQUENCE	Minor
JUSTIFICATION	Due to the separation between the wind turbines and other infrastructure, the separation surrounding the BESS, the possibility of the Wind Farm Site being impacted by a bushfire is reduced. The provision of fire breaks around the base of the towers, BESS area and other infrastructure will ensure a bushfire can't directly impact on the structure.
RISK RATING	Low
STRATEGY TO LOWER RISK	Prior to construction commencing, an Emergency Management Plan will be developed that includes the requirements for vacating the site when the fire danger is elevated during both construction and operations phases of the project. The project is monitored through a SCADA system that will enable remote operation in the event that the site needs to be closed to personnel.
RESIDUAL RISK	Low

Table 13 - Risk assessment – Dangerous goods

RISK	Dangerous Goods
CAUSE	With reference to the Dangerous Goods (Storage and Handling) Regulations 2012, there are quantities of Dangerous Goods at the Site within various components of the Proposal. There is the potential for a leak of Dangerous Goods to occur that may cause a threat to people, the environment or be involved in a fire.
LIKELIHOOD	Unlikely
JUSTIFICATION	There will be dangerous goods associated with the BESS and the associated infrastructure. The quantities of dangerous goods will depend on the chosen supplier of the battery packs and other the types of other equipment including transformers. As a minimum the following dangerous goods will be present: • Lithium ion • Refrigerant Both products are contained within the battery packs and have their own bunding, and sensors and alert system that will send a message to the operator if a leak is occurring. The Dangerous Goods are installed within the infrastructure during the manufacturing process. This means that Dangerous Goods are contained and sealed and not readily accessible at the site. Following transportation to the Site, any infrastructure with Dangerous Goods will be inspected to ensure it has not been damaged during transportation. If infrastructure with Dangerous Goods is to be stored at Site prior to installation, it will be stored in line with manufacturer's specifications. Infrastructure will be installed in line with manufacturer's specifications (including inspection and testing). Together, these measures will prevent the likelihood of leaks outside the infrastructure footprint. The manufacturers installation specifications include the protection of the battery pack to ensure that no damage occurs during installation. The design of the BESS including the installation of bollards at high risk locations will prevent vehicles from impacting the infrastructure and potentially causing a leak.
CONSEQUENCE	Minor
JUSTIFICATION	The assessment of the dangerous goods quantities at the BESS will be confirmed following the selection of the chosen technology and will comply with the requirements of the Dangerous Goods legislation.
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 will be likely be the case for the Lithium-Ion and the insulating gas.

	The Emergency Management Plan will include details of the hazards associated with dangerous goods and appropriate procedures in response to this RMP, including leak management and other response arrangements to Dangerous Goods related emergencies.
RESIDUAL RISK	Low

Table 14 - 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. The CFA Guideline outlines the need to provide capacity for the management of fire water runoff for the BESS to ensure this water does not enter the environment.
LIKELIHOOD	Unlikely
JUSTIFICATION	The risk of a fire within the BESS that would result in fire water runoff is unlikely due to the design of its components, particularly the battery packs and the mitigation features incorporated into its design. This includes: • Quality components will be selected for the Proposal. Most of the infrastructure that supports the BESS is non-combustible or has low quantities of combustible materials. • The battery packs are contained within an enclosure and have several features incorporated within the design that limits the potential for fire spread between components. • The separation between the battery packs and supporting infrastructure (transformers) is in accordance with manufacturer specifications. • Battery packs will be installed on a non-combustible area that will prevent fire spreading along the ground. Due to the design features incorporated into the BESS the likelihood of a fire occurring at the BESS is low. As such, the likelihood of requiring fire water to extinguish a fire at the BESS is also low.
CONSEQUENCE	Minor
JUSTIFICATION	The BESS area will be designed to enable the collection of fire water in the event of a fire. A basin will be constructed where water will flow to and enable testing to then determine the most appropriate disposal method. The basin will ensure that the water is flowing away from firefighters and site staff to enable them to continue to monitor and undertake suppression activities if required.
RISK RATING	Low
STRATEGY TO LOWER RISK	The Emergency Management Plan will provide procedures to manage fire water runoff on the site and provide contact details for organisations that can undertake testing and disposal if required.
RESIDUAL RISK	Low

Table 15 - Risk assessment – Staff and responding firefighters

RISK	Staff and responding 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 and the infrastructure. The CFA Guideline does impose a variety of controls onto the management of the site through the Emergency Management Plan and how CFA interacts with the site if they are called to a fire.
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. The local CFA brigades will be provided the opportunity to tour the facility regularly.
RISK RATING	High
STRATEGY TO LOWER RISK	In all cases a technician will be dispatched to the site to review any faults or alerts that may if not checked, cause a fire. 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.
RESIDUAL RISK	Medium

6.6 Cumulative impact assessment

Consideration of the potential cumulative effects of multiple Wind Farms in the surrounding landscape has not identified any issues that require assessment. The closest Wind Farms area:

- Stockyard Hill Wind Farm is approximatley four kilometres to the north.
- Berrybank Wind Farm is nine kilometres to the south.
- Golden Plains Wind Farm is 11 kilometres to the south east.

The matters considered included use of firefighting aircraft, firefighting strategies and bushfire ignition risk and spread. It was determined that due to the existing separation it was unlikely for a bushfire to impact on multiple Wind Farms at the same time. If this did occur, the geographical separation would not cause any cumulative effects.

7 Conclusion

The assessment of risk for the proposed Moreton Hill Wind Energy Facility and BESS has identified that this project can occur safely providing the requirements outlined within this RMP are implemented.

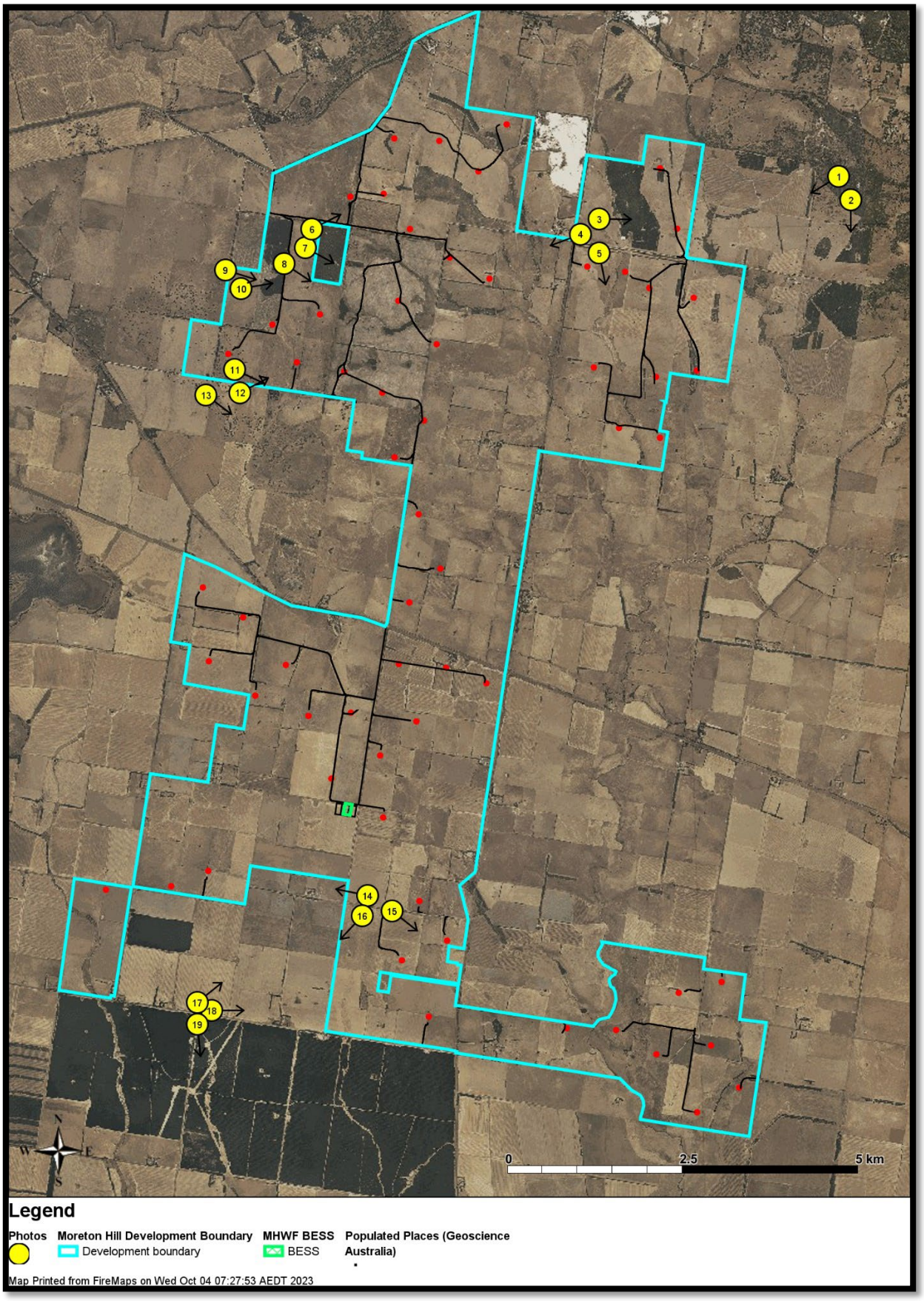
This report acknowledges the existing bushfire risk in the surrounding landscape, and it has demonstrated how the design will reduce the potential for bushfire to either enter or leave the property.

The assessment of fire history in relation to WEF and BESS infrastructure identifies limited examples of where these renewable energy developments and systems have caused fires. There is no doubt that a wind turbine 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 additional requirements imposed on the project by the CFA Guideline and this RMP will strengthen the management of fire risk. In addition to this, following the issue of a Planning Permit, the development of a Fire Management Plan and Emergency Management Plan that meets the requirements of the CFA Guideline will assist with managing the risk of fire.

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

Appendix A – Site photos



1 Looking towards the project site. The forested areas opens into farming properties in the vicinity of the project site.	
2 Typical landscape surrounding the project site.	
3 Example of a small plantation area to the east of Pittong Lismore Road. WTGs will be located in the farming areas to the east of this plantation.	

4 Typical vegetation across the majority of the project site.	
5 Looking south across the project site.	
6 Plantations in the north western section of the project site. The amount of plantation has declined since the introduction of the BMO.	

7 Existing plantation.	
8 Existing plantations surrounded by farming properties.	
9 Existing plantations surrounded by farming properties.	

10 Plantation area in the north western section of the project site.	
11 Typical landscape near Spring Hill Road and Notmans Road.	
12 Looking across Notmans Road to the north east.	

13 Typical landscape along the western boundary of the project.	
14 Typical landscape near the intersection of Parkers Road and Gillespies Road.	
15 Example of the variable farming activities that is developing a highly fragmented landscape and will likely reduce bushfire behaviour in these areas.	

16 Looking south west from near Parkers Road.	
17 Looking north east from Crawfords Road.	
18 Looking along Crawfords Road to the east. The Plantation is located to the south of the road.	

19 Typical layout within the plantation area to the south of the project site.	

Appendix B – fire water locations