Meering West Wind Farm

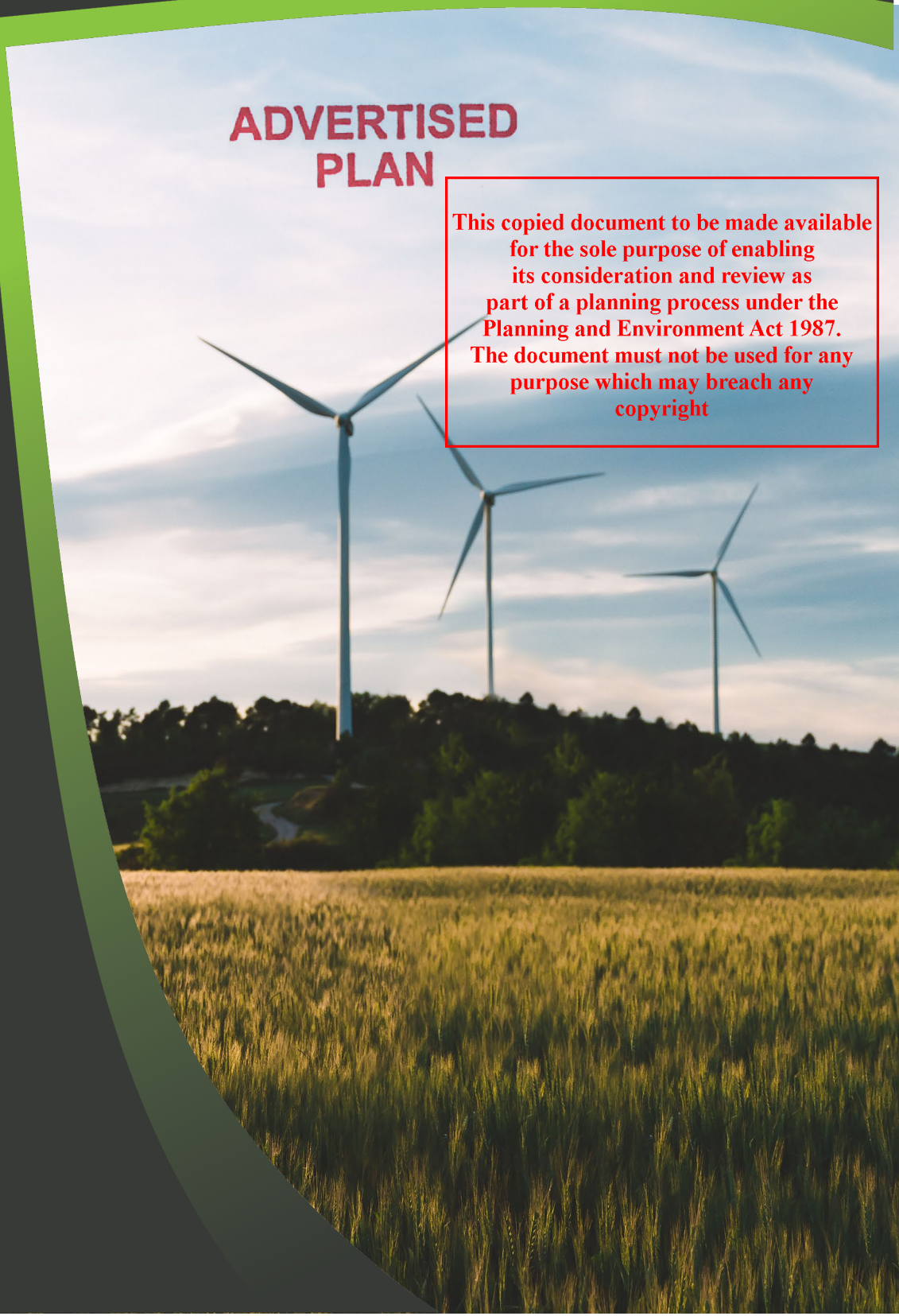
Hazard and Risk Assessment

Meering West Wind Farm Pty Ltd as trustee for the Meering West Wind Farm Trust

Reference: P527201

Revision: E

2026-04-14



aurecon

Bringing ideas to life

Document control record

Document prepared by:

Aurecon Australasia Pty Ltd
ABN 54 005 139 873
Aurecon Centre
Level 8, 850 Collins Street
Docklands, Melbourne VIC 3008
PO Box 23061
Docklands VIC 8012
Australia

T +61 3 9975 3000
F +61 3 9975 3444
E melbourne@aurecongroup.com
W aurecongroup.com

A person using Aurecon documents or data accepts the risk of:

a) Using the documents or data in electronic form without requesting and checking them for accuracy against the original hard copy version.

b) Using the documents or data for any purpose not agreed to in writing by Aurecon.

Document control		aurecon				
Report title		Hazard and Risk Assessment				
Document code			**Project number**		P527201	
File path		Https://aurecongroup.sharepoint.com/sites/527201/5_WorkingFiles/Risk and Hazard/Hazard Assessment - MWWF.docx				
Client		Meering West Wind Farm Pty Ltd as trustee for the Meering West Wind Farm Trust				
Client contact		Phil Burn	**Client reference**			
Rev	**Date**	**Revision details/status**	**Author**	**Reviewer**	**Verifier (if required)**	**Approver**
A	2025-05-21	Draft issue for client comment	Diane Delgado/Leah Smyth	Lauren Landers/ Adam Rigg	Delene Kock	Jo Barnett
B	2025-06-03	Final	Diane Delgado/Leah Smyth	Lauren Landers/ Adam Rigg	Delene Kock	Jo Barnett
C	2025-07-02	Final update for DTP submission	Diane Delgado/Leah Smyth	Lauren Landers/ Adam Rigg	Delene Kock	Jo Barnett
D	2025-11-20	Layout revision	Diane Delgado/Leah Smyth	Lauren Landers/ Adam Rigg	Delene Kock	Jo Barnett
E	2026-04-14	Minor layout update	Diane Delgado/Leah Smyth	Lauren Landers/ Adam Rigg	Delene Kock	S Stewart
Current revision		**E**				

Approval			
Author signature		Approver signature	
Name	Diane Delgado, Consultant, Asset Management & Performance	Name	Sharon Stewart
Author signature		Title	Practice Leader, Environment & Planning
Name	Leah Smyth, Senior Consultant, Environment & Planning		

Executive Summary

Aurecon Australasia Pty Ltd (Aurecon) has been engaged by Meering West Wind Farm Pty Ltd as trustee for the Meering West Wind Farm Trust to facilitate the environmental and planning assessments and approvals for the Meering West Wind Farm Project (the Project), located near Meering West in Northern Victoria. This Project is situated approximately 250 kilometres (km) north of Melbourne and 100 km north of Bendigo. The Project encompasses around 20,000 hectares (ha) of farmland within the Loddon and Gannawarra Local Government Areas.

The Project includes the development of up to 164 wind turbines, collectively termed Wind Energy Facility (WEF), complemented by ancillary infrastructure including, permanent meteorological masts, a Battery Energy Storage System (BESS), a terminal substation, collector stations, underground electricity cables and an internal above ground powerline. A temporary construction compound and two concrete batching plants will be established during the construction phase. The construction phase is expected to span approximately three years, and the Project will have an operational life projected at around 40 years.

All renewable energy projects within the Country Fire Authority (CFA) jurisdiction in Victoria are required to submit plans showing conformance with the *Design Guidelines and Model Requirements for Renewable Energy Facilities* (CFA Guideline) [1] as part of their planning permit applications. The CFA Guidelines establishes the risk assessment methodology and key emergency and safety mitigations for renewable energy installations, including BESSs and WEFs. Under these guidelines, there is a requirement for hazard identification and the determination of appropriate dangerous goods storage and handling [1]. Where there is non-conformance to the CFA Guideline model requirements, a Fire Safety Study (FSS) is required.

The requirements have been assessed in the form of a Hazard and Risk Assessment – comprising a Dangerous Goods (DG) Screening Assessment, Hazard and Risk Impact Assessment, recommendations and Bushfire Hazard Assessment.

The Dangerous Goods (DG) Preliminary Risk Screening Assessment concluded that C1 combustible liquids are not classified as DGs for transport purposes [28], however, they are considered DGs in the context of storage and handling. C1 combustible liquids (30 kL of Diesel) stored on site exceed placard quantity thresholds set out in Schedule 2 of the *Dangerous Goods (Storage and Handling) Regulations 2022*. As the placard quantity thresholds for C1 combustible liquids as set out by Schedule 2 of the Dangerous Goods (Storage and Handling) Regulations 2022 have been exceeded, placards are required.

The Preliminary Impact Assessment demonstrates a potential for major consequences; implementation of risk controls will make these consequences unlikely. The recommended technical and management safeguards proposed are intended to comply with the CFA Guidelines to reduce the residual risk such that no identified hazards will pose a significant risk. These safeguards can be categorised under the following:

- General
- Facility Design
- BESS Design
- Wind Energy Facility Design
- Design of the BESS systems
- Lithium-ion battery design
- Transformers and switchgear design
- Separation distances required to prevent the escalation of potential consequences
- Fire Safety
- Safety Management Systems
- Natural Hazards.

Further study and planning will be undertaken as per CFA guidelines in the detailed design phase. This Hazard and Risk Assessment also includes elements of the Risk Management Plan that will be developed as the Project progresses and will support this future work.

The Bushfire Hazard Assessment found that the broader landscape surrounding the Project Area comprises largely cleared farmland and paddocks that are occasionally separated by strips of roadside vegetation, paddock trees, planted trees rows and small areas of remnant mallee woodland. The Project Area is considered to exhibit low-risk environmental attributes as per the CFA Guidelines. The primary landscape bushfire risk to the Project Area is from grassfire due to the minimal amount of treed or woodland vegetation in the landscape which has been cleared for farming. Consequently, based on the condition of the landscape and limited patches of vegetation, extreme bushfire behaviour is considered unlikely. The site also has ready access and egress to safe areas that would provide safety in the event of a fire.

The Hazard and Risk Assessment concludes that the proposed BESS and WEF development, should be provided with the required mitigations and controls, to meet the model requirements of the CFA Guidelines.

Contents

Figures

Tables

Glossary

Acronym	Definition
Aurecon	Aurecon Australasia Pty Ltd.
ADG	Australian Dangerous Goods
APZ	Asset Protection Zone
BAL	Bushfire Attack Level
BESS	Battery Energy Storage System
BMO	Bushfire Management Overlay
BPA	Bushfire Prone Area
CFA	Country Fire Authority
CFA Guideline	*Design Guidelines and Model Requirements: Renewable Energy Facilities* (CFA, 2025)
db	Decibel
db(A)	A-Weighted decibel
DEECA	Department of Energy, Environment and Climate Action
DELWP	Department of Environment, Land, Water and Planning (superseded by DEECA)
DG	Dangerous Goods
DTP	Department of Transport and Planning
EIS	Environmental Impact Statement
EVC	Ecological Vegetation Class
FSS	Fire Safety Study
FZ	Farming Zone
GHG	Greenhouse Gases
GIS	Geographic Information System
GW	gigawatt
ha	hectares
HAZID	Hazard Identification
HSE	Health, Safety and Environmental
km	kilometres
kV	Kilovolt
LFP	Lithium-ion Phosphate
LGA	Local Government Area
LIB	Lithium-ion Batteries
LOC	Loss of Containment
m	Meters
MHF	Major Hazard Facility
MW	Megawatts
MWh	Megawatt hours
NCC	National Construction Code
PCU	Power Conversion Unit
Project Area	The area in which construction will take place and for which approvals will be sought.

Acronym	Definition
SDS	Safety Data Sheet
The Project	Meering West Wind Farm Project
The Proponent	Meering West Wind Farm Pty Ltd as trustee for the Meering West Wind Farm Trust
WEF	Wind Energy Facility
WTG	Wind Turbine Generator
VNI West	Victoria to New South Wales Interconnector West

1 Introduction

Aurecon Australasia Pty Ltd (Aurecon) has been engaged by Meering West Wind Farm Pty Ltd as trustee for the Meering West Wind Farm Trust (the Proponent) to facilitate the environmental and planning assessments and approvals for the Meering West Wind Farm Project (The Project), located near Meering West in Northern Victoria. As part of these assessments, the Proponent has commissioned Aurecon to undertake a Hazard and Risk Assessment, including bushfire hazards (this Report).

1.1 Purpose

This Report has been prepared to accompany a planning permit application for the development of The Project in accordance with the Gannawarra Planning Scheme [2], Loddon Planning Scheme [3], Victoria Planning Provisions [4] and the *Planning and Environment Act 1987* [5]. Under this legislation, a Wind Farm is classified as a 'Wind Energy Facility' (WEF). This classification includes land used to generate electricity by wind force, as well as any turbine, building, or other structure associated with the generation of electricity by wind force, including an anemometer.

The Project is located within an area classified as Farming Zone (FZ) [6]. Pursuant to Clause 35.07 (subclauses 35.07-1, 35.07-3, and 35.07-4) of the Gannawarra [2] and Loddon Planning Schemes [3], a planning permit is required for a WEF, land subdivision and building and works.

Additionally, the Project must meet the requirements of Clause 52.32 (Wind Energy Facility). Furthermore, Clause 35.07-6 (Decision Guidelines for the Farming Zone) and Clause 65.01 (Approval of an Application or Plan) outlines the decision guidelines for the application, whereby the responsible authority must consider:

- The effect on the environment, human health, and amenity of the area, and
- The degree of flood, erosion, or fire hazard associated with the location of the land, as well as the use, development, or management of the land to minimize such hazards.

These requirements have been addressed in the form of this Hazard and Risk Assessment with a supporting Bushfire Assessment with the proposed scope outlined in Section 1.2.

The purpose of the Bushfire Hazard Assessment is to describe bushfire hazards in the broader landscape and at the site level, the existing and likely future conditions on the land that influences the bushfire risk, and identify the bushfire protection measures that are required for the proposed WEF, BESS and associated buildings to reduce the risk to life and property from bushfire to an acceptable level.

The Project must also comply with the CFA Guideline, which establishes the risk assessment methodology and key emergency and safety mitigations for renewable energy installations, including the BESS and WEF. The key legislative and regulatory requirements applicable to facilities in Victoria, as referenced in the CFA Guideline, have also been summarised in Table 1-1.

Refer to Appendix A: Gap Analysis against CFA Guidelines model requirements for a summary of the gap assessment conducted for the Project.

Table 1-1 Required Regulatory Conformance for the combined BESS and Wind Energy Facility (CFA Guideline)

CFA Section	CFA Guideline	Relevant Regulation(s)
Section 2.3.1	All buildings on site are required to comply with the National Construction Code (NCC). Where fire safety matters listed under Regulation 129 in the *Building Regulations 2018* do not meet the deemed to satisfy provisions of the NCC, the report and consent of the fire authority Chief Officer is required.	*Building Regulations 2018* [7]
Section 2.3.2	Where the facility includes a battery energy storage system or other significant quantities of dangerous goods, a request for emergency services written advice under Regulations 52 and/or 53 of the *Dangerous Goods (Storage and Handling) Regulations 2022* [8] may be required. Regulation 52 and 53 states that "An occupier of premises where dangerous goods are stored and handled in quantities that exceed the relevant quantities specified" must: ■ request written advice of emergency services authority in relation to the design/alteration of the fire protection system ensure that a written plan for dealing with any emergency associated with the storage and handling of dangerous goods on those premises is developed, implemented and maintained; and communicated to the relevant people	*Dangerous Goods (Storage and Handling) Regulations 2022* [8]

CFA Section	CFA Guideline	Relevant Regulation(s)
Section 3.1	Section 28 of the OHS Act states the following in relation to the duty of designers: "*A person who designs a building or structure or part of a building or structure who knows, or ought reasonably to know, that the building or structure or the part of the building or structure is to be used as a workplace must ensure, so far as is reasonably practicable, that it is designed to be safe and without risks to the health of persons using it as a workplace for a purpose for which it was designed*." Persons who have management or control of workplaces have obligations under the OHS Act to ensure the health and safety of people 'so far as is reasonably practicable'. This legislation requires consideration of risk control measures and safe systems of work, which for renewable energy installations may relate to the development of systems and activities for: ■ Housekeeping, including management of vegetation ■ Security (fencing, monitoring, alarms, etc.) ■ Undertaking hot works ■ Ignition source control ■ Vehicle, plant and equipment maintenance requirements.	*Victorian Occupational Health and Safety Act 2004 (OHS Act)* *Occupational Health and Safety Regulations 2017* [9]
Section 2.4	Sections 113A and 83BA of the Electricity Safety Act 1998 require major electricity companies and specified operators of at-risk electric lines to prepare and submit a Bushfire Mitigation Plan to Energy Safe Victoria for acceptance. Sections 6 and 7 of *the Electricity Safety (Bushfire Mitigation) Regulations 2023* contain the requirements for Bushfire Mitigation Plans.	*Electricity Safety (Bushfire Mitigation) Regulations 2023*
Section 4.2.4	Substations should be surfaced to eliminate all vegetation including grasses. The Electricity Safety (Electric Line Clearance) Regulations 2020 prescribe the vegetation clearance requirements for electric lines based on the assigned fire hazard rating for land established under Section 80 of the Electricity Safety Act 1998. Fire hazard ratings are available from CFA by request.	*Electricity Safety (Electric Line Clearance) Regulations 2020*

1.2 Scope of Assessment

This Hazard and Risk Assessment (including a bush fire assessment) will review the Project against the requirements of the CFA Design Guidelines and Model Requirements: Renewable Energy Facilities V4 [10]. This assessment covers:

- Facility description, including infrastructure details, activities, and operating hours
- A preliminary screening assessment to determine if the BESS facility and WEF trigger any specific screening criteria in relation to the storage and handling of dangerous goods and fire risk

- Identification of CFA guideline requirements requiring conformance for the Project during submission of the planning permit application.
- A desktop Hazard Identification exercise to identify hazards in accordance with the CFA Guideline for renewable energy facilities
- Assess the associated risks with the proposed BESS facility and WEF and potential mitigation measures
- Review Fire System/Safety design requirements for conformance with good practice for BESS facilities and WEFs
- Recommend risk reduction measures to be applied during the design, construction and operations of the BESS facility and WEF
- Review Fire System/Safety design requirements for conformance with good practice for BESS facilities and WEFs
- Description of the existing vegetation and bushfire hazards, including within the site and surrounding landscape
- A site assessment of the proposed WEF and associated infrastructure to record and map vegetation in consideration of the requirements of the *Australian Standard AS3959:2018 Construction of buildings in bushfire prone areas* (*AS 3959:2018*) (Standards Australia, 2018). The site assessment records:
  - categorised vegetation on site, including:
    - vegetation type (e.g. Woodland, Scrub, Grassland etc.)
    - effective slope under vegetation
    - distance and slope between the proposed permanent or temporary buildings (such as any battery storage or construction site offices) and any mapped categorised vegetation.
  - any areas of excluded vegetation (as per Section 2.2.3.2 of *AS 3959:2018*).
- Undertake a bushfire landscape hazard assessment in accordance with Bushfire Planning Clause 13.02-1 of the Gannawarra [2] and Loddon Planning Schemes [3], to provide details of the bushfire hazards in the broader landscape considering bushfire scenarios as well as egress to built-up areas
- Outline key bushfire management measures identified in the CFA Guidelines that are applicable to the site, detailing how the Project will implement these measures, specifically in relation to:
  - The proposed location and design of the WEF and associated infrastructure
  - Defendable space
  - Water supply
  - Access
  - Substation and transmission lines
  - Operational requirements.

The Hazard and Risk Assessment provides an input to key location/siting and layout/design and is intended to form the basis of the required Risk Management Plan and Fire Management Plan for the Project. Fire risks associated with the infrastructure (Section 3.3.2.4 of the CFA guidelines) and several components of the Project relating to construction and commissioning requirements are also beyond the scope of this assessment. These shall be undertaken for the Project in consultation with the CFA during further stages of the Project development.

1.3 Assumptions and Limitations

The following assumptions and limitations apply to this report:

- Lithium-ion battery modules. The quantities of batteries indicated in this document are considered indicative and have been estimated conservatively, representing the maximum expected values.

- It is assumed that fire suppression, thermal runaway prevention, and emergency response systems will be designed in accordance with best practice for BESS facilities.
- It is assumed that the facility will be managed via risk and emergency management plans which need to be prepared in consultation with the CFA. Should further information become available regarding the conditions of the Project Area, the assessment, findings and recommendations in this assessment may change.
- The next steps and recommendations outlined in this report are based on the information publicly accessible up to the point of its completion.
- The outcomes of the bushfire assessment are limited to the BESS, terminal substation, collector substations and temporary construction compound sites and immediate surrounds, and the proposed Project definition as outlined in Section 2.
- It is assumed that these facilities will be managed via risk and emergency management plans. Should further information become available regarding the conditions at the sites, the assessment, findings and recommendations in this assessment may change.
- While the measures identified in this assessment when fully implemented can assist in reducing the residual fire risk to the Project, they cannot fully guarantee assets will survive a bushfire or grassfire on every occasion due to the unpredictable nature of bushfires and extreme weather. Continual evaluation and review of this document, fire risk conditions at the site and updating management practices, may assist in further reducing the residual fire risk over the life of the Project.
- There has been no fire study undertaken for this Project. However, where there is non-conformance to model requirements in the CFA Guideline, a Fire Safety Study will be conducted.

1.4 Exclusions

The assessment exclusions are listed below:

- Fire Safety Study and Fire Management Plan
- Emergency response planning and Emergency Management Plan
- A Bushfire Attack Level (BAL) assessment of any permanent and temporary buildings.

2 The Project

The following section provides an overview of the Project, including highlighting the key infrastructure components, as well as important details regarding construction and operational information for the Project.

2.1 Project Area

The Project is located within the Loddon and Gannawarra municipalities (Figure 2-1). The Meering West Wind Farm is situated in Northern Victoria, approximately 250 km north of Melbourne and around 110 km north of Bendigo and 25 kilometres south-west of Kerang (to the centre of the Project).

The Project encompasses approximately 20,000 ha, with most of the area located within the Shire of Gannawarra with a smaller Project component located within the Shire of Loddon. The landscape is predominantly characterized by agricultural land, featuring cropped fields that are well-maintained and utilised mostly for dryland cropping. The environment is largely flat to gently undulating. Refer to Figure 2-1 for the Project area and regional context.

Victoria to New South Wales Interconnector West (VNI West) is a proposed new high capacity 500 kV transmission line between Victoria and New South Wales. The exact location of the VNI West has not been finalised however it is expected VNI West will run through the Project Area. It is proposed to connect the Meering West Wind Farm directly to VNI West.

Residential areas in the vicinity of the Project Area consist of the towns of Quambatook and Kerang. The closest point of the Project is located approximately 11.7 km southwest of Kerang and 7.8 km east of Quambatook.

Receptors include:

- Sensitive receptors within or outside the broader Project Area (e.g. residential dwellings or other occupied areas)
- Any occupied infrastructure within or outside the broader Project area (e.g. operation and maintenance facilities).

The sensitive receptors within the Project Area include 15 residential dwellings, many are not occupied or are considered a ruin. The sensitive receptors outside the Project Area include residential dwellings (approximately 30 residential dwellings within 2 km of the Project Area) and the schools, hospital, aged care, and childcare centres located further away in Kerang. All the sensitive receptors are not considered near the BESS facility with the closest being 1300m.

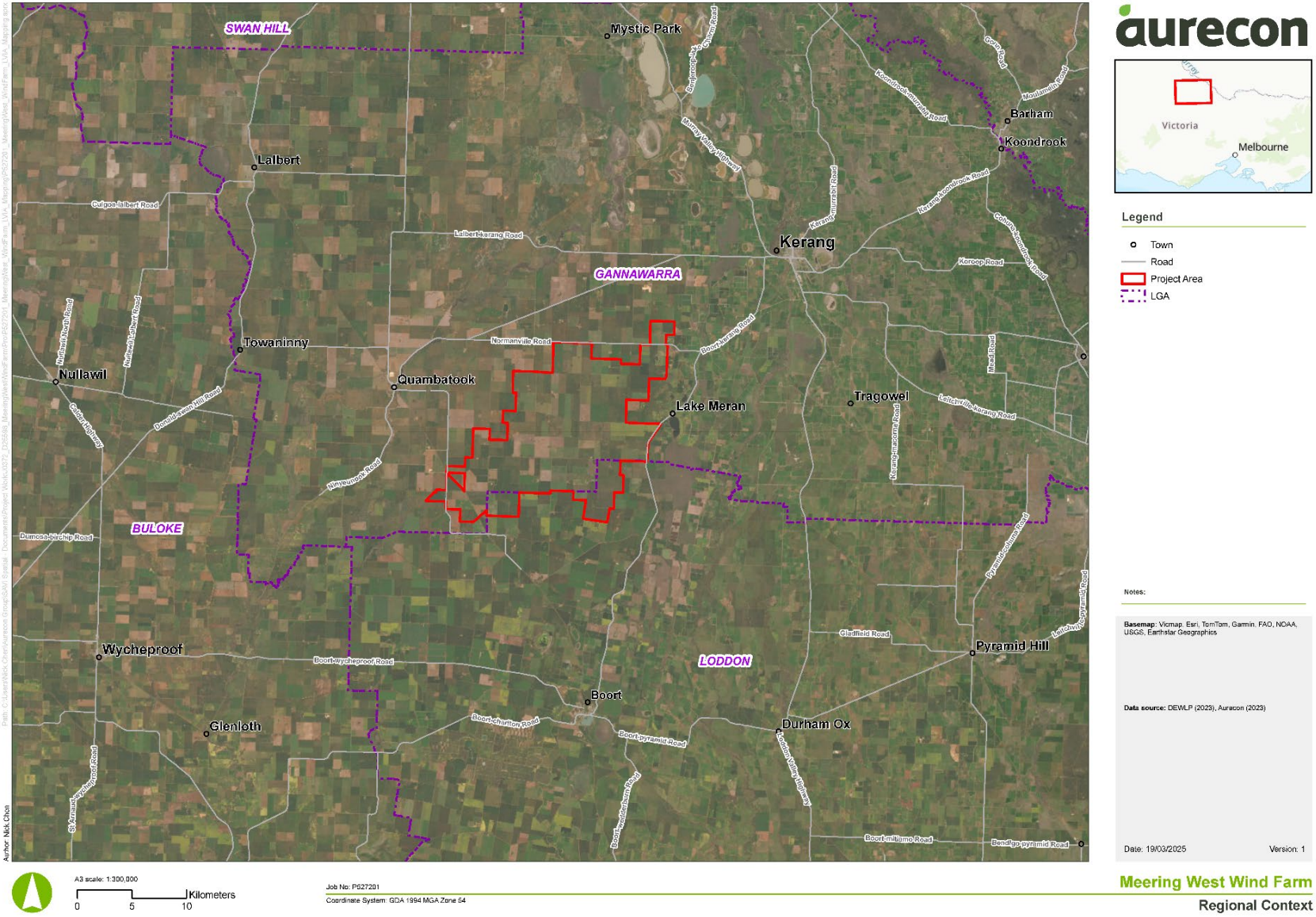


Figure 2-1 Regional Context

2.2 Project Description

-The Project includes the following permanent and ancillary infrastructure (refer Figure 2-2 Indicative Project Layout):

- Permanent core and ancillary infrastructure:
  - Up to 164 WTGs with adjoining hardstand
  - An operations and maintenance building, including a car park and an office
  - Internal access tracks
  - 1000 MW / MWh Battery Energy Storage System (BESS)
  - A terminal station connecting to VNI West
  - Collector stations
  - Permanent meteorological monitoring mast
  - Internal above ground power lines
  - Utility installations
- Temporary ancillary infrastructure:
  - A construction office and compounds, including site offices, car parking, storage and amenities
  - Concrete batching plants
  - Temporary civil works
  - Laydown areas

Further details on the Project infrastructure are shown in Table 2-1 .

Table 2-1 Key Parameters

Feature	Parameters	Quantity
Turbines		
Maximum Hub Height/ Tower Height	194 m	164
Maximum Blade Length	84.6 m	
Maximum Tip Height	280 m	
Rotor Swept Area	23,235 m^2	
Clearance (space between ground and lowest point of blade)	80-104 m	
Indicative Cut-in wind speed	3 m/s	
Indicative Cut-out wind speed	25 m/s	
Assessed Sound Power Level (STE)	107.8 db(A)	
Ancillary Infrastructure – Permanent		
BESS	Up to 8 ha	1
Operation and maintenance building	Up to 4 ha	1
Terminal station	Up to 4 ha	1
Collector station	Up to 4 ha	4
Permanent meteorological monitoring masts.	N/A	1
Ancillary Infrastructure – Temporary		
Construction compound	Up to 10 ha	1

Feature	Parameters	Quantity
Concrete batching plant	1 ha	2
Hardstand area	50m x 40m	164

2.3 Construction and Operational information

The anticipated construction phase for the Project is anticipated to last for approximately 3 years and the operational life of The Project is expected to be approximately 40 years, further information is provided in Table 2-2 Construction and Operational Information.

Table 2-2 Construction and Operational Information

Construction Phase	Proposed timing
A – Establish site offices, compounds and concrete batching batch plants	1-2 weeks
B – Commence gate installation, commence track construction, commence turbine foundation excavations and hard stands	18 months
C – Commence electrical work, cables, collectors, internal powerline, the terminal station	18 months
D – Turbine installation	24 months
E – Final commissioning and site demobilisation	6 months
G – Operation of wind farm	40 years
I – Decommission and make good	12 months

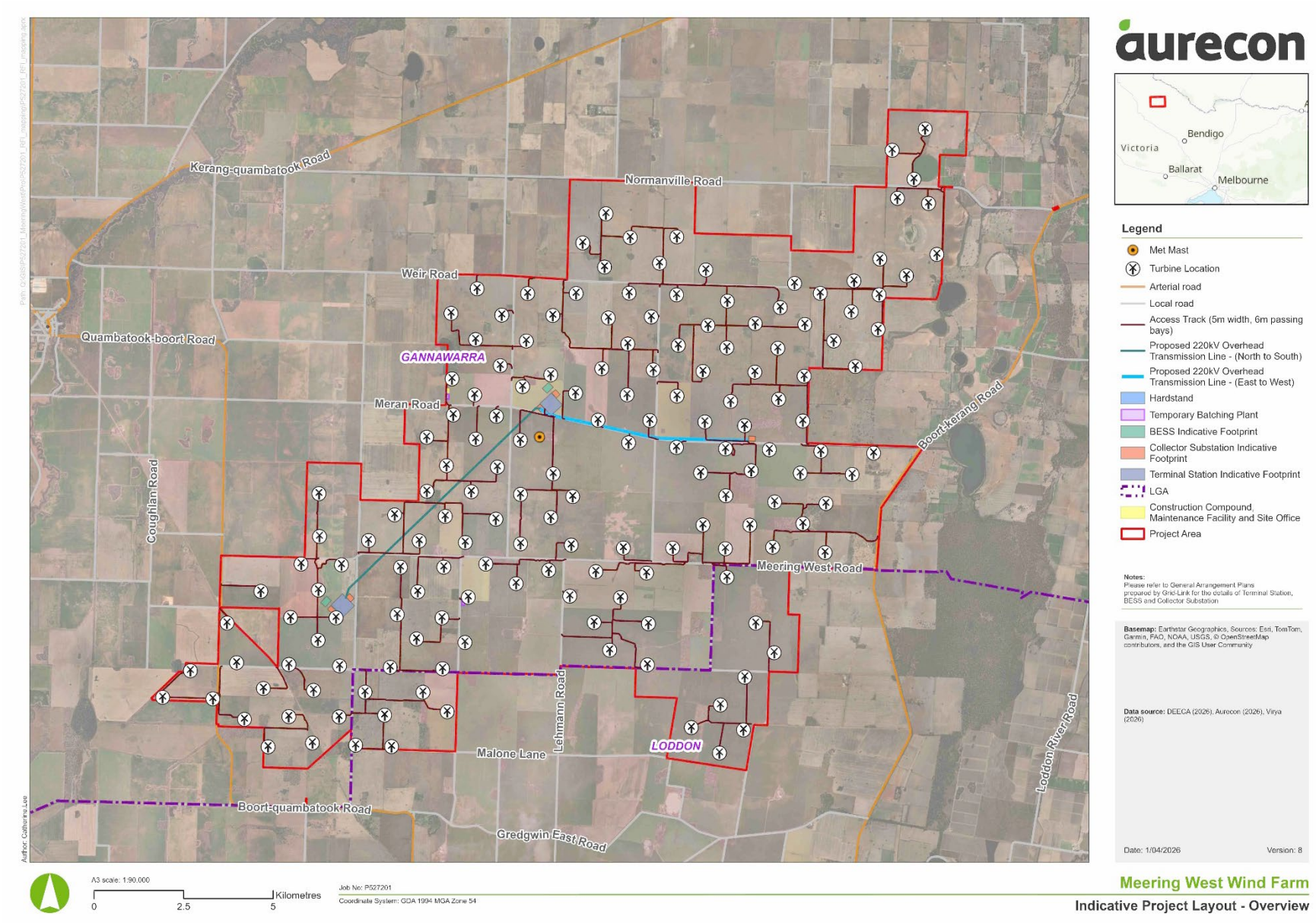


Figure 2-2 Indicative Project Layout

3 Legislative and policy context

The follow section details the legislation and policies applicable to this report.

3.1 Planning and Environment Act 1987

The *Planning and Environment Act 1987* (P&E Act) establishes the legal framework for land use planning in Victoria. Planning schemes, which operate under this Act, set out the controls governing how land may be used and developed. These controls include zones, overlays, particular provisions, and general provisions that determine whether planning approval is required for a given project.

The Wind Energy Facility and BESS proposed in this report require planning approval under the relevant planning schemes—Gannawarra Planning Scheme and Loddon Planning Scheme—which are implemented under the P&E Act. This report supports a planning permit application by addressing the hazard and risk considerations relevant to the responsible authority's decision-making process, including compliance with Clause 52.32 (Wind Energy Facility) and other applicable decision guidelines.

3.2 Occupational Health and Safety Act 2004

The *Occupational Health and Safety Act 2004* (OHS Act) sets out the legal duties for ensuring workplace health and safety in Victoria. This Act is relevant to the Project as it outlines the obligations for managing risks associated with construction, operation, and maintenance of both the Wind Energy Facility and BESS.

Under the OHS Act, duty holders, including designers, developers, and operators, must:

- Identify hazards associated with the storage and operation of lithium-ion batteries and wind turbines, including fire, structural failure, and electrical hazards.
- Implement risk control measures to eliminate or reduce risks so far as reasonably practicable.
- Ensure that workers, contractors, and emergency responders are adequately trained and informed about site-specific risks and mitigation measures.

The Hazard and Risk Assessment in this report aligns with OHS Act requirements by identifying the hazards and assessing the risks associated with fire safety, dangerous goods handling, and emergency management at the BESS facility, as well as operational risks related to the Wind Energy Facility.

3.3 Dangerous Goods Act 1985 and Dangerous Goods (Storage and Handling) Regulations 2022

The *Dangerous Goods Act 1985* and the *Dangerous Goods (Storage and Handling) Regulations 2022* regulate the safe storage, handling, and transport of dangerous goods and hazardous materials, including any spare lithium-ion batteries used in the BESS.

This legislation is relevant as:

- The Project may contain dangerous goods classified under the Act, requiring compliance with storage and handling regulations.
- Operators must ensure safe work practices and emergency response preparedness in accordance with WorkSafe Victoria guidelines.

The batteries within the BESS in this Project are connected for use and are therefore, exempt from this legislation.

3.4 Country Fire Authority Act 1958 and CFA Guideline for Renewable Energy Facilities

The *Country Fire Authority Act 1958* governs fire risk management in Victoria, particularly in rural and regional areas. The CFA Guideline outlines specific fire risk assessment and mitigation requirements for Wind Energy Facilities and BESS installations.

This report considers fire risk management using the CFA Guideline by:

- Identifying fire hazards associated with wind turbines and BESS facilities.
- Assessing bushfire risks and fire spread potential.
- Reviewing fire system design requirements, including fire breaks, access roads, and emergency response provisions.

The Hazard and Risk Assessment ensures the Project aligns with CFA fire safety requirements, particularly in addressing fire prevention, suppression, and emergency planning measures.

4 Methodology

The assessment is conducted in four tasks. The include

- Section 4.1:Task 1 Methodology used for the Dangerous Goods Screening
- Section 4.2:Task 2 Methodology for the Hazard and Risk Impact Assessment
- Section 4.3: Task 3 Project Recommendations basis
- Section 4.4: Task 4 Methodology for the Bushfire Hazard Assessment and resulting recommendations.

The process (outlined below) aligns with the WorkSafe Victoria Risk Control Plan Guidelines, as shown in Figure 4-1.

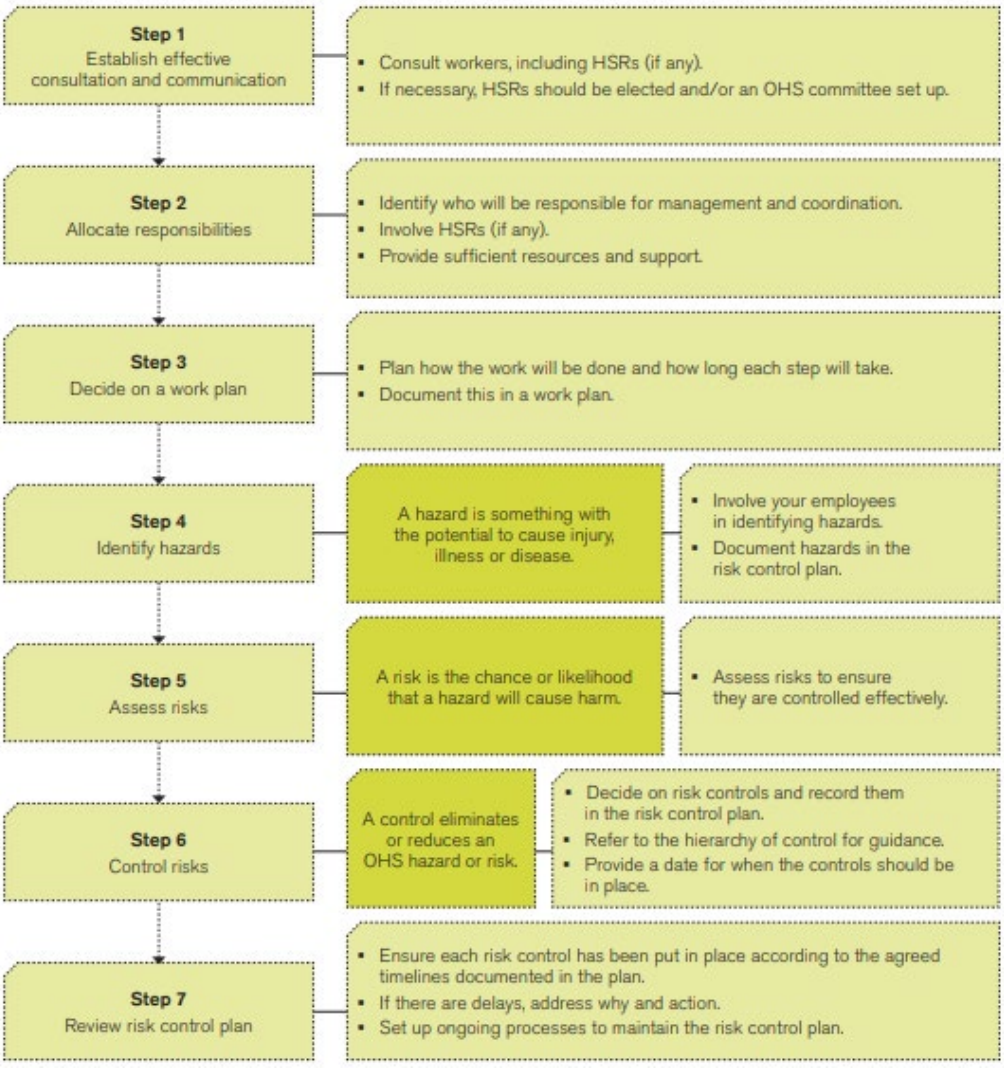


Figure 4-1 WorkSafe Victoria Risk Control Plan Guideline [11]

4.1 Task 1: Dangerous Goods Screening

The screening evaluates the storage of dangerous goods against thresholds set by the *Dangerous Goods (Storage and Handling) Regulations 2022* [11]. This screening compares the quantities of Dangerous Goods stored and handled with the Placarding Quantity, Manifest Quantity and Fire Protection Quantity thresholds defined in Schedule 2 of the *Dangerous Goods (Storage and Handling) Regulations 2022* [11].

If the storage quantities exceed the thresholds for placarding, manifests, or fire protection, the relevant Dangerous Goods regulatory requirements will be provided in Section 5.3.1.

4.2 Task 2: Hazard and Risk Impact Assessment

Following the screening assessment, a Hazard and Risk Impact Assessment will be conducted.

The Hazard and Risk Impact Assessment will focus on major incident scenarios that may result in impacts to receptors or outside of the Project Area defined as “off-site”. In this context, “impact” is defined as the potential to cause fatalities. The analysis will focus on identifying and evaluating these scenarios to ensure that any risks with the potential to extend to receptors or offsite are appropriately managed and mitigated.

WorkSafe Victoria’s guide, “A Guide to Risk Control Plans” [12], provides a methodology that can be applied to the risk assessment for the proposed facility, refer to Figure 4-1. The approach includes:

- **Hazard Identification**: Identifying significant on-site and off-site hazards that may pose off-site risks, including potential fire sources and operational risks (e.g. electrical faults, chemical releases, bushfires, floods).
- **Risk Documentation**: Developing a risk assessment table to document key hazards, detailing the nature and characteristics of each risk, and applying controls based on the hierarchy of controls and industry best practices.
- **Consequence Analysis**: Assessing the consequences of identified hazards to determine their potential impact on adjacent facilities or sensitive receptors. Hazards with no significant impacts are screened out, while those with possible impacts are carried forward.
- **Frequency Analysis**: Evaluating the frequency of hazards that have been carried forward from the consequence assessment.
- **Risk Assessment and Evaluation**: Assessing the overall risk by combining the consequence and frequency analyses for hazards with potential off-site impacts.

For this assessment, a qualitative approach was assumed to be appropriate and sufficient to evaluate the potential impacts on neighbouring land uses based on the following:

- The expected types and quantities of chemicals stored and handled at the Project (primarily Diesel)— are not expected to pose significant on or off-site risks. and
- There are non-sensitive surrounding land uses (i.e. no schools, hospitals, aged care and childcare facilities)

Additionally, risk assessment is a continuous and iterative process. The Hazard Assessment should be regularly reviewed and updated throughout each stage of the Project to address any emerging risks and ensure ongoing safety.

4.3 Task 3: Project Recommendations

Based on the findings from the Preliminary Impact Assessment, recommendations will be made, if necessary. These recommendations will be informed by relevant Australian standards and guidelines such as:

- CFA Design Guidelines and Model Requirements: Renewable Energy Facilities V4 [10]
- AS/NZS 5139-2019: Electrical installations – Safety of battery systems for use with power conversion equipment
- AS 1940-2017: The storage and handling of flammable and combustible liquids.

The identified recommendations and mitigation measures should be considered during detailed design and while developing the Emergency Management Plan for the Project.

4.4 Task 4: Bushfire hazard assessment

The following sources of information were reviewed to inform the preparation of this bushfire hazard assessment:

- VicPlan [13]
- Victoria Planning Provisions [14]
- NatureKit [15]
- Loddon Mallee Region – Central Victoria Mapping Tool [16]
- *Regional Bushfire Planning Assessment – Loddon Mallee Region* [17]
- *Design Guidelines and Model Requirements: Renewable Energy Facilities* [1]
- *Planning Permit Application Bushfire Management Overlay – Technical Guide* [18].
- *Australian Fire and Emergency Service Authorities Council - Wind Farms and Bushfire Operations Guideline Version 3* [19].

For the purposes of bushfire hazard assessment, areas of vegetation considered to pose a bushfire threat are classified according to the vegetation classes defined as per *AS 3959:2018* [20]. Under Clause 2.2.3 and Table 2.3 of *AS 3959:2018*, vegetation is classified into the following classes:

- **Forest**: includes tall open forest, woodland and low open forests which includes trees up to or over 30m tall and 30%-70% foliage coverage. This category also includes mature pine plantations
- **Woodland**: includes tress up to 30m high with a 10% - 30% foliage coverage.
- **Shrubland**: includes heath that is found in wet areas, poor soil conditions and 1m-2m high as well as low shrubland that is <2m high, 30% foliage coverage and has an understorey.
- **Scrub**: includes closed and open scrub which can range from wet or rocky areas with poor soil conditions and contain a mixed species composition.
- **Mallee/Mulga**: includes low tress or tall shrubs, usually >2m tall with sparse grassy understorey.
- **Rainforest**: includes trees with a >90% foliage cover, mixed species understorey and is not dominated by eucalypts.
- **Grassland**: includes all forms of grasses (except tussock moorlands) and where managed in a minimal fuel condition and non-curing cropland is regarded as a low threat vegetation.
- **Tussock Moorland**: includes all forms for vegetation where the overstorey is dominated by Button-grass.

AS 3959:2018 also describes situations where vegetation is classified as 'low threat' due to factors such as flammability, moisture content or fuel load. This includes grassland managed in a minimal fuel condition, non-curing cropland, maintained lawns, golf courses, maintained public reserves and parklands, nature strips and windbreaks etc.

Details of the bushfire hazards within the Project Area, including the presence and type of classified vegetation and topography was determined during a field assessment undertaken on 10 April 2025. Bushfire hazards situated beyond the Project Area were determined based on observations from publicly accessible locations during the site inspection and aerial photo interpretation.

5 Task 1: Screening Assessment

5.1 Dangerous goods storage and transport requirements

Dangerous Goods screening of the proposed development was conducted to determine if the development must adhere to specific requirements under Victorian legislation. The following regulations and codes were reviewed against the proposed hazardous materials and quantities:

- *Occupational Health and Safety Act 2004* [21]
- *Dangerous Goods (Storage and Handling) Regulations 2022* [8]
- *Australian Dangerous Goods Code* [22]

The hazardous chemicals on site (i.e. Class 9 lithium-ion batteries, diesel, transformer oil) are not listed in Schedule 14 of the *Occupational Health and Safety Regulations 2017* and hence, their storage quantities do not trigger a major hazard facility classification.

The *Dangerous Goods (Storage and Handling) Regulations* set out the requirements for the use, handling, and storage of hazardous chemicals at a workplace. Specifically, this report assesses requirements for exceeding placard, manifest and fire protection quantities found in Schedule 2 of the Regulation.

A summary of the expected hazardous materials to be stored and handled on site for the Project, are listed in Table 5-1 and Table 5-2. These have been compared to the thresholds provided in Schedule 2 of the *Dangerous Goods (Storage and Handling) Regulations 2022* [11] for placarding, manifest, and fire protection.

Where the storage quantities exceed the thresholds for placarding, manifests, or fire protection, the relevant DG regulatory requirements will be provided in Section 5.3.1.

5.2 Dangerous Goods on Site

The hazardous materials being screened have been separated into two categories; BESS hazardous materials and other possible hazardous materials.

Table 5-1 below details the hazardous materials associated with BESS battery units.

The Battery Technology Original Equipment Manufacturer (OEM) is not finalised at this stage. However, it is anticipated that the battery system will consist of battery enclosures containing lithium-ion battery modules. They will be delivered pre-assembled meaning all substances required by the units are built into the battery enclosure and do not need to be added at the time of installation at the Site.

Table 5-2 provides a list of non-battery hazardous materials which are expected to be present in various quantities on site and may be part of adjacent infrastructure (e.g. transformers). In cases where the packing group is ambiguous, the worst-case scenario is assumed.

.

5.3 Summary of Dangerous Goods and Threshold Quantities

Table 5-1 Threshold Quantities for BESS Hazardous Materials

Material	UN No.	DG Class	Category	Packing Group	Project Storage Quantities and Movements	Dangerous Goods Threshold			Exceedance
						Placarding	Manifest	Fire Protection	
Lithium-ion Batteries (LIB)	3480	9	Miscellaneous dangerous goods and article	II	**Battery Storage** No batteries stored on site	1,000 kg	10,000 kg	20,000 kg	N/A
					Batteries in Use Total on site **is 10,972,800 kg** [2]	N/A[1]	N/A[1]	N/A[1]	N/A[1]

Notes:

1. Lithium-ion batteries **in use** are not subject to the requirements of the *Dangerous Goods (Storage and Handling) Regulations 2022* as per Regulation 6 (c) and, hence, do not have a prescribed storage threshold under Schedule 2 of the *Dangerous Goods (Storage and Handling) Regulations 2022*.
2. The weight provided is the total BESS Enclosure weight rather than the total weight of the batteries.

Table 5-2 Threshold Quantities for Other Possible Hazardous Materials

Material	UN No.	DG Class	Category	Packing Group	Project Storage Quantities and Movements	Dangerous Goods Threshold			Exceedance
						Placarding	Manifest	Fire Protection	
Diesel (Fuel for minor maintenance machinery)	1202	N/A – C1 Combustible Liquids are not classified as DGs for transport purposes[1] [22]. However, they are classified as DGs in the context of storage and handling [11].		N/A	Total on site is **30,000 L (30 kL)**	10,000 L (10 kL)	100,000 L (100 kL)	100,000 L (100 kL)	Only placarding threshold exceeded.
Transformer Oil	Various	N/A – C2 Combustible Liquid[2]		II	Total on site is **10,000 L (10 kL)**	N/A	N/A	N/A	N/A
Lube Oil	Various	N/A – C2 Combustible Liquid[2]		N/A	Total on site is **5,000 L (5 kL)**	N/A	N/A	N/A	N/A

Notes:

1. No placarding is required by the ADG Code on a portable tank or tank vehicle transporting only C1 liquid [22].
2. As per Regulation 6(g) of Clause 6(c) of *the Dangerous Goods (Storage and Handling) Regulations 2022* [11], "dangerous goods that are combustible liquids other than C1 combustible liquids;" are exempt from the regulations.

5.3.1 Lithium-ion Batteries

Lithium-ion batteries are classified as Class 9 Miscellaneous Dangerous Goods. However, Clause 6(c) of *the Dangerous Goods (Storage and Handling) Regulations 2022* states that the regulations do not apply to "*dangerous goods that are batteries while they are in use".*

The facility is not expected to store lithium-ion batteries (additional BESS units) on site (i.e. for repair or replacements), all batteries on site will be in use.

Once installed and connected, lithium-ion batteries are not considered Dangerous Goods. As such, lithium-ion batteries that are in use within the facility are excluded from the requirements of Schedule 2, and only lithium-ion batteries in storage are required to be assessed against the General Screening Thresholds in Table 5-1.

The content of the battery, lithium, poses little threat to people or property. However, the potential of thermal runaway effects may lead to fire and explosion hazards [23]. As such, the risks of lithium batteries in use have been considered as part of this study and mitigation measures of Li-ion batteries in are further discussed in Section 7.2

5.3.2 Diesel (Combustible Liquid)

Diesel is not classified as a DG by the Australian Dangerous Goods (ADG) Code [24].

Additionally, in accordance with the Special Provision No. AU02 of the *Australian Dangerous Goods Code* (ADGC), "*GAS OIL or DIESEL OIL or HEATING OIL, LIGHT or PETROLEUM DISTILLATE is not subject to this Code if it does not meet the criteria of Chapter 2.3* [of the ADGC] *for assignment to Class 3; i.e., if the flash point is more than 60°C and the substance is not offered for transport at a temperature above its flash point. Such substances will normally be C1 combustible liquids which are not classified as dangerous goods for transport purposes*" [22]. Thus, diesel will not be considered a dangerous good (DG) for transportation.

Moreover, it is expected that the risk associated with diesel transportation to be low. This is due to the low annual movements expected, as diesel will only be used in generators when back-up power is required, and/or testing undertaken.

However as per Clause 6(g) and Schedule 2 of the *Dangerous Goods (Storage and Handling) Regulations 2022* [11], C1 combustible liquids are classified as dangerous goods in the context of storage and handling. A recommendation has therefore been made for the storage of diesel in Section 7.1 of this Risk and Hazard Assessment.

5.3.3 Transformer Oil and Lube Oil

Transformer oil and Lube Oil are both classified as a C2 combustible liquid. As per Regulation 6(g) of the Clause 6(c) of *the Dangerous Goods (Storage and Handling) Regulations 2022* [11], "dangerous goods that are combustible liquids other than C1 combustible liquids;" are exempt from the regulations and have therefore, been excluded from this study (Task 1 and Task 2).

However, quantities for anticipated storage have been detailed for completeness.

5.4 Dangerous Goods Regulatory Requirements

5.4.1 Placard Quantities

Diesel (Combustible Liquid)

The maximum allowable placard quantity of diesel as per Schedule 2 of the *Dangerous Goods (Storage and Handling) Regulations 2022* [11] is 10 kL. The proposed quantity of **30 kL** to be stored at site exceeds the placard quantity, therefore:

- In accordance with Regulation 46 of the *Dangerous Goods (Storage and Handling) Regulations 2022* [11], “HAZCHEM” outer warning placards are to be displayed at every entrance for road vehicles.The placard must display the word "HAZCHEM" in red letters not less than 100 mm high and of the style shown in Figure 5-1, on a white or silver background. Note: Red means the colour Signal Red in accordance with AS 2700S:2011.

Figure 5-1: Form and dimensions of an outer warning placard

- Specifically, the placard for C1 combustible liquids in bulk must:
  - Display the words “COMBUSTIBLE LIQUID” in the style shown in Figure 5-2
  - The words must be in black letters that are not less than 100 mm high, be in the style shown in Figure 5-2 and on a white or silver background

Figure 5-2: Placard for C1 combustible liquids in bulk

6 Task 2: Hazard and Risk Impact Assessment

Section 4(2) of the *Victorian Occupational Health and Safety Act 2004* [21] states "*persons who control or manage matters that give rise or may give rise to risks to health or safety are responsible for eliminating or reducing those risks so far as is reasonably practicable*".

6.1 Hazard Identification

Hazard Identification (HAZID) aims to identify all reasonably foreseeable hazards and associated events that may arise due to the operation of the facilities and defining the relevant controls through a systematic and structured approach.

All potential significant hazards that may pose a risk to the Project or an off-site risk were identified and documented in a Risk Management Plan. The consequences of each of the identified hazards were assessed to determine if such consequences may impact off-site adjacent facilities or any receptors.

Hazards are grouped by component; all hazards are listed along with causes and consequences in Appendix B: Risk Management Plan.

- BESS (Lithium-Ion Battery)
- Wind Turbines
- Transformer and Electrical Network Hazards
- Combustible Liquid Hazards
- Natural Hazards
- Other Hazards.

6.1.1 BESS Hazards (Lithium-ion Battery Hazards)

The primary hazard for lithium-ion batteries is thermal runaway, which can lead to a fire, explosion, and release of toxic and flammable gases. A thermal runaway event may also propagate to other batteries and cause further incident escalation. Various factors may contribute to a thermal runaway event, including operating outside safe temperature ranges, improper charging/discharging practices, and physical damage.

In most cases, the temperature of the lithium-ion batteries should be controlled to prevent thermal runaway, which causes propagation of increasing temperatures, pressures, and fire toward neighbouring cells. Similarly, the temperature of the lithium-ion batteries, should not drop too low to prevent lithium plating around the anode during charging, which can cause internal shorts.

Although the choice of anode-cathode chemistry can result in different thermal stability and volatility, all lithium-ion batteries are flammable when exposed to fire. Lithium-ion fires are a unique class of fire and may result in emissions of large volumes of toxic or combustible gases, which must be managed accordingly. These hazards are described in Appendix B: Risk Management Plan.

An internal or external short circuit can cause significant overheating and provide an ignition source resulting in fire, including surrounding materials or materials within the cell or battery. Under normal conditions of use, the electrode materials and electrolyte they contain are not exposed, provided the battery integrity is maintained, and seals remain intact. The risk of exposure may occur only in cases of damage (mechanical, thermal and/or electrical).

Prolonged exposure of the product to conditions of abuse (mechanical, thermal and/or electrical) may increase the potential of thermal runaway and result in a fire. Exposure of battery packs to localised heat sources such as flames may result in cell thermal runaway reactions and should be avoided [25].

6.1.2 Wind Turbine Generator Hazards

There are three main hazards associated with wind turbine generators (WTGs):

- Blade throw
- Toppling or collapse of the structure
- And a generator failure.

Blade Throw

In a WTG a blade throw incident is a rare structural failure of a blade (or blades) this can lead to in either the full blade or a segment of the blade detaching from the structure and being “thrown” from the turbine. Various factors may contribute to a blade throw incident, including physical damage (erosion or lightning), material defects or fatigue. Recommendations have been detailed in Appendix B: Risk .

Toppling/Collapse of Structure

The ‘collapse’ of the tower occurs more frequently than the toppling of a tower but the events are considered rare The main causes for tower collapse are material fatigue, storms, lightning strike and fire [26]. The bolt installation method is also proposed to be a contributor to the cause of structural failure for the incidents outlined above [26].

Generator

The generator located in the nacelle of a wind turbine usually has the highest failure rate compared to the other components of the WTG. The main two incidents that can occur are generator fires and structural damage to the WTG. The main causes of these incidents are overheating, faults, jammed bearing, bearing seizure or overspeed. The main root causes for generators are design issues, operation issues, maintenance practices and environmental conditions [27].

6.1.3 Transformer and Electrical Network Hazards

Access to equipment, safe operation and maintenance, safe personnel egress, equipment clearance, electrical safety and fire safety systems need to be considered for transformer installations. AS 2067:2016: *Substations and high voltage installations exceeding 1 kV a.c.* [28] outlines the risks and safety measures for these hazards. Contact with live parts, arc flashing, and transformer fires are the most common hazards associated with transformers. As this area involves high voltages, the site must comply with the *Electricity Supply Act 1995* [29]

The causes of fire hazards relating to transformers are typically categorised as one of the following:

- Plant and equipment containing combustible insulating liquids may rupture due to internal failure; there may be an explosion, and ignition may occur with a serious fire risk.
- Plant and equipment without combustible insulating liquids may rupture due to internal failure; there may be an explosion and modest fire risk.
- Other plant and equipment such as cables, batteries, and drainage pipes may catch fire and spread the fire.

6.1.4 Combustible Liquid Hazards

Diesel may be present at the Project as a fuel for various pieces of equipment, especially during construction. Diesel is classified as a C1 Combustible Liquid. A Loss of Containment (LOC) of diesel may accumulate and pose a fire risk if ignited. If ignited, the LOC may result in a pool fire; however, given diesel’s high flashpoint, the probability of ignition is low.

A similar hazard is present for various oils and lubricants used in the Project Area. However, these are stored in much smaller quantities and are unlikely to cause a significant incident escalation if a LOC is ignited.

6.1.5 Natural Hazards

Several potential natural hazards pose a risk to the Project or significant off-site consequence. These hazards include extreme ambient temperatures, bushfires, seismic activity, flooding, wind, subsidence, and lightning.

The main concern for WTG is Upward Lightning strikes (lightning strikes that occur that do not reach the ground) [30]. The concern comes from both the height of WTG and the large current transfer that is involved in the Upward Lightning strike (significantly larger than ground struck lightning). These strikes are rare but can be destructive. Depending on the size of the current / strike incidents such as equipment damage due to the additional high current and physical destruction of WTG can occur.

6.1.6 Other

Other hazards associated with the Project for potential off-site consequence were also considered, including hazards such as vehicle collision / congestion and loss of containment (e.g. of waste, contaminated water, and refrigerant). These hazards are described further in the Risk Management Plan located in Appendix B: Risk Management Plan.

6.2 Risk Analysis

In this study, risk is defined as the likelihood of a specified undesired event occurring within a specified period or in specified circumstances. It may be either a frequency (the number of specified events occurring in a unit of time) or a probability (the probability of a specified event following a prior event) depending on the circumstances.

The matrices set out in Table 6-1, Table 6-2, Table 6-3 are part of Aurecon's management framework and were used to complete a qualitative risk assessment of the identified hazards. Consistent with standard risk assessment methodology, the risk rating for a given hazard is a product of the likelihood and consequence of its occurrence.

As such, the potential consequence for each identified hazard carried forward due to posing significant off-site risk was first assessed (Table 6-1), followed by an assessment of their estimated likelihood of occurrence (Table 6-2). Finally, the overall current risk rating was then calculated by using likelihood and consequence as inputs (Table 6-3).

Table 6-1 Hazard Consequence Assessment Matrix

Consequence	People	Property	Environment	Community
A – Catastrophic	Single or multiple fatality	Virtual complete loss of plant or system	Permanent / irreversible widespread ecological damage not able to be remediated	Outrage by a sizeable community or many communities. Riots.
B – Major	Disabling injury or illness i.e., amputation and/or permanent loss of bodily function, or any kind of permanent health impact	Extensive damage to plant or system	Extensive ecological damage, lengthy remediation process	Community/NGO legal actions. Pickets, demonstrations.
C – Moderate	Any Lost Time Incident (LTI), i.e., an illness or injury resulting in one or more consecutive days or shifts off work	Significant damage to plant or system	Substantial ecological damage but able to be remediated	Persistent formal community complaints. Formal complaints to politicians or comparable representatives.
D – Minor	A medical treatment case (MTC) / or restricted work case (RWC)	Damages impact on budget and program	Localised ecological damage, easily remediated	Formal complaints from local Community complaints locally

Consequence	People	Property	Environment	Community
E – Incidental	First Aid case, or an injury or illness not requiring treatment	Minor damage to plant or system	Negligible ecological damage, may not require remediation	No Informal community complaints &/or negative comments / views.

Table 6-2: Hazard Likelihood Assessment Matrix

Likelihood	Descriptor	Likelihood	Industry Incidences
5 – Almost Certain	The threat is expected to be realised.	90% < Likelihood ≤ 100%	Common incident
4 – Likely	The threat is likely to be realised.	5% < Likelihood ≤ 90%	Several incidents nationally
3 – Possible	The threat may be realised.	1% < Likelihood ≤ 5%	One or a few incidents nationally
2 – Unlikely	The threat is not expected to be realised.	0.1% < Likelihood ≤ 1%	No known national incidents. One or a few incidents in comparable international operating regimes.
1 – Rare	The threat may be realised in reasonably foreseeable but exceptional circumstances.	0% < Likelihood ≤ 0.1%	No known incidents in comparable international operating regimes.

Table 6-3: Risk Rating Matrix

		Likelihood				
		1 – Rare	**2 – Unlikely**	**3 – Possible**	**4 – Likely**	**5 – Almost Certain**
Consequence	**A - Catastrophic**	High	Critical	Critical	Critical	Critical
	B – Major	High	High	Critical	Critical	Critical
	C – Moderate	Medium	Medium	High	High	Critical
	D – Minor	Low	Low	Medium	High	High
	E – Incidental	Low	Low	Low	Medium	Medium

6.3 Risk Management Plan

The identified hazards, events, applicable infrastructure and the relationships with causes, consequences and controls are summarised in the risk management plan (Appendix B: Risk Management Plan).

Importantly, the consequences of these events are not anticipated to lead to significant on or off-site impacts, including serious injury or fatality to the public or off-site population. This expectation is also grounded in the development's rural location, where no associated residential dwellings or other sensitive receptors are near the site.

The risk assessment has shown that, whilst there is potential for major consequences, implementing risk controls will make these consequences unlikely, particularly for off-site effects. The recommended technical

and management safeguards set out in Appendix B: Risk Management Plan are intended to reduce the residual risk so that no identified hazards pose a significant risk.

6.4 Other risk factors

A review of other risk factors was also carried out to identify any hazards that may be outside the scope of the screening. It was noted that the project would not involve:

- Storage or transport of incompatible materials (i.e., hazardous and non-hazardous). Hazardous materials will be stored in dedicated areas and storage protocols in accordance with standard and guidelines will be followed.
- Generation of hazardous waste.
- Possible generation of dusts within confined areas.
- Type of activities involving hazardous materials with the potential to cause significant off-site impacts (i.e. multiple fatalities outside the site boundary).
- Incompatible, reactive, or unstable materials and process conditions that could lead to uncontrolled reaction or decomposition.
- Storage or processing operations involving high (or extremely low) temperature and/or pressures.
- Hazardous materials and processes with known past incidents (or near misses) that resulted in significant off-site impacts at BESS and wind energy facilities.

7 Task 3: Project Recommendations

There are several Australian and international standards which govern the best practice design and installation of the facility. The following recommended technical safeguards are expected to reduce the residual risk such that no identified hazards pose a significant risk.

7.1 Dangerous Goods and Environmental Recommendations

General recommendations for risk reduction due to dangerous goods on site shall include:

- Buildings should be designed to relevant applicable codes for the range of natural hazards listed in Appendix B: Risk .
- While the ADG code does not classify diesel or other combustible liquids as a dangerous good, it is a C1 combustible liquid. Given its classification as a C1 combustible liquid and the commonplace use of diesel, compliance with AS 1940 *The Storage and Handling of Flammable and Combustible Liquids* is considered sufficient to mitigate this risk.

7.2 CFA Guideline Recommendations

7.2.1 General

In accordance with CFA Design Guidelines and Model Requirements: Renewable Energy Facilities V4 [10], it is recommended that the following requirements shall be met:

- Early consultation with CFA's Specialist Risk and Fire Safety Unit, before developing a planning permit application
- A Risk Management Plan must be developed for the facility, in consultation with CFA, before development starts
- An Emergency Plan must be developed for the construction and commissioning phase of the facility.
- A Fire Management Plan must be developed for the facility, in consultation with CFA, before development starts.
- Appropriate demarcation of arc boundaries to at least 10 m from power conversion unit (PCU) arc flash outlet flaps (blow-out panels) must be provided.
- 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.
- An Emergency Plan must be developed for the operational phase, specific to the facility, in consultation with CFA, before development starts.
- 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.

7.2.2 Facility Design

Emergency vehicle access

In accordance with CFA Design Guidelines and Model Requirements: Renewable Energy Facilities V4 [5], it is recommended that the following requirements shall be met:

- Construction of a minimum four (4) metre perimeter road within the perimeter fire break associated with the BESS facility (Note: N/A for wind energy facilities.)
- Roads must be of all-weather construction and capable of accommodating a vehicle of fifteen (15) tonnes (e.g. no compacted earth).
- 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. Ensure any fencing along access routes allows for width of fire trucks.
- 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.
- Dips in the road should have no more than a 1 in 8 (12.5% or 7.1°) entry and exit angle.
- 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.
- Road networks must enable responding emergency services to access all areas of the facility, including fire service infrastructure, buildings, and battery energy storage systems and related infrastructure.
- The provision of at least two (2) but preferably more access points to each part of the facility

Firefighting Water Supply

In accordance with CFA Design Guidelines and Model Requirements: Renewable Energy Facilities V4 [5], it is recommended that the following requirements shall be met:

- Water access points must be clearly identifiable and unobstructed to ensure efficient access.
- Static water storage tank installations must comply with AS 2419.1-2021: Fire hydrant installations – System design, installation and commissioning.
- The static water storage tank(s) must be an aboveground water tank constructed of concrete or steel.
- The static water storage tank(s) must be capable of being completely refilled automatically or manually within 24 hours.
- 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.
- The hard-suction point must be provided with a 150mm full bore isolation valve equipped with a Storz connection, sized to comply with the required suction hydraulic performance.
- The hard-suction point must be positioned within four (4) metres to a hardstand area and provide a clear access for emergency services personnel.
- 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 road access and hardstand must be kept clear at all times.
- The hard-suction point must be protected from mechanical damage where necessary.
- Where the access road has one entrance, an eight (8) metre radius turning circle must be provided at the tank.
- An external water level indicator must be provided to the tank and be visible from the hardstand area.
- Signage indicating 'FIRE WATER' and the tank capacity must be fixed to each tank.
- Signage must be provided at each vehicle entrance to the facility, indicating the direction to the nearest static water tank(s).

Fire Detection and Suppression Equipment

In accordance with CFA Design Guidelines and Model Requirements: Renewable Energy Facilities V4 [5], it is recommended that the following requirements shall be met:

- Provision of suitable fire detection and suppression equipment for on-site buildings and structures, according to the requirements of the National Construction Code.
- Provision of suitable fire detection and suppression equipment for storages of dangerous goods, according to the requirements of any Australian Standards for the storage and handling of dangerous goods.
- For electrical installations, a minimum of two suitable fire extinguishers must be provided within 3m-20m of each PCU.
- In all vehicles and heavy equipment, each vehicle must carry at least a nine (9)-litre water stored-pressure fire extinguisher with a minimum rating of 3A, or other firefighting equipment as a minimum when on-site during the Fire Danger Period.

Fire Breaks

In accordance with CFA Design Guidelines and Model Requirements: Renewable Energy Facilities V4 [5], it is recommended that the following provision of fire break facility design requirements shall be met:

- Around the perimeter of the BESS facility, commencing from the boundary of the facility or from the vegetation screening inside the property boundary. (Note: N/A for wind energy facilities.)
- Around the perimeter of control rooms, electricity compounds, substations and all other buildings onsite.
- A fire break must be established and maintained around the base of wind turbines.
- Be a width of at least 10m.

7.2.3 BESS Design

In accordance with CFA Design Guidelines and Model Requirements: Renewable Energy Facilities V4 [5], it is recommended that the following requirements shall be met:

- Where reticulated water is available, the provision of a fire hydrant system that meets the requirements of AS 2419.1-2021: Fire hydrant installations, Clause 3.9: Open Yard Protection, and Table 2.2.5(D): Number of Fire Hydrants Required to Flow Simultaneously - Open Yards.
- Where no reticulated water is available, provision of a fire water supply in static storage tanks, where:
    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 2419.1-2021: Fire hydrant installations, flowing for a period of no less than four hours at 20L/s, whichever is the greater.
    ii. The quantity of static fire water storage is to be calculated from the number of hydrants required to flow from AS 2419.1-2021: Fire hydrant installations, Table 2.2.5(D).
    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.
    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).
    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).
    vi. The fire water supply must comply with AS 2419.1-2021: Fire hydrant installations, Section 5: Water storage tanks
- The provision of a fire break around battery energy storage systems and related infrastructure.

- The design of the facility must incorporate:
  a) A separation distance that prevents fire spread between battery containers/enclosures and other site elements.
  b) A fire break around the battery energy storage system and related infrastructure, of a width of no less than 10m.
  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. Minimises the potential for fires in battery containers/enclosures to impact on-site and offsite infrastructure.
- BESS must be:
  a) Located so as to be reasonably adjacent to a site vehicle entrance (suitable for emergency vehicles).
  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.
  c) Provided with in-built fire and gas detection systems.
  b) Provided with explosion prevention via sensing and venting, or explosion mitigation through deflagration panels.
  c) Provided with suitable ember protection.
  d) Provided with suitable access roads for emergency services vehicles.
  e) Installed on a non-combustible surfaces.
  f) Provided with suitable ventilation.
  g) Provided with suitable impact protection.
  h) Provided with enclosed wiring and buried cabling, except where required to be above-ground for grid connection.
  i) Provided with spill containment that includes provision for management of fire water runoff.

7.2.4 Wind Energy Facility Design

In accordance with CFA Design Guidelines and Model Requirements: Renewable Energy Facilities V4 [5], the following facility design requirements shall be met:

- Constructed roads developed during construction phase must be maintained post-commissioning and throughout the operational life of the facility, to allow access to each turbine. (The number and location of vehicle access points must be determined in consultation with CFA.)
- The fire protection system for wind energy facilities must incorporate at least one static firewater storage tank of at least 45,000L effective capacity at each site entrance.
- 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.)
- Nacelles must be equipped with automatic fire detection, alarm and fire suppression systems.
- A fire break must be established and maintained around the base of wind turbines.

7.3 Lithium-ion Battery Recommendations

The primary reference standards are *IEC 62619 Safety Requirements for Secondary Lithium Cells and Batteries, for use In Industrial Applications* [32] and IEC 62485-5: *Safety requirements for secondary batteries and battery installations – Part 5: Safe operation of stationary lithium-ion batteries* [33].

These standards outline safety and protection measures for lithium-ion batteries, addressing the major hazards identified in this risk and hazard assessment. They provide requirements for installation, operation, maintenance, and end-of-life management of lithium-ion batteries in BESS. Contractors and suppliers must adhere to these standards for BESS component installation, operation, maintenance, and disposal.

Design of the Lithium-Ion BESS should consist of modular, insulated battery cells and the container should be kept free of extraneous and combustible materials to mitigate the risk of fire or thermal overload spreading to multiple battery cells. These units need to account for adequate separation to prevent fire propagation considering the findings from the 2021 Victorian Big Battery fire incident [34] where fire propagation to the roof of the adjacent BESS sub-unit occurred.

7.4 Transformer and Switchgear Recommendations

AS 2067:2016*: Substations and high voltage installations exceeding 1 kV a.c*. [28] outlines the risks and safety measures for primary hazards presented by transformer which includes live contact, arc flashing, and fire and explosions. The BESS (including transformers) should be designed in line with and comply with this standard. All transformers should have separation distances away from other transformers, control rooms and office complexes that exceed the required distances in the standard. Details of the requirements for this standard is listed below:

- Protection against live contact of a transformer is generally achieved with the following mitigation measures:
  - protection by enclosure
  - protection by barrier
  - protection by obstacle
  - protection by placing out of reach.
- Protection against arc faults between transformers and other equipment or people is generally achieved with the following mitigation measures:
  - Protection against operating error through:
    - load break switches
    - short-circuit rated fault-making switches
    - interlocking devise
    - noninterchangeable key locks.
  - Operating aisles as short, high, and wide as possible
  - Solid covers as an enclosure or protective barrier
  - Equipment tested to withstand internal arc fault
  - Arc protection to be directed away from operating personnel and vented outside the building if necessary
  - Use of current limiting devices
  - Very short tripping time
  - Operating of the plant from a safe distance
  - Prevention of reenergisation by use of manually resettable devices which detect internal equipment faults, and which incorporate pressure relief and provide external indication

- To mitigate the risks associated with transformer fire, the following steps should be followed:
  - Minimise the risk of a fire starting:
    - The transformer specification should consider insulation levels, operating temperatures, cooling systems, protection systems, operation (including the effect of prolonged overloading) and maintenance practices
  - Minimise the risk of transformer failure developing into an oil fire:
    - Consideration should be given to insulating liquid type, tank strength, low explosion risk bushings, and pressure relief
  - Minimise the impact of a transformer fire on the environment, other assets, and humans
- The following control measures should always be in place to minimise the damage resulting from a transformer fire.
  - Minimise risk of loss of life and injury to humans by:
    - providing adequate clearance around transformers, particularly those with sound enclosures
    - providing adequate access for firefighting equipment
    - providing adequate egress routes

  - Minimise the risk of the fire spreading or causing damage to adjacent transformers, control building, structures and other items of plant and equipment.
    - providing passive protection systems in the form of adequate separation distances, fire barriers, construction buildings of fire resisting materials
    - providing active suppression systems such as deluge, water mist, or gas flooding
  - Minimise contamination and damage to the environment by provision of oil containment systems and bunding

7.5 Separation Distances Recommendations

Additional safeguarding includes designing to Australian Standards and industry best practice to minimise the risk of fire through inherently safe design such as onsite separation of BESS units (i.e., obtaining vendor test results of the battery enclosures for fire propagation is recommended).

Recommendations for separation distances are as follows:

- Safe separation distances and limited access to the existing substation and switchyard should be maintained for construction, installation, and commissioning workers.
- The design of BESS and auxiliary infrastructure should consider:
  - Surface Water and Groundwater Assessment to determine special flood considerations
  - Provision for water retention facility
- The layout should be developed to accommodate the anticipated number of BESS enclosures and the necessary separation distances to mitigate the spread of fires. The BESS installation will also adhere to fire and safety codes and standards such as NFPA 855, UL 9540, and UL 9540A.
- The separation of the buildings, including switch rooms, control room and workshop shall be in accordance with AS 2067:2016*: Substations and high voltage installations exceeding 1 kV a.c.* [35] and the National Construction Code. Additional discussion on the separation from the transformers is noted within Section 7.2.4 of this report.
- Lithium-ion batteries are considered DGs while in storage and not connected to the grid. *AS/NZS 4681 The Storage and Handling of Class 9 (miscellaneous) Dangerous Goods and Articles* [36] outlines requirements for Class 9 DGs (i.e., lithium-ion batteries and battery enclosures) which should be followed while battery enclosures are onsite and not connected to the grid.

Since the final dimensions of the enclosures and associated clearances may vary depending on the selected supplier and product type and the final detailed design, the supplier appointed will be required to finalise the detailed design in accordance with the above design considerations for the appropriate management and minimisation of fire risk. The battery enclosure supplier will advise the safe separation demonstrated by tests within battery enclosures to prevent fire propagation should an incident occur involving the battery cells.

7.6 Fire Safety Recommendations

Additionally, CFA expects that a Fire Safety Study (FSS) be conducted, in line with the NSW *Hazardous Industry Planning Advisory Paper No. 2* (HIPAP 2) *Fire Safety Study Guidelines* [37], and provided to CFA's Specialist Risk and Fire Safety Unit for facilities with battery energy storage system(s) where the Model Requirements within their design guideline for renewable facilities [10] are not fully met. A Fire Safety Study, as outlined in HIPAP 2, aims to assess and document the effectiveness of fire prevention, detection, and mitigation measures specific to the site's hazards, ensuring compliance with fire safety standards and reducing risks to people and property.

Additionally, the CFA design guideline for renewable facilities [10] states that the management of fire water runoff must also be addressed. CFA recommends that infrastructure is provided for the containment and management of contaminated fire water runoff from battery energy storage systems. Infrastructure may include bunding, sumps and/or purpose-built, impervious retention facilities. A fire water management plan may consist of the containment and disposal of contaminated fire water. CFA also recommends a containment and management capacity equivalent to the on-site fire protection system.

7.7 Safety Management System Recommendations

The following recommendations relate to Safety Management Systems which should be implemented to ensure safe operations of the Project.

7.7.1 Construction Phase Recommendations

The construction contractor is to prepare an adequate safety management system and documentation for the Project construction phase (e.g., various management plans, emergency plans, traffic management plans, procedure for removal of contaminated land and remediation as required).

7.7.2 Operational and Maintenance Recommendations

The BESS should be installed correctly and commissioned / tested to ensure safe function. The safety testing of the lithium-ion BESS should be conducted under the guidance of IEC 62619: *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for secondary lithium cells and batteries, for use in industrial applications*.

7.7.3 Safety Management Plan Recommendations

The assessment recommends that a safety management system is implemented prior to the commencement of commissioning or operation of the Project.

The following safety management plans should specifically address the BESS and be in place prior to commencement of operation of the Project:

- Work Health and Safety Management Plan, compliant with AS 5577: 2013 Electricity network safety management systems.
- Emergency Response Plan to be prepared as per the CFA guidelines prior to commissioning:
  - Safe operating conditions for temperature
  - Details of the electrical safety hazards
  - Details of the effects of fire on the battery energy storage system
  - The shut-down procedures if the batteries are involved in fire
  - A plan for partial and full decommissioning of the BESS in the event of an emergency incident that renders the facility inoperable or unsafe, prior to its anticipated end-of-life
  - A Fire Management Plan to minimise fire risks
  - An Emergency Information Book within the Emergency Information (Manifest) Container; including the following:
  - The safe operating conditions (e.g. temperature) of the BESS
  - The details of any emissions or toxic gases, including during a fire,
  - All dangerous goods stored on-site must have a current Safety Data Sheet (SDS).
  - Other manifest requirements as listed in the *Dangerous Goods (Storage and Handling) Regulations 2022* [8]
- Asset Management Plans and assurance activities. A comprehensive and regular program of maintenance and inspections, covering the BESS and related infrastructure (i.e., transformers, HVAC, civil structures) to ensure the system is serviced and maintained as per the manufacturer's requirements, including measures to vet contractor appointments to ensure batteries are designed and installed to appropriate standards.
- Stormwater management plan is to be developed.

- Waste management plans for construction and operation of the Project are to be developed.
- Provisions are to be in place for identification and removal of any contaminated land during construction.
- Housekeeping procedures are to be developed for construction and operation.
- Development and implementation of plant operating and maintenance procedures.
- Pest control/management is to be implemented.
- Adequate safeguards are to be implemented for hazards related to working in proximity to a HV substation.
- An audit system should also be developed to ensure regular review and update of the safety management plans.

7.8 Natural Hazard Recommendations

The following recommendations in Table 7-1 relate to Natural Hazards which shall be implemented to ensure safe operations of the Project.

Table 7-1 Natural hazard recommendations

Natural hazard	Description	Recommendation
Extreme Temperatures	The maximum and minimum temperatures recorded at the closest weather station, Kerang weather station (080023), between 1903 to 2025 were 9.5°C and 23°C [38].	▪ Batteries should be designed to operate beyond the maximum temperature range with allowance for higher maximum temperatures of approximately 1.5 to 2ºC to account for the likely effects of global warming. ▪ Electrical design in accordance with AS/NZS 3000:2018. ▪ Battery enclosures have suitable enclosure design for the environment.
Bushfire	The Project is located with a Bushfire Prone Area (BPA) and has sections subject to a Bushfire Management Overlay (BMO). See Section 8 for further details.	▪ Refer to Section 8 for recommendations and Appendix B: Risk for proposed controls.
Seismic Activity	According to the National Seismic Hazard Assessment 2023, the peak ground acceleration for a 10% probability of exceedance in 50 years of mean hazard levels is 0.015-0.02 m/s^2 [39]. Risk of seismic activity is assumed to be minimal.	No recommendations are proposed.
Flooding	Flood risk must be considered in planning to avoid intensifying any impacts of flooding. Design to consider flood planning areas.	▪ A Surface Water and Groundwater Assessment is to be conducted to determine special flood considerations. ▪ Construction should occur during dry periods, account for light and heavy vehicles in heavy rain/flooding events.

Natural hazard	Description	Recommendation
Excessive Wind	The Project Area within the A0 Wind Region as per Figure 3.1 of AS/NZS 1170.2:2021 [40].	▪ The BESS should be designed in accordance with AS/NZS 1170.2.2021. ▪ Housekeeping schedule should be maintained regularly to ensure debris is cleared.
Lightning	The average annual ground lightning flash density in Project Area is around 0.5 to 1 events / km^2 / year [41].	▪ The location of the Wind Turbine Generators (WTGs) should stay within the site boundary in the event of a WTG total collapse from lightning strike hitting WTG. ▪ A lightning protection study should be conducted. ▪ BESS equipment should not be located underneath powerlines. ▪ An earthing system should be implemented. ▪ The BESS facility and Wind Energy facility should be designed in accordance with AS 1768:2021.
Subsidence	[The Project Area will be located above ground and away from any areas prone to subsidence (e.g. abandoned mines). Other design mitigations (e.g. grouting) will be determined during detailed design if infrastructure cannot be located away from such areas.	Ground surveying should be completed to confirm risk of subsidence.

8 Bushfire Hazard Assessment

8.1 Assessment of the planning scheme requirements

To ensure fire risk management can be effectively assessed by the CFA, the CFA expects that all planning applications address all relevant aspects of fire safety, including landscape and bushfire hazards, and hazards to and from the proposed technologies. The following sections provide a tailored response to requirements set out in Section 2.2.2 of the CFA guidelines and Clause 13.02 of the Victoria Planning Provisions based on the project description in Section 2.

8.1.1 Victoria Planning Provisions

Clause 13.02-1S (Bushfire Planning) outlines the State's objectives in managing bushfire risk to life and property through appropriate hazard identification and strategic planning. Clause 13.02 (Bushfire) includes strategies for bushfire hazard identification and applies to all development in a designated BPA, BMO or any development that may create a bushfire hazard. The CFA Guidelines also require appropriate consideration of Clause 13.02-1S. Table 8-1 below and subsequent sections provide responses to each of the strategies within Clause 13.02-1S.

Table 8-1 Addressing information requirements within Clause 13.02-1S of the Victoria Planning Provisions in relation to bushfire hazard identification

Bushfire hazard identification and assessments	Response
Applying the best available science to identify vegetation, topographic and climatic conditions that create a bushfire hazard.	A site visit was conducted on 10 April 2025 and vegetation was assessed in accordance with *AS 3959:2018*.
Considering the best available information about bushfire hazard including the map of designated bushfire prone areas prepared under the *Building Act 1993* or regulations made under that Act.	Mapping confirms that the Project Area is within a BPA (Figure 8-1) and fire history maps have been sourced from DEECA.
Applying the Bushfire Management Overlay to areas where the extent of vegetation can create an extreme bushfire hazard.	Mapping confirms that two small areas in the Project Area, associated with remnant vegetation, one towards the north-western corner and another towards the south-western corner, are within the BMO (Figure 8-1).
Considering and assessing the bushfire hazard on the basis of: ■ Landscape conditions - meaning conditions in the landscape within 20 kilometres (and potentially up to 75 kilometres) of a site; ■ Local conditions - meaning conditions in the area within approximately 1 kilometre of a site; ■ Neighbourhood conditions - meaning conditions in the area within 400 metres of a site; and ■ The site for the development.	A description of the Project Area and the surrounding landscapes are provided below and shown in the bushfire landscape hazard assessment map (Figure 8-2). ■ Landscape, local and neighbourhood conditions (refer to sections directly below this table) ■ The site for development (refer to Section 8.1.2 and 8.1.3) **Note:** DELWP requirements on landscape and site bushfire hazard assessment have been used in providing a response to these conditions [18].
Consulting with emergency management agencies and the relevant fire authority early in the process to receive their recommendations and implement appropriate bushfire protection measures.	This assessment provides the basis for initial consultation with CFA. This plan will be provided to CFA prior to initial consultation. Ongoing consultation will then occur with CFA during the planning application and in developing documentation prior to commissioning of the facility.

Bushfire hazard identification and assessments	Response
Ensuring that strategic planning documents, planning scheme amendments, planning permit applications and development plan approvals properly assess bushfire risk and include appropriate bushfire protection measures.	This assessment identifies the bushfire risks within the Project Area and surrounding landscape and includes bushfire protection measures that should be employed in the site layout and design (Section 7.2).
Not approving development where a landowner or proponent has not satisfactorily demonstrated that the relevant policies have been addressed, performance measures satisfied, or bushfire protection measures can be adequately implemented.	The Project Area is considered to have a low bushfire risk and contains suitable access and egress options (refer to Section 8.1.2). The WEF and associated infrastructure will also incorporate fire protection measures through design, construction, and operation (Section 7.2).

Landscape condition and bushfire hazards

Most of the land within the Meering, Kerang and Quambatook landscape is utilised for crop cultivation and grazing. Historical broad-scale vegetation clearance has occurred throughout the landscape to support these agricultural land uses and woodland vegetation now predominantly remains as small, isolated fragments in paddocks and linear strips along roadsides. There are no large dense treed areas within the Project Area; however, Leaghur State Park occurs 3.1 km east of the closest proposed wind turbine and comprises moderately dense mallee woodland vegetation.

The Project Area is considered to exhibit the following low-risk environmental attributes as per the CFA Guidelines:

- The majority of the site is covered by either cropped paddocks or grassland paddocks used for grazing by livestock interspersed with small, isolated patches and strips of vegetation
- The surrounding landscape is generally flat with some undulation
- Slopes are less than 5 degrees
- Good road access with multiple routes available in variations directions
- No Land Subject to Inundation Overlay (LSIO) applies.

The final low-risk environmental attribute as per the CFA Guidelines is ‘no BMO applies’. However, there is a BMO located over two sections in the north-western and south-western corners of the Project Area which covers two small areas of remnant woodland vegetation.

The majority of the Project Area is deemed to have a low bushfire risk on the Loddon Mallee Region – Central Victoria mapping tool [16], excluding one small area classified as low-intermediate risk associated with a small patch of vegetation along Noske Road. Furthermore, according to the Loddon Mallee Region Regional Bushfire Planning Assessment [42], there are no lots within the Project Area that are in, or close to, a bushfire hazard.

The primary landscape bushfire risk to the Project Area is from grassfire due to the minimal amount of treed or woodland vegetation in the landscape which has been cleared for farming. Particularly from the prevailing bushfire directions of the north-west and south-west [18], there is some treed or mallee vegetation that could pose a potential fire risk, although much of this is mallee vegetation which is fairly open with less foliage cover than forest or woodland. Unmanaged grasslands and non-curing croplands occur immediately around the Project Area in all directions. The crops are usually harvested prior to summer before they dry out and become a fire hazard, and much of the grasslands are grazed by cattle so are kept in a minimal fuel condition. Overall, there are only minor bushfire hazards present in the surrounding landscape.

Based on the condition of the landscape and limited patches of vegetation, extreme bushfire behaviour is considered unlikely. The broader landscape is Type One [18] as there is little vegetation beyond the site (except grasslands and low-threat vegetation), the type and extent of vegetation is unlikely to result in neighbourhood-scale destruction of property. Suitable access and egress is available to places that provides shelter from bushfire (several roads that lead to Quambatook to the west or Kerang to the north-east) and allow suitable access for emergency response to bushfires or grassfires.

A landscape bushfire hazard assessment in accordance with CFA guidelines has been developed and is provided below in Figure 8-2.

Past bushfires

One recent grass fire occurred within the Project Area in 2023, between Meering West Road and Lester Smith Road, east of Lehmanns Road [15] (Figure 8-1). The area burnt was approximately 48 ha in size. Outside of the Project Area, there have been minimal past fires, the majority of which have occurred within remnant patches of mallee woodland, none which would be considered significant due to their small size (<100 ha). One mallee fire occurred in 2024 within Leaghur State Park, however, this was also small in size (approximately 27 ha). There have been no recent planned burns within the broader landscape.

Local and neighbourhood conditions bushfire hazards

The local and neighbourhood conditions surrounding the Project Area are similar and therefore can be considered by one assessment. The Project Area is bordered in all directions by farmland with scattered dwellings and outbuildings. The Project Area is situated between Boort-Quambatook Road (to the south and west), Kerang-Quambatook Road (to the north) and Boort-Kerang Road (to the east). Two large roads, Meering West Road and Meran Road, bisect the Project Area in an east-west direction. The remaining Project Area is split up by several small artillery roads utilised predominantly by local traffic. Most of the land within the works footprint is privately owned farmland, apart from the road networks and adjacent roadsides, the Meering West Bushland Reserve, the Quambatook-Ultima Channel and two small patches of uncategorised public land. The small township of Quambatook and large township of Kerang occur approximately 8 km north-west and 25 km north-east of the Project Area, respectively.

There are scattered patches of remnant mallee vegetation within paddocks and along creeklines and unnamed tributaries within the surrounding farmland, as well as thin strips of roadside vegetation and planted windbreaks. These linear strips of vegetation occur alongside almost all of the roads within the Project Area and vary in width, disturbance history and quality. Given the extensive network of roads, many of these linear patches are connected, however, minor interruptions to connectivity occur where roads cross and there are large entrances into paddocks and private land. Native vegetation also remains where scattered paddock trees and remnant (often isolated) patches of woodland vegetation have not been cleared. Given these areas of native vegetation are dispersed and mostly disconnected, they present a reduced bushfire hazard.

Overall, the surrounding local and neighbourhood conditions are considered a low bushfire risk and extreme bushfire behaviour is considered unlikely due to the lack of treed vegetation. Although there is potential for grassfires to occur from human-induced factors, though this is typically low due to land management (irrigation and grazing) and crop types present in the landscape.

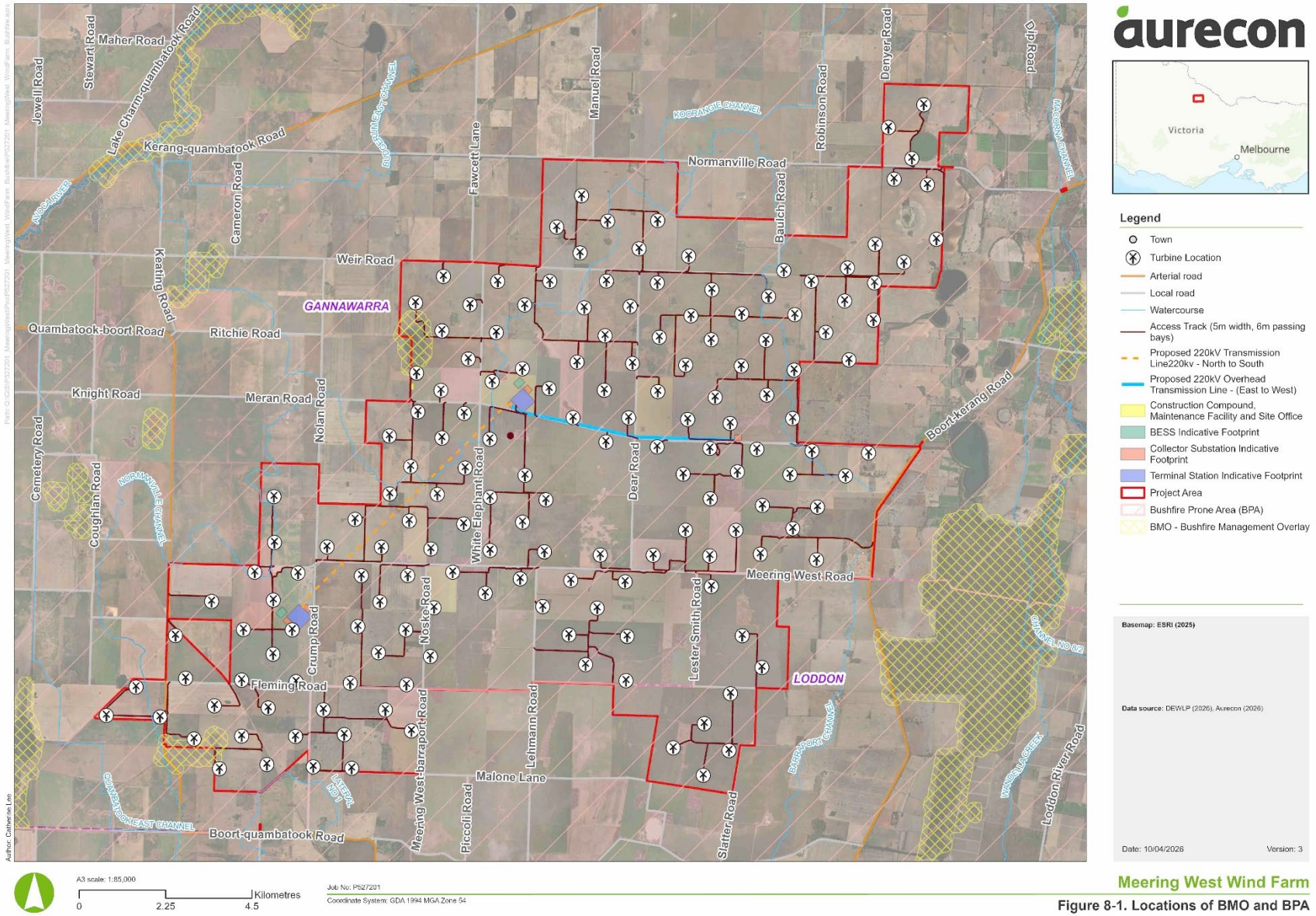


Figure 8-1 Locations of BMO and BPA

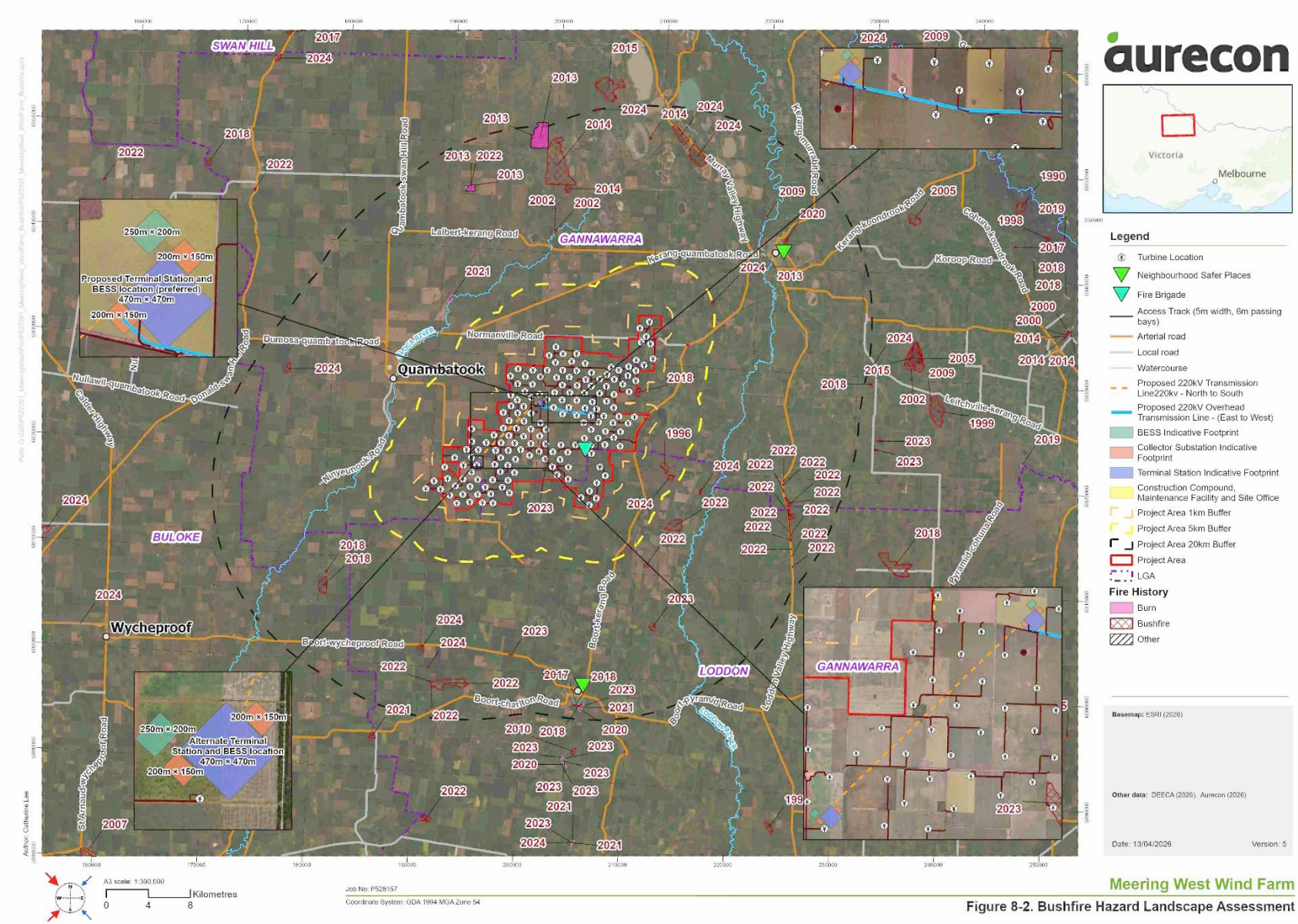


Figure 8-2 Bushfire Landscape Hazard Assessment

8.1.2 Site for development

Site description

The majority of the land with the Project Area is utilised for crop cultivation and grazing (Photo 1). Broad-scale vegetation clearance has occurred throughout the landscape to support these agricultural land uses and native vegetation now predominantly remains as small, isolated fragments in paddocks and linear strips along roadsides. The roadside vegetation was characteristic of mallee woodland, which was fairly open, comprising of a canopy of rough-barked mallee species *Eucalyptus spp.* and occasional Buloke (*Allocasuarina luehmannii*) up to 10 m high with a grassy, shrubby and herb-rich understorey including large areas of bare ground (Photo 2, Photo 3, Photo 4). There were scattered rough-barked mallee *Eucalyptus spp.* within some paddocks (Photo 5), and other paddocks contained isolated patches of remnant mallee woodland (Photo 6) which comprised a similar vegetation structure to the roadside strips, however, lacked an understorey (Photo 7). Some properties contained farm dams used by grazing cattle (Photo 8). All remaining areas consisted of non-curing cropland and unmanaged grasslands (Photo 9).

More detailed vegetation descriptions in accordance with the *AS 3959:2018* vegetation classifications can be found in Section 8.1.3.

Photo 1 Cleared agricultural land

Photo 2 Roadside vegetation – image 1

Photo 3 Roadside vegetation – image 2

Photo 4 Roadside vegetation – image 3

Photo 5 Scattered paddock trees

Photo 6 Remnant woodland within paddocks – image 1

Photo 7 Remnant woodland within paddocks – image 2

Photo 8 Farm dam

Photo 9 Cropped paddocks with unmanaged grassland

Existing access

The Project Area is accessible from three major roads, Boort-Quambatook Road (to the south and west), Kerang-Quambatook Road (to the north) and Boort-Kerang Road (to the east), as well as several small local roads and farm tracks within the Project Area itself, utilised predominantly by local traffic. Additionally, two larger local roads, Meering West Road and Meran Road, bisect the Project Area in an east-west direction.

Numerous access points are proposed off the above listed roads, namely the small artillery roads, to access the 164 proposed wind turbines. Regarding the BESS, substations and terminal station, there are two access points proposed off of Meran Road for the proposed terminal station location and Crump Road for the alternative terminal station location, respectively.

8.1.3 Site bushfire assessment

Using *AS 3959:2018*, classified vegetation within and adjacent to the Project Area comprises grassland and mallee/mulga. Grassland (Figure 8-3) includes the unmanaged pasture grasses (Photo 9). These areas are classified as sown pasture.

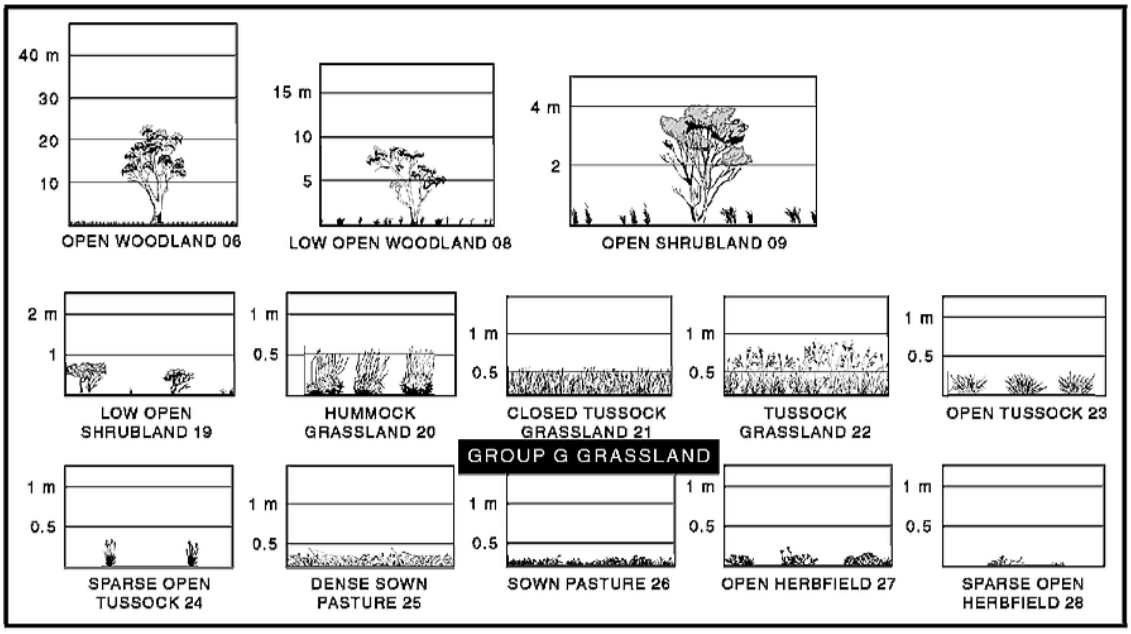


Figure 8-3 Classification of vegetation: Grassland [20]

Mallee/Mulga (Figure 8-4) includes the strips of roadside vegetation and remnant patches within some paddocks (Photo 3, Photo 6). The vegetation within these patches conforms to the Ecological Vegetation Class (EVC) Ridged Plains Mallee, which matches the description of tall shrubland (15), comprising vegetation dominated by low trees or tall shrubs (especially eucalypts and acacias) some with a multi-stemmed habitat, usually greater than 2 m high, with foliage cover <30% and an understorey of dense low shrubs and sparse grasses (Photo 2, Photo 4, Photo 7).

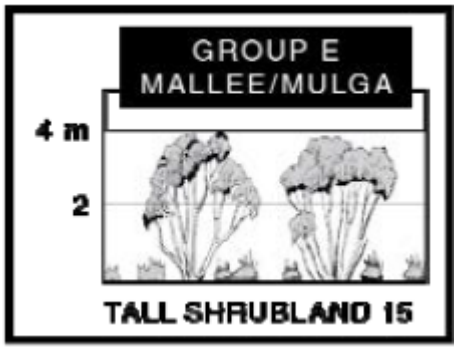


Figure 8-4 Classification of vegetation: Mallee/Mulga [20]

As the vegetation within the Project Area is considered to be low threat, a BAL assessment is not considered to be required to measure radiant heat flux in accordance with *AS 3959:2018*.

8.2 Addressing risk to the infrastructure from the landscape (bushfire/grassfire)

8.2.1 Overall bushfire/grassfire risk

Due to the modified nature of the site and the surrounding landscape, the overall potential bushfire risk is considered low.

Potential bushfire hazards in and around the Project Area is largely limited to grassland associated with agriculture. The scattered patches of mallee vegetation may increase the risk of fires within the landscape, however, these are narrow strips of vegetation and are adjacent to roads that provide fuel breaks and allow access for emergency services to control fires. They are of insufficient dimensions to enable a fire to burn at maximum intensity directly towards the infrastructure.

Grassfires may spread through or from the surrounding agricultural properties, although these are likely to be contained due to multiple fuel breaks, such as roads and waterways. Additionally, the level of grass is also often low with limited vegetation hazard present as the adjoining agricultural lands are cropped, irrigated or actively grazed.

The slope across the majority of the Project Area is noted as flat. The vegetation around the site does not pose a substantial bushfire risk to the Project Area.

While the overall bushfire/grassfire risk to or from the Project is relatively low, the measures adopted from the CFA Guidelines outlined in the following section will:

- further reduce the likelihood of a fire starting at the wind energy facility, particularly around the more hazardous infrastructure (BESS, operations and maintenance building, substations and terminal station).
- mitigate and manage the risk to life and property in the event of a fire entering or spreading from the BESS.

Overall, no significant bushfire hazards are identified within the Project Area.

8.2.2 Addressing bushfire risks to the Wind Energy Facility

Table 8-2 provides a description of control measures to address bushfire/grassfire risk to the proposed wind energy facility. Further information regarding conformance with the CFA Guidelines is provided in Appendix A: Gap Analysis against CFA Guidelines .

Table 8-2 Summary of measures to manage fire risk

Consideration	Project design response
Location	The facility is located in a low-risk environment to reduce the risk of external fire impacting the facility. The site is currently undeveloped and is used for farming practices. The immediate surrounds present a low bushfire risk, with the site consisting of grassed paddocks with strips of roadside vegetation and scattered patches of mallee vegetation. The site is easily accessible via several roads. The site environment meets the attributes described in Section 4.1 of the CFA Guidelines, namely: - primarily grassland - generally flat topography, some undulation may be present - slopes are less than 5 degrees - good road access with multiple routes available to and from the Project site - no LSIO applies.
Design	The facility will meet the design requirements of the CFA Guidelines.

Consideration	Project design response
Layout	A 10 m wide firebreak around the base of each wind turbine and around the BESS and related infrastructure, including the operations and maintenance building, will be established and maintained. For the BESS and related infrastructure a minimum 4 m wide perimeter road within the perimeter firebreak will be incorporated into the site layout.
Administration, permits and training	Fire risk management is to be implemented by adhering to any conditions during the Fire Danger Period. Conditions include remaining on designated tracks for driving and restricted smoking areas. Appropriate permits (such as hot work permit) to be obtained if required. Site personnel to be equipped with first aid and fire mitigation training including CFA's training modules for bushfire safety. An Emergency Management Plan should be prepared as per the CFA guidelines.
Emergency vehicle access	Two access points are proposed for both BESS options. The two access points will be provided via Meran Road and Crump Road for Option A and Option B, respectively. A perimeter access road around the BESS and associated infrastructure will be included within the 10 m firebreak. Access roads will be constructed as per CFA guidelines, including for construction type, width and grade.
Firefighting water supply	The fire water system is yet to be designed. The water supply volume required is to be determined during detailed design post a fire safety study. There is potential to install a ring main fire water supply and locate fire hydrants as per NFPA 855 and CFA requirements. The CFA Guidelines Section 4.2.2 (Firefighting Water Supply) model requirements will be incorporated in the final design.
Aerial firefighting	The layout considers the requirements for aerial firefighting during a bushfire with wind turbines must be located no less than 300 m apart.
Firebreaks	A 10 m wide firebreak around the base of each wind turbine and around the BESS and related infrastructure will be established and maintained. For the BESS and related infrastructure, a minimum 4 m wide perimeter road within the perimeter firebreak will be incorporated into the site layout. Firebreaks will be maintained to be free of flammable materials.
Landscape	There is limited vegetation in the Project Area, mostly grassland. No screening vegetation is currently proposed for the BESS. If required during stakeholder consultation, any screening will consider vegetation with fire-retardant properties as per CFA planting guidelines at a suitable distance from the facilities. Fire breaks may need to be expanded to at least 20 m to allow for screening vegetation. Landscaping may be employed around the proposed Operations and Maintenance building. CFA planting guidelines should be considered in the design and layout of landscaping.
Vegetation and fuel management	The grass on site will be maintained at or below 100 mm during Fire Danger Period. This includes within proximity of the Operations and Maintenance building, with extent and distance based on landscaping design. All vehicles will be equipped with appropriate firefighting equipment.

8.3 Addressing risks from the infrastructure

8.3.1 Construction risks

Project-related ignition sources have the potential to ignite adjacent vegetation and structures, pose a risk to life and assets, and require mitigation. Prior to mitigation and management of impacts, the risk of ignition and fire spread from construction of the Project is highest near the vegetated areas and unmanaged grasslands.

The most significant bushfire risk for the Project is during construction (Table 8-3), where potential ignition sources occur adjacent to vegetated areas.

Table 8-3 Project-related ignition sources: construction

Ignition source	Description
Construction equipment and hot works	Construction equipment including bulldozers and excavators, and construction activities involving hot works (such grinding, welding, and cutting) are a potential ignition risk, as they may result in sparks from plant or equipment. Sparks can be accidentally produced when steel blades encounter rocks and can spread via wind. Sparks are a high ignition risk to adjacent vegetation, where mitigation and control measures are not applied. Fires igniting adjoining vegetation may spread quickly under adverse conditions such as elevated fire danger days, potentially impacting life, and property.
Electrical faults in equipment	Electrical faults in equipment are a potential ignition risk to adjacent vegetation. Equipment should be checked for potential faults or visible weaknesses regularly to reduce the potential for failure in accordance with manufacturers' specifications.
Motor vehicles	Motor vehicle exhaust systems are a potential ignition risk to adjacent grassland and other vegetation. The highest risk is from diesel powered trucks and light vehicles with pollution controlling exhaust devices, which may emit burning diesel particles. Vehicles may also collide with equipment or infrastructure, which may result in spilt fuel, or sparks that may be an ignition risk to adjacent vegetation.
Accidental ignitions	Accidental ignitions include smoking, are non-deliberate ignitions occurring from accidents or error, and not specified under any other ignition risk. Accidents and error are a potential ignition risk to adjacent vegetation.
Dangerous materials	Dangerous materials include chemicals, explosives, or otherwise flammable materials. Inappropriate storage of dangerous materials, and insufficient fuel-free buffers around work sites, are a potential ignition risk to adjacent vegetation. Ignition risk occurs through increased risk of chemical fire or explosion, or a risk from a grass or bushfire burning a storage area and igniting dangerous materials.

8.3.2 Operational risks

Bushfire impacts from the operation of the Project are assessed in terms of Project-related ignition sources (Table 8-4). Project-related ignition sources have the potential to ignite adjacent vegetation and structures, pose a risk to life and assets, and require mitigation. Prior to mitigation and management of impacts, the risk of ignition and fire spread from operation of the Project is highest near the vegetated areas and unmanaged grasslands.

Table 8-4 Project-related ignition sources: operation

Ignition source	Description
Maintenance and hot works	Hot work would generally be associated with maintenance works on infrastructure, including operation of winches and machinery during monitoring and maintenance [19]. Hot works (such grinding, welding, and cutting) are a potential ignition risk, as they may result in sparks from plant or equipment and could increase the risks of bushfire ignition. Sparks can spread via wind, posing a high ignition risk to dry vegetation. Fires igniting adjoining vegetation may spread quickly under adverse conditions such as elevated fire danger days, potentially impacting life, and property. Subject to relevant national and state legislation, wind farms may operate on days of Total Fire Ban (TOBAN) [19].

Ignition source	Description
Electrical faults in equipment including WTG malfunction	Electrical faults in equipment are a potential ignition risk to adjacent vegetation. Risk of sparks and ignition from electrical faults would generally be associated with maintenance works on infrastructure. Equipment should be checked for potential faults or visible weaknesses regularly to reduce the potential for failure in accordance with manufacturers' specifications. Consider the use of wind farm turbine models that have automatic safe shutdown systems, isolation procedures and protection mechanisms in the cases of fire within [19].
Blade throw	Blade throw involves detachment of a full blade or fragment into the surrounding area. Blade throw is a potential ignition risk to adjacent vegetation. Mitigation of bushfire risk from blade throw is adherence to standard emergency management measures such as access, emergency response, and water supplies, preparation of an emergency plan, notification procedures.
Motor vehicles	Motor vehicle exhaust systems are a potential ignition risk to adjacent grassland and other vegetation. The highest risk is from diesel powered trucks and light vehicles with pollution controlling exhaust devices, which may emit burning diesel particles. Vehicles may also collide with equipment or infrastructure, which may result in spilt fuel, or sparks that may be an ignition risk to adjacent vegetation.
Accidental ignitions	Accidental ignitions include smoking, are non-deliberate ignitions occurring from accidents or error, and not specified under any other ignition risk. Accidents and error are a potential ignition risk to adjacent vegetation.
Dangerous materials	Dangerous materials include chemicals, explosives, or otherwise flammable materials. Inappropriate storage of dangerous materials, and insufficient fuel-free buffers around work sites, are a potential ignition risk to adjacent vegetation. Ignition risk occurs through increased risk of chemical fire or explosion, or a risk from a grass or bushfire burning a storage area and igniting dangerous materials.
Lightning	Lightning can strike wind turbines during thunderstorms. Lightning strike on wind turbines may reduce the risk of lightning as a regional ignition source, through reduction of lightning strike on vegetation. Wind turbines should contain built-in mechanisms to reduce risk of ignition from lightning strike [19].

8.4 Bushfire management recommendations

As outlined in Section 8.2.2, a 10 m fire break around the BESS and associated infrastructure is to be implemented as part of the Project's detailed design which is in line with Section 4.2.5 of the CFA Guidelines (Fire Breaks). As per Section 4.2.5 of the CFA Guidelines, fire breaks are not required around the perimeter of WEFs, however, a fire break must be established and maintained around the base of WTGs (i.e. a 10 m fuel exclusion zone).

Additionally, to further reduce the bushfire risk further it is recommended that the following defendable space requirements from Table 6 of 53.02-4.2 shall be adhered to for the duration of each fire season in perpetuity:

- Vegetation within a fenced area for the BESS, terminal station, collector substations and O&M building, must be short cropped (<100 mm in height) and maintained during the declared fire danger period.
- All leaves and vegetation debris must be removed at regular intervals during the declared fire danger period.
- Within 10 m of a building, flammable objects must not be located close to the vulnerable parts of the building.
- Plants greater than 10 cm in height must not be placed within 3 m of a window or glass feature of the building.
- Shrubs should not be planted under the canopy of trees (if any trees are to be retained).
- Individual and clumps of shrubs must not exceed 5 m^2 in area and must be separated by at least 5 metres.

- Trees must not overhang or touch any elements of the building.
- The canopy of trees must be separated by at least 5 m.
- There must be a clearance of at least 2 m between the lowest tree branches and ground level.

The above should also be incorporated into the landscape design around the Operations and Maintenance building. Additionally, vegetation should not be placed within close proximity to the Operations and Maintenance building, and it is recommended to provide for non-combustible areas, including pathed or crushed rock roads and walkways, around the perimeter of the building.

It is recommended that vegetation management across the Project and landscaping design for the Operations and Maintenance building should also be undertaken in accordance with the CFA guidelines *Landscaping for Bushfire – Garden Design and Plant Selection* (CFA, 2022).

9 Applicable Standards

A list of standards and codes applicable to the identified hazards to be applied to the design of the Project are listed below:

- *AS 1530.4 Methods for fire tests on building materials, components, and structures – Fire-resistance tests for elements of construction.*
- *AS 1554.1 Structural steel welding - Welding of steel structures*
- *AS 1603 Automatic fire detection and alarm systems*
- *AS 1670 Fire detection, warning, control and intercom systems*
- *AS 1725 Chain-link fabric security fences and gates*
- *AS 1768 Lightning protection*
- *AS 1940 The storage and handling of flammable and combustible liquids*
- *AS 2067 Substations and high voltage installations exceeding 1 kV a.c.*
- *AS 2374.1 Power transformers Part 1: General*
- *AS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules)*
- *AS 3008 Electrical installations – Selection of cables*
- *AS 3011.2 Electrical installations - Secondary batteries installed in buildings Sealed cells*
- *AS 3786 Smoke Detectors*
- *AS 3959 Construction of buildings in bushfire-prone areas*
- *AS 4086.1 Secondary batteries for use with stand-alone power systems General requirements (where applicable)*
- *AS 4086.2 Secondary batteries for use with stand-alone power systems Installation and maintenance (where applicable)*
- *AS 4417 Regulatory compliance mark for electrical and electronic equipment*
- *AS 4428 Fire detection, warning, control and intercom systems Control and indicating equipment*
- *AS 4681 The Storage and Handling of Class 9 (miscellaneous) Dangerous Goods and Articles*
- *AS / IEC 60076 Power Transformers Package*
- *AS 61558.1 Safety of Power Transformers, Power Supplies, Reactors and Similar Products - General requirements and test*
- *AS / IEC 62271-200 High-voltage switchgear and controlgear - Part 200: AC metal-enclosed switchgear and control gear for rated voltages above 1 kV and up to and including 52 kV*
- *IEC 63056 Safety requirements for secondary lithium cells and batteries for use in electrical energy storage systems*
- *AS 60529 Degrees of protection provided by enclosures (IP Code)*
- *AS 61439 (Series)- Low-voltage switchgear and control gear*
- *NFPA 855 Standard for the Installation of Stationary Energy Storage Systems*
- *UL 1642 Certification of Lithium-ion Battery*
- *UL 1741 Inverters, converters, controllers and inter-connection system equipment for use with distributed energy resources*
- *UL 9540 Energy Storage Systems and Equipment*

- *UL 9540A ANSI/CAN/UL Standard for Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems.*
- *NFPA 70 National Electrical Code*

10 References

[1] CFA, “Design Guidelines and model requirements for Renewable Energy Facilities v4,” Country Fire Authority, Melbourne, 2023.

[2] Victoria State Government, “Gannawarra planning scheme,” 21 March 2025. [Online]. Available: https://planning-schemes.app.planning.vic.gov.au/Gannawarra/ordinance.

[3] Victoria State Government, “Loddon planning scheme,” 3 March 2025. [Online]. Available: https://planning-schemes.app.planning.vic.gov.au/Loddon/ordinance.

[4] Department of Transport and Planning, “Guide to Victoria's Planning System,” 2023.

[5] The Chief Parliamentary Counsel, “Planning and Environment Act 1987,” 2023.

[6] Victoria State Government, “Planning Property Report (713 YARRAGON-SHADY CREEK ROAD YARRAGON 3823),” 29 Jan 2025. [Online]. Available: https://prod-pis-planning-report-pdf.s3-ap-southeast-2.amazonaws.com/713-Yarragon-Shady-Creek-Road-Yarragon-(ID45412875)-Vicplan-Planning-Property-Report.pdf.

[7] State Government of Victoria, “Building Regulations 2018,” 2018.

[8] State Government of Victoria, “Dangerous Goods (Storage and Handling) Regulations,” 2022.

[9] State Government of Victoria, “Occupational Health and Safety Regulations 2017,” 2017.

[10] Country Fire Authority (CFA), “Design Guidelines and Model Requirements for Renewable Energy Facilities V4,” January 2025. [Online]. Available: https://www.cfa.vic.gov.au/plan-prepare/building-planning-regulations/renewable-energy-fire-safety. [Accessed January 2025].

[11] State Government of Victoria, “Dangerous Goods (Storage and Handling) Regulations,” 2022.

[12] WorkSafe Victoria, “A Guide to Risk Control Plans,” WorkSafe Victoria, 2017.

[13] DTP, “VicPlan,” 2025. [Online]. Available: https://mapshare.vic.gov.au/vicplan/.

[14] DTP, “Victorian Planning Provisions,” 2025a.

[15] DEECA, “NatureKit,” 2025. [Online]. Available: https://maps2.biodiversity.vic.gov.au/Html5viewer/index.html?viewer=NatureKit.

[16] DELWP, “Loddon Mallee Region Central Victoria Mapping Tool,” 2021. [Online].

[17] DPCD, “Regional Bushfire Planning Assessment – Barwon South West Region,” 2012.

[18] DELWP, “Technical Guidance: Planning permit applications Bushfire Management Overlay,” 2017.

[19] AFAC, “Wind Farms and Bushfire Operations,” Australasian Fire and Emergency Service Authorities Council Limited, Melbourne, 2018.

[20] Standards Australia, “AS 3959: Construction of Buildings in Bushfire Prone Areas,” Standards Australia, Sydney, 2018.

[21] The Parliament of Victoria, “Occupational Health and Safety Act,” Authorised Version No. 043, 2004.

[22] National Transport Commission, “Australian Code for the Transport of Dangerous Goods by Road & Rail,” National Transport Commission, 2018.

[23] DNV-GL, Safety, operation and performance of grid-connected energy storage systems, 2017.

[24] National Transport Commission, Australian Code for the Transport of Dangerous Goods by Road & Rail, 2020.

[25] Tesla, Industrial Lithium-Ion Battery Emergency Response Guide , Rev 2.6, 2022.

[26] W.-T. T. Jui-Sheng Chou, “Failure analysis and risk management of a collapsed large wind turbine tower,” *Engineering Failure Analysis,* vol. 18, no. 1, pp. 295-313, 2011.

[27] C. Zhu and Y. Li, “Reliability Analysis of Wind Turbines,” in *Stability Control and Reliable Performance of Wind Turbines*, InTech, 2018.

[28] Standards Australia, AS2067 Substations and high voltage installations exceeding 1 kV a.c, Sydney: Standards Asutralia, 2016.

[29] Department of Energy, “Electricity Supply Act 1995 No 94,” NSW Parliamentary Council , 1995-94.

[30] J. &. H. Y. &. L. L. &. F. S. &. L. Z. Zhang, “The impact of lightning strike to multi-blade on the lightning overvoltage and stresses of arresters in offshore wind farm,” *IET Renewable Power Generation,* vol. 15, pp. 2814-2825, 2021.

[31] State Government of Victoria, “Victoria Planning Provisions,” 03 May 2024. [Online]. Available: https://planning-schemes.app.planning.vic.gov.au/Victoria%20Planning%20Provisions/ordinance/33.01.

[32] International Electrotechnical Commission, “IEC 62619:2022 Safety Requirements for Secondary Lithium Cells and Batteries, for use In Industrial Applications,” 2022.

[33] International Electrotechnical Commission, “IEC 62485-5 Safety requirements for secondary batteries and battery installations - Part 5: Safe operation of stationary lithium ion batteries,” 2020.

[34] Fisher Engineering Inc., “Victorian Big Battery Fire,” 30 July 2021. [Online]. Available: https://victorianbigbattery.com.au/wp-content/uploads/2023/10/VBB-Fire-Independent-Report-of-Technical-Findings.pdf.

[35] Standards Australia, AS 2067, “Substations and high voltage installations exceeding 1 kV a.c,” 2016.

[36] Standards Australia, AS/NZS 4681, “The Storage and Handling of Class 9 (miscellaneous) Dangerous Goods and Atricles,” 2000.

[37] NSW Department of Planning, “HIPAP No. 2: Fire safety study guidelines,” State of NSW, Sydney, January 2011.

[38] Bureau of Meteorology, “Climate Statistics for Australian Locations,” 2025. [Online]. Available: http://www.bom.gov.au/climate/averages/tables/cw_080023.shtml.

[39] Geoscience Australia, “Natural Hazard Scenarios (Beta),” 2025. [Online]. Available: https://portal.ga.gov.au/persona/hazards.

[40] Standards Australia and Standards New Zealand, “AS/NZS 1170.2 Structural design actions - Part 2: Wind actions,” 2021.

[41] Bureau of Meteorology, “Average annual thunder-day and lightning flash density,” 2025. [Online]. Available: http://www.bom.gov.au/climate/maps/averages/thunder-lightning/?maptype=otdg.

[42] DPCD, “Regional Bushfire Planning Assessment Loddon Mallee Region,” 2012.

[43] Aurecon, “GIS Portal Version 3.5,” 9 May 2025. [Online]. Available: https://geoportal.aurecongroup.com/portal/apps/webappviewer/index.html?id=f2eaba53b52a4e098bfb0cd896b757cb.

[44] Department of Energy, “Electricity Safety Act No 13 of 194,” NSW Government, 1945.

[45] Victoria State Government, “Baw Baw Planning Scheme,” 14 January 2025. [Online]. Available: https://planning-schemes.app.planning.vic.gov.au/BAW%20BAW/ordinance/35.07-s1. [Accessed 2025].

[46] The Chief Parliamentary Counsel, “Environment Protection Act 2017,” Parliament of Victoria, Authorised Version No. 014, 2024.

[47] C. P. Counsel, “Dangerous Goods Act,” 1985.

[48] Gannawarra Shire Council, “Gannawarra Shire Municipal Fire Management Plan,” 2019. [Online]. Available: https://www.gannawarra.vic.gov.au/files/assets/public/v/1/document-resources/municipal-emergency-management/mfmp-feb-2019-signed.pdf. [Accessed April 2025].

[49] DELWP, “Technical Guidance: Planning permit applications Bushfire Management Overlay,” 2017.

[50] Aurecon, “Blade Throw Assessment,” 2025.

[51] State Government of NSW and DPHI, “Wind Energy Guideline: Guidance for State significant wind energy development,” Department of Planning, Housing and Infrastructure, 2024.

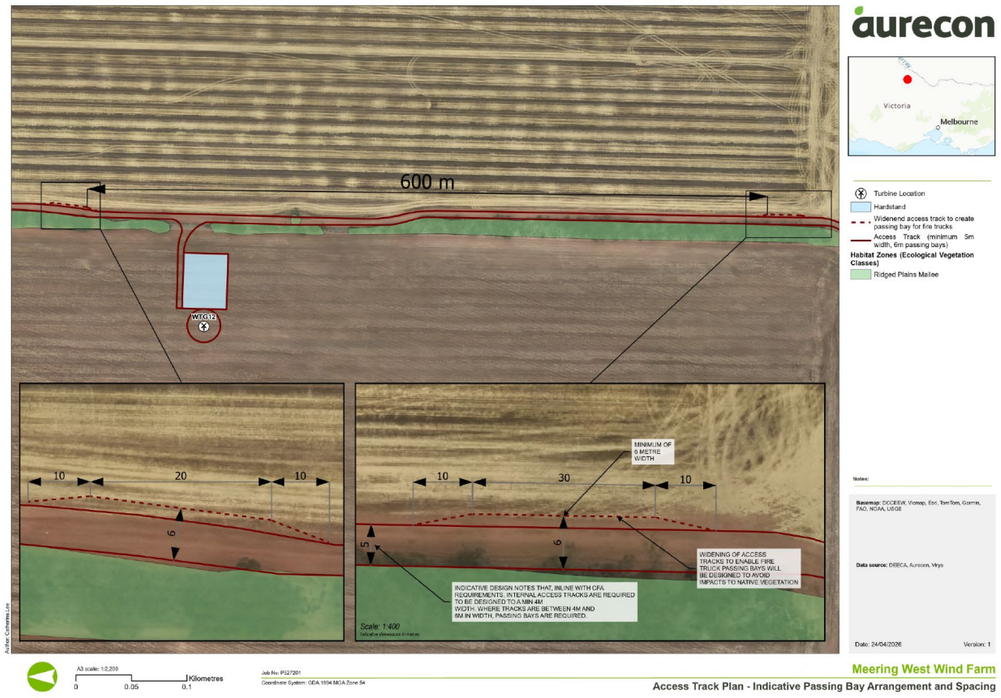
[52] Grid-Link, “MWWF-BS-DWG-GNA-01-001[B],” 2024.

Appendix A: Gap Analysis against CFA Guidelines

A gap analysis was conducted against the CFA guideline checklist (within Appendix A of the CFA Design Guidelines and Model Requirements: Renewable Energy Facilities V4 [10]) to identify what actions need to be considered to ensure the Project is able to satisfy all CFA requirements.

Table 5 CFA Guideline Checklist Gap Analysis

CFA Section	Guideline Requirement	Project Assessment
Section 2: Consultation	Consulting with CFA Early consultation with CFA's Specialist Risk and Fire Safety Unit, before developing a planning permit application	Consultation was undertaken with CFA on 17 February 2026. No actions were required following the meeting and the CFA will work with the Proponent to manage bushfire hazard as the project progresses.
Section 3: Fire Risk Management	Risk Management A Risk Management Plan must be developed for the facility, in consultation with CFA, before development starts	Will be developed as per CFA guidelines during detailed design.
	Landscape Risk to Facility An assessment against policy at VPP Clause 13.02-1S (Bushfire Planning) that considers: a) The impact of any ignitions arising from the infrastructure on nearby communities, infrastructure and assets. b) The impact of bushfire on the infrastructure (e.g. ember attack, radiant heat impact, flame contact).	Due to the modified nature of the site and the surrounding landscape, the overall potential bushfire risk is considered low. Potential bushfire hazards in and around the Project Area is largely limited to grassland associated with agriculture. The scattered patches of mallee vegetation may increase the risk of fires within the landscape; however, these are narrow strips of vegetation and are adjacent to roads that provide fuel breaks and allow access for emergency services to control fires. They are of insufficient dimensions to enable a fire to burn at maximum intensity directly towards the infrastructure. Grassfires may spread through or from the surrounding agricultural properties, although these are likely to be contained due to multiple fuel breaks, such as roads, wind farm access tracks and waterways. Additionally, the level of grass is also often low with limited vegetation hazard present as the adjoining agricultural lands are cropped, irrigated or actively grazed. The slope across the majority of the Project Area is noted as flat. The vegetation around the site does not pose a substantial bushfire risk to the Project Area. While the overall bushfire/grassfire risk to or from the Project is relatively low, the measures adopted from the CFA Guidelines outlined in the following section will: ■ further reduce the likelihood of a fire starting at the wind energy facility, particularly around the more hazardous infrastructure (BESS, substations and terminal station). ■ mitigate and manage the risk to life and property in the event of a fire entering or spreading from the BESS. Overall, no significant bushfire hazards are identified within the Project Area. See Section 8.3 for information outlining the impact of ignitions arising from the facility on nearby communities, infrastructure and assets.
	Facility Risk to Landscape As assessment of the fire risk from the proposed facility to the landscape.	There is minimal offsite risk after mitigations (see Appendix B: Risk Management Plan) and the Project Area and surrounding land is classified as Farming Zone with the nearest residential area approximately 7.8 km away. The facility is not expected to lead to a significant increase in risk to adjacent land. Additionally, the site will be designed to comply with NFPA 855 which outlines battery separation, containment, fire detection and suppression systems and explosion control system requirements. The BESS will be equipped with a BMS which monitors and controls the performance of a batteries, ensuring it functions safely and efficiently. Fire safety study results will also be incorporated to the final design to reduce risks at the site to an acceptable level.

CFA Section	Guideline Requirement	Project Assessment
	Emergency Vehicle Access for All Facilities a) Construction of a minimum four (4) metre perimeter road within the perimeter fire break. b) Roads must be of all-weather construction and capable of accommodating a vehicle of fifteen (15) tonnes (e.g. no compacted earth). 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. Ensure any fencing along access routes allows for width of fire trucks. 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. e) Dips in the road should have no more than a 1 in 8 (12.5% or 7.1°) entry and exit angle. 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 g) Road networks must enable responding emergency services to access all areas of the facility, including fire service infrastructure, buildings, and battery energy storage systems and related infrastructure. h) The provision of at least two (2) but preferably more access points to each part of the facility ADVERTISED PLAN	CFA Section 4.2.1(Emergency Vehicle (Fire Truck) Access) model requirements are proposed to be incorporated in the final design. Access tracks have been designed to a width of 5m. Per CFA Guideline requirements, the Project will implement passing bays to allow for Emergency Vehicle access, designed to a width of 6m and spaced at a maximum distance of 600m between bays. An example passing bay design is included below: 
	Additional Requirements for Battery Energy Storage Systems The provision of at least two access points into each section where battery energy storage systems are located.	There are two access points into each location where the BESS will be located.
	Firefighting Water Supply for All Facilities a) Water access points must be clearly identifiable and unobstructed to ensure efficient access. b) Static water storage tank installations must comply with AS 2419.1-2021: Fire hydrant installations – System design, installation and commissioning. c) The static water storage tank(s) must be an aboveground water tank constructed of concrete or steel. d) The static water storage tank(s) must be capable of being completely refilled automatically or manually within 24 hours. 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. f) The hard-suction point must be provided with a 150mm full bore isolation valve equipped with a Storz connection, sized to comply with the required suction hydraulic performance. 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.	CFA Section 4.2.2 (Firefighting Water Supply) model requirements will be incorporated in the final design.

CFA Section	Guideline Requirement	Project Assessment
	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. i) The road access and hardstand must be kept clear at all times. j) The hard-suction point must be protected from mechanical damage where necessary. k) Where the access road has one entrance, an eight (8) metre radius turning circle must be provided at the tank. l) An external water level indicator must be provided to the tank and be visible from the hardstand area. m) Signage indicating 'FIRE WATER' and the tank capacity must be fixed to each tank. n) Signage must be provided at each vehicle entrance to the facility, indicating the direction to the nearest static water tank(s).	
	<u>Additional Requirements for Battery Energy Storage Systems - Centralised BESS</u> a) Where reticulated water is available, the provision of a fire hydrant system that meets the requirements of AS 2419.1-2021: Fire hydrant installations, Clause 3.9: Open Yard Protection, and Table 2.2.5(D): Number of Fire Hydrants Required to Flow Simultaneously - Open Yards. **OR** b) Where no reticulated water is available, provision of a fire water supply in static storage tanks, where: 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 2419.1-2021: Fire hydrant installations, flowing for a period of no less than four hours at 20L/s, whichever is the greater. ii. The quantity of static fire water storage is to be calculated from the number of hydrants required to flow from AS 2419.1-2021: Fire hydrant installations, Table 2.2.5(D). 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. 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). 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). vi. The fire water supply must comply with AS 2419.1-2021: Fire hydrant installations, Section 5: Water storage tanks.	CFA Section 4.2.2 (Firefighting Water Supply) model requirements will be incorporated in the final design.
	<u>Fire Detection and Suppression Equipment for All Facilities</u> a) For on-site buildings and structures, according to the requirements of the National Construction Code. b) For storages of dangerous goods, according to the requirements of any Australian Standards for the storage and handling of dangerous goods. c) For electrical installations, a minimum of two suitable fire extinguishers must be provided within 3m-20m of each PCU. d) In all vehicles and heavy equipment, each vehicle must carry at least a nine (9)-litre water stored-pressure fire extinguisher with a minimum rating of 3A, or other firefighting equipment as a minimum when on-site during the Fire Danger Period.	CFA Section 4.2.3 (Fire Detection and Suppression Equipment) model requirements will be incorporated in the final design.
	<u>Fire Breaks</u> The provision of fire breaks: a) Around the perimeter of the BESS facility, commencing from the boundary of the facility or from the vegetation screening inside the property boundary. (Note: N/A for wind energy facilities.) b) Around the perimeter of control rooms, electricity compounds, substations and all other buildings onsite. c) A fire break must be established and maintained around the base of wind turbines.	CFA Section 4.2.5 (Fire Breaks) model requirements have been incorporated in the BESS design.

CFA Section	Guideline Requirement	Project Assessment
	d) Be a width of at least 10m. e)	
	Additional Requirements for Battery Energy Storage Systems The provision of a fire break around battery energy storage systems and related infrastructure.	CFA Section 4.2.5 (Fire Breaks) model requirements have been incorporated in the BESS design.
	Design Specific to Facility Type - Requirements for Battery Energy Storage Systems 1. Facility design that incorporates: a) A separation distance that prevents fire spread between battery containers/enclosures and other site elements. b) A fire break around the battery energy storage system and related infrastructure, of a width of no less than 10m. 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. Minimises the potential for fires in battery containers/enclosures to impact on-site and offsite infrastructure. 3. Battery energy storage systems must be: a) Located so as to be reasonably adjacent to a site vehicle entrance (suitable for emergency vehicles). 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.) c) Provided with in-built fire and gas detection systems. d) Provided with explosion prevention via sensing and venting, or explosion mitigation through deflagration panels. e) Provided with suitable ember protection. f) Provided with suitable access roads for emergency services vehicles. g) Installed on a non-combustible surfaces. h) Provided with suitable ventilation. i) Provided with suitable impact protection. j) Provided with enclosed wiring and buried cabling, except where required to be above-ground for grid connection. k) Provided with spill containment that includes provision for management of fire water runoff.	CFA Section 4.2.6 (Design Specific to Facility Type) model requirements for a BESS facility will be incorporated in the final design.
	Additional requirements for Wind Energy Facilities Requirements for Wind Energy Facilities are listed below.	N/A
	Emergency Vehicle Access Requirements for Wind Energy Facilities a) Constructed roads developed during construction phase must be maintained post-commissioning and throughout the operational life of the facility, to allow access to each turbine. (The number and location of vehicle access points must be determined in consultation with CFA.)	CFA Section 4.2.1 (Emergency Vehicle (Fire Truck) Access) model requirements will be incorporated in the final design.
	Firefighting Water Supply Requirements for Wind Energy Facilities a) The fire protection system for wind energy facilities must incorporate at least one static firewater storage tank of at least 45,000L effective capacity at each site entrance. 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.)	CFA Section 4.2.2 (Firefighting Water Supply) model requirements will be incorporated in the final design.

CFA Section	Guideline Requirement	Project Assessment
	c) Nacelles must be equipped with automatic fire detection, alarm and fire suppression systems.	
	Fire Breaks for Wind Energy Facilities a) A fire break must be established and maintained around the base of wind turbines.	CFA Section 4.2.5 (Fire Breaks) model requirements have been incorporated in the BESS design.
	Design Specific to Facility Type - Requirements for Wind Energy Facilities a) Wind turbines must be located no less than 300 m apart. 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. c) Installed weather monitoring stations must be notified to the Civil Aviation Safety Authority (CASA) as per CASA Advisory Circular AC 139.E-05 v1.1, October 2022 (as for all structures 110m or more above the ground). d) All guy wires and monitoring towers must be clearly marked, even where marking is not required by CASA.	The CFA design requirements specific to Wind Energy Facilities has been met. a) [43]There are no wind turbines proposed to be within 300m of each other. Wind turbines are located in rows (generally running north east to south west where turbines are located around 900m to 1km apart and around 1km and 1.4km east to west) b) Modern wind turbines are fitted with automatic shutdown and can be electrically isolated in the event of a fire. Final design can confirm the turbine make and model and specific safety features. c) CASA has been advised of the wind monitoring mast before and after its erection. d) The wind monitoring mast has aviation markings on the top section, marker balls on the guys and steady red aviation lighting.
	Additional Requirements for Wind Energy Facilities a) The provision of access roads, to and around each wind turbine.	The proposed project layout features an access road to and around each wind turbine.
Section 5: Facility Construction and Commissioning	Emergency Plan An Emergency Plan must be developed for the construction and commissioning phase of the facility.	Will be developed and provided to the CFA.
Section 6: Facility Operation	Fire Management Plan A Fire Management Plan must be developed for the facility, in consultation with CFA, before development starts.	Will be developed per CFA guidelines during detailed design.
	Bushfire and Grassfire If your facility is at-risk of bushfire, prevention and preparedness activities must be detailed in the Fire Management Plan.	As the site has been identified as at-risk of bushfire (due to presence in a BPA and BMO), this must include prevention and preparedness activities as per Section 6.2.1 Bushfire and Grassfire Risk of the CFA Guidelines. The Fire Management Plan will also need to be regularly reviewed and updated, in accordance with Section 6.3 of the CFA Guideline.
	Vegetation 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. b) Long grass and/or deep leaf litter must not be present in areas where heavy equipment will be working, during construction or operation. 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).	It is important that vegetation and fuel is managed effectively to reduce both the risk of fire entering the facility, as well as minimise the consequences of fire. Given that the BESS site is within a BPA and has two small areas subject to a BMO, it is a priority to allow for fire risks to be managed for the duration of the operational life of the facility. The current site is predominately cropped paddocks. Therefore, the primary management action is to maintain grass height during the fire danger period. Throughout the year, long grass should also be reduced where possible, particularly if there is long grass in and adjacent to work areas that will utilise heavy equipment or machinery. Additionally, during the fire danger period, restrictions should be adhered to, and it is recommended that vehicles, particularly maintenance vehicles and machinery, carry a fire-extinguisher.
	Arc Flash Hazard Management Where required, appropriate demarcation of arc boundaries to at least 10m from PCU arc flash outlet flaps (blow-out panels) must be provided.	CFA Appendix A (Arc Flash Hazard Management) requirements will be incorporated in the final design.

CFA Section	Guideline Requirement	Project Assessment
	Facility and System Monitoring 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	CFA Section 6.2.4 (Facility and System Monitoring) model requirements for a Wind Energy Facility will be incorporated in the final design.
	Maintenance 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	All infrastructure, equipment, and vehicles at the facility will undergo regular inspection, maintenance, and any necessary repair activities, in accordance with relevant Australian Standards and the manufacturer's specified requirements.
Section 7: Emergency Planning	Emergency Plan (Operational) An Emergency Plan must be developed for the operational phase, specific to the facility, in consultation with CFA, before development starts.	Will be developed per CFA guideline during detailed design.
Section 8. Provision of Emergency Information	Developing an Emergency Information Book 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.	Will be developed per CFA guideline during detailed design.

Appendix B: Risk Management Plan

No.	Source	Hazard	Cause	Consequence	Does the Hazard have the Potential to pose Offsite or to a receptor on site Significant Risk?	Inherent Risk			Proposed Controls – Technical / Design	Proposed Controls – Safety Management	Residual Risk			Does the Hazard result in an Offsite or to a receptor on site Significant Risk?
						Likelihood	Consequence	Risk Rating			Likelihood	Consequence	Risk Rating	
1.	Wind Turbine Generator	Blade throw	Physical damage (erosion or lightning), Material defects or fatigue	Turbine blade detaching and is propelled away from the turbine resulting: Potential injury or fatality Physical damage to nearby equipment/ infrastructure Damage to the Nacelle / Tower	Potential	E – Rare	5 – Catastrophic	Medium	Wind turbine components should be manufactured and certified to current best practice Australian and international safety standards (including the Internation Electrotechnical Commission), and equipped with sensors that can identify any imbalance in the rotor blades and shut down the turbine if necessary	Inspection and Testing Procedures to be developed and adhered to during the construction and commissioning phases. The Project should use a high-quality maintenance programme to ensure that blade throw events remain very low risk. Health and safety measures should be developed and adhered to for workers on site throughout construction and during the lifetime of the Project. Blade throw risk should be discussed as part of a site wide construction and operational safety management plans to improve worker awareness of this risk.	E - Rare	5 – Catastrophic	Medium	Unlikely
2.	Wind Turbine Generator	Toppling	Material fatigue Storms, Lightning strike and Fire	Physical damage to nearby equipment/ infrastructure Permanent damage to the WTG Potential injury or fatality	Potential	E – Rare	5 – Catastrophic	Medium	Wind turbine components should be manufactured and certified to current best practice Australian and international safety standards (including the Internation Electrotechnical Commission), and equipped with sensors that can identify any imbalance in the rotor blades and shut down the turbine if necessary	Inspection and Testing Procedures to be developed and adhered to during the construction and commissioning phases. The Project should use a high-quality maintenance programme to ensure that blade throw events remain very low risk. Health and safety measures should be developed and adhered to for workers on site throughout construction and during the lifetime of the Project. Blade throw risk should be discussed as part of a site wide construction and operational safety management plans to improve worker awareness of this risk.	E - Rare	5 – Catastrophic	Medium	Unlikely

No.	Source	Hazard	Cause	Consequence	Does the Hazard have the Potential to pose Offsite or to a receptor on site Significant Risk?	Inherent Risk			Proposed Controls – Technical / Design	Proposed Controls – Safety Management	Residual Risk			Does the Hazard result in an Offsite or to a receptor on site Significant Risk?
						Likelihood	Consequence	Risk Rating			Likelihood	Consequence	Risk Rating	
3.	Wind Turbine Generator	Collapse	Material fatigue Storms, Lightning strike and Fire	In potential injury or fatality Physical damage to nearby equipment/ infrastructure Permanent damage to the WTG	Potential	D – Unlikely	5 – Catastrophic	High	Wind turbine components should be manufactured and certified to current best practice Australian and international safety standards (including the Internation Electrotechnical Commission), and equipped with sensors that can identify any imbalance in the rotor blades and shut down the turbine if necessary	Inspection and Testing Procedures to be developed and adhered to during the construction and commissioning phases. The Project should use a high-quality maintenance programme to ensure that blade throw events remain very low risk. Health and safety measures should be developed and adhered to for workers on site throughout construction and during the lifetime of the Project. Blade throw risk should be discussed as part of a site wide construction and operational safety management plans to improve worker awareness of this risk.	E - Rare	5 – Catastrophic	Medium	Unlikely
4.	Wind Turbine Generator	Generator Fire	Overheating, Electrical and mechanical faults Jammed bearing, Bearing seizure Overspeed	Damage tower, blades or other components causing consequences relating to structural hazards Serious injuries or fatalities are considered not credible due to the location (height) of the generator fire	No potential (local impacts)									
5.	Wind Turbine Generator	Generator Structural Damage	Mechanical Faults, Jammed bearing, Bearing seizure Overspeed	Loss of turbine unit and other environmental damage	No potential (local impacts)									
6.	Lithium-ion Battery	Arcing or short-circuit	Cable or equipment fault. Cable Thermal Failure Dust ingress	Electrocution resulting in injury or fatality	No Potential (in terms of electrical shock hazard is expected to be localised)									

7.	Lithium-ion Battery	Battery cell fire	Equipment fault and ignition of combustible materials used in the storage system. BESS module arc flash induced fire. A installation error – reverse polarity connection. Dust ingress.	Personnel injury due to burns or smoke/chemical inhalation. Damage/ destruction of battery cell. Overheating/ electrical fault potentially leading to thermal runaway.	Potential	C – Possible	4 – Major	High	HVAC systems AS compliant. Battery enclosures will be located outdoors Battery enclosures include a thermal management system that provides active cooling and heating to the internal battery enclosure components. Battery systems modular and compartmentalised to minimise damage. Battery enclosures minimum distancing applied Adequate spacing of battery modules. Batteries and associated balance of plant certified and designed to Australian Standards, particularly IEC 62485-5, IEC 62933-5-1, IEC 62933-5-2, AS/NZS 5139 and AS 4681. Battery Management System to provide functional safety of electronic safety-related systems certified to IEC 61508 e.g., fail safe function. BESS design location sufficient distance from other infrastructure. Fire protection and suppression system to be included in BESS design. Emergency shutdown incorporated into BESS design. Containers/infrastructure for BESS located to be directly accessible to emergency responders. Thermal overtemperature detection and prevention in battery enclosures design. Cell overpressure detection and protection in battery enclosures design. Remote monitoring. Access controls for HV areas (arc flash risk). Hydrant to be located proximal to BESS. Dangerous goods risk assessment. Storage and handling of BESS / Li-batteries according to AS 4681. Fire modelling study to be conducted as part of design to ensure fire radiation effects do not impact on adjacent infrastructure. Fire Risk Evaluation to be conducted to provide fire safety recommendation and required firefighting equipment. Electronic safety-related systems should be installed at both a hardware and software level, designed to applicable standards, to allow for safe isolation of electrical energy in the event of a failure.	HVAC systems correctly installed and maintained. Safety system maintenance, testing and inspections. Safety Management Plans. Trained operators/maintainers. Plant operating and maintenance procedures. Remote isolation for non-manned facility. Appropriate signage and site manifest to identify hazardous chemicals associated with the contents of BESS.	E – Rare	4 – Major	Medium	Unlikely

8.	Lithium-ion Battery	Battery cell thermal hazard	Chemical properties of the battery materials and thermal runaway. Propagation of adjacent battery fire (escalation event).	Personnel injury due to burns or smoke/chemical inhalation. Damage/ destruction of battery cell.	Potential	C – Possible	4 – Major	High	HVAC systems AS compliant. Battery enclosure will be located outdoors Battery enclosure includes a thermal management system that provides active cooling and heating to the internal Battery enclosure components Battery systems modular and compartmentalised to minimise damage. Adequate spacing of battery modules. Battery enclosures minimum distancing applied Batteries and associated balance of plant certified and designed to Australian Standards, particularly IEC 62485-5, IEC 62933-5-1, IEC 62933-5-2, AS/NZS 5139 and AS 4681. Battery Management System to provide functional safety of electronic safety-related systems certified to IEC 61508 e.g., fail safe function. BESS design location sufficient distance from other infrastructure. Fire protection and suppression system to be included in BESS design. Emergency shutdown incorporated into BESS design. Containers/infrastructure for BESS located to be directly accessible to emergency responders. Thermal overtemperature detection and prevention in Battery enclosure design. Cell overpressure detection and protection in Battery enclosure design. Remotely accessible fire, smoke and flammable gas leak monitoring. Access controls for HV areas (arc flash risk). Hydrant to be located proximal to BESS. Fire Safety Study to be conducted as part of design to ensure fire radiation effects do not impact on adjacent infrastructure. Fire Risk Evaluation to be conducted to provide fire safety recommendation and required firefighting equipment. Electronic safety-related systems should be installed at both a hardware and software level, designed to applicable standards, to allow for safe isolation of electrical energy in the event of a failure.	HVAC systems correctly installed and maintained. Safety system maintenance, testing and inspections. Safety Management Plans. Trained operators/maintainers. Plant operating and maintenance procedures. Remote isolation for non-manned facility. Lessons learnt from previous battery fire incidents.	E – Rare	4 – Major	Medium	Unlikely
9.	Lithium-ion battery	Battery cell equipment failure	Loss of cooling fluid/ Coolant leak from equipment attributable to design fault/.	Battery overheats and thermal runaway. (refer to thermal hazard)	Potential	C – Possible	4 – Major	High	Installation of coolant leak alarms. Ensure all telemetry, fault monitoring and electrical safety protection devices remain active regardless of keylock switch position or system state.	Development and implementation of commissioning procedures in accordance with manufacturer's procedures. Safety system maintenance, testing and inspections.	E – Rare	4 – Major	Medium	Unlikely

No.	Source	Hazard	Cause	Consequence	Does the Hazard have the Potential to pose Offsite or to a receptor on site Significant Risk?	Inherent Risk			Proposed Controls – Technical / Design	Proposed Controls – Safety Management	Residual Risk			Does the Hazard result in an Offsite or to a receptor on site Significant Risk?
						Likelihood	Consequence	Risk Rating			Likelihood	Consequence	Risk Rating	
			Improper installation/ commissioning. Lack of maintenance or collision or impact on the BESS.						Active monitoring and control of the pyro disconnect's power supply circuit. Required clearance between Battery enclosures for maintenance access as per BESS provider recommendations. Electronic safety-related systems should be installed at both a hardware and software level, designed to applicable standards, to allow for safe isolation of electrical energy in the event of a failure.	Development and implementation of safety management plans. Trained operators/maintainers. Plant operating and maintenance procedures. Implementation of operating plant manuals.				
10.	Lithium-ion battery	Battery cell operational hazard	Control breakdown from equipment fault; design fault/error. Improper installation/ commissioning Lack of maintenance or collision or impact on the BESS.	Battery overheats and thermal runaway. (refer to thermal hazard)	Potential	C – Possible	4 – Major	High	Ensure all telemetry, fault monitoring and electrical safety protection devices remain active regardless of keylock switch position or system state. Active monitoring and control of the pyro disconnect's power supply circuit. Required clearance between battery enclosures for maintenance access as per BESS provider recommendations. Electronic safety-related systems should be installed at both a hardware and software level, designed to applicable standards, to allow for safe isolation of electrical energy in the event of a failure.	Development and implementation of commissioning procedures in accordance with manufacturer's procedures. Safety system maintenance, testing and inspections. Development and implementation of safety management plans. Trained operators/maintainers. Plant operating and maintenance procedures. Implementation of operating plant manuals.	E – Rare	4 – Major	Medium	Unlikely
11.	Lithium-ion Battery	Battery cell chemical hazard	Fault or failure and release of corrosive and/or toxic materials	Personnel injury from burns or gas inhalation. Environmental damage.	Potential (biophysical damage)	D – Unlikely	4 – Major	Medium	Equipment designed to be compliant with applicable Australian/International Standards, particularly IEC 62485-5, IEC 62933-5-1, IEC 62933-5-2, AS/NZS 5139 and AS 4681.. Preferably modular design. Spill containment design.	Material SDS to be consulted. Emergency Response Plan to be developed to define actions in unlikely event of potential hazards. Trained operators/maintainers. Plant operating and maintenance procedures.	E – Rare	4 – Major	Medium	Unlikely

No.	Source	Hazard	Cause	Consequence	Does the Hazard have the Potential to pose Offsite or to a receptor on site Significant Risk?	Inherent Risk			Proposed Controls – Technical / Design	Proposed Controls – Safety Management	Residual Risk			Does the Hazard result in an Offsite or to a receptor on site Significant Risk?
						Likelihood	Consequence	Risk Rating			Likelihood	Consequence	Risk Rating	
12.	Lithium-ion Battery	Explosion Hazard	HVAC failure (loss of cooling system) and/or overcharging of battery causing rapid expansion and confinement of gases	Personnel injuries or fatalities. Damage / destruction of battery cell.	Potential	D – Unlikely	5 – Catastrophic	High	Batteries and associated balance of plant certified to relevant international standards (e.g. UL1976, UL9540). BESS installed outdoors with sufficient distance from infrastructure and people. Explosion risk assessment to be undertaken on selected BESS plant as part of the Fire Safety Study to ensure overpressure does not impact adjacent infrastructure. Battery Management System to provide functional safety of electronic safety-related systems certified to IEC 61508 e.g., fail safe function. Emergency shutdown incorporated into BESS design. Containers/infrastructure for BESS located to be directly accessible to emergency responders. Thermal overtemperature detection and prevention in battery enclosure design. Cell overpressure detection and protection in battery enclosure design. Remote monitoring. Electronic safety-related systems should be installed at both a hardware and software level, designed to applicable standards, to allow for safe isolation of electrical energy in the event of a failure.	HVAC systems correctly installed and maintained. Safety system maintenance, testing and inspections. Safety Management Plans. Trained operators/maintainers. Plant operating and maintenance procedures.	E – Rare	5 – Catastrophic	Medium	Unlikely

No.	Source	Hazard	Cause	Consequence	Does the Hazard have the Potential to pose Offsite or to a receptor on site Significant Risk?	Inherent Risk			Proposed Controls – Technical / Design	Proposed Controls – Safety Management	Residual Risk			Does the Hazard result in an Offsite or to a receptor on site Significant Risk?
						Likelihood	Consequence	Risk Rating			Likelihood	Consequence	Risk Rating	
13.	Lithium-ion battery	Release and dispersion of flammable and toxic gases	Fire hazard arising from combustible materials used in the storage system. Incomplete combustion of gases generated during initial battery cell thermal runaway phase.	Personnel injury due to burns or smoke/chemical inhalation. Vapour cloud explosion. Environmental contamination (Hydrogen Fluoride contacts with water)	Potential	D – Unlikely	5 – Catastrophic	High	HVAC systems AS compliant. BESS installed outdoors. Battery cooling systems. Battery components isolated. Battery systems modular and compartmentalised to minimise damage. Adequate spacing of battery modules and heat shields. Remote emergency shutdown and monitoring of the BESS. ESD buttons located at the BESS and site office. Fire detection and protection/suppression included in the design of the BESS. BESS designed in accordance with UL 9540. Batteries and associated balance of plant certified and designed to Australian Standards, particularly IEC 62485-5, IEC 62933-5-1, IEC 62933-5-2, AS/NZS 5139 and AS 4681. Battery Management System to provide functional safety of electronic safety-related systems certified to IEC 61508 e.g., fail safe function. BESS design location sufficient distance from other infrastructure. 24-hour monitoring and installation of alarms. Access controls for HV areas (arc flash risk). Hydrant to be located proximal to BESS. Dangerous goods risk assessment. Storage and handling of BESS / Li-batteries according to AS 4681. Fire Safety Study to be conducted as part of design to ensure fire radiation effects do not impact on adjacent infrastructure. Fire Risk Evaluation to be conducted to provide fire safety recommendation and required firefighting equipment.	HVAC systems correctly installed and maintained. Safety system maintenance, testing and inspections. Development and implementation of safety management plans. Trained operators/maintainers. Plant operating and maintenance procedures. Implementation of operating plant manuals (OPM). Develop and implement strategy for life of plant. Pest control/management.	E – Rare	5 – Catastrophic	Medium	Unlikely
14.	Lithium-ion battery	Exposure to EMF	Differences in electric or magnetic fields around the BESS (transformer, powerlines).	Danger to personnel.	No Potential (local impact)									

No.	Source	Hazard	Cause	Consequence	Does the Hazard have the Potential to pose Offsite or to a receptor on site Significant Risk?	Inherent Risk			Proposed Controls – Technical / Design	Proposed Controls – Safety Management	Residual Risk			Does the Hazard result in an Offsite or to a receptor on site Significant Risk?
						Likelihood	Consequence	Risk Rating			Likelihood	Consequence	Risk Rating	
15.	Lithium-ion Battery	Dropping of battery cell(s) during installation	Faulty equipment or procedure during battery installation	Personnel injury. Damage to battery cell.	No Potential (local impact))									
16.	Lithium-ion Battery	Malicious damage to BESS	Unauthorised access, few staff onsite. Compromised cybersecurity system.	Damage to battery cell and/or other infrastructure. Electrolyte emission. Electrocution resulting in injury or fatality. Mal-operation from external digital access of control systems.	Potential	D – Unlikely	5 – Catastrophic	High	BESS and auxiliary equipment to be surrounded by fencing as per AS 1725, locked gates and other security measures as necessary (e.g. CCTVs, continuous remote monitoring). Consultation with cybersecurity experts should also be conducted to implement appropriate security measures for the computer control systems.	Regular and appropriate operations and maintenance covering inspections of the facilities.	E – Rare	5 – Catastrophic	Medium	Unlikely
17.	Transformer	Transformer arcing / fire / explosion	Insufficient insulating oil maintenance, equipment fault	Electrocution resulting in injury or fatality. Damage to transformer. Ignition source for BESS fire.	Potential	D – Unlikely	5 – Catastrophic	High	Transformers to be designed to AS 2067:2016. Sufficient separation between transformers and the BESS, other transformers, and structures / fence. Transformers to be self-bunded. Using dry type transformer oil is recommended Fire modelling to be conducted as part of the Fire Safety Study to ensure fire radiation effects do not impact on adjacent infrastructure.	Maintain transformer as per OEM recommended regime, including regular insulation and function testing.	E – Rare	5 – Catastrophic	Medium	Unlikely
18.	Transformer	Loss of containment (oil)	Maintenance operations (failure of pipe). Equipment fault or arc fault Design fault/error.	Pool fire (if ignited). Personnel injury due to burns or smoke/chemical inhalation.	Potential	D – Unlikely	4 – Major	Medium	Transformers to be designed to AS 2067:2016. Transformers are self-bunded. Fire modelling to be conducted as part of the Fire Safety Study to ensure fire radiation effects do not impact on adjacent infrastructure / fence. Security fencing around transformer. Safeworks system. Remote operation of equipment. Non HV-transformer oil is FR3 which has higher fire point.	Safety system maintenance, testing and inspections. Safety procedures (training, PPE). Works undertaken by authorised personnel (inducted, licenced and trained). Development and implementation of safety management plans. Trained operators/maintainers. Plant operating and maintenance procedures. Implementation of operating plant manuals.	E – Rare	4 – Major	Medium	Unlikely
19.	Transformer	Live contact with transformer	Insufficient enclosure or barricading	Electrocution causing injury or fatality.	No Potential									
20.	Transformer	Transformer fire	Transformer cooling system/s failure Cooling system/s control system failure	Damage to infrastructure Injury Loss of life	Potential	D - Unlikely	5 - Catastrophic	High	Transformers to be designed to AS2067:2016. Fire modelling to be conducted as part of the Fire Safety Study to ensure fire radiation effects do not impact on adjacent infrastructure. Non HV-transformer oil is FR3 which has higher fire point.	Maintain transformer as per OEM recommended regime, including regular insulation and function testing.	E – Rare	5 – Catastrophic	Medium	Unlikely

No.	Source	Hazard	Cause	Consequence	Does the Hazard have the Potential to pose Offsite or to a receptor on site Significant Risk?	Inherent Risk			Proposed Controls – Technical / Design	Proposed Controls – Safety Management	Residual Risk			Does the Hazard result in an Offsite or to a receptor on site Significant Risk?
						Likelihood	Consequence	Risk Rating			Likelihood	Consequence	Risk Rating	
21.	Transformer / switchgear	Loss of containment (sulphur hexafluoride [SF6]).	Maintenance operations (failure of pipe). Equipment fault. Design fault/error.	Release toxic gas. Personnel injury.	Potential	D – Unlikely	3 – Moderate	Medium	Design transformers and switchgear in accordance with AS IEC 62271.4:2015. Gas leak and high/low pressure alarms. Continuous monitoring of gas flow.	Safety system maintenance, testing and inspections. Safety procedures (training, PPE). Works undertaken by authorised personnel (inducted, licenced and trained). Development and implementation of safety management plans. Trained operators/maintainers. Plant operating and maintenance procedures. Implementation of operating plant manuals.	E – Rare	3 – Moderate	Low	Unlikely
22.	Switchyard	Live contact with conductor	Insufficient enclosure or barricading around conductor	Electrocution causing injury or fatality.	No Potential									
23.	Switchgear	Outdoor switchgear failure	Arc-flashing induced fire Switchgear insulator failure Operation failure causing continued arcing Surge arrestor failure	Damage to infrastructure Electrocution Injury Loss of life	Potential	D - Unlikely	5 - Catastrophic	High	The design should comply with the Electricity Supply Act 1995 No 94 [44] and Regulations 2013 AS 5139: 2019 Electrical installations - Safety of battery systems for use with power conversion equipment should be consulted for design. Fire modelling to be conducted as part of the Fire Safety Study to ensure fire radiation effects do not impact on adjacent infrastructure.	Regular maintenance and testing of switchgear functionality	E – Rare	5 – Catastrophic	Medium	Unlikely
24.	Cable tray	Live contact with cable	33 kV cable exposed from wildlife (rodents).	Electrocution causing injury or fatality.	Unlikely	D – Unlikely	5 – Catastrophic	High	Design powerlines in accordance with relevant Standards.	Safety system maintenance, testing and inspections. Pest control/management.	E – Rare	5 – Catastrophic	Medium	Unlikely

No.	Source	Hazard	Cause	Consequence	Does the Hazard have the Potential to pose Offsite or to a receptor on site Significant Risk?	Inherent Risk			Proposed Controls – Technical / Design	Proposed Controls – Safety Management	Residual Risk			Does the Hazard result in an Offsite or to a receptor on site Significant Risk?
						Likelihood	Consequence	Risk Rating			Likelihood	Consequence	Risk Rating	
25.	Natural Hazard	Grass or mallee fire Stray ember induced fire	Bushfire Hot work Lightning strike Vandalism	Damage to BESS, WTG. Significant environmental damage.	Potential	C – Possible	4 – Major	High	10 m wide defendable space surrounding the BESS development footprint. Minimum 20 kL water tank or other reticulated water source designed in accordance with the requirements of AS 2419.1 and CFA for fire-fighting purposes. Remote monitoring. BESS and auxiliary equipment to be surrounded by fencing as per AS 1725, locked gates and other security Lightning protection design for BESS and electrical equipment, transformers etc Fire Safety Study to be conducted as part of design to ensure fire radiation effects do not impact on adjacent infrastructure. Fire Risk Evaluation to be conducted to provide fire safety recommendation and required firefighting equipment. Ensure the layout of site infrastructure that minimises the potential for grassfire and/or bushfire to impact the BESS. Fire protection system must incorporate at least one static firewater storage tank of at least 45,000L effective capacity at each site entrance for the Wind Farm. Install additional static fire water storage tanks of at least 45,000L effective capacity must also be incorporated in the Wind Farm. Nacelles must be equipped with automatic fire detection, alarm and fire suppression systems.	Development of a Fire Management Plan with appropriate mitigations to minimise risks. Development and implementation of safety management plans (e.g., permit to work).	D – Unlikely	4 – Major	Medium	Unlikely

No.	Source	Hazard	Cause	Consequence	Does the Hazard have the Potential to pose Offsite or to a receptor on site Significant Risk?	Inherent Risk			Proposed Controls – Technical / Design	Proposed Controls – Safety Management	Residual Risk			Does the Hazard result in an Offsite or to a receptor on site Significant Risk?
						Likelihood	Consequence	Risk Rating			Likelihood	Consequence	Risk Rating	
26.	Natural Hazard	Extreme ambient temperature (high humidity)	Extreme temperatures	Personnel injury due to burns or smoke/chemical inhalation. Damage/ destruction of battery cell.	Potential	D – Unlikely	4 – Major	Medium	Batteries designed to operate beyond maximum temperature range with allowance for higher maximum temperatures of approximately 1.5 to 2ºC to account for the likely effects of global warming. Electrical design in accordance with AS/NZS 3000:2018. Battery enclosures have suitable enclosure design for the environment.	-	D – Unlikely	4 – Major	Medium	Unlikely
27.	Natural Hazard	Seismic activity	Failure to design the BESS to the correct earthquake loading code to account for seismic activity Earthquake	Damage to battery casings, cells and other infrastructure.	No Potential									
28.	Natural Hazard	Flooding	Drainage system failure Fire-fighting activity Failure to account for flooding during foundation construction	Damage to battery casings, cells and other infrastructure.	Unlikely	E – Rare	4 – Major	Medium	Surface Water and Groundwater Assessment to be conducted to determine special flood considerations.	Schedule construction during dry season to account for light and heavy vehicles in heavy rain/flooding events.	E – Rare	4 – Major	Medium	Unlikely
29.	Natural Hazard	Excessive wind	Storms (hail and extreme winds).	Damage to battery casings, cells and other infrastructure.	Unlikely	E – Rare	3 – Moderate	Low	The site is located in an A0 wind region. The BESS should be designed in accordance with AS/NZS 1170.2.2021.	Housekeeping schedule should be maintained to ensure debris is cleared	E – Rare	3 – Moderate	Low	Unlikely
30.	Natural hazard	Ambient weather (lightning) striking	Lightning strike hitting WTG causing additional high current and physical destruction of WTG Failure to design the BESS to the correct isokeraunic level to account for lightning strikes	Resulting in structural damage, fires and tower collapse [1] Potential single or multiple fatalities are in the localised area of the WTG	Potential	E – Rare	5 – Catastrophic	Medium	Ensure the location of the WTGs will stay within the site boundary in the event of a WTG total collapse. Conduct a lightning protection study. Ensure no BESS equipment is located underneath powerlines. Implement an earthing system. Design the BESS facility in accordance with AS 1768:2021.	-	E – Rare	5 – Catastrophic	Medium	No
31.	Natural Hazard	Subsidence	Collapse of pillars within abandoned underground mine and mine roof	Ground instability resulting in damage to BESS units and infrastructure.	[HOLD]									

No.	Source	Hazard	Cause	Consequence	Does the Hazard have the Potential to pose Offsite or to a receptor on site Significant Risk?	Inherent Risk			Proposed Controls – Technical / Design	Proposed Controls – Safety Management	Residual Risk			Does the Hazard result in an Offsite or to a receptor on site Significant Risk?
						Likelihood	Consequence	Risk Rating			Likelihood	Consequence	Risk Rating	
32.	Other	Loss of containment (contaminated water)	Spent fire water runoff. Runoff from site. Failure of process waste piping.	Harm to the environment (flora and fauna).	Potential	D – Unlikely	3 – Moderate	Medium	Installation of oily water interceptors. Design and Installation of containment infrastructure/impervious retention facilities, ponds and such with adequate capacity. Bunded transformers. Use of mineral oils.	Stormwater Management Plan. Operations and maintenance of retention facilities/ponds. Continuous monitoring and alarms. Emergency response plan/procedure	E – Rare	3 – Moderate	Low	Unlikely
33.	Other	Exposure to contaminated land	Construction activities exposing contaminated material from legacy works.	Harm to personnel and the environment.	Potential	D – Unlikely	3 – Moderate	Medium	-	Identification and testing of any contaminated land. Development and implementation of procedure for removal of contaminated land and remediation. Removal of contaminated land before construction. Tracking of contaminated land removal.	E – Rare	3 – Moderate	Low	Unlikely
34.	Other	Vehicle collision / congestion	Construction activities (increased heavy vehicles). Driver fatigue.	Personnel injury/fatality.	Potential	D – Unlikely	5 – Catastrophic	High	-	Traffic Management Plan, including fatigue management.	E – Rare	5 – Catastrophic	Medium	Unlikely
35.	Other	Loss of containment (waste/fuel)	Commissioning activities.	Harm to personnel and the environment.	Potential	D – Unlikely	3 – Moderate	Medium	BESS and auxiliary equipment to be surrounded by fencing as per AS 1725, locked gates and other security	Waste Management Plan Construction Waste Management Plan Emergency Management Plan	E – Rare	3 – Moderate	Low	Unlikely

36.	Other	Fire	Other dangerous goods / incompatible materials	Impinged fire to BESS/Fire propagation from BESS Harm to personnel and the environment	Unlikely	D – Unlikely	3 – Moderate	Unlikely	Adequate separation from BESS to fence/ other DGs Minor storage quantities of other DG Dangerous Goods risk assessment to be conducted. Fire Safety Study to be conducted as part of design to ensure fire radiation effects do not impact on adjacent infrastructure. Fire Risk Evaluation to be conducted to provide fire safety recommendation and required firefighting equipment Where reticulated water is available for centralised BESS, the provision of a fire hydrant system that meets the requirements of AS 2419.1-2021 Clause 3.9 and Table 2.2.5(D). Where no reticulated water is available for centralised BESS, provision of a fire hydrant system water supply in static storage tanks that complies with AS 2419.1-2021, where: 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 2419.1-2021: Fire hydrant installations, flowing for a period of no less than four hours at 20L/s, whichever is the greater. ii. The quantity of static fire water storage is to be calculated from the number of hydrants required to flow from AS 2419.1-2021 Table 2.2.5(D). iii. Fire hydrants must be provided and located so that every part of the battery energy storage system is within reach of a 10 m hose stream issuing from a nozzle at the end of a 60 m length of hose connected to a fire hydrant outlet. iv. The fire water supply must be located at vehicle entrances to the facility, at least 10 m from any infrastructure (electrical substations, inverters, battery energy storage systems, buildings). 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	Safety system maintenance, testing and inspections. Safety Management Plans. Remote isolation for non-manned facility. Emergency response plan/procedure	E – Rare	3 – Moderate	Low	Unlikely

No.	Source	Hazard	Cause	Consequence	Does the Hazard have the Potential to pose Offsite or to a receptor on site Significant Risk?	Inherent Risk			Proposed Controls – Technical / Design	Proposed Controls – Safety Management	Residual Risk			Does the Hazard result in an Offsite or to a receptor on site Significant Risk?
						Likelihood	Consequence	Risk Rating			Likelihood	Consequence	Risk Rating	
									closer to the site entrance that the battery energy storage system). vi. The fire water supply must comply with AS 2419.1-2021, Section 5. A fire break must be established and maintained around BESS and related infrastructure. A fire break must be established and maintained around the base of wind turbines.					

Document prepared by

Aurecon Australasia Pty Ltd
ABN 54 005 139 873

Aurecon Centre
Level 8, 850 Collins Street
Docklands, Melbourne VIC 3008

PO Box 23061
Docklands VIC 8012
Australia

T +61 3 9975 3000
F +61 3 9975 3444
E melbourne@aurecongroup.com
W aurecongroup.com

aurecon
Bringing ideas to life