



APPENDIX L AMENDED BUSHFIRE RISK ASSESSMENT



The Plains Wind Farm

Amended Bushfire Risk Assessment

PREPARED FOR



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SIGNATURE PAGE

The Plains Wind Farm

Amended Bushfire Risk Assessment

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ACRONYMS AND ABBREVIATIONS

Acronyms	Description
APZ	Asset Protection Zones
AFDRS	Australian Fire Danger Rating System
AS 3959-2018	<i>Australian Standard 3959 - 2018 Construction of Buildings in Bushfire-prone Areas</i>
BC Act	<i>Biodiversity Conservation Act 2016</i>
BOM	Bureau of Meteorology
CASA	Civil Aviation Safety Authority
EIS	Environmental Impact Statement
EP&A Act	<i>NSW Environmental Planning and Assessment Act 1979</i>
ERM	Environmental Resources Management Australia Pty Ltd
ha	hectare
m	metres
MNES	Matter of National Environmental Significance
NSW RFS	New South Wales Rural Fire Service
PBP 2019	Planning for Bushfire Protection 2019
RF Act	<i>NSW Rural Fires Act 1997</i>
SCADA	supervisory control and data acquisition
SEARs	Secretary's Environmental Assessment Requirements
SFAZ	Strategic Fire Advantage Zone
SSD	State Significant Development
TOBAN	Total Fire Ban

Important Note:

Despite the mitigation measures and treatments that are put in place, it is noted that some bushfire risk will always remain and that some of the infrastructure may be subject to direct flame contact. The absence of any identified hazard or asset in the Project Area should not be interpreted as a guarantee that such hazards or impacts do not exist. It is also important that a Bushfire Emergency Management and Operations Plan is prepared prior to the commencement of any construction works in conjunction with relevant stakeholders, including local fire services, NSW RFS, NSW Fire and Rescue, landowners and adjoining property owners.

Important Disclaimer:

Any representation, statement of opinion, or advice expressed or implied in the bushfire assessment will be made in good faith on the basis that ERM employees and / or agents are not liable (whether by reason of negligence, lack of care or any other reason) to any person, company or their agents for any damage or loss whatsoever which has occurred or may occur in relation to that person taking (or not taking) action in respect of any representation, statement or advice provided within the bushfire assessment.

1. INTRODUCTION

Engie Australia Pty Ltd ('ENGIE' or the 'Applicant') proposes to construct, operate, maintain and decommission The Plains Wind Farm (the 'Project') located south of Hay in the Riverina Murray Region of New South Wales (NSW).

The need for a Bushfire Risk Assessment was identified within the Secretary's Environmental Assessment Requirements (SEARs), and the *Rural Fires Act 1997* imposes obligations on land occupiers to take all practicable steps to prevent the occurrence and spread of wildfire to adjoining lands from lands under their care and management.

This report identifies potential hazards and risks associated with the amended Project layout and has been prepared to support the preparation of the Project Amendment and Response to Submission (RtS) reports. It contains management and mitigation measures designed to address these obligations consistent with the NSW Rural Fire Service (RFS) guidelines including Planning for Bush Fire Protection (PBP) (2019) inclusive of the PBP Addendum (2022).

It does not assess the individual design or engineering components of the wind farm (or other infrastructure as described in **Section 1.1**) themselves but does consider locations of the infrastructure relative to the identified hazards and the requirements for separation distances.

1.1 DESCRIPTION OF THE PROJECT

The Project is situated on Mungadal Station and neighbouring properties to the east and west of the Cobb Highway in the Riverina Murray Region of NSW. Amendments have been made to the Project layout to respond to submissions received during EIS public exhibition. The amended Project involves the construction, operation and where relevant decommissioning of:

- 171 wind turbine generators (WTGs), with each having a hub height of up to 180 metres (m) and tip height of up to 270 m, and a total maximum capacity of up to 1,230 megawatts (MW);
- Electrical reticulation; and
- Associated and ancillary facilities.

Consistent with the original EIS, two accommodation compounds will be provided to accommodate the construction workforce (a peak construction workforce of approximately 700 FTE personnel with an average of 550 FTE during construction periods). Each compound will include accommodation and amenity facilities, car parking, food and catering facilities, recreational facilities, first aid facilities and telecommunication services for personal use. Accommodation facilities will consist of prefabricated demountable units, that will be delivered and installed on site.

Figure 1-1 shows the Project locality in a regional setting and the amended Project layout is provided in **Figure 1-2**.

The final layout remains subject to further detailed design and refinement. To allow the Applicant to make general design refinements without the need to modify the application, the EIS and Project Amendment Report have assessed impacts for an area that includes temporary and permanent Project infrastructure with, generally, a 100 m micro-siting buffer applied (the Project Area).

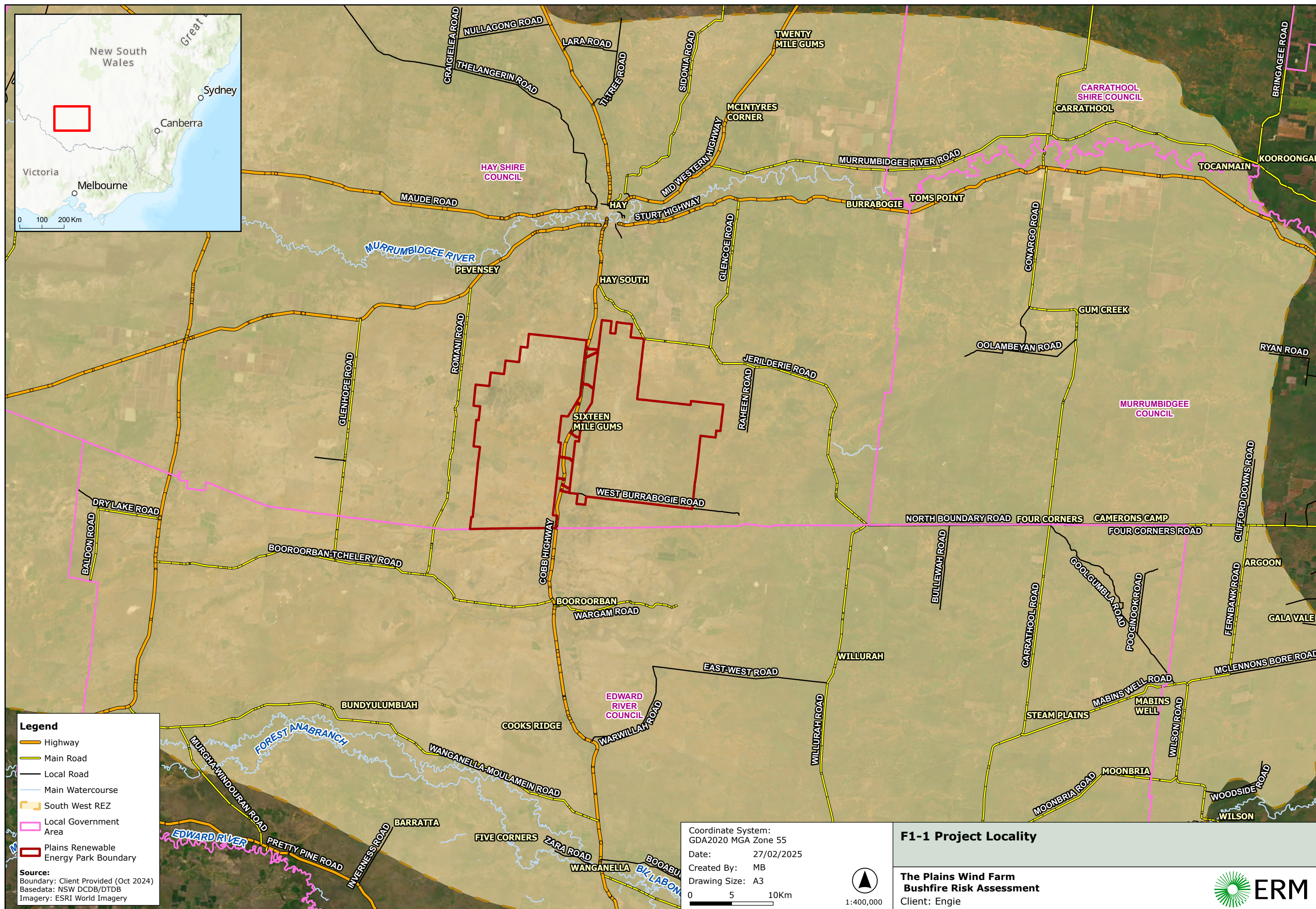
1.2 AIMS AND OBJECTIVES

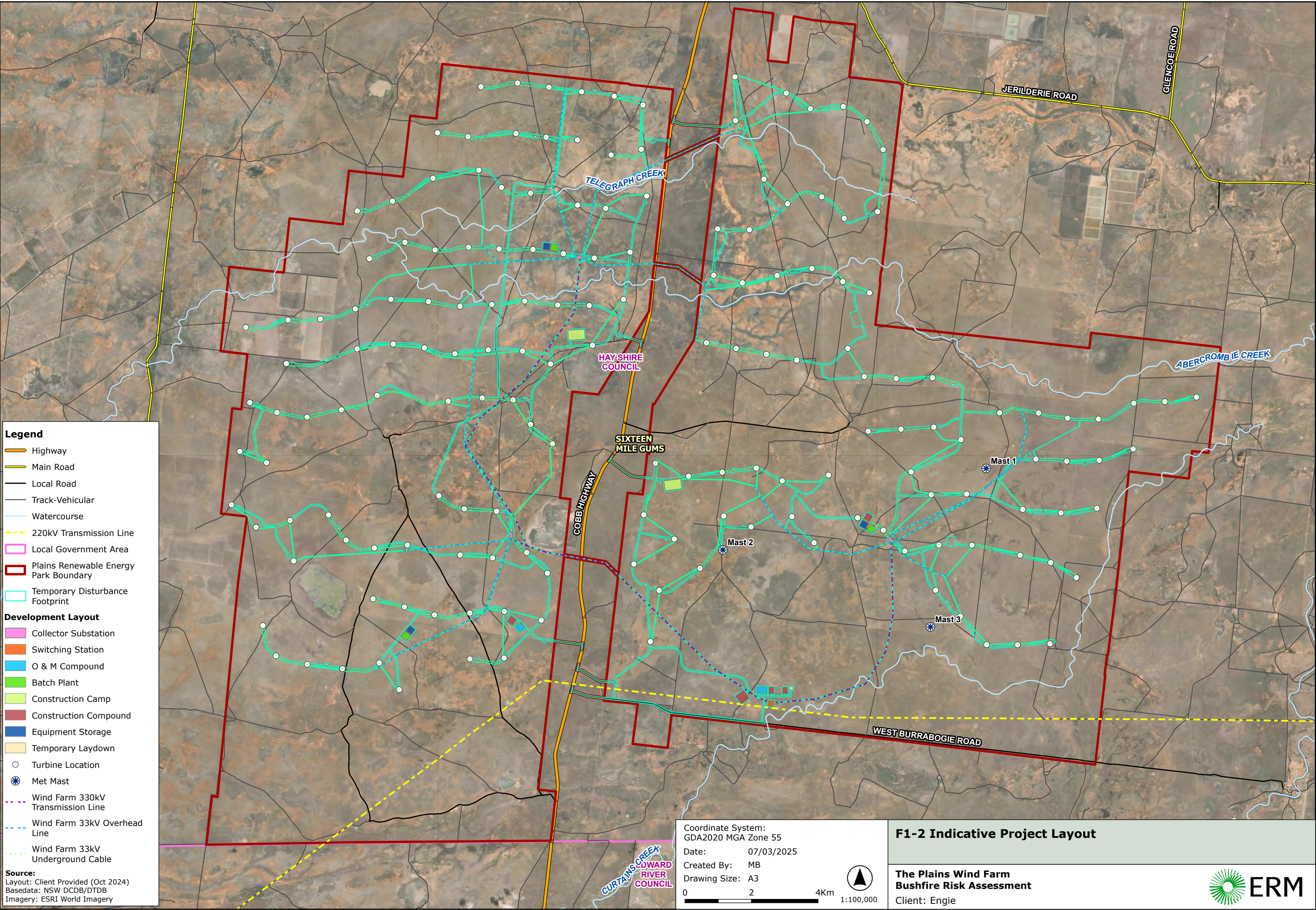
Bushfire presents a threat to human life and assets and can adversely impact ecological values. Bushfire risk can be considered in terms of environmental factors that increase the risk of fire (e.g., fuel quantity and type, topography and weather patterns), as well as specific activities (e.g., hot works and construction activities) or infrastructure components that exacerbate combustion or ignition risks (e.g., transmission lines and other electrical components).

This Bushfire Risk Assessment aims to address the requirements identified by the SEARs to identify potential hazards and risks associated with bushfires / use of bushfire prone land and demonstrate that the proposed wind farm can be designed, constructed and operated to minimise ignition risks and provide for asset protection consistent with relevant NSW RFS design guidelines PBP 2019 and Standards for Asset Protection (available on the NSW RFS website www.rfs.nsw.gov.au).

The objectives of this assessment are to identify and, where possible, reduce the likelihood of a bushfire impacting the Project Area or spreading from the Project Area to surrounding properties.

Despite the mitigation measures and treatments that are put in place, it is noted that some bushfire risk will always remain and that some of the infrastructure may be subject to direct flame contact. The absence of any identified hazard or asset in the Project Area should not be interpreted as a guarantee that such hazards or impacts do not exist.





2. PLANNING FRAMEWORK

2.1 RELEVANT LEGISLATION AND GUIDELINES

Table 2-1 outlines the relevant legislation and guidelines and how they have been considered in this Bushfire Risk Assessment.

TABLE 2-1 RELEVANT LEGISLATION AND GUIDELINES

Relevant Legislation/Guideline	Description
<i>Environment Planning and Assessment Act 1979</i>	The Project was declared a State Significant Development (SSD) and will be assessed under Part 4 of the <i>Environment Planning and Assessment Act 1979</i> (EP&A Act). The SEARs issued for this Project require an assessment of bush fire risk in accordance with PBP 2019. Section 4.41 of the EP&A Act excludes projects approved under Part 4 of the EP&A Act from requiring “a bush fire safety authority under section 100B of the <i>Rural Fires Act 1997</i>”.
<i>NSW Rural Fires Act 1997</i>	The NSW Rural Fire Service (NSW RFS) administers the <i>Rural Fires Act 1997</i> (RF Act). The RF Act was proclaimed in September 1997 and superseded the <i>Bush Fires Act 1949</i>. The RF Act is supported by the <i>Rural Fire Regulation 2013</i> and they should be read together. Under Section 63 of the RF Act, owners and occupiers of land have a duty to take practicable steps to prevent the occurrence of bushfires on, and to minimise the danger of the spread of bushfires on or from, that land. This assessment considers the risk of spreading bushfires from the Project to the surrounds and provides measures to minimise the risk of bushfires. The wind farm operators must also be aware of operations that can be carried out on days of Total Fire Ban and any prohibited activities or exemptions that are notified by the Commissioner of the NSW RFS under Section 99 of the RF Act. The proposed development does not require subdivision of land and is not defined as a special fire protection purpose development under Section 100B of the RF Act. Accordingly, the Project does not require a bushfire safety authority. <u>Bushfire Management Committee</u> Set up under the RF Act, bushfire management committees (BFMCs) coordinate fire management planning, prevention and suppression in local areas. The relevant committee for the Project is the Murrumbidgee Irrigation Area BFMC. Each BFMC is required to prepare and submit to the Bush Fire Risk Management Plan (BFRMP). The relevant plan to the Project is the Murrumbidgee Irrigation Area BFRMP (2024) and has been referred to as part of this assessment (Section 3.2).
<i>Planning for Bushfire Protection 2019</i>	Planning for Bushfire Protection 2019 (NSW RFS) (PBP 2019) is a planning document to link responsible planning and development control with the protection of life, property and the environment. Consideration has been given to the following overall aims and objectives of PBP 2019: - Afford buildings and their occupants protection from exposure to a bushfire; - Provide for a defensible space to be located around buildings;

Relevant Legislation/Guideline	Description
	• Provide appropriate separation between a hazard and buildings which, in combination with other measures, minimises material ignition; • Ensure that appropriate operational access and egress for emergency service personnel and residents is available; • Provide for ongoing management and maintenance of bushfire protection measures; and • Ensure that utility services are adequate to meet the needs of firefighters. PBP 2019 provides specific requirements for wind farm development and notes that wind farms require special consideration and should be provided with adequate clearances to combustible vegetation as well as firefighting access and water. The following minimum standards should be provided for wind farms (noting that the recommendations of this assessment exceed these minimum standards): • 10 m Asset Protection Zone (APZ) from the structures / associated buildings / infrastructure; and • The APZ will be maintained to the standard of an inner protection area for the life of the development to provide adequate access for firefighting purposes. Essential equipment should be designed and housed in such a way as to minimise the impact of bush fires on the capabilities of the infrastructure during bush fire emergencies. It should also be designed and maintained so that it will not serve as a bush fire risk to surrounding bush.
<i>Commonwealth Environment Protection and Biodiversity Act 1999</i>	<i>The Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act) is the primary piece of Federal legislation relating to the environment. Under the EPBC Act any action that has, or is likely to have, a significant impact on a Matter of National Environmental Significance (MNES) requires approval from the Commonwealth Minister for the Environment. An action is defined as a project, development, undertaking, activity (or series of activities), or alteration to any of these. <i>Consideration of the impact of the proposed activity on MNES has been provided in The Plains Wind Farm Biodiversity Development Assessment Report (ERM, 2025).</i>
<i>Biodiversity Conservation Act 2016</i>	The <i>Biodiversity Conservation Act 2016</i> (BC Act) requires the consideration of threatened species and their habitats in the developmental planning process and a responsibility of the proponent to determine potential impacts on listed species and Endangered Ecological Communities. Schedule 3 of the BC Act lists Key Threatening Processes for species, populations and ecological communities within NSW. 'Clearing of native vegetation', 'high frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition' and 'removal of dead wood and dead trees' need to be carefully considered and managed when implementing fire management activities.

2.2 SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

The SEARs were issued for the proposed development on 23 December 2022 (SSD-50629707). The SEARs state the following with regard to bush fire risk:

'Bushfire – identify potential hazards and risks associated with bushfires / use of bushfire prone land including the risks that a wind farm would cause bush fire and demonstrate compliance with Planning for Bush Fire Protection 2019'.

Four Government agencies provided bushfire related advice on the SEARs, as reproduced in **Table 2-2** below.

TABLE 2-2 SEARs AGENCY ADVICE

Agency	Date	Advice	Where addressed
NSW Rural Fire Service	17 March 2023	The NSW Rural Fire Service advises that any SEARs for the proposed development should incorporate a bush fire hazard assessment undertaken by a suitably qualified consultant to address the aims and objectives of Planning for Bush Fire Protection 2019. At a minimum, the report should address the following considerations: • Suitable access for fire fighting vehicles, including access around structures on the site; • Suitable SWS including access for fire fighting vehicles; • Appropriate APZs and BALs for structures, where appropriate; • Preparation of a Bush Fire Emergency Management and Evacuation Plan in accordance with Table 6.8d of Planning for Bush Fire Protection 2019 and be consistent with the NSW RFS document: A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan. • Provision of a Fire Management Plan that at minimum includes; ◦ Ongoing bush fire fuel management within the site; ◦ Site infrastructure plan; ◦ Site access and internal road plan; ◦ APZs and their continued maintenance; ◦ Location of hazards (physical, chemical etc) that may impact on fire fighting operations; and ◦ Any such additional matters as may be required by the NSW RFS District Office for the MIA.	This report
Fire and Rescue NSW	24 November 2022	There is currently insufficient information available regarding the fire safety and emergency response management aspects of the project. FRNSW requests to be consulted and given the opportunity to review and provide comment regarding the proposed fire and life safety systems at the preliminary and final design phases of the project.	Section 4

Agency	Date	Advice	Where addressed
Edward River Council	9 Dec 2022	Bushfire risks associated with the construction and operation of the development need to be carefully considered in the EIS. Noting that the portion of the site within Edward River Council area is Bushfire Prone Land [<i>note that revised project layout is no longer in the Edward River LGA</i>]. Of specific concern is the large expanses of grassland and the remoteness of this areas. Adequate resources would be required to protect these areas in the event of fire outbreak as there are extended response times and limited access to adequate resources for fire defence.	This report

2.3 RESPONSE TO SUBMISSIONS

In support of the SSD application (SSD-50629707), an Environmental Impact Statement (EIS) was prepared for the Project (ERM, 2024). The EIS was publicly exhibited between 8 May 2024 and 4 June 2024 by the NSW Department of Planning, Housing and Infrastructure (DPHI).

During the public exhibition period, submissions were received from government agencies, organisations and members of the public. A summary of bushfire related submissions is provided in **Table 2-3** below.

TABLE 2-3 SUMMARY OF KEY CONSULTATION

Contact	Summary	Key Response/Action
NSW Rural Fire Service	The NSW RFS recommends the following requirements be adopted as part of any subsequent approval for the proposal: - The recommendations made in Table 7-1 of the report titled The Plains Wind Farm - Bushfire Risk Assessment (Dated 21 March 2024, ref 0667692.) - Continued engagement with local RFS (NSW RFS District Office for the MIA, phone 02 6966 7800) is strongly recommended to ensure that the recommended provisions are fit for purpose and that there is a shared situational awareness of the mitigation measures as recommended.	Noted. Table 7.1 has been updated to reflect the amended project layout.
NSW Rural Fire Service	Please note that the Bush Fire Prone Land Mapping for Murrumbidgee LGA does not appear to have been updated to include grassland areas. It is reasonable to assume that any future revision of the mapping would show most of the site to be mapped as Bush Fire Prone Vegetation Category 3.	Noted.
FRNSW	It is deemed that the proposal has limited scope and application in regard to special hazards or special problems of firefighting. FRNSW submit no comments or recommendations for consideration, nor any requirements beyond that specified by applicable legislation. While there is currently no requirement for a Fire Safety Study, FRNSW may recommend one be undertaken at a later stage should information be provided such that the development is deemed to pose special problems of firefighting or special hazards exist that require additional fire safety and management measures.	Noted. The Applicant will prepare a Fire Safety Study post approval if required.

3. EXISTING CONDITIONS

3.1 LOCAL CONTEXT

The Project Area is situated in the Hay LGA within the Riverina Murray Region of NSW. The Hay LGA covers a total area of 11,326 km² and has a population of 2,882 (ABS, 2021). The LGA is serviced by the Sturt Highway, Mid-Western Highway, and Cobb Highway, which intersect within the township of Hay. The key land uses within the region are agriculture and food production, and its economy is reliant on tourism, agriculture and associated industries (DPE, 2023).

The Project Area is zoned in its entirety as RU1 – Primary Production under the Hay Local Environmental Plan 2011 (LEP). The existing land uses surrounding the Project Area are predominantly agricultural and primarily used for irrigated cropping and grazing.

3.2 CURRENT BUSHFIRE MANAGEMENT CONTROLS

The existing land uses surrounding the Project Area are predominantly agricultural and primarily used for irrigated cropping and grazing. Current bushfire control is limited general land management practices including maintenance of access tracks and consideration of fire danger ratings and total fire bans.

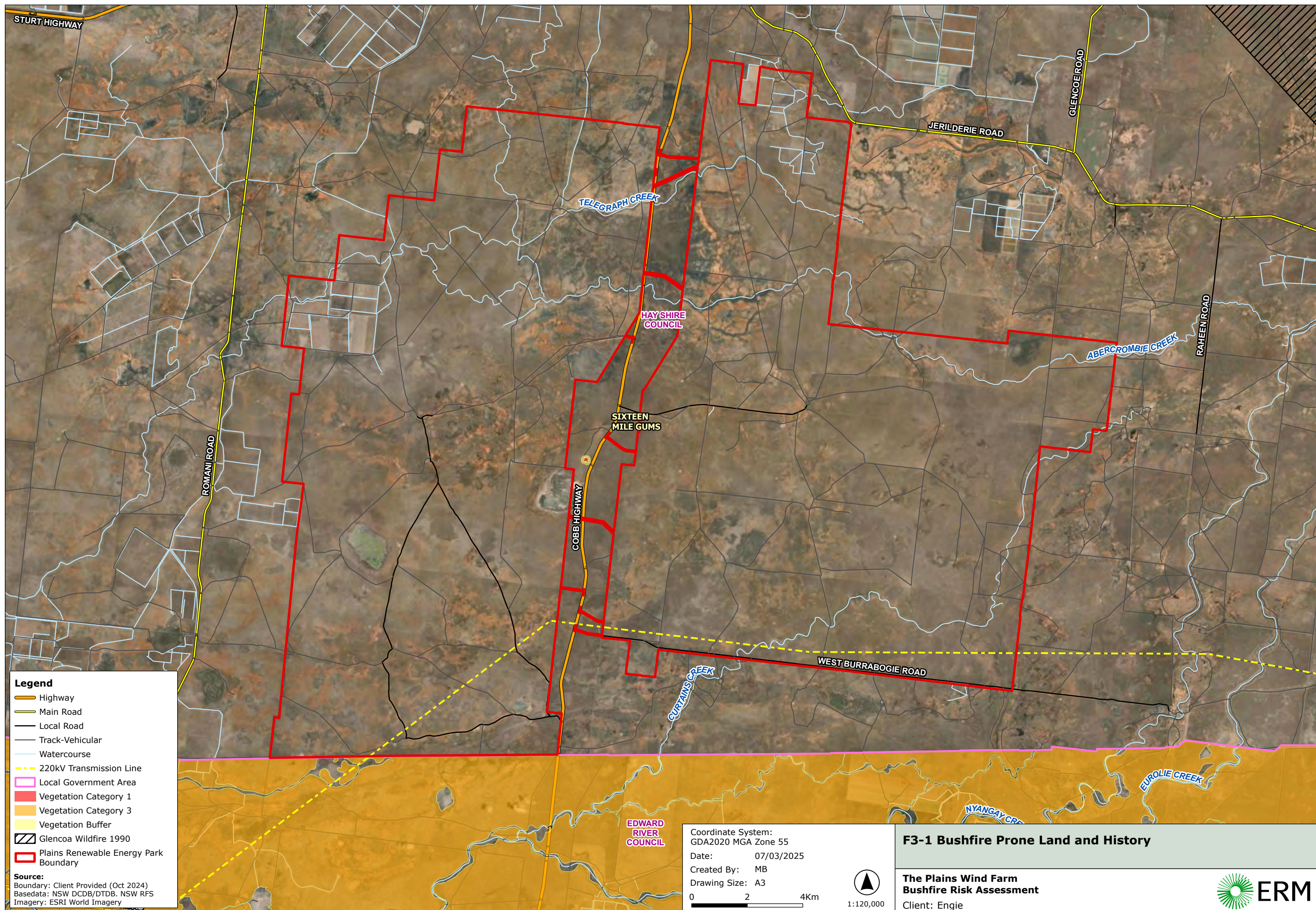
The relevant BFRMP for the Project is the Murrumbidgee Irrigation Area BFRMP (2024). The Project Area is not mapped as a bushfire management zone under this plan.

3.3 BUSHFIRE PRONE LAND

A review of the NSW RFS Bushfire Prone Land mapping confirms that the Project Area is not currently recognised as being bushfire prone (refer **Figure 3-1**). Vegetation Category 3 bushfire prone land is located immediately south, outside of the Project Area boundary and presents a medium bushfire risk. It is recognized that Category 3 vegetation will likely be added to the bushfire prone land mapping at some stage to align with the requirements of the NSW RFS Guide for Bush Fire Prone Land Mapping (RFS, 2015).

Vegetation Category 3 is considered to be medium bush fire risk vegetation. It is higher in bush fire risk than category 2 (and the excluded areas) but lower than Category 1. It is represented as dark orange on a Bush Fire Prone Land map. This category consists of grasslands, freshwater wetlands, semi-arid woodlands, alpine complex and arid shrublands.

This bushfire prone land triggers the requirement to apply the aims and objectives of the PBP 2019.



3.4 FIRE HISTORY

The NSW Government Central Resources for Sharing and Enabling Environmental Data (SEED) provides information on wildfires that have occurred in the vicinity of the Project Area. No fires have been reported within the Project Area. The closest reported fire (15km to the east of the Project Area) is the Glencoa wildfire which occurred in November 1990 and consumed 181,148 ha of prime grazing land, destroyed 100,000 sheep and hundreds of kilometres of fencing. No other fires have been reported within 20 km of the Project Area.

3.5 CLIMATE AND FIRE WEATHER

Weather conditions influence the size, intensity, speed, and predictability of bushfires and how dangerous they can be to the community. While bushfires can happen at any time of the year in Australia, the time of peak bushfire activity varies across the country with the changes in the seasonal weather patterns. Within the region, the bushfire season generally runs from October-November through to March-April depending on seasonal conditions. This is consistent with the statutory Bush Fire Danger Period which generally runs from 1 October to 31 March each year.

As described by the Bureau of Meteorology (BOM, 2024), as grass and forests dry during summer and autumn, southeast Australia becomes vulnerable to the threat of bushfire. During late spring and early summer grass and forest fuels hold some moisture but fires can occur on hot days with strong winds. Fuels dry out in mid and late summer but winds are typically not as strong. Early autumn sees a transition to cooler conditions and generally lighter winds.

Prevailing weather conditions associated with the bushfire season are winds from the west around to the north accompanied by high daytime temperatures and low relative humidity. Dry lightning storms occur frequently during the bushfire season often starting forest and grass fires. Data from the BOM weather station at Hay (Miller Street) (Station No: 075031) and Hay (CSIRO AWS) (Station No: 075175) confirms that both low humidity and high temperature occur within the bushfire season and would contribute to the fire hazard within this region (refer **Figure 3-2**).

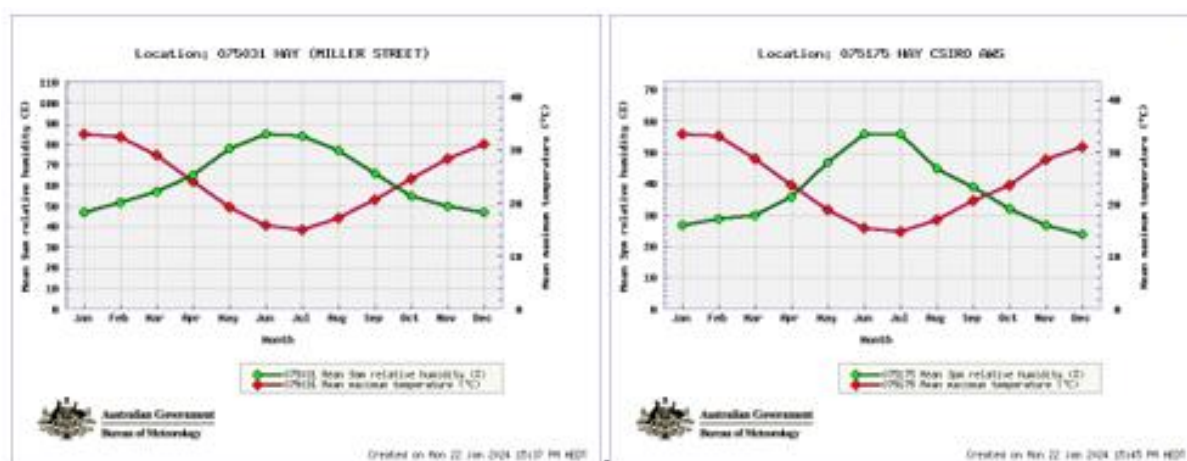


FIGURE 3-2 LOW HUMIDITY AND HIGH TEMPERATRUE WITHIN THE BUSHFIRE SEASON (BOM 2024)

Strong gusty winds help fan the flames and cause a fire to spread faster across the landscape. Strong winds can carry hot embers long distances - these can start spot fires many kilometres ahead of the main fire front. Data from the BOM weather station at Hay (Miller Street) (Station No: 075031) suggest that strong westerly and south westerly winds (moving to southerly winds in late summer) are common during the bushfire season.

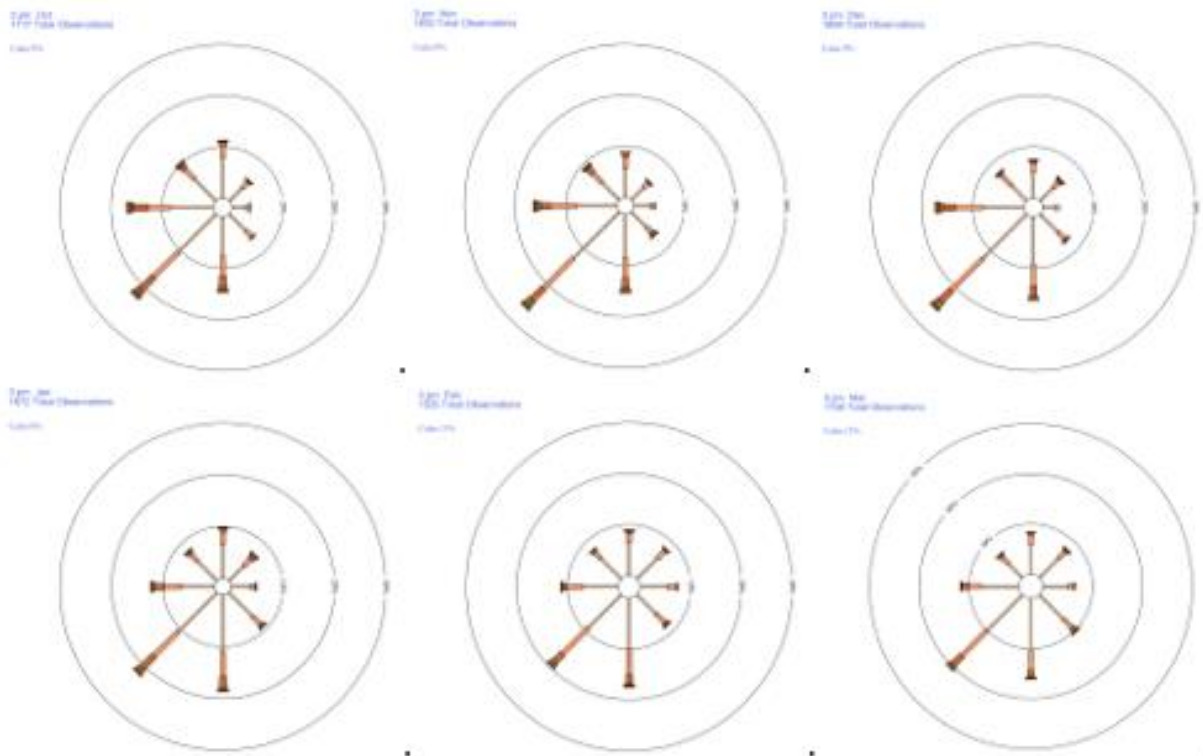


FIGURE 3-3 ROSE OF WIND DIRECTION VERSUS WIND SPEED IN KM/H WITHIN THE BUSHFIRE SEASON (BOM 2024)

The exposure to wind effects will not vary across the Project Area due to the gently undulating nature of the landscape although strong winds will rapidly spread fires across the open landscape.

3.6 TOPOGRAPHY

The slope of the land under the classified vegetation has a direct influence on the rate of fire spread, the intensity of the fire and the level of radiant heat flux. The effective slope of the land is categorised into one of the following classes, relative to the location of the hazard:

- All upslope vegetation (considered 0 degrees);
- >0 to 5 degrees downslope vegetation;
- >5 degrees to 10 degrees downslope vegetation;
- >10 degrees to 15 degrees downslope vegetation; and
- >15 degrees to 20 degrees downslope vegetation.

The Project Area is characterised by a relatively flat topography with low relief and slight variation to elevations, it generally differs by only a few metres. Hay Plains area has gently west sloped topography.

3.7 VEGETATION HAZARD

Descriptions of the vegetation types including species composition and structural diversity are provided in The Plains Wind Farm Biodiversity Development Assessment Report (ERM, 2025).

Vegetation growth can be encouraged by periods of wet weather, increasing the amount of fuel available (grass, leaf litter, twigs, bark). When the weather is hot, the humidity is low and there's been little recent rain, this vegetation dries out and becomes more flammable. A fire is more likely to start, and continue to burn, in hot, dry and windy weather.

For the purposes of this bushfire risk assessment, the vegetation has been simplified in line with the vegetation formations as per Keith (2004).

The vegetation classifications are shown in **Table 3-1** and **Figure 3-4**. The dominant vegetation types across the Project Area that would influence fire behaviour are Chenopod shrublands and Riverine grasslands, with isolated pockets of Sandhill woodlands. Chenopod shrublands are less flammable than most other vegetation and are fire sensitive.

Most of the Project Area has some level of management by grazing, the success of this management practice can vary depending on the amount of rainfall in the spring period leading to abundant growth of grasses in summer. Fuel load is also dependent on the stock loading across the various paddocks which will vary across years and seasons.

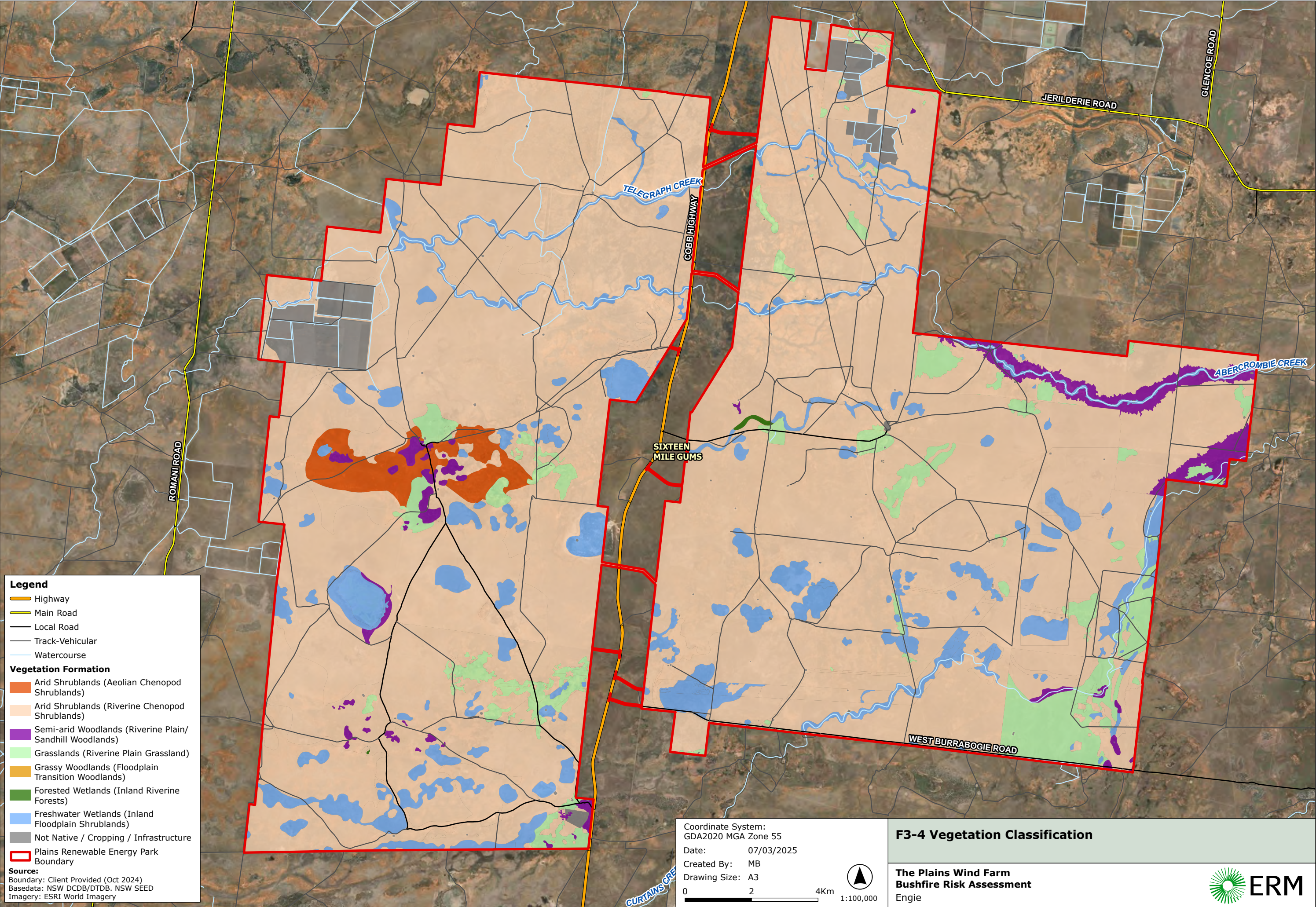
The assessment of dominant fuel hazard will be determined for grazed grassland across the entire Project Area. The smaller patches of woodland, whilst recognized as a higher hazard vegetation, are not the dominant vegetation type that would carry a fire across this site.

The proposed Accommodation Compounds are located greater than 1km to areas of mapped woodland vegetation and the dominant vegetation affecting this infrastructure is also noted to be grazed grassland and Chenopod Shrubland.

TABLE 3-1 DESCRIPTION AND CHARACTERISTICS OF FUEL GROUPS WITHIN THE PROJECT AREA

Vegetation Formation^{1, 2}	Bushfire Characteristics³	Overall Fuel Load⁴
Arid Shrublands (Aeolian Chenopod Shrublands)	Mid-high open shrubland generally less than one meter high dominated by Black Bluebush on this site. This community is rarely burnt, and intense fire may kill bluebush.	3.2 t/ha
Arid Shrublands (Riverine Chenopod Shrublands)	Arid shrublands occur in arid and semi-arid regions of western NSW, where limited, sporadic rainfall and low soil moisture are unable to support tree-dominated vegetation. Chenopod shrublands have low flammability, although occasional summer wildfires occur after spring rain. They are considered extremely fire sensitive. Chenopod species are mostly obligate seeders with only local seed dispersal and no effective post-fire seedbank.	3.2 t/ha
Forested Wetlands (Inland Riverine Forests)	Open eucalypt forest located on fertile alluvium subject to frequent flooding on the sandy banks of major inland rivers and the beds of intermittent streams, billabongs and channelled floodplains.	15.1 t/ha
Freshwater Wetlands (Inland Floodplain Shrublands)	Freshwater wetlands are ecosystems that are affected by permanent or temporary inundation. There is considerable floristic variation across its range and soils are red-grey compact clay or sandy clay that crack very little. These soils form claypans that pond from local runoff after rain. Little ground cover is present to carry a fire - dense stands may occasionally burn.	4.4 t/ha
Grasslands (Riverine Plain Grassland)	Typically displays as a grassland, with a species-rich, moderately dense shrub layer and ground cover that is predominantly native forbs and a mix of native and exotic grasses. Grazing and fire affects species composition and abundance. Species composition alters with the seasons and from year to year depending on rainfall. Legumes such as Swainsona appear to germinate profusely after fire but intense frequent fire is likely to eliminate some chenopod shrubs. All grasslands can sustain a fire. They are unpredictable, can start easily and spread quickly.	6 t/ha
Semi-arid Woodland (Riverine Sandhill Woodlands)	Open woodland dominated by cypress pines with scattered eucalypts and an open shrub stratum. Intense fire may kill Callitris. Fire rarely burns remnants due to lack of ground cover and fragmentation of remnants.	14.5 t/ha

1. Keith (2004) From ocean shores to desert dunes: the vegetation of New South Wales and the ACT.
2. DPE (2023) Online Vegetation Formation Profiles. <https://www.environment.nsw.gov.au/threatenedSpeciesApp/>
3. DPE (2023) Bionet Vegetation Classification Database. <https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-bionet/about-bionet-vegetation-classification>
4. Fuel loads are expressed in tonnes per hectare as per NSW RFS – Comprehensive Vegetation Fuel Loads (NSW Rural Fire Service, 2019)



3.8 INDICATIVE FIRE BEHAVIOUR

While not identified on the current bushfire prone land mapping, grassfires should not be underestimated and can start and spread quickly. It should be assumed that, under the most extreme weather, a fire would spread even in heavily grazed pastures and embers may breach any APZ. For this reason, and in line with the EIS and Project Amendment Report we have considered all the native vegetation communities across the Project Area as a bushfire hazard and minimum APZ have been recommended for all wind farm infrastructure. **Potential fire runs of more than 20 km extend in all directions and predominantly relate to the connectivity of grassland communities within the region.**

Grassfires are the main bushfire risk at this site due to the dominance of Chenopod shrublands and Riverine Plain grassland and can travel up to 25 km per hour and pulse even faster over short distances. As described by Sullivan *et al.* (2012), grass is a fine, high surface area to volume ratio fuel with high thermal conductivity, low density and vertical orientation, which rapidly ignites (and rapidly burns out). Grassfires are also generally more open to wind than forest fuels (Cheney and Sullivan 2008) making them unpredictable. Grassfires tend to be less intense and produce fewer embers than bushfires but still generate enormous amounts of radiant heat. Grassfires can also start earlier in the day than bushfires because grass dries out more quickly when temperatures are high and humidity is low.

As described by AFAC (2022) grass fuel load has a strong influence on flame size, flaming duration, radiation output and suppression difficulty. Grass fuel types are divided into three main fuel conditions in the Australian Fire Danger Rating System (AFDRS) system:

1. Undisturbed or natural (i.e. uncut and/or ungrazed);
2. Grazed or cut; and
3. Eaten-out or very heavily grazed grasslands.

The Fire Behaviour Index (FBI) assists operational decision making and provides a scale of potential fire danger (should a fire start) based on the predicted rate of fire spread. Based on the overall fuel load and reduced flammability of the Chenopod shrublands as identified in **Table 3-1** and **Table 3-2**, the Wind Farm Project Area has a low to moderate bushfire danger rating.

TABLE 3-2 FIRE BEHAVIOUR INDEX, GRAZED PASTURE

Dominant Vegetation Formation ¹	Overall Fuel Load ²	Fire Behaviour Index ³	Fire Danger Rating ³
Grasslands (Riverine Plain Grassland)	6 t/ha	15	Moderate
Arid Shrublands (Chenopod Shrublands)	3.2 t/ha	11	Low

1. Keith (2004) From ocean shores to desert dunes: the vegetation of New South Wales and the ACT.
2. Fuel loads are expressed in tonnes per hectare as per NSW RFS – Comprehensive Vegetation Fuel Loads (NSW RFS 2019)
3. CSIRO Grassland Fire Spread Model available online <https://aurora.landgate.wa.gov.au/fbc/#!/csiro-grass>. Input values: grass continuity: discontinuous; temperature 30 °C; relative humidity 30%; windspeed at 10m height 20 km/h; curing 60%; slope 0 degrees.

TABLE 3-3 GRASSLAND, FIRE BEHAVIOUR INDEX

Fire Behaviour Index	Fire Danger Rating ³	Fire Suppression and Containment	Potential for Impact
0-5	Low	Fire difficult to ignite and sustain. Fires generally unlikely to spread and likely to self-extinguish.	Community losses are unlikely.
6-11	Low	Fire easily sustained. Typically, wind driven fires that can spread quickly. Fires usually contained within road networks and fuel breaks	Community losses are unlikely however unattended infrastructure may be at risk.
12-23	Moderate	Typically wind driven and rapidly spreading fires with the potential to gain size quickly. Fires typically controlled within established road networks and fuel breaks together with using direct, indirect or parallel attack suppression strategies.	Possible agricultural/pasture/crop/stock losses together with loss of rural assets such as fencing, machinery and buildings. Unattended infrastructure may be at risk.
24-49	High	Wind driven, rapidly spreading fires with potential for development into large fire area/size and with the potential for short distance spotting and long flame lengths. Increasing focus on defensive suppression strategies.	High likelihood of agricultural/pasture/crop/stock losses together with loss of rural assets such as homesteads, fencing, machinery and buildings.
50-99	Extreme	Extremely rapid fire growth and increasing likelihood of large final fire area/size. Possibility for fire behaviour to become erratic and plume driven. High levels of threat to life and property. Elevated risk to firefighter safety	Increasingly high likelihood of agricultural/pasture/crop/stock losses together with loss of rural assets such as homesteads, fencing, machinery and buildings. Limited visibility due to smoke and dust. High risk to the community related to inappropriate pre-considered plans, inadequate sheltering. Strong winds are likely to impact infrastructure (e.g. power lines) and fall trees increasing the likelihood of obstructed roads and power outages.
100+	Catastrophic	Extremely rapid fire growth and high likelihood of large final fire area/size. Possibility for fire behaviour to become erratic and plume driven. Fire control is extremely difficult and unlikely until conditions ease.	High probability of loss of life and property

Source: <https://www.afac.com.au/docs/default-source/afdrs/afdrs-quick-guide---grassland.pdf>

4. BUSHFIRE RISK CONTEXT

4.1 CLIMATE CHANGE AND BUSHFIRES

Eastern Australia is documented to be one of the most bushfire-prone areas in the world. As reported by the BOM (2025), human induced climate change is influencing the frequency and severity of dangerous bushfire conditions in Australia and other regions of the world, influencing temperature, environmental moisture, weather patterns and fuel conditions. Observed changes in southern and eastern Australia include more extreme conditions during summer, as well as an earlier start to the bushfire season with dangerous weather conditions occurring significantly earlier in spring than they used to. The frequency of dangerous fire weather days has increased significantly in recent decades. These increases are particularly evident during spring and summer and are associated with an earlier start to the southern fire weather season. The 2019–20 Black Summer fire season was the most severe ever recorded in NSW, and as the climate warms and dries such fire patterns are likely to become more frequent.

While climate change might not ignite the fire, it is giving fires the chance to turn into catastrophic fires by creating warmer temperatures, increasing the amount of fuel (dried vegetation) available, and reducing water availability due to higher evaporation. In relation to fire ignition, there is some indication that human induced climate change could also influence the risk of ignitions from dry lightning (i.e., lightning that occurs without significant rainfall). Additionally, there has recently been several devastating fire events in Australia associated with extreme pyroconvection (including thunderstorm development in a fire plume), with recent research indicating a long-term trend towards increased risk factors associated with pyroconvection in southeast Australia.

Bushfire weather conditions in future years are projected to increase in severity for many regions. This will result in:

- An earlier start to the bushfire season;
- Reduced opportunities for fuel reduction burning;
- Management of fire risk to property, people and biodiversity will become increasingly challenging; and
- An increase in the number of extreme fire danger days.

4.2 HISTORY OF FIRE AND WIND FARMS IN AUSTRALIA

Several learnings for emergency management procedures and protocols in relation to wind farms and bushfires have been reported by AFAC (2018) and Clean Energy Council (2017). These include:

- The wind farm's access roads were beneficial in helping fight the bushfire on the ground and provided an effective firebreak;
- The wind farm's turbines did not present a hazard to aerial firefighting and the turbines were clearly visible to the pilots involved in operations. However, transmission infrastructure, transmission lines and meteorological masts were difficult to see by pilots and did pose a safety risk;
- To maximise air space for firefighting between the turbines, turbines should be locked in the 'Y' position;
- Improved communication protocols need to be in place between wind farm operators and fire and land management agencies to direct turbine shut-down procedures in an emergency and initiate emergency response plans;
- Wind farm operators should ensure that they have the capacity to respond to emergency events; and
- Additional precautionary measures should be considered to allow for aerial identification of meteorological masts (measurement towers), guy wires and other infrastructure such as transmission lines that are not easily visible from air.

The Australia Institute (2006) describe the fire risk associated with wind farms as minuscule provided the wind farm is properly constructed and managed. They determine fires caused by wind turbines are very rare and pose little risk to surrounding property. While it is possible for a catastrophic failure to cause fire within the turbine mechanism, the system is designed to contain fire and the likelihood of fire commencing from a tower equipment failure is much lower than from a faulty header or other farm machinery. The Government of South Australia (2004) also concluded that with normal maintenance and servicing practices in place, a wind farm will not pose an increased fire hazard to the host community and further that there has never been an incident involving a member of the public during normal operation.

Sophisticated monitoring technology is used to ensure that electrical, mechanical and hydraulic systems are functioning correctly and to isolate equipment if operating thresholds such as temperature or blade speed are reached (Government of South Australia 2004). Instances of extreme wind have been linked to wind turbine fire due to friction generated by the excessive speed of the blades (Government of South Australia 2004). Fire hazards can present when turbine bearings wear out, crankcases run out of lubricant, cables are damaged during rotation, there are electrical shorts or electrical arcing occurs in the transmission and distribution facilities (Government of South Australia 2004). This highlights the importance of scheduled and preventative maintenance routines as well as monitoring systems.

4.3 FIRE IGNITION

Bushfires have occurred in most years in this bushfire management district, and natural ignitions such as lightning strikes are likely and historically common across the region. Human induced ignitions (both accidental and arson) are also known to occur across the region.

Extreme heat can cause equipment to deteriorate. Other factors such as damaged equipment and poor installation can also contribute to the ignition of a fire.

The risk of fire starting because of a lightning strike may be reduced by the presence of wind turbines (AFAC, 2018). Wind turbines include an in-built lightning protection system which safely dissipates the electricity from the blades or the nacelle to the ground, although there are no ignition occurrence records for the Project Area that provide statistical validity or a guide to likelihood of ignition.

Wind turbines also have a variety of on-board control systems specifically designed to mitigate the risk of fire. Each wind turbine is connected to a control centre which constantly monitors the wind turbine and shuts down the turbines if there is a risk of overheating. Turbines also automatically shut down if they are close to functioning outside their design conditions such as wind speeds greater than 25 m/s. The risk that a wind farm itself will cause a fire is considered low given appropriate protection measures (AFAC, 2018) (refer to Mitigation Strategies in **Section 5**). The WTG towers are also made from non-combustible material.

Earth moving equipment, power tools (e.g., welders, grinders), mowers and slashers are well known for starting bushfires under conditions of high temperature, low humidity and high wind. Therefore, construction and ongoing maintenance of the wind farm will be a potential source of ignitions. However, the level of risk from faults cannot be assessed at this stage because there is no case history available, and it is not possible to compare the existing ignition risk from farm operations relative to wind farm operation.

As evidenced by the Currandooley fire in 2017 bird flashover faults on high voltage power lines can also cause bushfires when fuel conditions beneath the fault location are conducive to fire ignition and spread. This risk can be reduced by maintaining reduced fuel loads beneath transmission lines and will be the responsibility of the asset owner.

4.4 ASSETS AT RISK

The following assets are located on site or within 2 km of the proposed wind farm:

- Project Infrastructure;
- Temporary Accommodation Compounds;
- Residential Properties and Farms;
- Stock (sheep and cattle); and
- Fences.

All these assets, including the wind farm infrastructure may be exposed to bushfire impacts.

Assets within and surrounding the Project Area are shown in **Figure 1-1** and **Figure 1-2** and described in

Table 4-1 below, noting that this assessment does not address the individual design or engineering components of the turbines (or other infrastructure).

Electrical hazards including battery fires and transformer fires are addressed separately as part of the revised Preliminary Hazard Assessment (Riskcon,2025) and are not included here.

TABLE 4-1 IDENTIFICATION OF ASSETS

Asset	Description
Assets within the Project Area	
Project Infrastructure	<u>Wind Turbine Generators</u> • 171 WTGs, with a 7.2 MW capacity each • Maximum installed capacity up to 1,230 MW • Hub height of up to 180 m • Tip height of up to 270 m • Blade Length of up to 90 m • Hardstand of 3.6 ha per WTG required for construction.
	<u>Meteorological Monitoring Mast</u> Up to 10 permanent met masts The met masts consist of a buried concrete base foundation and guy wires which are attached to buried anchor points. These will be marked using three-dimensional coloured objects attached to the wire or cables (for example spheres or pyramids) if necessary.
	<u>Permanent Operations and Maintenance Facilities (O&M facilities)</u> The O&M facility with carparks will be constructed in proximity of the proposed main substation location within the central part of the Project Area.
	<u>Electrical Reticulation Infrastructure</u> • One main 330 kV substation including switchyard, transformers, voltage controls, storage units control room and potentially power quality control equipment. • Up to three 132 kV collector substations. • 33 kV medium-voltage underground and occasionally overhead lines connecting WTGs to collector substations. • 330 kV high-voltage (HV) overhead lines connecting collector substations to main substations and to the switchyard. • Direct grid connection to existing 220 kV or EnergyConnect.
Site Access and Internal Access Tracks	Access to the east and west portions of the Project Area during construction and operations is proposed via Cobb Highway. The internal access tracks will be connected to existing public roads and will be up to 6 m trafficable width, with localised widening on curves and where required to support transportation of the over-dimensional component vehicles. The internal access tracks will be constructed with dirt, sand, gravel or sealed pavement with the final design based on material in proximity to site.
Temporary Facilities	A temporary construction compounds including storage areas, material stockpile, and temporary power supply for construction will be available for the Project construction. Temporary concrete batching plants and rock-crushing facilities will be established within the Project Area. While the exact details of the facilities will be determined closer to construction, the area required for the plant and storage of materials are estimated to be approximately 40 ha, located within the Development Footprint.
Temporary Accommodation Compounds	Two accommodation compounds will be provided to accommodate the construction workforce. Each compound will include accommodation and amenity facilities, car parking, food and catering facilities, recreational facilities, first aid facilities and telecommunication services for personal use. Accommodation facilities will consist of prefabricated demountable units, that will be delivered and installed on site.
Residential Properties and Farms	For the purposes of the amended project, dwellings whose owners are hosting Project infrastructure or have entered into an agreement in relation to the Project are referred to as 'associated' dwellings with all other dwellings within the relevant assessment area (generally up to 8.0 km) to a WTG referred to as 'non-associated' dwellings. There are no associated dwellings located within the Project Area.

4.5 FIREFIGHTER AND PUBLIC SAFETY

The firefighters likely to respond to a bushfire in this area would be volunteers from the NSW RFS and / or individual property owners. The remoteness and expanse of the wind farm also makes it hard for firefighting brigades to access the area.

The materials for individual components within the wind farm infrastructure have not yet been finalised although this information may form part of the recommended Bushfire Emergency Management and Operations Plan that will be developed prior to construction. The risks to firefighter safety associated with a fire burning the turbines and associated equipment include inhalation of potentially toxic fumes and smoke from any plastic components such as cables (although the main structure of the WTG will be steel or concrete/steel hybrid) or other decomposed products (Allianz Risk Consulting, 2012).

Any volunteer firefighters from the NSW RFS, NPWS or property owners from neighbouring farms attending bushfires in this area may not be trained in structural and electrical firefighting. The Bushfire Emergency Management and Operations Plan will detail appropriate risk control measures that would need to be implemented to safely mitigate potential risks to the health and safety of the firefighters and first responders. At least two copies of the Emergency Management and Operations Plan will be stored in an Emergency Information Cabinet located at the main entrance points and will be accessible to all first responders. Two copies of the Emergency Management and Operations Plan will also be stored within the operations facilities and one at the NSW RFS Hay Brigade office.

As reported by AFAC (2018) wind farms can interfere with local and regional radio transmissions by physical obstruction and radio frequency electromagnetic radiation (Australian Wind Energy Association, 2004). The risk of radio communications affecting emergency response operations has been assessed in the Electro-Magnetic Interference (EMI) Assessment prepared by Middleton Group. Based on assessment, the Project is not expected to have a material impact on telecommunication services.

The combination of dense smoke and hot gases generated by a large fire directly under or near a high voltage power line can create a conductive path that increases the potential for a 'flashover'. The National Guidelines on Electrical Safety for Emergency Personnel provide critical information relating specifically to fire control near high voltage power lines, including the special conditions that apply to the use of water in fire control activities near power lines. This industry code will be considered in the preparation of the Bushfire Emergency Management and Operations Plan.

The increased risk of arcing in dense smoke has been considered. In terms of arcing potential, the WTGs will have a detection system that protects them from surges, arcing and other electrical hazards. Arcing would be detected, and electrical systems shut off if these persisted over several split seconds.

Most of the electrical reticulation will be underground however in areas where overhead transmission is required, similar detection systems to the above will be installed to monitor changes over split seconds and within tight bands. Automatic Circuit Breakers at either end of the lines would open to stop transmission of electricity if any arcing is detected.

If a fire does breach any containment lines and threatens the wind farm assets, it is possible that the windfarm infrastructure will sustain direct flame contact and that firefighting will

require aerial support. Aerial support was used during the catastrophic 2019/2020 fires across NSW and Aviation Projects (2025) recommends that the Proponent consider engaging with local aerial agricultural and aerial firefighting operators to develop procedures for their safe operation within the Project site.

Wind turbines, similar to high voltage transmission lines, are part of the landscape and would be considered in the incident action plan and NSW RFS would be provided with maps and GPS coordinates of the final wind turbine layout and identification information for individual wind turbine sites for their internal response planning. Any risk of wake turbulence from wind turbines influencing fire behaviour will be mitigated through the shutting down of wind turbines in a bushfire event.

In the unlikely event that a fire did spread from the wind farm to surrounding properties, the turbines would not limit aerial firefighting capabilities on other properties in the surrounding area.

4.6 SUMMARY OF BUSHFIRE RISK FACTORS

The Project Area and the surrounds does not have a history of bushfire (refer **Section 3.2**), and the risk that a wind farm itself will cause a fire is considered low given appropriate protection measures (refer **Section 5**).

If a fire does breach any containment lines and threatens the wind farm assets, it is possible that the wind farm infrastructure will sustain direct flame contact and that firefighting will require aerial support. As the WTG towers are made from non-combustible material and do not present a significant risk, efforts would be concentrated on defending those assets that could contribute to widespread fire and controlling on spot fires on the ground.

It is therefore important that key assets such as the accommodation compound, switching station, substations and O&M buildings all have adequate defendable space all sides, and that suitable access is provided across the entire windfarm in accordance with PBP 2019. These will be considered in the Bushfire Emergency Management and Operations Plan to be prepared in consultation with key stakeholders.

5. MITIGATION STRATEGIES

As identified within Section 8.3.5 of PBP 2019, wind farms require special consideration and should be provided with adequate clearances to combustible vegetation as well as firefighting access and water. Mitigation will be a combination of complementary strategies, all of which are required to provide the best possible protection outcome for the wind farm and the community.

In terms of design principles to minimise risk, the wind farm layout will be designed to:

- Provide a defensible space around infrastructure (refer **Section 5.1** below); and
- Ensure that appropriate access, egress and manoeuvrability within the wind farm is provided for first responders (refer **Section 5.4**).

5.1 ASSET PROTECTION ZONE

An APZ is typically designed to separate a vulnerable asset from the bushfire hazard (vegetation/fuel). APZs do not eliminate the fire risk but may lower it to an extent where fire control is more feasible or damage to the asset is reduced or eliminated. The ongoing maintenance of APZs are recognised under the *Rural Fires Act 1997* and are supported in 2.8(1)(d) of the *Biodiversity Conservation Act 2016*.

Understanding the value and limitations of APZ is important, as is the understanding that bushfires attack built assets by either flame contact, radiant heat or burning debris. An APZ can be used to lower or eliminate the bushfire attack from flame contact and radiant heat around all built assets, but under strong winds or during a major fire event burning debris can result in a fire breaching an APZ.

A minimum 10 m APZ is required to comply with Section 8.3.5 of PBP 2019 and must be established on all sides of the WTG, substations, switching station, and O&M Buildings.

For the Accommodation Compounds, a minimum APZ of 24 m is required in accordance with Table 6.8a and Table A1.12.1 of PBP 2019. This will ensure that radiant heat levels do not exceed critical limits for firefighters and other emergency services personnel undertaking operations, including supporting or evacuating occupants. Construction standards for BAL-12.5 apply.

Note: In line with PBP 2019, Table 6.8a, this APZ can be reduced to 10m, consistent with the other associated infrastructure provided that the construction standards meet BAL-29 as a minimum standard. The specifications recommended for the APZ are as follows:

- All APZ are to be managed as an inner protection zone (IPA) for the life of the development as outlined within Appendix 4 of PBP 2019, and NSW RFS 'Standards for Asset Protection Zones';
- APZ will not extend beyond the property boundary or rely on actions being undertaken by adjacent landowners; and
- No trees and shrubs are to be planted within the APZ.

5.2 WINDFARM CONSTRUCTION

As considered in **Section 3.8**, human induced climate change is influencing the frequency and severity of dangerous bushfire conditions in Australia including an earlier start to the bushfire season with dangerous weather conditions occurring significantly earlier in spring than they used to. The following measures are recommended to be implemented during the entire period of construction:

- The access roads will be constructed prior to the installation of any WTG or related infrastructure (in advance of each development stage);
- Ensure appropriate bunding in areas where there is potential for flammable fuels and oils to leak and create bushfires or other environmental risks;
- Install appropriate signs to assist emergency response crews determine track names, and location of infrastructure;
- Ensure that appropriate permits have been issued for work during the Fire Danger Period, and that any conditions on permits are adhered to;
- Adhere to restrictions on Total Fire Ban or days of high fire danger;
- Suitable firefighting equipment (specific requirements to be confirmed in consultation with NSW RFS) is present onsite;
- Carry fire extinguishers or firefighting equipment in vehicles;
- Carry emergency communications equipment;
- Where practicable, site vehicles during the construction phase will have diesel engines and/or will use the site access roads (if available) to minimise the likelihood of igniting dry grass;
- Restrict smoking to prescribed areas, and provide suitable ash and butt disposal facilities;
- All plant, vehicles and earth moving machinery are cleaned of any accumulated flammable material (e.g., vegetation); and
- On days when Very High fire danger or worse is forecast, the "fires near me" app is to be checked hourly for the occurrence of any fires likely to threaten the Project Area.

5.3 WINDFARM OPERATION

Fuel Reduction

It is recommended that vegetation fuels throughout the windfarm are maintained in a minimal condition by grazing, or with additional slashing or mowing if required. This will minimise the radiant heat exposure to infrastructure and reduce the risk of a fire spreading beyond the windfarm.

Days of Very High or Worse Fire Danger

Fire Danger Ratings give you an indication of the consequences of a fire if one was to start. The higher the fire danger, the more dangerous the conditions. These forecasts are updated daily during the fire danger season and are available on the NSW RFS website (<http://www.rfs.nsw.gov.au/fire-information/fdr-and-tobans>) and the BOM website (<http://www.bom.gov.au/nsw/forecasts/fire-danger-ratings.shtml>).

To reduce the risk of fires damaging or destroying life, property and the environment the NSW RFS Commissioner may also declare a Total Fire Ban (TOBAN). In a Total Fire Ban no fire may be lit in the open and all fire permits are suspended. No general-purpose welding, grinding, soldering or gas cutting can be done in the open.

Emergency Management and Operations Plan

An Emergency Management and Operations Plan should be prepared for the windfarm in accordance with Section 8.3.5 and Table 6.8d of PBP 2019. The management plan will also be prepared with consideration of the NSW RFS document: A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan and Australian Standard 3745: Planning for emergencies in facilities.

The Emergency Management and Operations Plan will provide the following:

- A site plan showing infrastructure, site access and the internal road layout;
- A detail site plan identifying, using GPS coordinates, each turbine tower location;
- Wind turbines are shut down immediately during emergency operations – where possible, blades should be stopped in the 'Y' or 'rabbit ear' position, as this positioning allows for the maximum airspace for aircraft to manoeuvre underneath the blades and removes one of the blades as a potential obstacle;
- Control and coordination arrangements for emergency response (e.g., triggers for pre-emptive closures, evacuation procedures, emergency assembly areas and procedures for response to hazards);
- Protocols should be explicit about what party has the authority to direct turbine shut-down procedures;
- Construction of asset protection zones and their continued maintenance;
- Location of all fire control advantages within the Project Area (e.g., access road, gates, water points);
- Agreed roles and responsibilities of onsite personnel (e.g., equipment isolation, liaison, evacuation management);
- Up-to-date contact details including alternative telephone of site personnel and any relevant offsite personnel who could provide technical support during an emergency, including a 24/7 contact;
- A manifest (and safety data sheets) for any battery, diesel or other dangerous goods storage/handling, including the class identification, quantity, type (bulk or packaged) and location. Appropriate material (including absorbent, neutralisers, equipment and personal protective equipment) for the clean-up of spills is to be provided and available onsite;
- Minimum evacuation zone distances;
- Fire reporting and response to formal emergency alerts;
- Activation of water spray/foam systems and any other response/protection measures; and
- Any other risk control measures required to be followed by firefighters.

Two copies of the Emergency Management and Operations Plan should be permanently stored in a prominent 'Emergency Information Cabinet' to be located at each vehicle entrance point to the windfarm, external to any security fence or locked gate, and a copy provided to local emergency responders. Two copies of the Emergency Management and Operations Plan will also be stored within the operations facilities and one at the local NSW RFS Brigade office.

The Emergency Information Cabinets will be clearly visible, installed at a height of 1.2 m - 1.5 m and accessible by all emergency services.

A schedule for ongoing site familiarisation to account for changing personnel, site infrastructure and hazards should be developed in conjunction with NSW RFS.

5.4 ACCESS ROADS AND ROAD NETWORK

All seven primary site access locations would also facilitate access for emergency vehicles. Each access has been designed for B-Doubles which are larger than any emergency service vehicle which would access the site. An additional dedicated emergency access location is proposed on the eastern side of Cobb Highway near West Burrabogie Road.

The ongoing maintenance of the Project will be accessed through internal access roads within the Project Area that will be connected to existing public roads (refer **Figure 1-2**).

The tracks will provide ongoing access to the WTG, substation and associated infrastructure. The internal access roads will be up to 6 m trafficable width, with localised widening on curves. The internal access roads will be constructed using gravel or sealed pavements.

Site access points will be constructed as the first stage of development and the final design of access roads will enable safe access and egress for residents attempting to leave the area at the same time that emergency service personnel are arriving to undertake firefighting operations.

Site access points will be maintained for the life of the Project and include appropriate signs throughout the windfarm to assist emergency response crews determine track names and location of any locked gates.

All access roads will be upgraded to provide sufficient width and other dimensions to ensure safe unobstructed access and allow firefighting crews to operate equipment around the vehicle. Dead-end roads should be avoided. However, where they are present, they will incorporate a sufficient turn-around area to minimise the need for vehicles to make multipoint turns. As a minimum, and to enable access for RFS all roads will be maintained to the minimum standards as outlined within the NSW RFS Fire Trail Standards and the NSW RFS Fire Trail Design, Construction and Maintenance Manual. This includes:

- The trafficable surface has a width of four (4) metres except for short constrictions to 3.5 metres for no more than 30 metres in length where an obstruction cannot be reasonably avoided or removed;
- Trail surfaces and crossing structures can carry vehicles with a gross vehicle mass of 15 tonnes and an axle load of nine (9) tonnes;

- The maximum grade of a trail is not more than 15 degrees. Any localised sections of road with steeper grades will be designed to meet performance criteria in consultation with the NSW RFS and clearly sign posted to ensure that the roads provide for traction and safe working angles within the physical operational capability of the firefighting vehicles;
- The cross fall of the trail surface is not more than six (6) degrees;
- Drainage structures, feature crossings, or other significant changes in the grade of the trail are in accordance with the NSW RFS Fire Trail Design, Construction and Maintenance Manual;
- A minimum vertical clearance of four (4) metres is provided above the surface of the trafficable surface clear of obstructions;
- Capacity for passing is provided every 250 m; and
- A turning area is provided at the termination of a trail and every 500 m.

Where practicable site vehicles during the construction phase will have diesel engines and/or will use the site access roads (if available) to minimise the likelihood of igniting dry grass.

5.5 WATER STORAGE

Reticulated water supply is not provided to the site. The availability of water is a critical element in the control of a bushfire. Water for the project will likely be supplied by truck (or on-site bore water) and stored in an on-site water tank, which will be available for firefighting if required. The volume and location of the tanks will be confirmed in consultation with the NSW RFS, although it is likely to require minimum 50,000 litre tanks, based on refilling six tanker units (4,000 litres) twice each.

The control room will contain an office, communications equipment, and staff amenities (toilet, kitchen, first aid, potable water supply, etc.). The compound will also include a static water supply for firefighting/bushfire management (may be part of above water supply) as well as a septic system. The control room, switch room and storage shed will each contain essential fire safety equipment, including fire extinguishers and hose reels.

5.6 TOTAL FIRE BANS

It is important to be aware of operations that may be carried out on days of total Fire Ban and any prohibited activities or exemptions that are notified by the Commissioner of the NSW RFS under section 99 of the RF Act.

Under Section 63 of the RF Act it is the responsibility of the landowner to limit the ignition and prevent the spread of fires from the property. On days declared Total Fire Ban you cannot light, maintain or use a fire in the open, or carry out any activity in the open that has the potential for a fire to develop. General purpose hot works (such as welding, grinding or gas cutting or any activity that produces a spark or flame) are not to be done in the open.

Fire permits are also suspended on days of total fire ban. Permits may resume after the Total Fire Ban is lifted, as long as the permit has not expired. The NSW RFS Commissioner is responsible for exemptions to Total Fire Bans. These exemptions are detailed in the NSW Government Gazette each time a Total Fire Ban is declared under the RF Act section 99.

5.7 CUMULATIVE IMPACTS

The proximity of multiple construction and/or operational projects provides opportunity for potential cumulative impacts. The cumulative impacts related to bushfire mitigation are as follows:

- Volunteer fire-fighter workload – Response call outs should not significantly increase because the ignition risk will be very low. There will, however, be an ongoing requirement for briefing on the Emergency Management and Operations Plan;
- Construction stage transport and road use – The bushfire mitigation will add a small percentage to the total construction traffic and road use; and
- Ongoing operations – there would not be any cumulative operational impacts.

The proximity of multiple projects actively managing fire risk could assist in management responses and may create a positive cumulative impact, in comparison with existing conditions. In consultation with key stakeholders, the preparation of the Emergency Management and Operations Plan will consider the most current information available regarding fire risk from and to surrounding land uses.

6. CONCLUSION

The risk that the windfarm itself will cause a fire is minimal and the proposed development is not located within a bushfire prone landscape (based on the current bushfire prone land mapping). While not identified as a bushfire prone vegetation community within the current bushfire prone land mapping, fires within grasslands and arid shrublands should not be underestimated and can start and spread quickly. For this reason, we have considered these as a bushfire hazard. Mitigation measures and treatments will include a combination of complementary strategies, all of which are required to provide the best possible protection outcome for the windfarm and the community.

Despite the application of mitigation measures, bushfire risk will remain and it is therefore important that a Bushfire Emergency Management and Operations Plan is prepared in conjunction with relevant stakeholders, including NSW RFS, NSW Fire and Rescue, landowners and adjoining property owners.

Should a fire breach containment lines and threaten the windfarm assets, windfarm infrastructure may sustain direct flame contact. While this event would not be the result of the windfarm itself, it is recognised that the windfarm would result in additional assets that would need to be protected.

The detailed mitigation measures outlined in the bushfire risk assessment have been developed to meet the relevant provisions outlined in Section 8.3.5 of PBP 2019 and to ensure that the windfarm development does not present any increased risk of widespread fire across the landscape. These mitigation measures will be applied for the life of the Project and have been summarised in **Table 6-1**.

TABLE 6-1 SUMMARY OF RECOMMENDED MITIGATION STRATEGIES AND ACTIONS

Mitigation Strategy	Section of Report	Action	Timing
Asset Protection Zone (APZ)	6.1	A <i>minimum</i> 10 m APZ is to be established on all sides of the WTG, substations, switching station and O&M Buildings. A <i>minimum</i> 24 m APZ is to be established on all sides of the accommodation compounds. All APZ are to be managed as an inner protection zone (IPA) as outlined within Appendix 4 of PBP 2019, and NSW RFS 'Standards for Asset Protection Zones'. APZ will not extend beyond the property boundary or rely on actions being undertaken by adjacent landowners.	The APZ will be constructed as the first stage of development and maintained for the life of the Project.
Windfarm construction	6.2	The following measures are recommended to be implemented during the entire period of construction: - The access road will be constructed prior to the installation of any WTG or related infrastructure (in advance of each development stage); - Ensure appropriate bunding in areas where there is potential for flammable fuels and oils to leak and create bushfires or other environmental risks;	During Construction

Mitigation Strategy	Section of Report	Action	Timing
		• Install appropriate signs to assist emergency response crews determine track names, and location of infrastructure; • Ensure that appropriate permits have been issued for work during the Fire Danger Period, and that any conditions on permits are adhered to; • Adhere to restrictions on Total Fire Ban or days of high fire danger; • Suitable firefighting equipment (specific requirements to be confirmed in consultation with NSW RFS) is present onsite; • Carry fire extinguishers or firefighting equipment in vehicles; • Carry emergency communications equipment; • Where practicable, site vehicles during the construction phase will have diesel engines and/or will use the site access roads (if available) to minimise the likelihood of igniting dry grass; • Restrict smoking to prescribed areas, and provide suitable ash and butt disposal facilities; • All plant, vehicles and earth moving machinery are cleaned of any accumulated flammable material (e.g., vegetation); and • On days when Very High fire danger or worse is forecast, the "fires near me" app is to be checked hourly for the occurrence of any fires likely to threaten the Project Area.	
Windfarm ongoing operations	6.3	• The Project will be controlled by a remote supervisory control and data acquisition (SCADA) system from a control room located within the permanent site operations and maintenance facility. The SCADA system will allow remote operation of all WTGs with the ability to shut-down individual or all WTGs if required; • NSW RFS and CASA will be provided with maps and GPS coordinates of the final wind turbine layout and identification information for individual wind turbine sites for their internal response planning; • Liaise with local aerial agricultural and aerial firefighting operators to develop procedures for their safe operation within the Project site; • Safe working and emergency response procedures for all work tasks will be developed and implemented; • The control room, switch room and storage shed will each contain essential fire safety equipment, including fire extinguishers and hose reels; and • Vegetation fuels throughout the windfarm are to be maintained in a minimal condition by grazing, or with additional slashing or mowing if required.	Maintained for the life of the Project.

Mitigation Strategy	Section of Report	Action	Timing
Fire preparedness and response	6.3	Prior to construction, an Emergency Management and Operations Plan will be prepared for the windfarm that provides the following: • A site plan showing infrastructure, site access and the internal road layout; • Blades should be stopped in the 'Y' or 'rabbit ear' position; • Control and coordination arrangements for emergency response and who has the authority to direct turbine shut-down procedures; • Hazard reduction strategies; • Fire suppression equipment details; • Location of all fire control advantages and APZ; • Flammable materials storage requirements; • Minimum evacuation zone distances • Fire reporting and response to formal emergency alerts; and • Any other risk control measures required to be followed by firefighters.	Prior to construction
Maintain emergency access/egress for fire fighters and site personnel	6.4	Access to the Project Area is proposed via Cobb Highway. The ongoing maintenance of the Project will be accessed through internal access roads within the Project Area. All access roads will be upgraded to provide sufficient width and other dimensions to ensure safe unobstructed access and allow firefighting crews to operate equipment around the vehicle and will be maintained to the minimum standards as outlined within the NSW RFS Fire Trail Standards and the NSW RFS Fire Trail Design, Construction and Maintenance Manual. Site access points will be constructed as the first stage of development and the final design of access roads will enable safe access and egress for residents attempting to leave the area at the same time that emergency service personnel are arriving to undertake firefighting operations.	Site access points will be constructed as the first stage of development and maintained for the life of the Project.
Water storage	6.5	Reticulated water supply is not provided to the site. The volume and location of static water tanks will be confirmed in consultation with the NSW RFS, although it is likely to require minimum 50,000 litre tanks, based on refilling six tanker units (4,000 litres) twice each. The control room, switch room and storage shed will each contain essential fire safety equipment, including fire extinguishers and hose reels.	Maintained for the life of the Project.

7. REFERENCES

- ABS. (2016). 2016 Census Community Profiles. Retrieved from Australian Bureau of Statistics: https://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/communityprofile/036?opendocument
- ABS. (2021). 2021 Census All persons QuickStats. Retrieved from Australian Bureau of Statistics: <https://www.abs.gov.au/census/find-census-data/quickstats/2021/LGA15520>
- ABS. (2021). 2021 Census Data. Retrieved from Australian Bureau of Statistics: <https://www.abs.gov.au/census/find-census-data/search-by-area>
- AFAC. (2018). Wind Farms and Bushfire Operations (AFAC Publication No. 2053). Melbourne: Australasian Fire and Emergency Service Authorities Council.
- AFAC. (2022). Grassland Quick Guide Understanding The Fire Behaviour Index v. 2022_6. <https://www.afac.com.au/docs/default-source/afdrs/afdrs-quick-guide---grassland.pdf>
- BOM. (2025). Bushfire weather. Bureau of Meteorology. Retrieved from <http://www.bom.gov.au/weather-services/fire-weather-centre/bushfire-weather/index.shtml>
- Cheney, Phil & Sullivan, Andrew. (2008). Grassfires: Fuel, Weather and Fire Behaviour.
- Clean Energy Council. (2017). *In Case of Fire: a real-life experience at a wind farm site*. Retrieved from <https://www.cleanenergycouncil.org.au/news/2017/october/In-case-of-fire.html>
- DPE. (2023). Online Vegetation Formation Profiles. Retrieved from <https://www.environment.nsw.gov.au/threatenedSpeciesApp/>
- DPE. (2023). Riverina Murray Regional Plan 2041. NSW Department of Planning and Environment. Retrieved from <https://www.planning.nsw.gov.au/-/media/Files/DPE/Plans-and-policies/riverina-murray-regional-plan-2017.pdf>
- Keith, D.A. (2004). From ocean shores to desert dunes: the vegetation of New South Wales and the ACT. Department of Environment and Conservation NSW.
- Murrumbidgee Irrigation Area BFMC. (2009). Murrumbidgee Irrigation Area Bush Fire Management Committee: Bush Fire Risk Management Plan.
- MRC. (2022). Fire lighting permits required from Oct 1. Retrieved from <https://www.murrayriver.nsw.gov.au/Council/News/Public-notice/>
- NSW Rural Fire Service (2015). Guide for Bush Fire Prone Land Mapping. NSW Rural Fire Service. Retrieved from https://www.rfs.nsw.gov.au/_data/assets/pdf_file/0011/4412/Guideline-for-Councils-to-Bushfire-Prone-Area-Land-Mapping.pdf
- NSW Rural Fire Service (2017). *Fire Trail Design, Construction and Maintenance Manual*. State of NSW through Department of Industry, Soil Conservation Service.

- NSW Rural Fire Service (2023). *NSW Fire Trail Standards version 2.0*. NSW Rural Fire Service. NSW Rural Fire Service (2019). *Planning For Bush Fire Protection. A guide for councils, planners, fire authorities and developers*. November 2019 .
- NSW Rural Fire Service (2024) NSW Bush Fire Prone Land, accessed from The Sharing and Enabling Environmental Data Portal
<https://datasets.seed.nsw.gov.au/dataset/d6f2d89f-3cdc-4da0-add2-f2da74bc0bfc>, date accessed 2024-03-08.
- The Australia Institute (2006) *Wind Farms: The facts and the fallacies*. Discussion Paper Number 91, October 2006. ISSN 1322-5421. https://australiainstitute.org.au/wp-content/uploads/2020/12/DP91_8.pdf
- The Government of South Australia. (2004). *Wind Farm Safety in Australia*.



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