



Paling Yards Development Pty Ltd

Tract



Paling Yards Wind Farm

Bushfire Risk Assessment
(Consultation Version)

25 November 2022

Project No: 0578575

Document details	
Document title	Paling Yards Wind Farm
Document subtitle	Bushfire Risk Assessment (Consultation Version)
Project No.	0578575
Date	25 November 2022
Version	2.2
Author	Joanne Woodhouse, Lorena Boyle
Client Name	Tract for Paling Yards Development Pty Ltd

Document history

				ERM approval to issue		
Version	Revision	Author	Reviewed by	Name	Date	Comments
Draft	00	Joanne Woodhouse	Karie Bradfield	Karie Bradfield	15.07.2022	Draft for client review
Final Draft	01	Joanne Woodhouse	Elspeth Mackenzie	Karie Bradfield	17.08.2022	Final Draft for client
Final	02	Joanne Woodhouse	Elspeth Mackenzie	Karie Bradfield	26.08.2022	Final for Consultation
Final	03	Joanne Woodhouse	Elspeth Mackenzie	Karie Bradfield	25.11.2022	Consultation version with updated project layout

Signature Page

25 November 2022

Paling Yards Wind Farm

Bushfire Risk Assessment (Consultation Version)



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Acronyms and Abbreviations

Name	Description
AFAC	Australasian Fire and Emergency Services Council
APZ	Asset Protection Zones. APZs are 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.
AS 3959-2018	<i>Australian Standard 3959 - 2018 Construction of Buildings in Bushfire-prone Areas</i>
BAL	Bushfire Attack Level
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
IFEG	<i>International Fire Engineering Guidelines</i>
IPA	inner protection area
km/h	Kilometres per hour
kW/m ²	Kilowatts per metre squared
MNES	Matter of National Environmental Significance
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
SFPP	special fire protection purpose
SSD	State Significant Development
TOBAN	Total Fire Ban
WTG	wind turbine generators

1. INTRODUCTION

Environmental Resources Management Australia Pty Ltd (ERM) has been commissioned by Tract on behalf of Paling Yards Development Pty and Global Power Generation Australia (GPG) to consider bushfire risk in the vicinity of the proposed Paling Yards Wind Farm (the Project). The proposed site is located across three landholdings (Mingary Park, Middle Station and Paling Yards) with the transmission line corridor being located across nine parcels of land to the north-east of the project site. The site comprises a total of approximately 4,600 ha located in the Central Tablelands of NSW and is situated within the Oberon Local Government Area (LGA). The site is approximately 60 km south of Oberon and 60 km north of Goulburn and is bisected by Abercrombie Road, which links the towns of Oberon and Goulburn, changing its name to Taralga Road at the crossing with the Abercrombie River just south of the Project Area (the LGA boundary). Several watercourses traverse the area, principally the Abercrombie River which forms part of the southern boundary of the site and flows west into the Lachlan River.

The location of the Project Area is shown in Figure 1-1 and the proposed wind farm development footprint and conceptual layout is shown in Figure 1-2.

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 Project and use of bushfire prone land. **It contains management and mitigation measures designed to address these obligations consistent with NSW Rural Fire Service (RFS) guidelines Planning for Bushfire Protection 2019 only.** It does not assess the individual design or engineering components of the turbines (or other infrastructure as described in Section 1.1) and recommendations for **ongoing consultation within the NSW RFS and NPWS during detailed design are a key recommendation of this assessment.**

1.1 Description of the Project

The Project involves the construction, operation and commissioning of a wind farm with up to 47 wind turbine generators (WTG), together with associated and ancillary infrastructure.

The Project has been revised and refined over time in response to design and constructability requirements, and in consideration of environmental constraints and the outcomes of community consultation.

The Project consists of the following key components:

- up to 47 WTGs, each with:
 - a maximum height of 240 m (to the blade tip) with a generating capacity of approximately 6.1 MW per turbine and a total generation capacity of 287MW;
 - tubular steel tower holding the nacelle;
 - three blades mounted to a rotor hub and the gearbox and generator assembly housed in the nacelle; and
 - adjacent hardstands for use as crane pads and assembly / laydown areas;
- installation of three wind monitoring masts, fitted with various instruments such as anemometers, wind vanes, temperature gauges and other electrical equipment;
- obstacle lighting to selected turbines (if required);
- construction of on-site electrical substations (collector substation and connection substation) connecting to the existing Mt Piper to Bannaby 500 kilovolt (kV) transmission line to the north east via a proposed 9 km overhead line of 132 kV (up to 500 kV);

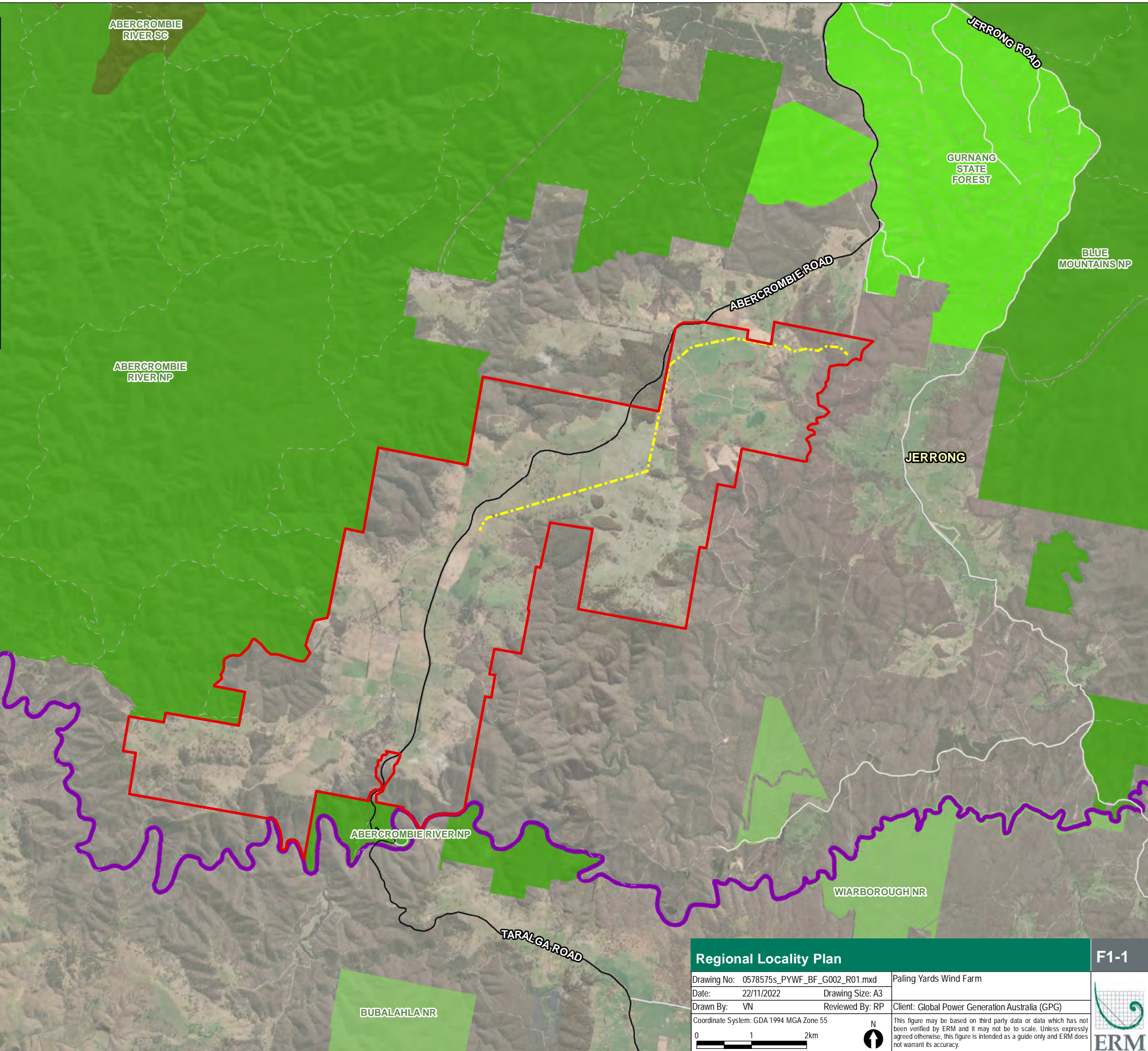
- construction of a control room, maintenance buildings, switchgear, and associated control systems in the vicinity of the wind turbine towers;
- roadworks and upgrades to local road infrastructure at key access points along Abercrombie Road in addition to internal tracks for vehicle access to turbines and infrastructure;
- removal of native vegetation and additional vegetation planting to provide screening (as required);
- temporary site buildings and facilities for construction contractors / equipment, including site offices, car parking and amenities for the construction workforce; and
- a temporary batching plant to supply concrete.

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 (fuel quantity and type, topography and weather patterns), as well as specific activities (such as hot works and construction activities) or infrastructure components that exacerbate combustion or ignition risks (such as transmission lines and other electrical components).

This Bushfire Risk Assessment aims 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 provide for asset protection consistent with NSW RFS Planning for Bushfire Protection 2019.

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. It is also important that following project approval, and prior to construction, a Bushfire Emergency Management and Operations Plan is prepared in conjunction with relevant stakeholders, including local fire services, NSW RFS, NSW Fire and Rescue, NPWS, adjoining property owners and employees.

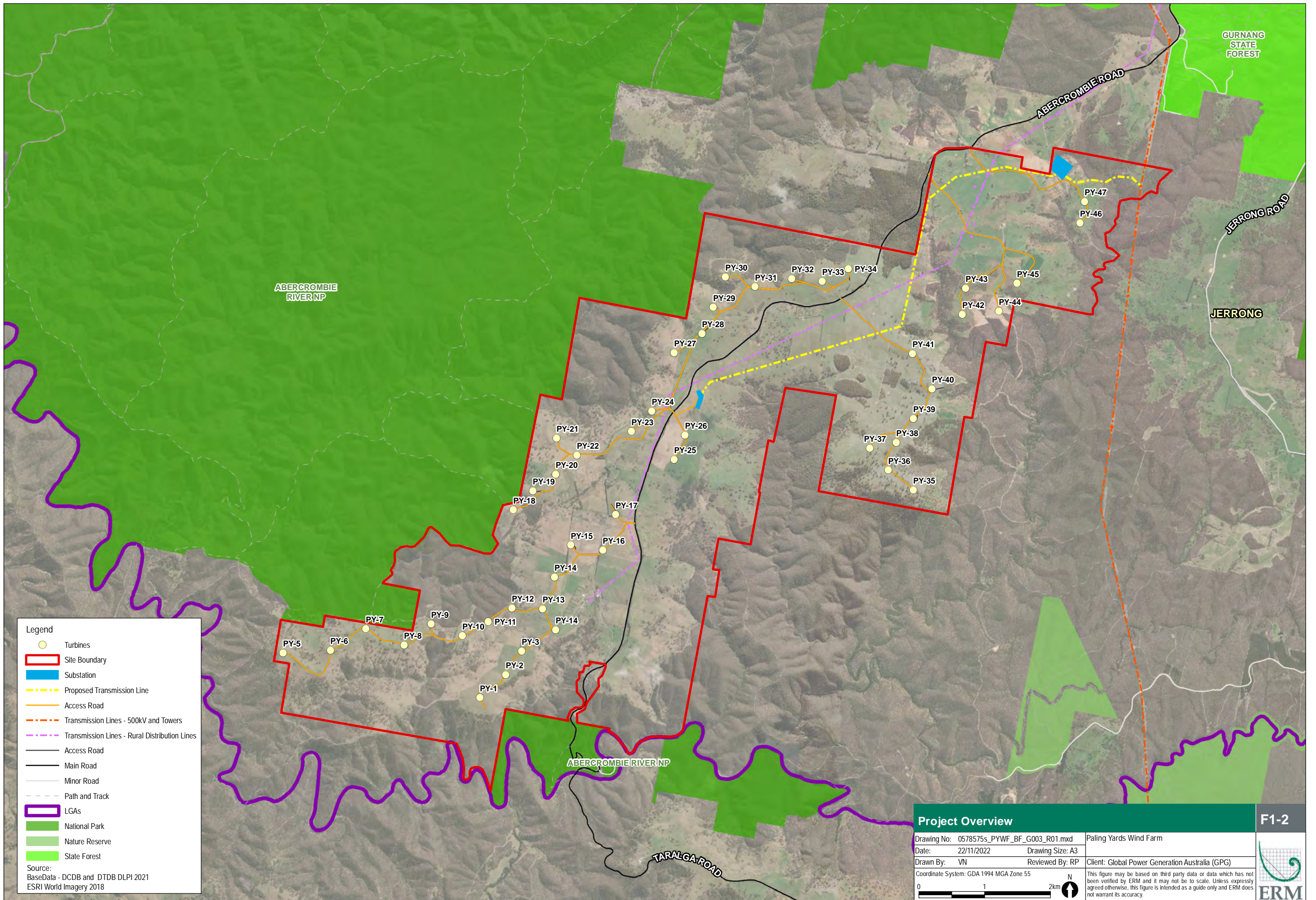


Legend

- Site Boundary
- Proposed Transmission Line
- Main Road
- Minor Road
- Path and Track
- LGAs
- National Park
- Nature Reserve
- State Conservation Area
- State Forest

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018, ESRI World Street Map

Regional Locality Plan		F1-1
Drawing No: 0578575s_PYWF_BF_G002_R01.mxd	Paling Yards Wind Farm	
Date: 22/11/2022	Drawing Size: A3	Client: Global Power Generation Australia (GPG)
Drawn By: VN	Reviewed By: RP	
Coordinate System: GDA 1994 MGA Zone 55		This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.



Legend

- Turbines
- Site Boundary
- Substation
- Proposed Transmission Line
- Access Road
- Transmission Lines - 500kV and Towers
- Transmission Lines - Rural Distribution Lines
- Access Road
- Main Road
- Minor Road
- Path and Track
- LGAs
- National Park
- Nature Reserve
- State Forest

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

Project Overview		F1-2
Drawing No: 0578575s_PYWF_BF_G003_R01.mxd	Paling Yards Wind Farm	
Date: 22/11/2022	Drawing Size: A3	
Drawn By: VN	Reviewed By: RP	
Coordinate System: GDA 1994 MGA Zone 55		This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
<div style="display: flex; align-items: center;"> <div style="flex: 1;"> </div> <div style="text-align: center; margin-left: 10px;"> N </div> </div>		

2. PLANNING FRAMEWORK

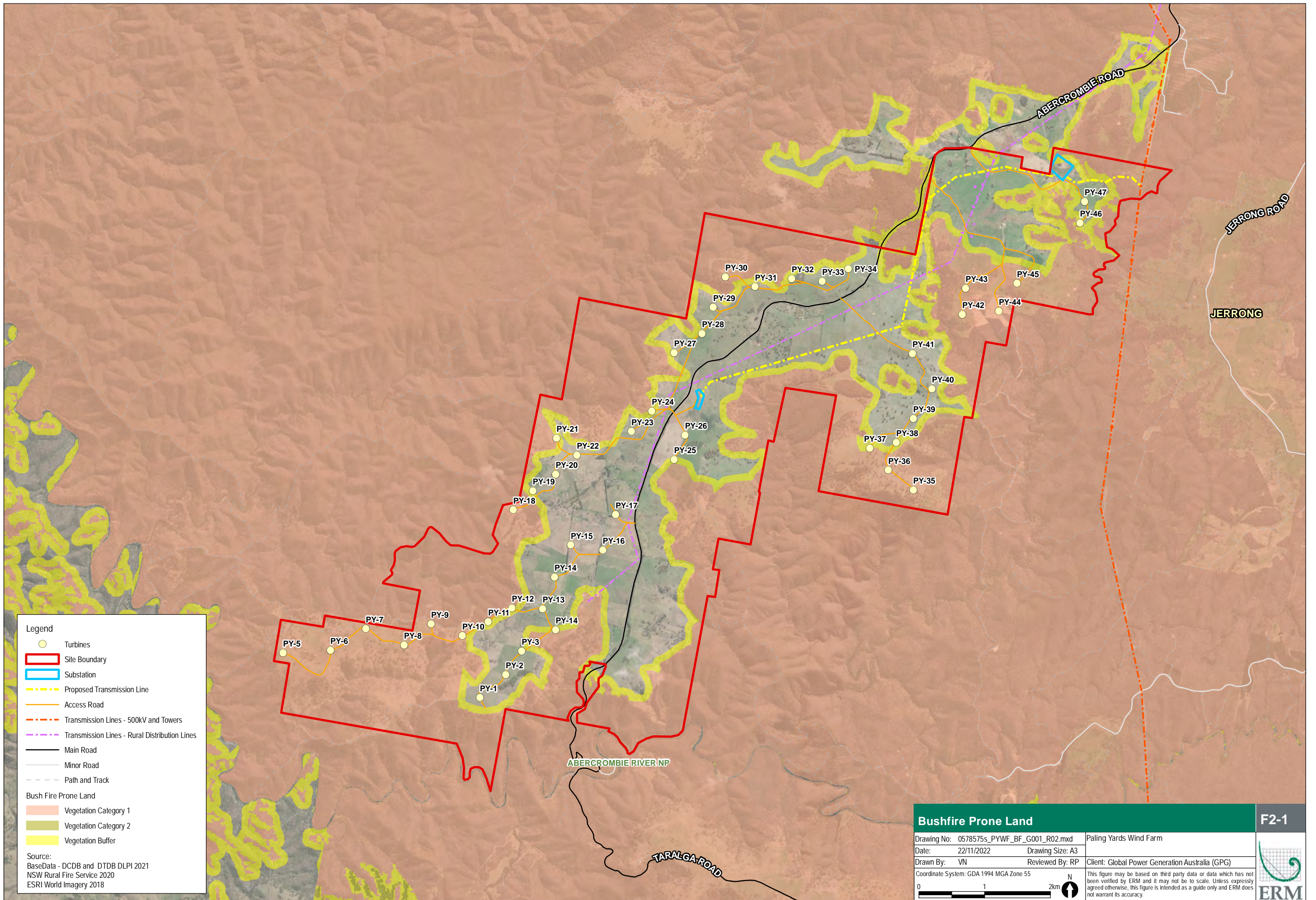
Table 2-1 outlines the relevant legislation and planning controls and how they have been considered in this Bushfire Risk Assessment.

Table 2-1 Key Legislation and Guidelines Addressed within the Assessment

Key Legislation/Guideline	Description
<i>NSW Rural Fires Act 1997</i>	<p>The main objectives of the Rural Fires Act 1997 (RF Act) are to:</p> <ul style="list-style-type: none"> ■ prevent, mitigate and suppress bush and other fires in NSW; ■ co-ordinate bushfire fighting and bushfire prevention throughout the State; ■ protect people from injury or death and property from damage as a result of bushfires; and ■ protect the environment. <p>The proposed development does not require subdivision of land and is not defined as a special fire protection purpose (SFPP) development under Section 100B of the RF Act. Accordingly, the proposal does not require a bushfire safety authority.</p> <p>It is also noted that 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 spread of bushfires from the Project to the surrounds and provides measures to minimise the risk of bushfires.</p>
<i>Planning for Bushfire Protection 2019</i>	<p>NSW RFS Planning for Bushfire Protection 2019 is a planning document to link responsible planning and development control with the protection of life, property and the environment. It is the culmination of significant investment in scientific research and policy development to provide appropriate bush fire protection whilst still having due consideration for development potential and economic sustainability.</p> <p>Planning for Bushfire Protection 2019 applies to all development applications on land that is classified as bushfire prone land. A review of the NSW RFS Bushfire Prone Land mapping confirms that the Project site is recognised as being bushfire prone and while relatively cleared itself, the Project site is surrounded by steep, vegetated and in many cases inaccessible areas within the Abercrombie National Park, Wiarborough Nature Reserve and the Blue Mountains National Park (refer to Figure 2-1). Therefore, consideration has been given to the following overall aims and objectives of Planning for Bushfire Protection 2019:</p> <ul style="list-style-type: none"> ■ afford buildings and their occupants protection from exposure to a bushfire; ■ provide for a defensible space to be located around buildings; ■ 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.

Key Legislation/Guideline	Description
	<p>Planning for Bushfire Protection 2019 provides specific requirements for wind farm development and notes that wind and solar farms require special consideration and should be provided with adequate clearances to combustible vegetation as well as firefighting access and water. The following should be provided for wind farms:</p> <ul style="list-style-type: none"> ■ 10m Asset Protection Zone (APZ) from the structures/associated buildings/ infrastructure; and ■ the APZ will be maintained to the standard of an inner protection area (IPA) for the life of the development to provide adequate access for firefighting purposes. <p><i>Note: An Asset Protection Zone (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.</i></p>
<p><i>Australian Standard 3959 - 2018 Construction of Buildings in Bushfire-prone Areas (AS 3959-2018)</i></p>	<p>For the purposes of this assessment the Project is considered 'other development', as it is not residential subdivision, residential infill, or Special Fire Protection Purpose (SFPP) and the National Construction Code 2019 does not provide for any bushfire specific performance requirements.</p> <p>General fire safety provisions and the methodology for determining the bushfire attack level (Section 2 AS 3959-2018) are taken as acceptable solutions. The aims and objectives of Planning for Bushfire Protection 2019 apply in relation to other matters such as access, water and services, emergency planning and landscaping/vegetation management. The proposed mitigation measures meet the aims and objectives of Planning for Bushfire Protection 2019 as discussed in Section 6.</p>
<p><i>Biodiversity Conservation Act 2016</i></p>	<p>Projects determined by a statutory authority of the NSW State Government are required to be assessed in accordance with the <i>NSW Environmental Planning and Assessment Act 1979</i> (EP&A Act) and the <i>Biodiversity Conservation Act 2016</i> (BC Act).</p> <p>The 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', are listed by the BC Act as Key Threatening Processes and need to be carefully considered and managed when implementing fire management activities.</p> <p>The Project Area contains threatened species that may be impacted by the proposal (refer to Section 3). <i>Refer to the Paling Yards BDAR (Hunter Ecology 2022) for more detail on the habitat requirements and confirmed records of these species.</i></p>

Key Legislation/Guideline	Description
<i>Commonwealth Environment Protection and Biodiversity Act 1999</i>	<p><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 Paling Yards BDAR (Hunter Ecology 2022).</i></p>
<i>Environment Planning and Assessment Act 1979</i>	<p>The Project was declared a State Significant Development (SSD) in accordance with clause 20 of Schedule 1 the <i>State Environmental Planning Policy (State and Regional Development) 2011</i> and will be assessed under Part 4 of the <i>Environmental Planning and Assessment Act 1979</i> (EP&A Act). 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>”.</p>



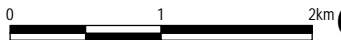

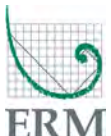
Legend

- Turbines
- Site Boundary
- Substation
- Proposed Transmission Line
- Access Road
- Transmission Lines - 500kV and Towers
- Transmission Lines - Rural Distribution Lines
- Main Road
- Minor Road
- Path and Track

Bush Fire Prone Land

- Vegetation Category 1
- Vegetation Category 2
- Vegetation Buffer

Source:
 BaseData - DCDB and DTDB DLPI 2021
 NSW Rural Fire Service 2020
 ESRI World Imagery 2018

Bushfire Prone Land		F2-1
Drawing No: 0578575s_PYWF_BF_G001_R02.mxd	Paling Yards Wind Farm	
Date: 22/11/2022	Drawing Size: A3	
Drawn By: VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)
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2.1 Secretary's Environmental Assessment Requirements

The Secretary's Environmental Assessment Requirements (SEARs) were originally issued for the proposed development on 6th May 2010. Supplemental SEARS were issued on 16 August 2011 in relation to the community consultation undertaken by the Proponent. An extension of time was granted by the Office of the Director General until the 31 January 2013, and a further extension of time request was submitted by the Proponent on 23 October 2012. In response to a new project layout and revised technical assessments, the original planning application was withdrawn and a revised Scoping Report was submitted in 2021. New SEARs were issued on 09 March 2022.

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, potential impacts on Abercrombie National Park and including the risks that a wind farm would cause bush fire and any potential impacts on the aerial fighting of bushfires and demonstrate compliance with Planning for Bush Fire Protection 2019;

In addition, Fire and Rescue NSW (FRNSW) provided advice on 16 February 2022 for consideration in the development of the SEARs. In their advice, FRNSW requests to be consulted with respect to the proposed fire and life safety systems and their configuration at the project's preliminary and final design phases. They request that they be given the opportunity to review and provide comment once approvals have been granted and the project has progressed such that there is more relevant detailed information available.

A copy of this Bushfire Risk Assessment (Consultation Version) should be provided to NSW RFS and the FRNSW for their review and comment. Ongoing consultation with both the NSW RFS and the FRNSW will also be an important post-approvals commitment and will form part of the detailed design process as well as the development and approval of all management and emergency response plans.

3. EXISTING CONDITIONS

The following steps were undertaken in the assessment process:

- determine whether the development area has been mapped as bushfire prone land (Figure 2-1) and whether the Project is in compliance with Planning for Bushfire Protection 2019;
- identification of the assets within and surrounding the Project Area requiring protection (Section 3.1);
- identification of the bushfire risk factors such as bushfire history and known bushfire behaviour in the Project Area and within the surrounding lands (Section 5); and
- produce risk mitigation and management treatments and satisfy Planning for Bushfire Protection 2019 requirements (Section 6).

3.1 Identification of Assets

Assets within and surrounding the Project Area are shown in Figure 3-1 and described in Table 3-1. A detailed description of the Project components is provided in the Environmental Impact Statement (EIS).

Table 3-1 Identification of Assets

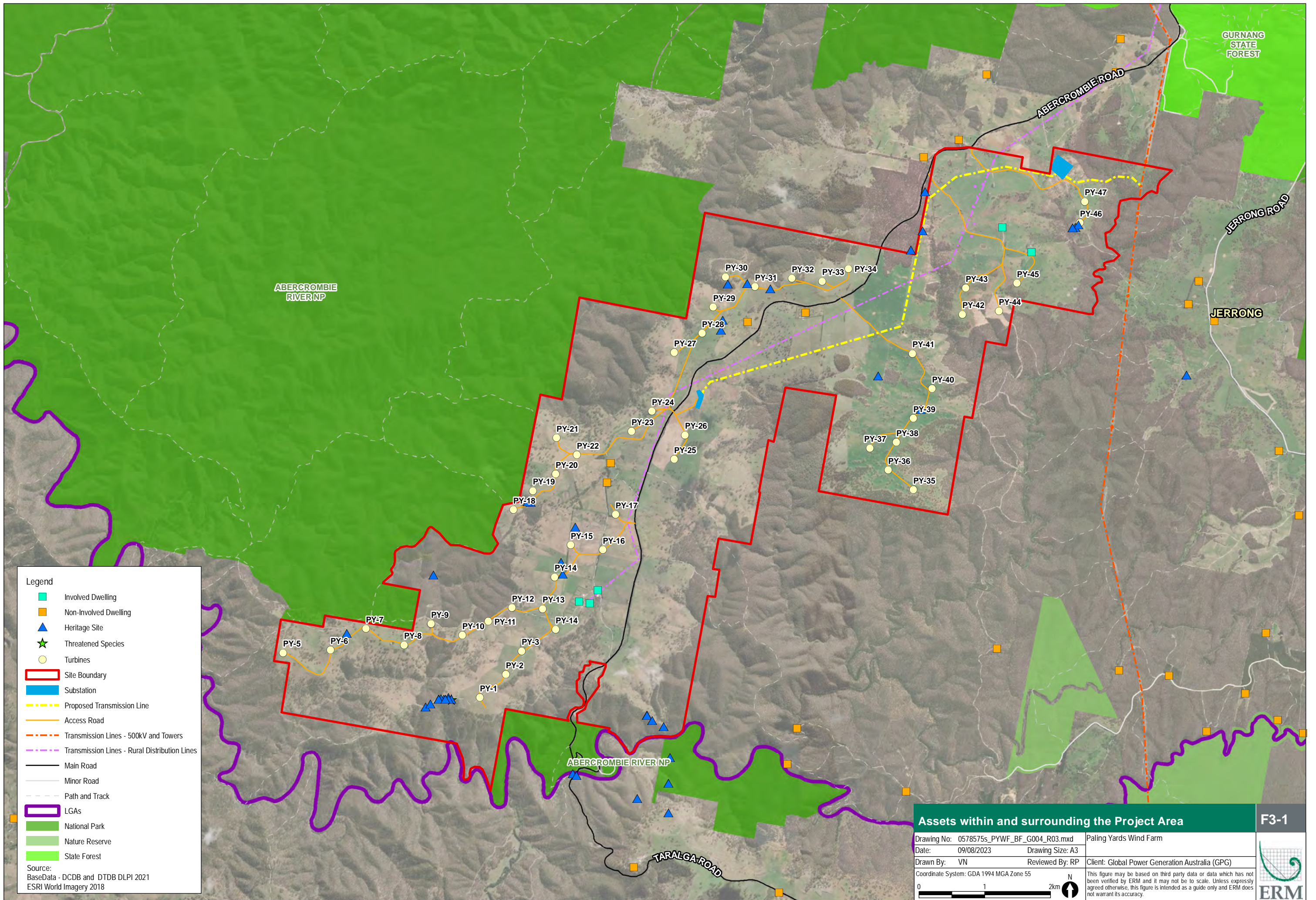
Asset	Description
Assets Within the Project Area	
Project Infrastructure	<p><u>Wind Turbine Generators</u></p> <p>Each WTG consists of a tower, nacelle, hub and rotor. The process of installing the WTGs is outlined in the accompanying EIS.</p> <p>Each WTG will be mounted on a concrete foundation (minimum 20-25m in diameter) located on a cleared hardstand area. The actual foundation type to be utilised will be based on the results of geotechnical surveys undertaken prior to commencement of the construction at each WTG site.</p> <p>The nacelle is the housing that sits on the top of the turbine tower and accommodates the generator, control systems, pitch and yaw drives. The nacelle may also include the transformer and gearbox (if used) and is typically constructed of fibreglass. Given the nature of the components housed within the nacelle, oil containment and sound insulation will be provided for within each WTG.</p> <p>The rotor, which includes the blades, is the portion of the WTG that captures the energy from the wind. The energy captured by the rotating blades is transferred to a generator housed within the nacelle. Blades are generally made of fibreglass reinforced with epoxy and carbon fibre. The rotor is controlled by a central wind turbine control unit (microprocessor). The microprocessor controls the rotational speed of the rotor and the pitch of the blades, therefore enabling the rotor to maximise energy production from the wind resource and ensure the safe and reliable operation of the WTG. When wind speeds get too high the microprocessor controls the pitch of the blades to stop the WTG rotating, which minimises wear on the components from operating at too high wind speeds.</p> <p>Each WTG will be connected to the on-site substations via a network of underground power and communication cables.</p> <hr/> <p><u>Obstacle Lighting</u></p> <p>The Project may require obstacle lighting at night or during periods of reduced visibility.</p>

Asset	Description
	<p><u>Meteorological Monitoring Mast</u></p> <p>The Project includes the installation of three (3) meteorological monitoring masts. It is noted that unmarked meteorological monitoring towers and guy ropes present greater risks for aerial firefighting operations than wind turbines (AFAC 2018). This has been considered in Section 6.</p> <hr/> <p><u>Permanent Operations and Maintenance Building (O&M Building)</u></p> <p>A permanent site operations and maintenance facility will be constructed to provide for all operations and maintenance activities associated with the Project. Car parking facilities will also be provided for employee and service vehicles.</p> <p>During operations, up to 4 permanent staff will occupy these premises. Whilst most activity is anticipated to occur during business hours, access to the wind farm site will be required on a 24 hour basis, seven days a week.</p>
Electrical Reticulation	<p><u>Overhead Transmission Line Connection</u></p> <p>A 132kV (up to 500 kV) overhead transmission line connection is proposed to connect the onsite electrical substation to the Mt Piper to Bannaby 500 kV transmission line network. The transmission line will be centred on a 70 m wide easement. For the safe operation of the transmission line, certain activities will be restricted within the easement such as planting and growing trees, construction of buildings, or erection of antennae or masts. While it has not been confirmed how the easement will be formally registered, for the purposes of this bushfire risk assessment, key responsibilities and management measures must be applied in accordance with the ISSC3 Guide for the Management of Vegetation in the Vicinity of Electricity Assets which requires assets to be maintained to minimise the risk of fire ignition and to ensure that vegetation clearance are maintained. Poles will not be located closer than 40m to any watercourse, except where first-order minor streams are identified as per the Water Management Act 2000.</p> <hr/> <p><u>Onsite Substation</u></p> <p>An electrical substation compound is proposed on-site. The primary purpose of the electrical substation is the reception, transformation and distribution of electrical power and energy. The electrical substation will house a series of transformers, switch gear, and ancillary equipment for the transformation and distribution of energy. The approximate dimensions are:</p> <ul style="list-style-type: none"> ■ Collector substation – 170m x 120m ■ Terminal (switching) station – 280m x 155m
Construction Laydown Areas	<p>A hardstand pad will be required adjacent to the base of the WTGs to enable the assembly and erection of the tower, nacelle and blade components. Although the final design will depend on the topography of the surrounding land, each crane pad will consist of crushed rock hardstand approximately 195 m by 75 m.</p> <p>Additional construction laydown areas may be required at select locations within the wind farm site to support the delivery of equipment and WTG components during construction.</p>
Site Access	<p>There will be a minimum of five site access points off Abercrombie Road.</p>
Heritage	<p>There are a number of archaeological sites located within the Project Area, the majority of which are artefact scatters of low density (n=15), with some medium density scatters (n= 2) and one modified tree.</p>

Asset	Description
Biodiversity	<p>The Project Area itself is characterised by cleared agricultural land with exotic derived grassland and patches of open forest or woodland vegetation. It is located between large tracks of forested land, including Abercrombie River National Park to the west and north and a combination of state forest, private land and various nature reserves (including Blue Mountains National Park and Kanangra-Boyd National Park) to the east and south.</p> <p>The Project Area contains two TEC listed under the BC Act and EPBC Act and potential habitat for several threatened species.</p>

Assets Surrounding the Project Area

Residential Properties and Farms	<p>Land on which the Project is proposed to be located is owned by four freehold landholdings, including three landholdings known as 'Mingary Park', 'Middle Station' and 'Paling Yards'. The transmission line corridor is located across nine parcels of land to the north-east of the site. The Project Area is predominately agricultural land and borders the Abercrombie River National Park to the West. The Project Area has a history of agricultural use (grazing cattle and sheep). Native understorey has been converted to exotic pastures in many locations.</p>
Nearest Towns and Localities	<p>The Project is located approximately 60km south of Oberon, 60km north of Goulburn, 100km from Bathurst and 277km from Sydney. The proposal is located within the Oberon LGA, which borders on to the Lachlan Shire LGA.</p> <p>The general locality includes the Abercrombie River National Park, Abercrombie River State Conservation Area, and the Jenolan Caves.</p>
Conservation Areas	<p>Project and adjacent land uses include sheep and cattle grazing. The Project borders the National Parks and Wildlife Service (NPWS) managed area Abercrombie River National Park to the west and is nearby the NPWS managed Abercrombie River State Conservation Area.</p>



Legend

- Involved Dwelling
- Non-Involved Dwelling
- ▲ Heritage Site
- ★ Threatened Species
- Turbines
- Site Boundary
- Substation
- Proposed Transmission Line
- Access Road
- Transmission Lines - 500kV and Towers
- Transmission Lines - Rural Distribution Lines
- Main Road
- Minor Road
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Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

Assets within and surrounding the Project Area		F3-1
Drawing No: 0578575s_PYWF_BF_G004_R03.mxd		Paling Yards Wind Farm
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Coordinate System: GDA 1994 MGA Zone 55		<small>This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.</small>

3.2 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. In New South Wales and southern Queensland this generally occurs in spring to mid-summer.

As described by the BOM (2022), the greatest danger occurs following a dry winter and spring. The worst conditions occur when deep low-pressure systems near Tasmania bring strong, hot and dry, westerly winds to the coastal districts. The end of the fire season is determined by the onset of moister conditions, sometimes the result of a tropical cyclone developing near the Queensland coast.

The Chifley Bush Fire Management Committee (BFMC 2020) reports that the typical/average climate within the Oberon LGA is subject to cool to very cold and moist tablelands climate with maximum temperatures decreasing and rainfall increasing with elevation above sea level. The rainfall is generally evenly spread throughout the year with the lowest rainfalls recorded in autumn. The BMFC reports that the consequence of the interaction of these weather features is that Oberon LGA has been relatively free of severe extended fire events and have a shortened fire season typically occurring in January/February. However, they also report that extremes of drought have, occasionally, seen fires occurring as early as September and as late as March/April.

Data from the Bureau of Meteorology weather stations confirms that both low humidity and high temperature occur within the bushfire season and would contribute to the fire hazard within this region (Figure 3-2).

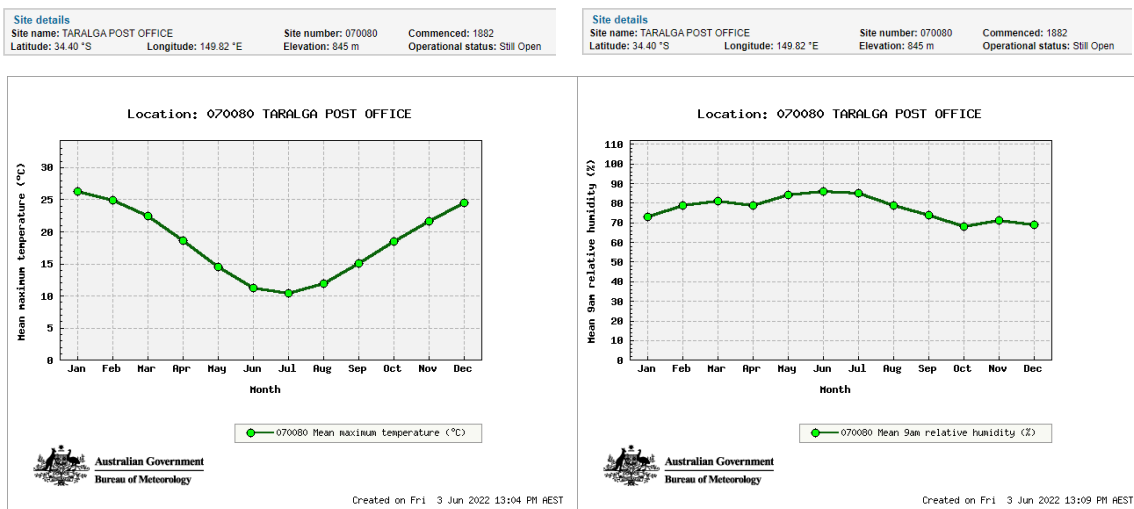


Figure 3-2 Humidity and temperature at the nearby Taralga Post Office (BOM 2022)

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 Bureau of Meteorology weather stations at Taralga Post Office (#070080) suggest that during early bushfire season strong north easterly winds are common, and relatively stronger westerly winds are common in the late bushfire season.

3.3 Climate Change and Bushfires

Eastern Australia is documented to be one of the most bushfire-prone areas in the world. As reported by the Bureau of Meteorology (BOM 2022 <http://www.bom.gov.au/weather-services/fire-weather-centre/bushfire-weather/index.shtml>), 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 previously.

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).

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.

3.4 Vegetation Hazard

Descriptions of the vegetation types including species composition and structural diversity is provided in the Paling Yards Biodiversity Development Assessment Report (Hunter Ecology 2022).

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 has 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.

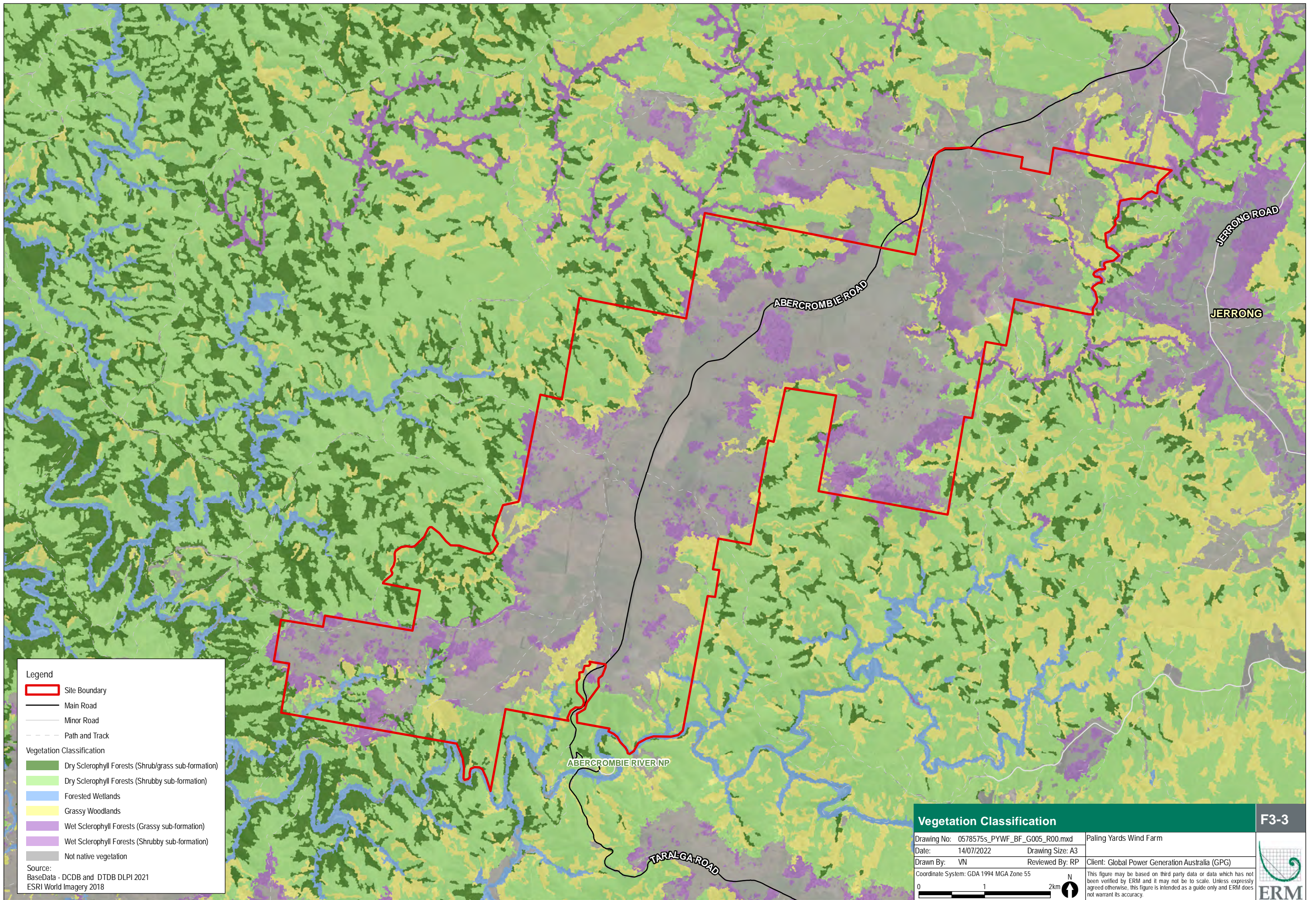
For the purposes of this bushfire risk assessment, the vegetation has been simplified in line with the vegetation formations as per Keith (2004). The vegetation classifications are shown in Table 3-2.

It is intended that the vegetation fuel around the turbine (hardstands), within the overhead transmission line easements and access roads will be maintained in a low fuel state by mechanical, manual and chemical clearing methods prior to construction activities commencing and as part of ongoing maintenance activities for the duration of the Project. Refer to Section 6.1 for detailed description of the recommended APZ.

Table 3-2 Description and Characteristics of Fuel Groups within the Project Area

PCT	PCT Description	Vegetation Formation
885	River Oak forest and woodland wetland of the NSW South Western Slopes and South Eastern Highlands Bioregion	Forested Wetlands
649	Apple Box - Broad-leaved Peppermint dry open forest of the South Eastern Highlands Bioregion	Dry Sclerophyll Forests (Shrubby sub-formation)
654	Apple Box - Yellow Box dry grassy woodland of the South Eastern Highlands Bioregion	Grassy Woodlands
727	Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South Eastern Highlands Bioregion	Dry Sclerophyll Forests (Shrubby sub-formation)
951	Mountain Gum - Manna Gum open forest of the South Eastern Highlands Bioregion	Wet Sclerophyll Forests (Grassy sub-formation)
1093	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion	Dry Sclerophyll Forests (Shrubby sub-formation)
-	Pasture and Grassland	Grassland

1. Keith (2004) From ocean shores to desert dunes: the vegetation of New South Wales and the ACT.
2. DPIE (2020) Online Vegetation Formation Profiles. <https://www.environment.nsw.gov.au/threatenedSpeciesApp/>
3. Table B3, AS3959:2018 Construction of buildings in bushfire-prone areas



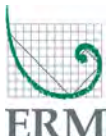
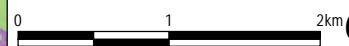

Legend

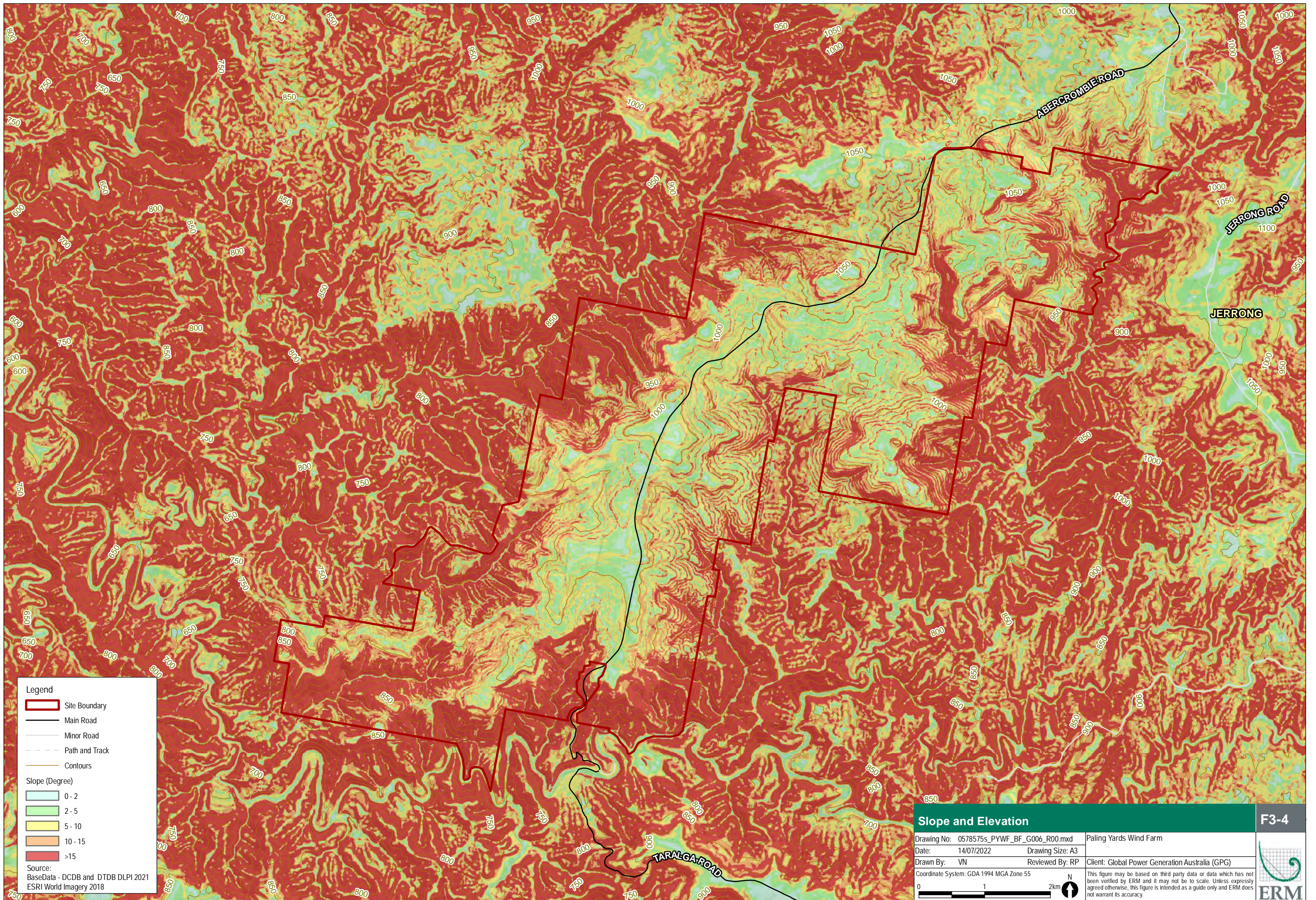
- Site Boundary
- Main Road
- Minor Road
- Path and Track

Vegetation Classification

- Dry Sclerophyll Forests (Shrub/grass sub-formation)
- Dry Sclerophyll Forests (Shrubby sub-formation)
- Forested Wetlands
- Grassy Woodlands
- Wet Sclerophyll Forests (Grassy sub-formation)
- Wet Sclerophyll Forests (Shrubby sub-formation)
- Not native vegetation

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

Vegetation Classification		F3-3
Drawing No: 0578575s_PYWF_BF_G005_R00.mxd	Paling Yards Wind Farm	
Date: 14/07/2022	Drawing Size: A3	
Drawn By: VN	Reviewed By: RP	
Coordinate System: GDA 1994 MGA Zone 55		<small>This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.</small>
<div style="display: flex; align-items: center;"> <div style="flex: 1;">  </div> <div style="flex: 0.2; text-align: center;"> N  </div> </div>		



Legend

- Site Boundary
- Main Road
- Minor Road
- Path and Track
- Contours

Slope (Degree)

- 0 - 2
- 2 - 5
- 5 - 10
- 10 - 15
- >15

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

Slope and Elevation		F3-4
Drawing No: 0578575s_PYWF_BF_G006_R00.mxd	Paling Yards Wind Farm	
Date: 14/07/2022	Drawing Size: A3	Client: Global Power Generation Australia (GPG)
Drawn By: VN	Reviewed By: RP	
Coordinate System: GDA 1994 MGA Zone 55		This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
<div style="display: flex; align-items: center; justify-content: center;"> <div style="margin-right: 10px;">0</div> <div style="flex-grow: 1; border-bottom: 1px solid black; position: relative;"> <div style="position: absolute; right: 0; top: -5px;">1</div> <div style="position: absolute; right: 0; bottom: -5px;">2km</div> </div> <div style="margin-left: 10px; text-align: center;"> <div style="font-size: 8px;">N</div> <div style="font-size: 12px;">↑</div> </div> </div>		

4. HISTORY OF FIRE AND WIND FARMS IN AUSTRALIA

The likelihood of a fire spreading within the area as a result of the proposed wind turbines is uncertain, because a detailed case history (i.e. previous fire records from fire agencies and wind farm sites) and experiments are required for similar environments, climate and wind farm components, ideally from within Australia is not available to enable assessment with more confidence.

A technical report into the financial and market impacts of wind turbine fires (Sharma, 2015) found that turbine fires are relatively infrequent, with approximately around 50 each year out of 300,000 wind turbines internationally (a rate of 1:6000).

A review of available literature identifies that there have been a number of reported fires involving wind farms within Australia:

- Ten Mile Lagoon in Western Australia in the mid-1990s. Damage limited to the relevant turbines, no damage to surrounding environment. Involved technology that is now redundant;
- Lake Bonney in South Australia in 2006. This fire was related to maintenance works during a shutdown. Damage limited to the relevant turbines, no damage to surrounding environment;
- the Star Fish Hill Wind Farm near Cape Jervis in South Australia experienced a turbine fire in October 2010. The turbine was damaged and surrounding spot fires were extinguished. The blades did not cease rotating in this instance, compounding the firefighting response due to the exclusion perimeter that was established and the spot fires due to flames coming off the rotating blades;
- a turbine fire occurred at Cathedral Rocks Wind Farm, South Australia, in February 2009. The turbine was damaged and surrounding spot fires required extinguishing (Parsons Brinkerhoff, 2012); and
- the Currandooley Fire in January 2017 was reportedly caused when a crow connected with overhead electrical infrastructure, caught alight and dropped into dry foliage underneath a power line that transfers electricity from Infigen's Woodlawn Windfarm to a substation at their Capital Wind Farm. The fire burnt approximately 3,400 hectares and was subject to a class action.

Another example of a fire that impacted on a wind farm (as opposed to the previous five examples that involved wind farm infrastructure) a bushfire started on a paddock near the Waterloo Wind Farm in South Australia. Fanned by gusty westerly and north westerly winds, the fire quickly spread through the area and raced up the ridge where the wind farm was located. 200 Country Fire Service volunteers were involved in firefighting operations and were supported by three water bombing aircraft. The wind farm operator confirmed that there was no damage to any wind farm infrastructure and no danger at any time to human life as a result of the fire. Normal wind farm operations resumed once the Country Fire Service advised the operator that it was safe to do so. Similarly, Pacific Hydro reported that a bushfire near Taralga Wind Farm in January 2018 was attended by NSW RFS firefighting teams on the ground, supported by firefighting aircraft and heavy plant. Turbines were shut down to assist aerial firefighting and no injuries to staff or damage to the wind farm was reported.

A number of 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 situation 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 conclude 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 utilised 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.**

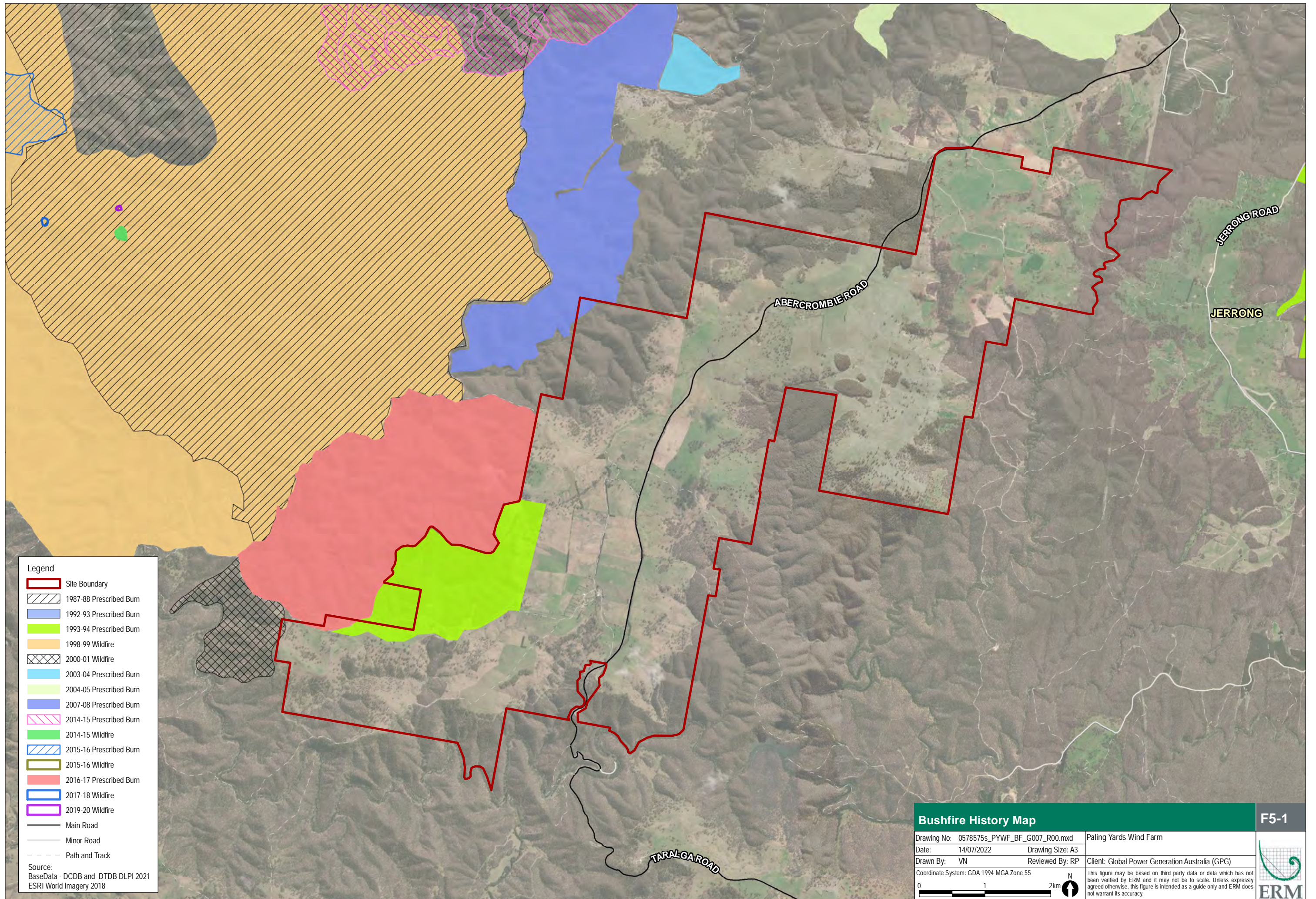
5. BUSHFIRE RISK

5.1 Fire history within the Project Area

A review of the NSW RFS Fire History Mapping available via SEED maps shows four recorded fires within the Project Area (refer to **Figure 5-1**). A summary of the publicly available information for all major fires within the surrounding area is presented in Table 5-1.

Table 5-1 Majors Fires Reported within the Immediate Area

Fire Name	Fire Number	Time Period	Fire type	Total Burnt Area (Ha)	Burnt Area within project area (Ha)	Location
KAN Paling Yards HR	HR14082769662	2016-17	Prescribed Burn	916.68	12.54	West of Project Area
Licking Hole HR	-	2014-15	Prescribed Burn	1306.1365	-	North west of Project Area
Silent Creek West	BMR-HR07-008	2007-08	Prescribed Burn	391.29	5.96	North west of Project Area
Tavern Creek	-	2007-08	Prescribed Burn	434.6644	-	North of Project Area
Cat Hill	-	2004-05	Prescribed Burn	147.6133	-	North east of Project Area
Cat Hill	-	2004-05	Prescribed Burn	223.9815	-	North east of Project Area
Bald Hill East	-	2004-05	Prescribed Burn	56.8317	-	North of Project Area
Little Bald Hill West	-	2003-04	Prescribed Burn	63.0165	-	North of Project Area
Black Bett	BMS 00-050	2000-01	Wildfire	185.01	2.00	South west of Project Area
Crookwell 1999	-	1998-99	Wildfire	16231.2537	-	South west of Project Area
unnamed	-	1998-99	Wildfire	8821.2522	-	West of Project Area
Gurnang	-	1993-94	Prescribed Burn	338.61	295.34	West of Project Area
Gurnang	-	1992-93	Prescribed Burn	505.7684	-	West of Project Area
unnamed	-	1987-88	Prescribed Burn	9221.6419	-	West of Project Area



Legend

- Site Boundary
- 1987-88 Prescribed Burn
- 1992-93 Prescribed Burn
- 1993-94 Prescribed Burn
- 1998-99 Wildfire
- 2000-01 Wildfire
- 2003-04 Prescribed Burn
- 2004-05 Prescribed Burn
- 2007-08 Prescribed Burn
- 2014-15 Prescribed Burn
- 2014-15 Wildfire
- 2015-16 Prescribed Burn
- 2015-16 Wildfire
- 2016-17 Prescribed Burn
- 2017-18 Wildfire
- 2019-20 Wildfire
- Main Road
- Minor Road
- Path and Track

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

Bushfire History Map		F5-1
Drawing No: 0578575s_PYWF_BF_G007_R00.mxd	Paling Yards Wind Farm	
Date: 14/07/2022	Drawing Size: A3	Client: Global Power Generation Australia (GPG)
Drawn By: VN	Reviewed By: RP	
Coordinate System: GDA 1994 MGA Zone 55		This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
N		

5.2 Fire ignition

The Chifley BFMC region is reported to have on average 150 bush or grass fires per year, with an average of 9 of these considered major (>20 ha). BFMC report that the bush fire seasons of 2013/2014 and 2019/2020 consisted of significant bush fire activities, however these are reported to be primarily in the Bathurst Council region.

The main source of ignition within the Chifley BFMC area are:

- Lightning activity (mainly associated with late spring and early summer);
- Illegal / careless burning activities by private land owners/occupiers, most commonly in grasslands and forested areas adjacent to villages;
- Escaped fires from legal burning activities by private land owners/occupiers;
- Campfires;
- Farm Machinery

The risk of fire starting as a result of a lightning strike may actually be reduced by the presence of wind turbines, particularly if they are located along a ridgeline (AFAC 2018). A built-in lightning protection system safely dissipates the electricity from the blades or the nacelle into 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.

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 (e.g. crop harvesting and paddock slashing) relative to wind farm operation.

As evidenced by the Curran Dooley 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.**

5.3 Fire behaviour potential

Based on the information provided above, the greatest hazard already present in the landscape is a combination of undesirable fire weather (i.e. hot and dry winds and low humidity) and the potential for a fire to spread from the adjacent properties and the rugged National Parks Estates towards farm assets. As identified within the Abercrombie River National Park Fire Management Strategy (2005), potentially damaging fires are most likely to occur in spring. Fires that do occur in summer have a higher intensity and damage potential.

Strong north easterly winds are common during the bushfire season, with relatively stronger westerly winds becoming increasingly common in the late bushfire season in this region (based on BOM data from the nearby Taralga Post Office) and would quickly carry a bushfire or grassfire from surrounding properties towards the wind farm assets. A fire under the influence of wind may travel upslope very fast, reaching assets before firefighters can attend the scene. This is noted to be an existing hazard and is not influenced by the proposed wind farm development itself.

Grassfires should also not be underestimated and can start and spread quickly. They can travel up to 25 km per hour and pulse even faster over short distances. 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.

It should be assumed that, under the most extreme weather, a fire would spread even in heavily grazed grass and embers may breach any APZ within the proposed windfarm.

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. It is also important that following project approval, and prior to construction, a Bushfire Emergency Management and Operations Plan is prepared in conjunction with relevant stakeholders, including local fire services, NSW RFS, NSW Fire and Rescue, NPWS, adjoining property owners and employees.

5.4 Firefighter and public safety

The usage of the general area surrounding the Project Area is mostly limited to existing landowners.

The firefighters likely to respond to a bushfire in this area would be volunteers from the NSW RFS and or individual property owners. Based on the locality of the site, NSW RFS may also work closely with the Fire and Rescue NSW, and National Parks in the event of any major fires in this area. These agencies and groups work together through local bushfire management committees across NSW. Set up under the NSW Rural Fires Act, these committees coordinate fire management planning, prevention and suppression in local areas.

The materials for individual components within the wind farm infrastructure have not yet been finalised, therefore, the flammability and toxicity of burning components have not been determined in detail (and is not included within the scope of risk assessment which addresses the Planning for Bushfire Protection Guidelines only). This information may form part of the recommended Bushfire Emergency Management and Operations Plan that will be developed post approval and 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, NSW Fire and Rescue, National Parks, 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 also need to 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. This plan be prepared in consultation with NPWS and will consider the existing fire management regimes within the National Parks estates as detailed within their respective fire management strategies.

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 will be considered in the planning stages of the development however is expected to be manageable.

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 should be considered by the Proponent. In terms of arcing potential, the Proponent will need to confirm that the turbines have a detection system that protects them from surges, arcing and other electrical hazards. Arcing should be detected, and electrical systems shut off if these persist.

The majority of the internal power lines are underground however where these are overhead, the Proponent will again need to confirm that similar detection systems will be installed to monitor changes. Automatic Circuit Breakers at either end of the lines should be installed to stop transmission of electricity in the event that any arcing is detected.

5.5 Summary of Bushfire Risk Factors

Table 5-2 below presents a summary of bushfire risk factors for the proposed wind farm development. Of particular note:

- the Project site is surrounded by steep, vegetated and in many cases inaccessible areas within the Abercrombie National Park, Wiaborough Nature Reserve and the Blue Mountains National Park. These characteristics lead to high intensity fires and a high rate of spread. These characteristics create a potential risk to fire fighters particularly on steep slopes and inaccessible areas of the adjacent National Park. Aerial support would likely be required in these areas and an aviation impact assessment has been prepared to support the EIS
- the proposed upgrade of the internal road network would increase the level of access available to fire fighters. It is important to note that the access road is already located within the flame zone and the proposed windfarm assets will not increase this existing hazard.
- the location of all fire control advantages within the Project Area (water points, gates, fire trails) currently mapped Abercrombie River National Park Fire Management Strategy (refer to Figure 6.1) will be reviewed and updated in consultation with the NSW RFS and NSW NPWS as part of the recommended Bushfire Emergency Management and Operations Plan.
- in the event that a fire does breach any containment lines and threatens the windfarm assets, it is possible that the windfarm infrastructure will sustain direct flame contact and that firefighting will require aerial support.
- noting that WTG towers are made from non-combustible material, firefighting efforts would most likely be concentrated on defending those assets that could contribute to widespread fire. It is therefore important that key assets such as the switching station, substation, and O&M buildings are all located outside of the flame zone and have adequate defendable space all sides. The recommendations in Section 6 exceed the 10m wide APZ identified within Planning for Bushfire Protection 2019.
- it is also important to note that there are residential dwellings on rural properties scattered throughout the landscape that may be at risk from fire and the steep, rugged topography within the adjacent National Parks Estate is considered to present an existing hazard that will also be considered in the Bushfire Emergency Management and Operations Plan.

Table 5-2 Summary of Bushfire Risk Factors

Risk Factor	Description of Risk	Analysis of the Risk	Potential to Mitigate/Reduce Impact
Loss of Life	Populated Area	<p>There are residential dwellings on rural properties scattered throughout the landscape that may be at risk from fire. This noted to be an existing hazard and is referred to here to recognise that bushfire is a key concern for the local community and the risk to life should not be discounted.</p> <p>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. The risk of fire starting as a result of a lightning strike is actually reduced by the presence of wind turbines. A built-in lightning protection system safely dissipates the electricity from the blades or the nacelle into the ground.</p> <p>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 or if electrical surges are detected.</p> <p>Wind farms are an infrastructure development that should be considered by fire and land management agencies through the preparation of incident action plans for the suppression of bushfires in their vicinity. These considerations are routine and wind farms are not expected to present elevated risks to operations compared to other electrical infrastructure (AFAC 2018).</p>	<ul style="list-style-type: none"> ■ The Project will be controlled by a remote supervisory control and data acquisition (SCADA) from a control room located within the permanent site operations and maintenance facility. This system will allow remote operation of all WTGs with the ability to shut-down individual or all WTGs if required. ■ Site access points will be constructed as the first stage of development and the final design of access roads will need to be reviewed by the NSW RFS to ensure that they 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. ■ Key assets such as the switching station, substation, and O&M buildings are all located outside of the flame zone and will have increased defensible space all sides. ■ Despite the mitigation measures and treatments that are put in place it is noted that some bushfire risk will always remain and it is important that a Bushfire Emergency Management and Operations Plan is prepared in conjunction with relevant stakeholders, including local fire services, adjoining property owners and employees.
	Aerial Fire Fighters	Fire suppression aircraft only operate in areas where there is no smoke and during daylight hours (CFA 2015). Wind turbines, similar to high voltage transmission lines, are part of the landscape and would be	<ul style="list-style-type: none"> ■ NSW RFS would be provided with maps of the final wind turbine layout and identification

Risk Factor	Description of Risk	Analysis of the Risk	Potential to Mitigate/Reduce Impact
		<p>considered in the incident action plan, thus not resulting in any increased risk to aerial fire fighters.</p> <p>The NSW RFS and Australasian Fire and Emergency Services Council (AFAC) have worked together to develop a national position on wind turbines (AFAC 2018). This position paper concludes that wind farms are not expected to adversely affect fire behaviour in their vicinity. Local wind speeds and direction are already highly variable across landscapes affected by turbulence from ridgelines, tall trees and buildings.</p> <p>As reported by AFAC (2018), the bushfire at the Waterloo Wind Farm demonstrated that if conditions are clear and wind turbines are turned off, wind turbines are clearly visible from aircraft and are not likely to constrain aerial firefighting operations (Clean Energy Council 2017). However, during this event transmission infrastructure, meteorological towers and guy-ropes were difficult to see; this infrastructure does have potential to limit the effectiveness of aerial firefighting operations.</p>	<p>information for individual wind turbine sites for their internal response planning.</p> <ul style="list-style-type: none"> ■ Ongoing consultation with NSW NPWS and NSW RFS and the proponent to ensure that appropriate mitigation methods are in place, so that in the event of a bushfire in the area, pilots are aware of the turbine locations and can respond appropriately; ■ Liaise with the Civil Aviation Safety Authority (CASA) and the RAAF Aeronautical Information Service, which maintains a database of structures on behalf of CASA. ■ Monitoring masts are to be recorded in the Tall Structures Database maintained by Air Services Australia (Civil Aviation Safety Authority 2018). ■ Install visible markers (such as orange balls) on all masts to minimise risks during aerial firefighting operations. These will also be installed on transmission lines where they span long distances. ■ To facilitate the flight planning of aerial application operators, the location and height of WTGs and monitoring masts should be provided to landowners so that, when asked for hazard information on their property, the landowner may provide the aerial application pilot with all relevant information. ■ As recommended by Aviation Projects (2022), Tract/GPG should consider engaging directly with local aerial agricultural operators and aerial firefighting operators in developing procedures in the vicinity of the Project.

Risk Factor	Description of Risk	Analysis of the Risk	Potential to Mitigate/Reduce Impact
	Firefighter	<p>The firefighters likely to respond to a bushfire in this area would be volunteers from the NSW RFS and or individual property owners. Brigades from NSW Fire and Rescue and National Parks could also respond. The proposed upgrade of the internal road network would increase the level of access available to fire fighters.</p> <p>In the event that a fire does breach any containment lines and threatens the windfarm assets, it is likely that firefighting will require aerial support.</p> <p>The location of all fire control advantages within the Project Area (water points, gates, fire trails) currently mapped Abercrombie River National Park Fire Management Strategy (refer to Figure 6-1) will be reviewed and updated in consultation with the NSW RFS and NSW NPWS as part of the recommended Bushfire Emergency Management and Operations Plan.</p>	<ul style="list-style-type: none"> ■ 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. ■ Ensure adequate access to water for NSW RFS and firefighting crews and provide static water supplies. ■ Provide all weather access for heavy fire fighting vehicles. ■ A schedule for ongoing site familiarisation to account for changing personnel, site infrastructure and hazards should be also developed in conjunction with the NSW RFS and the NPWS
	Workers and Visitors	<p>All employees and visitors involved in the operation and maintenance of the wind farm will be routinely trained.</p> <p>Construction and maintenance staff will also be trained in the basic first response firefighting techniques and appropriate communication and firefighting equipment will be maintained onsite. Provided that appropriate firefighting equipment, training in initial response and water supplies are maintained onsite the likelihood of fire adversely impacting the safety of site personnel is very low although the potential consequences are recognised as being major.</p>	<ul style="list-style-type: none"> ■ Develop and strictly implement safe working and emergency response procedures for all work tasks. ■ Provide and maintain firefighting equipment capable of controlling and suppressing small initial outbreaks of fire. As a minimum, these will be located on the outside of the switching station, substation, and O&M buildings.
Damage to infrastructure within the Project Area	Extensive and widespread loss of infrastructure	<p>Wind turbine monitoring technology is utilised 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. Wind turbines are a relatively passive technology that use few flammable materials and together with the maintenance of an adequate</p>	<ul style="list-style-type: none"> ■ To account for the steep slopes, an increased APZ of 20 m will be established on all sides of the substation, switching station, and O&M Buildings. This will be increased where required to ensure that these key assets are located outside of the flame zone.

Risk Factor	Description of Risk	Analysis of the Risk	Potential to Mitigate/Reduce Impact
		<p>defendable space reduces the risk of damage to the turbines in the event of a bushfire within the surrounding lands.</p> <p>All transmission line poles will be either concrete or galvanised steel poles, and the maintenance of the transmission line easement including reduced fuel loads beneath transmission lines will be the responsibility of the asset owner.</p>	<ul style="list-style-type: none"> ■ A minimum 10 m APZ is to be established around each wind monitoring masts; ■ Each WTG will be mounted on a concrete foundation (approximately 25 m in diameter) located on a cleared hardstand area; ■ The maintenance of the transmission line easement including reduced fuel loads beneath transmission lines will be the responsibility of the asset owner.
Damage to surrounding properties	Extensive and widespread loss of infrastructure and or property	<p>As outlined by AFAC (2018) and considered during project design, appropriately planned access roads can increase the ability of fire and land management agencies to successfully undertake firefighting operations by allowing increased accessibility for emergency vehicles. Access roads and other infrastructure can also reduce the likelihood of fire moving through or leaving the property and can act as an effective firebreak in many circumstances.</p> <p>Site access points will be constructed as the first stage of development and the final design of access roads will need to be reviewed by the NSW RFS to ensure that they 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.</p> <p>Site access points will be maintained for the life of the project and include appropriate signs throughout the wind farm to assist emergency response crews determine track names, location and turbines etc.</p>	<ul style="list-style-type: none"> ■ Site access points will be constructed as the first stage of development and will be maintained for the life of the project. The project will include appropriate signs throughout the wind farm to assist emergency response crews determine track names, location and turbines etc ■ Provide and maintain fire-fighting equipment capable of controlling and suppressing small initial outbreaks of fire. As a minimum, these will be located on the outside of the switching station, substation, and O&M buildings; ■ Ensure adequate access to water for NSW RFS and fire-fighting crews and provide static water supplies; and ■ Provide all weather access for heavy fire fighting vehicles.
Damage to ecological values/assets	Threatened species and ecological communities	The wind farm is unlikely to increase the frequency of fires across the landscape and so will not increase the fire related impacts to threatened species and ecological values.	<ul style="list-style-type: none"> ■ Ensure that operators are aware of location of threatened flora records to assist in managing fire in these areas.

6. MITIGATION STRATEGIES

Consideration is given to whether the proposed wind farm will result in people congregating in large numbers. The operation of the proposed wind farm is considered to be a low intensity use in terms of the number of people on site at any one time, with only 4 full time staff onsite during the operational phase, plus another ~10 full time support staff on monthly / quarterly / semi-annual / annual rosters. However, there could be up to 150 people onsite during construction phase over a period of up to 22 months. Although the construction period does not pertain to the expected end use of the Project Area, the number of people who could be within the Project Area at one time does warrant consideration in terms of providing adequate defensible space and access/egress as the first stage of construction (prior to the installation of any wind turbine or related infrastructure).

Mitigation strategies are guided by the following factors that contribute to bushfire risk:

- fuels, weather, topography and predicted fire behaviour;
- suppression resources (air and ground), access (roads, tracks) and water supply; and
- values and assets.

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.

6.1 Asset Protection Zone

An Asset Protection Zone (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.

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 the perimeter of the wind farm and all built assets, but under strong winds or during a major fire event burning debris can result in a fire breaching an APZ and flame length could exceed 100 m in the event of a severe fire event running up the steep slopes and valleys surrounding the development. Radiant heat levels impacting these assets could be up to 100 kW/m².

Despite the limitations of any APZ:

- a minimum 10 m APZ is to be established around each monitoring masts in accordance with the requirements of Planning for Bushfire Protection 2019. A 10 m wide APZ is also consistent with the requirements of the Victorian CFA renewable energy guidelines (CFA 2018);
- each WTG will be mounted on a concrete foundation (approximately 25 m in diameter) located on a cleared hardstand area; and
- to account for the steep slopes, a minimum APZ of 20 m will be established on all sides of the substation, switching station, and O&M Buildings. This will be increased where required to ensure that these key assets are located outside of the flame zone and exceeds the 10m wide APZ identified within Planning for Bushfire Protection 2019.

The specifications recommended for the APZ are as follows:

- APZ will not extend beyond the property boundary or rely on actions being undertaken by adjacent landowners. This includes the neighbouring National Park estate;
- mineral earth fire break i.e. dirt or gravel;
- no trees and shrubs planted within the APZ; and
- where possible, increase the distance between the trees and the APZ.

It is also recommended that vegetation fuels throughout the wind farm are maintained in a minimal condition by grazing, or with additional slashing or mowing if required. This will minimise the radiant heat exposure to wind farm components and reduce the risk of a fire spreading beyond the wind farm. If grazing or slashing is not possible under the WTG other lower risk ground cover should be considered e.g. gravel or a non-curing ground cover and/or a very low above ground biomass.

6.2 Other Fire Advantage Zones

While the objective of APZs is the protection of human life and property, Strategic Fire Advantage Zones (SFAZ) and Heritage Management Zones (HMZ) have also been identified to the west and southeast of the Project site within the Abercrombie River National Park Fire Management Strategy.

Heritage Management Zones are defined as those areas where assets are not at threat by wildfire and therefore management can concentrate on the natural and cultural values of the zone. The purpose of Heritage Management Zones (HMZ) is to prevent / limit the damage of wildfire events on sensitive areas within and adjacent to the Park.

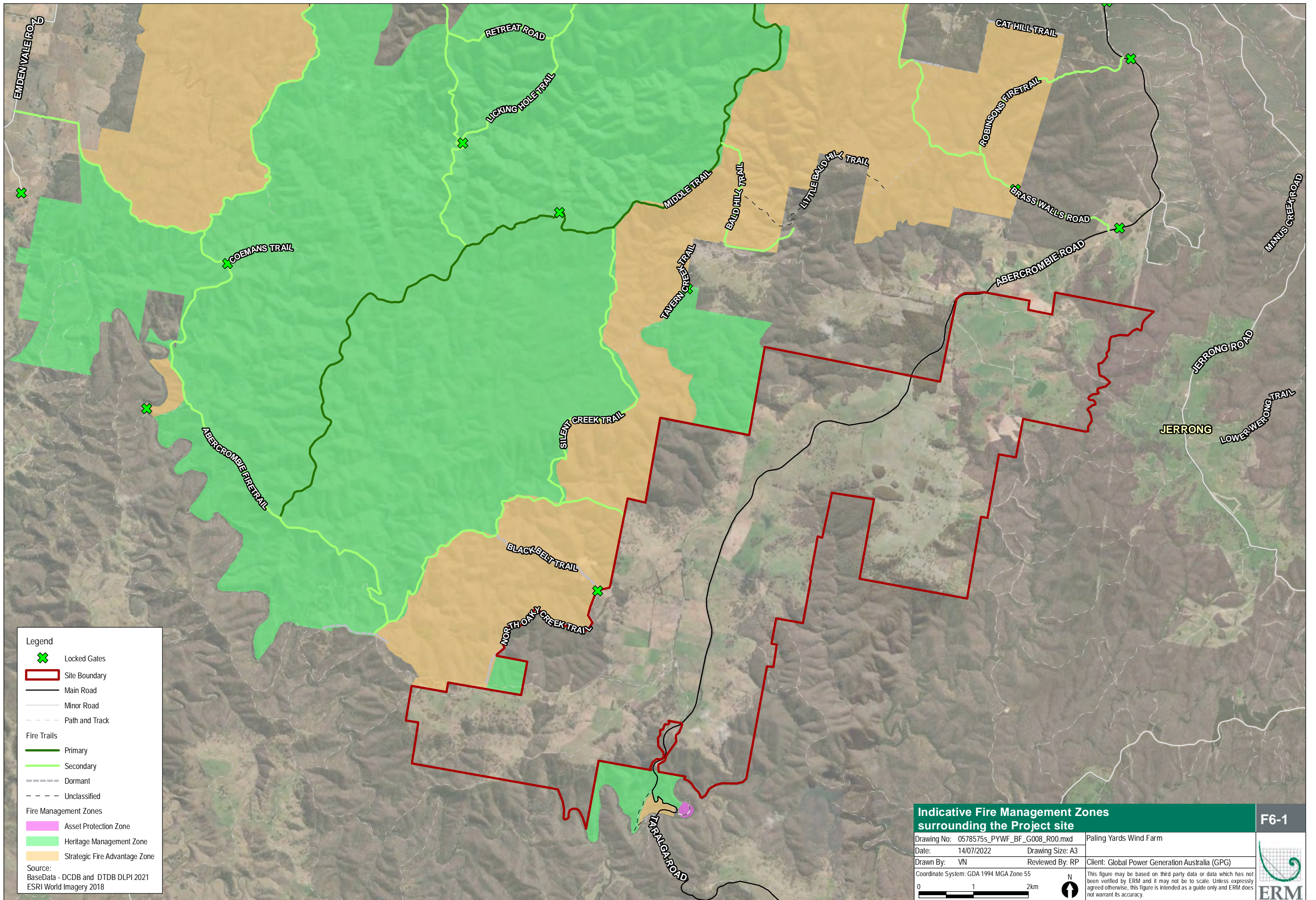
Strategic Fire Advantage Zones (SFAZ) assist in the containment of wildfire to provide safe access and egress to bushfire fighters and to assist with preventing wildfire leaving or entering the Park estate. These zones are typically located in an area which is effective in creating buffers in higher fuel areas to reduce the spread of fire into and from the Park and across whole landscapes.

The location of all fire control advantages within the Project Area including ongoing access to the fire trails currently mapped Abercrombie River National Park Fire Management Strategy (refer to Figure 6-1) will also be reviewed and updated in consultation with the NSW RFS and NSW NPWS as part of the recommended Bushfire Emergency Management and Operations Plan.

6.3 Wind Farm construction

As considered in Section 3.3, 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 previously. With this in mind, the following measures are recommended to be implemented during the entire period of construction:

- site access points will be constructed as the first stage of development and will be maintained for the life of the project;
- 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, location and turbines etc;
- 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;



Legend

- Locked Gates
- Site Boundary
- Main Road
- Minor Road
- Path and Track

Fire Trails

- Primary
- Secondary
- Dormant
- Unclassified

Fire Management Zones

- Asset Protection Zone
- Heritage Management Zone
- Strategic Fire Advantage Zone

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

Indicative Fire Management Zones surrounding the Project site		F6-1
Drawing No: 0578575s_PYWF_BF_G008_R00.mxd	Paling Yards Wind Farm	
Date: 14/07/2022	Drawing Size: A3	
Drawn By: VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)
Coordinate System: GDA 1994 MGA Zone 55		
<small>This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.</small>		

- 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 site.

6.4 Emergency Management and Operations Plan

An Emergency Management and Operations Plan should be prepared for the wind farm that provides the following:

- 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;
- protocols should be explicit about what party has the authority to direct turbine shut-down procedures;
- control and coordination arrangements for emergency response (eg evacuation procedures, emergency assembly areas and procedures for response to hazards);
- location of all fire control advantages within the Project Area (access road, gates, water points, helipads, staging area and refuge area);
- agreed roles and responsibilities of onsite personnel (eg equipment isolation, liaison, evacuation management);
- up-to-date contact details of site personnel and any relevant offsite personnel who could provide technical support during an emergency;
- 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;
- clearly states work health safety risks and procedures to be followed by firefighters, including personal protective clothing;
- minimum level of respiratory protection;
- minimum evacuation zone distances;
- activation of water spray/foam systems and any other response/protection measures; and
- any other risk control measures required to be followed by firefighters.

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

6.5 Access Roads and Road Network

Site access points will be constructed as the first stage of development and the final design of access roads will need to be reviewed by the NSW RFS to ensure that they 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 wind farm to assist emergency response crews determine track names, location of turbines 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 (refer to Appendix B).

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;
- curves have a minimum inner radius of six (6) metres. The minimum distance between inner and outer curves is six (6) metres;
- trail surfaces and crossing structures are capable of carrying 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 metres; and
- a turning area is provided at the termination of a trail and every 500 metres.

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.

6.6 Water Storage

Water supply should be designed to provide filling points for fire tanker units near the wind farm entrance and at the O&M Compounds. A minimum combined storage of 50,000 litres is recommended for the site, based on refilling an approximate of six tanker units (4,000 litres) twice each. **Noting that the final requirement will be confirmed by NSW RFS.**

It is important that the locations of any additional dams to be used as water supply points (if required or agreed by RFS) are carefully considered as they require a catchment area to ensure they remain full during the summer months yet they also need to be near the top of a hill rather than in a valley because it takes a lot of power to lift. Extremely hot conditions also exacerbate the lifting difficulty for aircraft. Helicopters also require an obstacle-free area on approach and departure from a water point.

6.7 Total Fire Bans

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). Under Section 63 of the Rural Fires Act 1997 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. The landowner should also reconsider activities such as using a tractor or slashing, to help reduce the chance of a fire.

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.

7. CONCLUSION

The Project site is surrounded by steep, vegetated, and in many cases, inaccessible areas within the Abercrombie National Park, Wiarborough Nature Reserve and the Blue Mountains National Park. These characteristics are conducive to high intensity fires and a high rate of spread and it is recognised that the proposed development is located within a bushfire prone landscape. It is also noted that despite the mitigation measures and treatments that are put in place, bushfire risk will always remain.

The improved access and additional recommended water sources will be an advantage to both the local RFS and the NPWS. In the event that a fire does breach any containment lines and threatens the windfarm assets, it is possible that the windfarm infrastructure will sustain direct flame contact and that firefighting will require aerial support.

Noting that WTG towers are made from non-combustible material, firefighting efforts would most likely be concentrated on defending those assets that could contribute to widespread fire. It is therefore important that key assets such as the switching station, substation, and O&M buildings are all located outside of the flame zone and have adequate defensible space all sides.

The detailed mitigation measures outlined in the bushfire risk assessment will be applied for the life of the project. All of the recommendations have been prepared in accordance with the requirements of Planning for Bushfire Protection 2019. To account for the steep slopes, an increased APZ of 20 m will be established on all sides of the substation, switching station, and O&M Buildings. This will be increased where required to ensure that these key assets are located outside of the flame zone and exceeds the 10m wide APZ identified within Planning for Bushfire Protection 2019.

It is also important to note that the APZ will not extend beyond the property boundary or rely on actions being undertaken by adjacent landowners. This includes the neighbouring National Park estate.

Noting the limitations of this Bushfire Risk Assessment which provides for asset protection consistent with NSW RFS Planning for Bushfire Protection 2019 only, the importance ongoing consultation with the NSW RFS and NPWS during detailed design and preparation of the Emergency Management and Operations Plan are once again highlighted for any development within this bushfire prone landscape.

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APPENDIX A KEY STAKEHOLDER REVIEW OF CONSULTATION DRAFT

APPENDIX B NSW RFS FIRE TRAIL STANDARDS



NSW RURAL FIRE SERVICE



NSW RFS FIRE TRAIL STANDARDS

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STATEMENT

NSW RFS FIRE TRAIL STANDARD 2016 V1.0, PRINTED 2016, 2018
 NSW RFS FIRE TRAIL STANDARD 2016, V1.1, PRINTED JUNE 2019.
 INCLUDES CORRECTION TO LAT/LONG FORMAT FROM 'DDM' TO 'DD' FORMAT.

1. Introduction

1.1 Background

Bush fires have been a natural part of the landscape for many thousands of years. As communities have developed and properties and towns have been established, the risk of bush fires impacting on communities has increased. Throughout NSW there are approximately 1.3 million properties on bush fire prone land.

Firefighters rely on public roads, trails and other tracks on public and private land to access the landscape to prevent and contain bush fires. Fire trails exist for the purpose of providing access to respond to bush fires, and it is critical to identify and maintain an effective network of accessible trails.

Historically, decisions regarding the establishment and maintenance of fire trails have rested with land managers guided by a cooperative framework established by the NSW Bush Fire Coordinating Committee (BFCC). A need for a different approach was identified to achieve a more consistent and strategic outcome across both public and private lands.

The NSW Government is establishing a more integrated and strategic network of fire trails and access arrangements to improve accessibility for firefighters during bush fires and hazard reduction burns.

Amendments to the *Rural Fires Act 1997*, through the *Rural Fires Amendment (Fire Trails) Act 2016*, provide a legislative basis for the establishment and maintenance of the enhanced network of fire trails.

The *Rural Fires Amendment (Fire Trails) Act 2016* provides for the NSW RFS Commissioner to make *Fire Trail Standards* that (without limitation) may set out:

- classification, length, width, gradient, signage, construction standards and maintenance of fire trails, and
- the structure and form of Fire Access and Fire Trail (FAFT) plans and Treatment Registers prepared by local Bush Fire Management Committees (BFMC).

1.2 Purpose

This document constitutes the *Fire Trail Standards* made by the NSW RFS Commissioner pursuant to section 62K of the *Rural Fires Act 1997*.

These Standards establish the requirements to achieve an integrated and strategic fire access and fire trail network. The Standards set out design and construction requirements for identified fire trails in NSW, and prescribe the structure of the FAFT plan and associated Treatment Registers to be prepared by BFMCs.

The Standards are to be used by organisations across NSW responsible for undertaking fire access and fire trail planning, and land managers responsible for the design, construction and maintenance of fire trails.

A suite of documents developed by the NSW RFS Commissioner and the NSW BFCC provide supplementary guidance and direction to land managers to assist in the design, construction and maintenance of fire trails on their land, and BFMCs involved in fire trail planning and the preparation of FAFT plans. These include:

- FAFT workshop presentation
- FAFT Plan Instructions
- Maps
- List of current fire trails
- Treatment Register (populated with BFMC fire trails)
- Trail ranking and prioritisation tool.

1.3. Aim

The aim of the Standards is to facilitate the planning and implementation of an integrated and strategic network of fire trails.

1.4 Objectives

The objectives of the Standards are:

- To provide a process to identify an integrated and strategic network of fire trails for the protection of the community and its assets, including environmental and social values;
- To establish a network of strategic fire trails which meet minimum standards and allow standard off- road capable firefighting vehicles to safely and effectively traverse the landscape;
- To ensure fire trails enable a vehicle to be driven safely along the trail without damage to the vehicle due to overhanging vegetation, built structures, rough trail surface or other physical impediments;
- To ensure fire trails are of an expected standard that is known and understood by firefighters, can be readily identified including in limited visibility conditions, and are available when required; and,
- To provide a sustainable fire trail network that meets operational requirements, minimises adverse impacts on the environment, and delivers value for money.

1.5 Assumptions

The Standards have been prepared on the basis of the following assumptions:

- The fire trail network will be used by suitably trained and competent firefighters capable of operating in the expected physical environment.
- Firefighting vehicles will meet NSW RFS standard specifications and be driven by licensed and competent drivers in accordance with local procedures.

1.6 Limitations

The Standards have been prepared with regard to the following limitations:

- Fire trails provided for in the Standards are for the purposes of bush fire suppression and other fire management purposes. While it is recognised that fire trails may also be used for other purposes (including other land management and commercial purposes, forming a part of fire breaks, fire containment lines and the like), such uses do not fall within the scope of these Standards.
- While fire trails will be built to a consistent acceptable standard in consideration of operational needs, the safety of firefighters cannot be guaranteed given variability in topography, weather and fire conditions.
- The design and construction standards specified in the Standards cater for standard off-road capable firefighting vehicles currently used in NSW.
- The implementation of a new standard is often challenging and subject to available funding and priorities. The NSW RFS Commissioner and the BFCC acknowledge that a cooperative and incremental approach in implementing this Standard will be required over several years, and the effectiveness of the Standard will be continually monitored to ensure it meets the intent of the legislation.

1.7 Definitions

Expressions defined in 62J of the *Rural Fires Act 1997* apply to the Standards. Definitions are per the NSW RFS Dictionary and apply to the Standards except where otherwise defined in section 62J of the Act. Key terms relevant to the Standards are included below for reference:

Designated fire trail	A fire trail identified by the NSW RFS Commissioner that must be upgraded or established to meet the Standards.
Certified fire trail	A fire trail that has been certified as compliant with the <i>Fire Trail Standards</i> .
Registered fire trail	A fire trail, regardless of tenure, that has been certified to meet these Standards and is placed on the Public Register.
Strategic fire trail	A fire trail on any tenure identified by a BFMC during the FAFT planning process, or by the NSW RFS Commissioner, to be of significant value in the suppression or management of fire within the landscape. These trails are placed on the Treatment Register approved by the NSW RFS Commissioner and subsequently designated. These may include multi- purpose trails.
Tactical fire trail	A fire trail on any tenure identified by a BFMC during the FAFT planning process, or by the NSW RFS Commissioner, that should remain open to support the prevention and suppression of fire. These may include multi- purpose trails.
Private land	means that is not public land (section 62J).
Public land	means managed land, unoccupied Crown Land, or land owned or occupied by a public authority. A public authority responsible for any particular land is taken to be occupier of the land for this Part (section 62J).

1.8 What is a fire trail for the purpose of these Standards?

There are a range of access ways across the landscape available for use by firefighters. These include public roads, tracks and trails or other roads used for land management, asset management or recreational purposes.

The purpose of these Standards is to define a network of fire trails for vehicular use identified through the processes established by the Act and deemed necessary for the protection of the community and its assets. These vehicular trails will be identified at a local level by the BFMC and recorded in a FAFT plan and the Treatment Register, or by the NSW RFS Commissioner. The NSW RFS Commissioner may provide guidance relating to the factors to be considered in this process.

While the Standards are principally concerned with fire trails designated and registered under provisions of the Act, it is recognised that other fire trails and access ways will continue to exist and serve an important role in bush fire suppression and fire management. These other fire trails will also be informed by the Standards. All fire trails and access ways will be identified as part of the overall fire access network captured in the FAFT planning process.

1.9 Performance-based approach

The Standards adopt a performance-based approach which allows for flexibility and innovation in the design of fire trails having regard to site-specific opportunities and constraints.

The performance criteria must be satisfied for registered fire trails, and should be achieved for other fire trails. Performance criteria are set out for each requirement and the outcome that needs to be achieved. Meeting the performance criteria is essential to maintain the safety and operational performance of firefighting resources. Compliance with the performance criteria can be achieved in one of two ways:

2. **Acceptable solution** – Acceptable solutions have been specified for each performance criteria and are ‘deemed to satisfy’. Materials, components, design factors, and construction methods may be included which, if used, will result in compliance with the performance criteria. It is expected that designated and registered fire trails on the whole will fall into this category; or,
3. **Performance solution** – A performance solution may be proposed where constraints mean compliance with the acceptable solution is not practicable, and it is demonstrated that it otherwise achieves the performance criteria.

The process of demonstrating compliance, including where a performance solution is proposed, is outlined in Chapter 3.

1.10 Environmental approvals

Fire trail works are required to be undertaken in accordance with applicable environmental and other regulatory requirements. A range of environment approval mechanisms exist for fire trails, these include:

- Bush Fire Hazard Reduction Certificate issued in accordance with the Bush Fire Environmental Assessment Code;
- Review of Environmental Factors (REF) under Part 5 of the *Environmental Planning and Assessment Act 1979*;
- Assessment in accordance with the Infrastructure State Environmental Planning Policy (ISEPP); or
- Any other relevant environmental approval methods.

The following applies to the Bush Fire Environmental Assessment Code.

The Bush Fire Environmental Assessment Code 2017* (the “Code”) provides a streamlined environmental assessment process for mechanical and burning methods for undertaking bush fire hazard reduction work, including fire trails.

For the purposes of clause 3.8 of the Code, the Code applies to the following works, provided the works are to bring the fire trail into closer compliance with an acceptable solution set out in, or performance solution approved in accordance with, the design and construction requirements set out in Chapter 2 and the work is in accordance with the *NSW RFS Fire Trail Design, Construction and Maintenance Manual* issued by the NSW RFS Commissioner:

- a designated fire trail;
- a registered fire trail;
- a fire trail that constitutes part of the fire trail network within a FAFT plan approved for the area;
- a fire trail shown on the BFMC’s fire trail layer and categorised as ‘essential’ or ‘important’ as at 1 August 2017 where there is no FAFT plan approved for the area; or
- an existing fire trail identified as a treatment in an approved Bush Fire Risk Management Plan where there is no FAFT plan approved for the area.

For the purposes of clause 3.9 of the Code, the Code applies to works for a vehicular control line, where those works are in accordance with an acceptable solution set out in, or performance solution approved in accordance with, the design and construction requirements set out in Chapter 2 and *NSW RFS Fire Trail Design, Construction and Maintenance Manual* issued by the NSW RFS Commissioner.

*Note: Once approved and Gazetted.

2. Fire Trail Standards

2.1 Classification of fire trails

The Standards provide for the classification of fire trails based on the type of firefighting vehicle required to access an area. Three categories are provided:

- **Category 1:** A fire trail that can be safely traversed by a Category 1 firefighting vehicle.
- **Category 7:** A fire trail that can be safely traversed by a Category 7 firefighting vehicle.
- **Category 9:** A fire trail that can be safely traversed by a Category 9 firefighting vehicle.

Specific requirements have been developed for each category of fire trail. The specifications are based on the engineering details contained in Appendix A.

The category of each fire trail will be identified in the FAFT plan as set out in Chapter 4 and as identified by the NSW RFS Commissioner in the designation and registration of the fire trail.

2.2 Design requirements

Intent of requirements: to provide a functional, strategic network of fire trails which permits access for firefighting vehicles used in NSW in order to support fire management and bush firefighting.

2.2.1 Category 1 Fire Trails

The following performance criteria and acceptable solutions are considered industry best practice and apply to Category 1 Fire Trails:

Table 1: Category 1 Fire Trail requirements

REQUIREMENT	PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS
Width	The width of the trail provides for safe, reliable and unobstructed passage by a Category 1 firefighting vehicle within acceptable operational limits.	<ul style="list-style-type: none"> ➤ The trafficable surface has a width of 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. ➤ Curves have a minimum inner radius of 6 metres. The minimum distance between inner and outer curves is 6 metres.
Capacity	The construction and formation of the trail is trafficable under all weather conditions (other than due to flood, storm surge or snowfall) for a Category 1 firefighting vehicle.	<ul style="list-style-type: none"> ➤ Trail surfaces and crossing structures are capable of carrying vehicles with a gross vehicle mass of 15 tonnes and an axle load of 9 tonnes.

REQUIREMENT	PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS
Grade and crossfall	<p>The vertical profile of the trail provides for traction and safe working angle within the physical operational capability of a Category 1 firefighting vehicle.</p> <p><i>Note: This includes design that does not impede the undercarriage of a vehicle.</i></p>	<ul style="list-style-type: none"> ➤ The maximum grade of a trail is not more than 15 degrees. ➤ The crossfall of the trail surface is not more than 6 degrees. ➤ Drainage structures, feature crossings, or other significant changes in the grade of the trail shall be in accordance with the <i>NSW RFS Fire Trail Design, Construction and Maintenance Manual</i>.
Clearance	<p>A cleared corridor is provided around the trail which permits the unobstructed passage of a Category 1 firefighting vehicle and for a working corridor either side of the vehicle to enable firefighters to exit from, and access equipment in, the vehicle.</p>	<ul style="list-style-type: none"> ➤ A minimum vertical clearance of 4 metres is provided above the surface of the trafficable surface clear of obstructions.
Passing	<p>The trail provides for two Category 1 firefighting vehicles to pass at appropriate intervals so as to avoid unacceptable delays in operations.</p>	<ul style="list-style-type: none"> ➤ Capacity for passing is provided every 250 metres comprising: <ul style="list-style-type: none"> ➤ A widened trafficable surface of at least 6 metres for a length of at least 20 metres; or ➤ A 6 metre wide and 8 metre long area clear of the trafficable surface with a minimum inner curve radius of 6 metres and minimum outer radius of 12 metres; or ➤ A turnaround as provided for in this table.
Turnarounds	<p>The trail provides for a turning manoeuvre for a Category 1 firefighting vehicle to return in the direction from which it came at appropriate intervals and at the termination of a trail.</p>	<ul style="list-style-type: none"> ➤ A turning area is provided at the termination of a trail and every 500 metres and is achieved by: <ul style="list-style-type: none"> ➤ An area clear of the trafficable surface 6 metres wide and 8 metres deep, with a minimum inner curve radius of 6 metres and outer minimum radius of 12 metres; or ➤ A turning circle of minimum 22 metre diameter. ➤ A T-junction with each terminating end of the junction being at least 10 metres in length from the intersection of the roads and the inner radius of that intersection being at least 6 metres ➤ A fire trail or road intersection.
Drainage	<p>The fire trail is drained effectively to manage rainfall runoff to prevent damage to the trafficable surface.</p>	<ul style="list-style-type: none"> ➤ Drainage of the trail is designed and constructed in accordance with the <i>NSW RFS Fire Trail Design, Construction and Maintenance Manual</i>.

2.2.2 Category 7 Fire Trails

The following performance criteria and acceptable solutions are considered industry best practice and apply to Category 7 Fire Trails:

Table 2: Category 7 Fire Trail requirements

REQUIREMENT	PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS
Width	The width of the trail provides for safe, reliable and unobstructed passage by a Category 7 firefighting vehicle within acceptable operational limits.	<ul style="list-style-type: none"> ➤ The trafficable surface has a width of 3.5 metres except for short constrictions to 3 metres for no more than 30 metres in length where an obstruction cannot be reasonably avoided or removed. ➤ Curves have a minimum inner radius of 5 metres. The minimum distance between inner and outer curves is 5 metres.
Capacity	The construction and formation of the trail is trafficable under all weather conditions (other than due to flood, storm surge or snowfall) for a Category 7 firefighting vehicle.	<ul style="list-style-type: none"> ➤ Trail surfaces and crossing structures are capable of carrying vehicles with a gross vehicle mass of 8 tonnes and an axle load of 6 tonnes.
Grade and crossfall	<p>The vertical profile of the trail provides for traction and safe working angle within the physical operational capability of a Category 7 firefighting vehicle.</p> <p><i>Note: This includes design that does not impede the undercarriage of a vehicle.</i></p>	<ul style="list-style-type: none"> ➤ The maximum grade of a trail is not more than 15 degrees. ➤ The crossfall of the carriageway is not more than 6 degrees. ➤ Drainage structures, feature crossings, or other significant changes in the grade of the trail shall be in accordance with the <i>NSW RFS Fire Trail Design, Construction and Maintenance Manual</i>.
Clearance	A cleared corridor is provided around the trail which permits the unobstructed passage of a Category 7 firefighting vehicle and for a working corridor either side of the vehicle to enable firefighters to exit from, and access equipment in, the vehicle.	<ul style="list-style-type: none"> ➤ A minimum vertical clearance of 3.5 metres is provided above the surface of the trafficable surface clear of obstructions.

REQUIREMENT	PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS
Passing	The trail provides for two Category 7 firefighting vehicles to pass at appropriate intervals so as to avoid unacceptable delays in operations.	<ul style="list-style-type: none"> ➤ Capacity for passing bays are provided every 250 metres comprising: <ul style="list-style-type: none"> ➤ A widened trafficable surface of at least 5.5 metres for a length of at least 15 metres; or, ➤ A 5.5 metre wide and 6 metre long area clear of the trafficable surface with a minimum inner curve radius of 5 metres and minimum outer radius of 10 metres.
Turnarounds	The trail provides for a turning manoeuvre for a Category 7 firefighting vehicle to return in the direction from which it came at appropriate intervals and at the termination of a trail.	<ul style="list-style-type: none"> ➤ A turning area is provided at the termination of a trail and every 500 metres and is achieved by: <ul style="list-style-type: none"> ➤ An area clear of the trafficable surface 5.5 metres wide and 6 metres deep, with a minimum inner curve radius of 5 metres and outer minimum radius of 10 metres; or ➤ Turning circle of minimum 17 metre diameter.
Drainage	The fire trail is drained effectively to manage rainfall runoff to prevent damage to the trafficable surface.	<ul style="list-style-type: none"> ➤ Drainage of the trail is designed and constructed in accordance with the <i>NSW RFS Fire Trail Design, Construction and Maintenance Manual</i>.

2.2.3 Category 9 Fire Trails

The following performance criteria and acceptable solutions requirements are considered industry best practice and apply to Category 9 Fire Trails:

Table 3: Category 9 Fire Trail requirements

REQUIREMENT	PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS
Width	The width of the trail provides for safe, reliable and unobstructed passage by a Category 9 firefighting vehicle within acceptable operational limits.	<ul style="list-style-type: none"> ➤ The trafficable surface has a width of 3 metres except for short constrictions to 2.5 metres for no more than 30 metres in length where an obstruction cannot be reasonably avoided or removed. ➤ Curves have a minimum inner radius of 5 metres. The minimum distance between inner and outer curves is 5 metres.
Capacity	The construction and formation of the trail is trafficable under all weather conditions (other than due to flood, storm surge or snowfall) for a Category 9 firefighting vehicle.	<ul style="list-style-type: none"> ➤ Trail surfaces and crossing structures are capable of carrying vehicles with a gross vehicle mass of 4 tonnes and an axle load of 2 tonnes.
Grade and crossfall	<p>The vertical profile of the trail provides for traction and safe working angle within the physical operational capability of a Category 9 firefighting vehicle.</p> <p><i>Note: This includes design that does not impede the undercarriage of a vehicle.</i></p>	<ul style="list-style-type: none"> ➤ The maximum grade of a trail is not more than 15 degrees. ➤ The crossfall of the trail surface is not more than 6 degrees. ➤ Drainage structures, feature crossings, or other significant changes in the grade of the trail shall be in accordance with the <i>NSW RFS Fire Trail Design, Construction and Maintenance Manual</i>.
Clearance	A cleared corridor is provided around the trail which permits the unobstructed passage of a Category 9 firefighting vehicle and for a working corridor either side of the vehicle to enable firefighters to exit from, and access equipment in, the vehicle.	<ul style="list-style-type: none"> ➤ A minimum vertical clearance of 3 metres is provided above the surface of the trafficable surface clear of obstructions.

REQUIREMENT	PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS
Passing	The trail provides for two Category 9 firefighting vehicles to pass at appropriate intervals so as to avoid unacceptable delays in operations.	<ul style="list-style-type: none"> ➤ Capacity for passing bays are provided every 250 metres comprising: <ul style="list-style-type: none"> ➤ A widened trafficable surface of at least 5 metres for a length of at least 15 metres; or, ➤ A 5.5 metre wide and 6 metre long area clear of the trafficable surface with a minimum inner curve radius of 5 metres and minimum outer radius of 10 metres.
Turnarounds	The trail provides for a turning manoeuvre for a Category 9 firefighting vehicle to return in the direction from which it came at appropriate intervals and at the termination of a trail.	<ul style="list-style-type: none"> ➤ A turning area is provided at the termination of a trail and every 500 metres and is achieved by: <ul style="list-style-type: none"> ➤ An area clear of the trafficable surface 5.5 metres wide and 6 metres deep, with a minimum inner curve radius of 5 metres and outer minimum radius of 10 metres; or ➤ Turning circle of minimum 16 metre diameter.
Drainage	The fire trail is drained effectively to manage rainfall runoff to prevent damage to the trafficable surface.	<ul style="list-style-type: none"> ➤ Drainage of the trail is designed and constructed in accordance with the <i>NSW RFS Fire Trail Design, Construction and Maintenance Manual</i>.

2.3 Construction and maintenance requirements

Fire trails shall be constructed and maintained in accordance the *NSW RFS Fire Trail Design, Construction and Maintenance Manual* issued by the NSW RFS Commissioner.

2.4 Access requirements

Access to fire trails shall not be obstructed to ensure that the fire trail is available for use by firefighting services. Where access to a fire trail is controlled through the installation of a gate or other control mechanism, this shall not unreasonably restrict access to firefighters. Access by firefighters and their representatives shall only be undertaken for the purposes of firefighting and associated activities.

Inappropriate / unauthorised access is not permitted without the knowledge of the land manager.

Any gate or control mechanism installed across a trail shall be operable by a single person without assistance or machinery, and provide a clear area for the passing of a vehicle at least the width of the trafficable surface specified in the relevant acceptable solution specified in Table 1, 2 or 3. This area for passing should be provided within 100 metres of the gate.

Where any securing arrangement to a gate or other control mechanism requires the use of the key for access, the land manager must provide firefighters with access such that firefighting efforts are not hampered or delayed, to the satisfaction of the NSW RFS Commissioner.

The NSW RFS Commissioner will work with major government land managers to identify suitable and efficient access control arrangements to facilitate access to the fire trail network across tenures.

It is acknowledged that fire trails may need to be closed periodically for maintenance and repair purposes. Any periods of closure should be minimised as far as reasonably practicable and local response agencies should be made aware of the closure, intended duration of closure and reopening.

2.5 Signage requirements

Standardised signs should be installed and maintained throughout the fire trail network so that fire trails are easily identified when required for firefighting activities and fire management, including in times of limited visibility. Signs will be required for all fire trails on public land, while signs to be installed on private land will be subject to agreement with the relevant private landowner.

The NSW RFS Commissioner will supply and install standard fire trail signs or approved indicative signage where appropriate for all registered fire trails. Signage will be installed in the first instance on trails where no current signage exists. Where existing signage exists that is clear and performs the required function, it will not require replacement until the sign is no longer functional, at which time it will be replaced by NSW RFS with a sign that meets this Standard.

To maintain consistency and ensure accuracy, the NSW RFS Commissioner will gather signage requirement details from each land manager through the BFMC prior to ordering signage.

2.5.1 Standard fire trail signs

A fire trail should be clearly signposted with standard signs at each entry point to the fire trail.

Fire trail signs will be a metal blade, Class 1 reflective yellow with black lettering, and include:

- NSW RFS* Logo
- Fire trail name (including 'F/T' as an abbreviation for 'fire trail');
- Latitude and longitude reference of the location of the sign in Degrees Decimal Minutes (DD) format, and;
- The vehicle carrying capacity (1, 7 or 9) in red within red circle as displayed in Appendix B.

Lettering is to be 70mm in height, and a blade is to be no longer than 1200mm. Should a fire trail name not fit on a single blade of this length, the following options are to be considered:

1. compress lettering spacing and retain 70mm height
2. reduce lettering size and print on two lines

Where a sign is to be mounted on a centre pole, blade length may be increased to 1800mm. Signs should consider the use of an anti-graffiti coating.

An illustration of a typical standard sign for a registered fire trail is at Appendix B.

In areas where permanent signage is unsuitable such as areas of high theft or vandalism, the NSW RFS Commissioner may consider the use of temporary signage such a v-frame signage, or other design suitable for use during an incident.

**except where the sign is paid and provided by the land manager. In these circumstances, the land manager may use their logo in place of the NSW RFS.*

2.5.2 Indicative fire trail signs

In circumstances where the use of a standard fire trail sign is not considered suitable, such as on or near private property, the NSW RFS Commissioner may issue and install indicative fire trail signs.

These signs will be a metal blade, Class 1 reflective yellow, and include only the trail Vehicle Carrying Capacity (i.e. 1, 7 or 9) as shown in Appendix B. These signs should consider the use of an anti-graffiti coating.

An illustration of a typical indicative sign for a registered fire trail is at Appendix B.

2.5.3 Installation of fire trail signs on non-registered fire trails

Should a BFMC or land manager wish to install fire trail signs on non-registered fire trails, the sign should use the design in Appendix B with the following alterations:

- all lettering is to be black, including the vehicle carrying capacity
- there must be no circle around the vehicle carrying capacity.

2.5.4 No through trails

All trails with only one entry and exit point (dead ends or to hand tool lines only) must be marked as a “No Through Road”. These signs to be Class 1 reflective white with black lettering 70mm in height, and are to be a single blade positioned directly under the fire trail sign.

2.5.5 Bridges

Bridges should be marked and identify load rating. These signs to be Class 1 reflective white with black lettering as per RMS standards, and are to be a single sign positioned appropriately in relation to the bridge.

2.5.6 Standard symbology and other advisory signs

In some circumstances there may be a requirement or benefit in displaying additional information on sign posts. This may include a six (6) figure grid reference.

Standard symbology, in accordance with AFAC Standards, for features considered relevant (such as Water Points, Escape Routes and Helipads) by a BFMC may be included on a Class 1 reflective white single blade. The symbology would be consistent with the colour of the standardised AFAC symbol. An example is provided in Appendix B.

Should the fire trail have any known restrictions, a separate blade shall be provided to identify the restriction. These will be a metal blade, Class 1 reflective white with black lettering.

2.5.7 Fire trail name

Fire trails shall be appropriately named in order to minimise confusion. BFMCs and land managers are required to name the fire trail prior to registration. If already known, use accepted names when formally naming a fire trail. Fire trails should not be referred to as ‘unnamed’, ‘no name’, or ‘unknown’.

Nominated names should be easy to pronounce, write and spell. Avoid duplication or the use of common names in existence elsewhere within the BFMC’s local area.

2.5.8 Other signs

Other signs may be required from time to time by the NSW RFS Commissioner. These may include guide posts for culverts, or signage required to indicate the location of turn-around points or helipads.

The NSW RFS will work with the other agencies to determine additional public safety information signage to be provided as part of, or in conjunction with, fire trail signs as required.

3. Assessment and compliance

Assessments will need to be undertaken at a number of points in this process to determine whether a fire trail complies with the design and construction requirements of the Standard. Assessments shall be focussed on whether the trail complies with the design and construction standards set out in Chapter 2. Where an assessment is undertaken for the purposes of submission to the NSW RFS Commissioner, the assessment will be required to be in the form specified by the NSW RFS Commissioner.

3.1 Performance solutions

Where a performance solution is proposed, the onus is on the land manager to demonstrate compliance with relevant provisions of the Standards.

Performance solutions must be assessed according to one or more of the assessment methods:

- Evidence to support that the use of a material, form of construction, or design meets the performance criteria;
- Verification methods such as a test, inspection, calculation or other method that determines whether a performance solution complies with the relevant performance criteria;
- Comparison with the acceptable solutions using expert judgement.

Performance solutions should be developed in consultation with the relevant stakeholders such as the NSW RFS, engineers, private land owners, and the BFMC before being forwarded to the NSW RFS Commissioner for approval.

3.2 Annual assessment

A public land manager shall provide to the NSW RFS Commissioner annually a statement as to the condition of each designated and registered fire trail on its land, and whether or not each of those trails meet the Standards. The statement must be made in the form as specified by the NSW RFS Commissioner.

Where a fire trail is located on private land, assessment arrangements will be determined and set out in the agreement entered into between the NSW RFS Commissioner and the landowner.

The NSW RFS may undertake inspections of fire trails on both public and private land additional to the annual assessment requirement.

An annual assessment of all other fire trails in a FAFT plan should be undertaken by the responsible agency and provided to the BFMC.

4. Planning

4.1 Fire Access and Fire Trail plan requirements

In order to provide a consistent approach to fire trail planning across NSW, the Act requires BFMCs to prepare a draft FAFT plan for their area. This must be prepared in accordance with requirements set out in these Standards and reviewed and approved by the BFCC.

The FAFT plan will supplement existing fire planning activities undertaken at the local level, such as bush fire risk management planning, and identify the appropriate means of accessing land to prevent, fight, manage or contain bush fires. The process will consider a wide range of factors that will review the adequacy of the access system for firefighting to provide access for the protection of life and property in an area.

A FAFT plan shall:

- Be prepared in accordance with instructions and be in a form specified by the NSW RFS Commissioner;
- Include all trails that form the fire trail network as envisaged in the Standards, along with other access ways; and
- Be prepared with a planning horizon of 5 years.

A FAFT plan shall comprise:

- A map showing:
 - A base layer containing all existing vehicular tracks, trails and roads;
 - The identified fire trail network comprising:
 - All strategic fire trails;
 - All tactical fire trails; and
 - Other fire access ways, such as existing roads, tracks and trails that may be of use for fire management, but do not form part of the fire trail network.
- A schedule of the identified fire trails that constitute the fire trail network detailing:
 - Name
 - Identifier
 - Category (strategic or tactical)
 - Status (registered, designated etc.)
 - Vehicle Carrying Capacity (VCC)
 - Proposed fire trails
 - Current fire trail condition
 - Responsible agency; and
 - Other matters as determined by the NSW RFS Commissioner.

4.2 Fire trail treatment register

A treatment register form should be used to set out a schedule of works for the construction and maintenance of fire trails that constitute the fire trail network.

A treatment register shall be prepared and submitted to the NSW RFS Commissioner for approval:

- Concurrently with the submission of a draft FAFT plan; and
- By 31 May each year.

A treatment register shall:

- Be prepared in accordance with the BFMC instructions and be in a format specified by the NSW RFS Commissioner; and
- Detail planned fire trail works for the nominal five year planning horizon of the FAFT plan to improve the network over time.



5. Document review

The *Fire Trail Standards* may be reviewed and amended by the NSW RFS Commissioner as required. A review must be undertaken before 30 June 2019.

Appendix A

Firefighting vehicle specifications

Category 1 Firefighting vehicle specifications

Length	8200 mm
Width	2400 mm
Mirror length	450mm
Height	3700 mm (including 600 mm for aerials)
Ground clearance	310 mm
Approach angle	35°
Departure angle	25°
Wheelbase	4700 mm
Turning circle - wall to wall	22m diameter
Weight	14200kg
Maximum axle loading	9,000kg



Category 7 Firefighting vehicle specifications

Length	6200mm
Width	2040mm
Mirror length	450mm
Height	3050mm (including 600 mm for aerials)
Ground clearance	230mm
Approach angle	35°
Departure angle	30°
Wheelbase	3395mm
Turning circle - wall to wall	17m diameter
Weight	7500kg
Maximum axle loading	5600kg



Category 9 Firefighting vehicle specifications

Length	5300mm
Width	1750mm
Mirror length	450mm
Height	2600 mm (including 600 mm for aerials)
Ground clearance	220mm
Approach angle	35°
Departure angle	30°
Wheelbase	3180mm
Turning circle - wall to wall	16m diameter
Weight	3700 kg
Maximum axle loading	2000kg

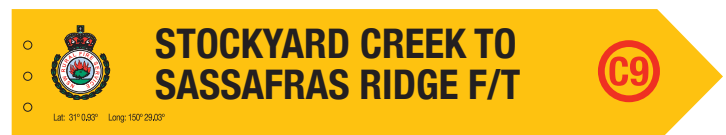


Appendix B

“Certified” Fire Trail Signage

PRIMARY FIRE TRAIL DIRECTIONAL SIGN SINGLE END-MOUNTED POST

- 200mm wide blade with Chevron
- Class 1 yellow reflective with black lettering
- Red circle and vehicle carrying capacity. Circle to be 125mm in diameter
- 70mm Lettering
- Where two lines are required, lettering height may be 60mm
- Max length 900mm
- Lat/ Long (DD format) lettering size to suit -single line
- Logo to be 115mm high



BI-DIRECTIONAL SIGN CENTRE-MOUNTED POST

- 200mm wide blade with chevron at each end
- Class 1 yellow reflective with black lettering
- Red circle and vehicle carrying capacity. Red circle to be 125mm in diameter at either end
- 70mm Lettering
- Where two lines are required, lettering height may be 60mm
- Max length 1200mm
- Lat/ Long (DD format) lettering size to suit -single line



INDICATIVE FIRE TRAIL SIGN FOR USE ON OR NEAR PRIVATE PROPERTY

- 200mm wide blade with chevron
- Class 1 yellow reflective with black lettering
- Red circle and vehicle carrying capacity. Red circle to be 125mm in diameter



“Advisory” Fire Trail Signage

AFAC SYMBOLOGY AND OTHER ADVISORY SIGNS

Attached under yellow blade

- 200mm wide blade with Chevron
- Attached under yellow blade
- 200mm blade with square end
- 70mm Lettering
- Reflective white background
- Black lettering
- AFAC symbology to be 125mm high
- Only AFAC Standard Bush Fire Symbology is to be used



AFAC BUSH FIRE SYMBOLOGY



Helipad



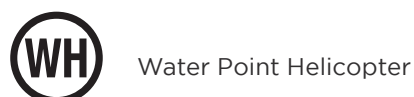
Refuge



Water Point



Staging Area



Water Point Helicopter



Escape Route

“Tactical” Fire Trail Signage

PRIMARY FIRE TRAIL DIRECTIONAL SIGN SINGLE END-MOUNTED POST

- 200mm wide blade with Chevron
- Class 1 yellow reflective with black lettering
- Cat number lettering to be 90mm
- 70mm Lettering
- Where two lines are required, lettering height may be 60mm
- Max length 900mm
- Lat/ Long (DD format) lettering size to suit on single line
- Logo to be 115mm high



BI-DIRECTIONAL SIGN CENTRE MOUNTED POST

- 200mm wide blade with chevron at each end
- Class 1 yellow reflective with black lettering
- Red circle and vehicle carrying capacity. Red circle to be 125mm in diameter at either end
- 70mm Lettering
- Where two lines are required, lettering height may be 60mm
- Max length 1200mm
- Lat/ Long (DD format) lettering size to suit on single line



NSW RURAL FIRE SERVICE

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