

Southern Bushfire Solutions

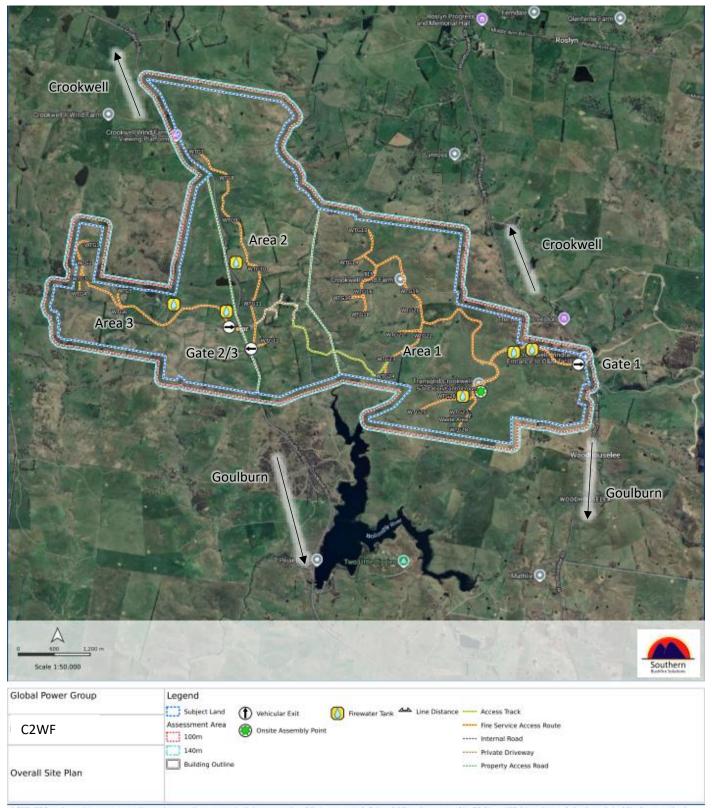
0402604000 | info@southernbushfiresolutions.com.au | www.southernbushfiresolutions.com.au



Crookwell 2 Wind Farm

Woodhouselee Rd Crookwell NSW





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Emergency Contacts

In case of emergency dial 000 Contact Address Phone GPG - 24hr General enquiries Site Supervisor -Kelly Wallace 0436319201 **Graham Young** 0419 605 728 02 4832 0268 40 McIntosh Road, Crookwell 2583 NSW RFS Crookwell Fire Control Centre 02 4822 2900 82-88 Combermere Street, Goulburn 2580 Goulburn Fire Control Center **TransGrid System Operations** 02 88180621 0457 707 698 GE Manager: Jason Maclaughlin Property managers: **Brett Hart** 0459 516 736 Carina Doran 0438 447 303 Vern Robinson 0432 544 845 Wildlife rescue: 02 4822 3888

WIRES

Bushfire Action Statements

The bushfire management plan is supplementary to the overall emergency plan for the facility and utilises the same communication plan, evacuation and shelter in place procedures. Bushfire specific actions are recommended where appropriate.

Bushfire Action Statements The Bushfire Management Plan is to undergo a minor review annually to maintain accuracy and all permanent staff familiarized with emergency procedures. A full review of the Bushfire Management plan is to be undertaken every 5 years or as required. Annual check of Asset Protection Zones should be conducted prior to the start of the bushfire season, and Annually Prior to start of the bushfire season any slashing or maintenance work is to be undertaken prior to the grass curing greater than 50%. Care is the be taken to avoid the risk of ignition during any vegetation management. 3. A >20,000L static water supply be provided in a metal or concrete tank at the control room/substation. This tank should have an outlet fitted with a 65m m storz coupling, with hardstand for a fire appliance within 4m. All associated valves and pipework should be metal. All contractors and remote workers are to be briefed of the overall emergency and Bushfire Management Plan as part of site induction to ensure they are familiar with evacuation and shelter in place procedures. The site manager is to maintain accountability and be aware of the number and location of all staff and contractors on the site. A communication plan is to be developed as part of the overall emergency plan to ensure reliable communication is provided for remote workers at the turbine sites. This communication system is to be checked regularly. 7. Hot works procedures are to be adhered to at all times, with consideration given to the potential for ignition of surrounding vegetation. 8. Adequate first aid firefighting equipment (such as water extinguisher, knapsack or similar) is to be on hand for immediate use during all hot works. All first aid fire fighting equipment is to be routinely inspected, maintained and operated as per manufacturers specifications. The operations manager is to monitor the Daily Fire Danger Rating with afternoon weather forecast and bushfire season During the notify all staff when elevated fire danger weather is predicted. The Fire Danger Rating for the following day should be posted in the control room each afternoon. The operations manager is to monitor NSW "Hazards near me" with a watch zone set up with a 50km radius of the site to receive notification of an incident in the area and be familiar with the bushfire advice ratings. All non-essential hot works are to cease during elevated fire conditions to avoid ignition. Crookwell Fire On days of elevated Control Center are to be notified prior to undertaking any works that have the potential to ignite the fire danger surrounding vegetation. Reduce non-essential activity during elevated fire conditions to avoid placing workers in high-risk and remote locations. If a fire occurs in the area, the operations manager is to actively monitor the situation and take appropriate When a fire actions are required. Remote workers should be notified to relocate to a safer place as early as possible, and evacuation of all staff as appropriate to the nature and location of the fire. If an ignition occurs within the site, call 000 immediately and take appropriate action as per the site Emergency Response Plan to evacuate or shelter in place as appropriate to the nature and location of the fire.

Transition to Recovery after the fire

- 1. Contact Crookwell Fire Control Centre to ensure the environment is safe to return to the site.
- 2. Contact all impacted staff for a welfare check, with peer support and counselling to be made available.
- 3. Undertake full electrical inspection to confirm integrity of any fire impacted infrastructure prior to reinstating the power generating system.
- 4. Contact property managers to coordinate any outstanding animal welfare and fencing issues, any injured livestock reported to property management. Issues with native wildlife may be reported to local wildlife rescue service.
- 5. Post incident debriefing to be undertaken as soon as practical and review of the bushfire management plan to implement changes as necessary.
- 6. Post incident counselling and peer support offered to any affected staff.

Amendment Schedule

Version	Date	Reason for issue	Draft
1	Wednesday 10 January 2025	Initial production	1
1	Tuesday 11 March	Completed internal consultation	2
1	Wednesday 19 March 2025	Completed external consultation	3
Prepared by	Neil Willis (BPAD31129)	Signature	·

Limitations and Disclaimer

This bushfire assessment report is primarily concerned with assessing the capacity of the proposed development to meet the minimum legislated requirements. Where necessary, bushfire protection measures will be recommended.

The measures prescribed cannot guarantee that the development will survive a bushfire event on every occasion. This is primarily due to the degree of vegetation management, the unpredictable behaviour of fire, extreme weather conditions and the actions of occupants and firefighters. In extreme conditions buildings may be considered un-defendable. Early evacuation is recommended as the safest course of action for life safety. A comprehensive bushfire survival plan is recommended for all occupants on bushfire prone lands.

Southern Bushfire Solutions has prepared this report with all reasonable diligence on behalf of the proponent. The information contained in this report has been gathered from field investigations of the site, plans provided and consultation with the client.

No assessment has been made on other aspects of the proposal outside the scope of this report.

Assessing Officer:



SBS ASSESSMENT REFERENCE: 2025046

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Supporting Information and Recommendations

1. Introduction

1.1Background and Brief

The Environmental Planning and Assessment Act (1979) requires the Commissioner of the NSW Rural Fire Service (RFS) in conjunction with local councils, to identify and map bushfire prone land (BFPL) for development purposes. BFPL maps are to be maintained and made publicly available by local councils. This map is a trigger for development proposals to meet a range of planning and construction requirements for bushfire protection.

Development consent cannot be granted unless the consent authority is satisfied that the development conforms to the specifications and requirements of NSW RFS document *Planning for Bushfire Protection (2019) (PBP)*. If the development does not meet the relevant requirements, consent may still be granted after consultation with NSW RFS concerning measures to be taken to protect life, property and environment from the effects of bushfire.

A detailed Bushfire Assessment was not required for this facility in the development application and construction phase. Global Power Generation have identified the risk of bush and grassfire at the site during development of the emergency plan and have commissioned a bushfire management plan supplementary to the overall emergency plan for the facility to be in line with the work health and safety obligations. This bushfire management plan is consistent with the overall emergency response plan for the facility, utilising the same communication methods, evacuation and shelter in place procedures.

This report is intended to be supplementary to the overall Emergency Plan for the facility and protection measures are recommended consistent with the Aims and Objectives of NSW Planning for Bushfire Protection (2019)

1.2 Aims and Objectives of this Bushfire Assessment

The aim of this assessment is to determine the ability of the proposal to achieve an appropriate level of bushfire protection to satisfy the aims and objectives of PBP (2019):

- afford buildings and their occupants protection from exposure to a bush fire;
- provide for a defendable space to be located around buildings;
- provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings;
- ensure that appropriate operational access and egress for emergency service personnel and occupants 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.

The specific objectives and performance criteria for Wind and Solar Farms are set out in section 8.3.5 of PBP (2019). Recommendations are made where appropriate for compliance and to ensure adequate bushfire protection measures for the development.

1.3 Bushfire Assessment Methodology

This bushfire assessment follows the methodology summarised in the following table:

Bushfire Assessment Methodology

Methodology	Task	Considerations
Desktop analysis to ascertain scope and requirements of the development.	Collate and review available mapping resources, relevant policy documents and development plans.	 NSW SIX Mapping, Google maps. Development plans provided by client. NSW Planning for Bushfire Protection (2019) AS3959-Construction of Buildings in Bushfire Prone Areas (2009)
Site inspection and consultation with the proponent	View the site and bushfire hazard; classify dominant vegetation and measure slope and distances. Detailed discussion with the proponent to establish objectives and limitations of the proposal.	The site inspection enables verification of mapping data and classification of the surrounding vegetation, slope, Asset Protection Zones and environmental constraints. Photographing relevant features for presentation.
Detailed assessment	Perform assessment of the development proposal against performance requirements of PBP and AS3959.	Assess the ability of the proposal to meet the intent and performance criteria of the relevant sections of PBP and make recommendations to address identified shortfalls.
Report	Preparation of Bushfire Management Plan.	Produce necessary documentation to demonstrate the proposal's ability to achieve the aims and objectives of PBP to accompany the development application.

Identification of Stakeholders

Company	Position	Name	Contact
Global Power Generation	Control Room Operator	APREC	PH: 0409 346 935
Global Power Generation	Regional Manager	Luke Hatherell	PH: 0417 960 747
Global Power Generation- Crookwell Wind Farm	Site Manager	Kelley Wallace	E: kelley.wallace@globalpower-generation.com.au PH: 0436 319 201
Global Power Generation- Crookwell Wind Farm	Site Supervisor	Grahame Young	E: graham.young@globalpower-generation.com.au PH: 0419 605 728
Global Power Generation	Head of operations	Gema Dues Vazquez	E: gdeus@globalpower-generation.com PH: 0498 388 547
Global Power Generation	Health and Safety, Environment, Quality and Compliance Manager	Kirsty Levings	E: kirsty.levings@globalpower-generation.com.au PH: 0458 166 084
NSW Rural Fire Service – Upper Lachlan Shire Fire Control Center	Southern Tablelands Office		PH: 02 4832 0268 40 McIntosh Road, Crookwell 2583
Southern Bushfire Solutions	BPAD Consultant	Neil Willis	PH: 0402 604 000 E: info@southernbushfiresolutions.com.au
TransGrid	Systems Operations	Operator	PH: 02 88180621
GE	Manager	Eli Donati	PH: 0447 493 652
Landowner	Farm Manager	Brett Hart	PH: 0459 516 736
Landowner	Farm Manager	Carina Doran	PH: 0438 447 303
Landowner	Farm Manager	Vern Robinson	PH: 0432 544 845

2. Scope of the Development

2.1 Site Location and Description.

The Crookwell 2 Wind Farm is located about 30 kilometers northwest of Goulburn, along Woodhouselee Road. Commissioned in December 2018, the facility operates on privately owned agricultural land used for cattle and sheep grazing, demonstrating a dual-purpose approach that combines renewable energy infrastructure with traditional farming.

Access to the wind farm is provided through Gate 1 on Woodhouselee Road and Gates 2 and 3 on Goulburn-Crookwell Road. These access points are essential for daily operations, maintenance, and emergency response. The gated entries are designed to accommodate large maintenance vehicles and firefighting equipment, with all-weather surfaces ensuring reliable, year-round access.

Given its location in a rural grazing area, the wind farm has been constructed with a high level of bushfire management measures. These include maintaining low vegetation to reduce fuel loads, ensuring clear access routes for firefighting crews, and conducting regular inspections of access roads and wind turbine bases to mitigate fire risks and protect personnel and equipment.

Coordination with local fire authorities is a key part of bushfire preparedness. A Bushfire Management Plan is developed and reviewed annually to align with regional fire response protocols. This plan identifies safe zones, water supply access points, and communication procedures, ensuring rapid and effective responses during periods of heightened fire danger or bushfire incidents.

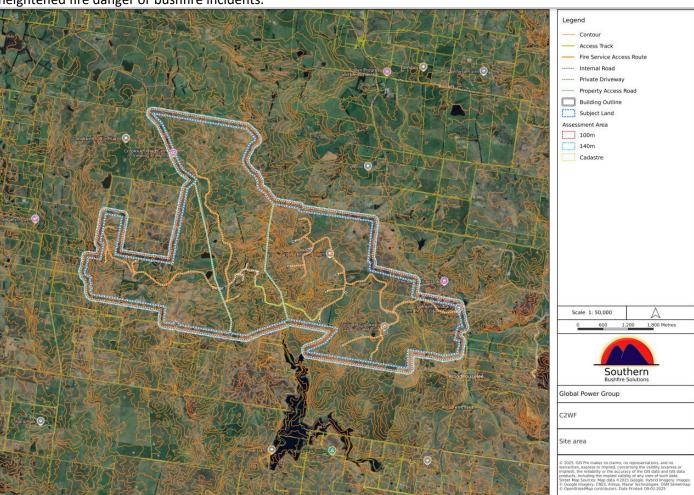


Figure 1: General location of proposed development

The area is zoned RU2- Primary Production and C3 — Environmental Management. RU2 zoning encourages agriculture and other supporting uses in rural areas with large lots and less productive soil. The zone is applied to land that is suitable for grazing, extensive agriculture, and intensive plant agriculture, but where the permitted uses are usually more limited due to landscape constraints. C3 zoning, also known as the Environmental Management zone or Conservation zone, is a land use zone that protects areas with special environmental values. It also allows for a limited range of development that is consistent these values.

The main activity in the area is primary production, with cattle and sheep grazing, and some cropping. The area is dominated by open pastures and generally considered grassland vegetation for bushfire behaviour. Built assets are minimal and typically provided with individual asset protection zones. Fencing and livestock assets are generally spread across the landscape.

There are isolated patches of heavy vegetation in and around the site that are is mapped as category 1 vegetation in the bushfire prone land map. This is considered to be the highest risk for bush fire. It is represented as red on the bush fire prone land map. This vegetation category has the highest combustibility and likelihood of forming fully developed fires including heavy ember production. Category 1 vegetation consists of forest, woodlands, heaths (tall and short), forested wetlands and timber plantations. (NSW Rural Fire Service, 2015)

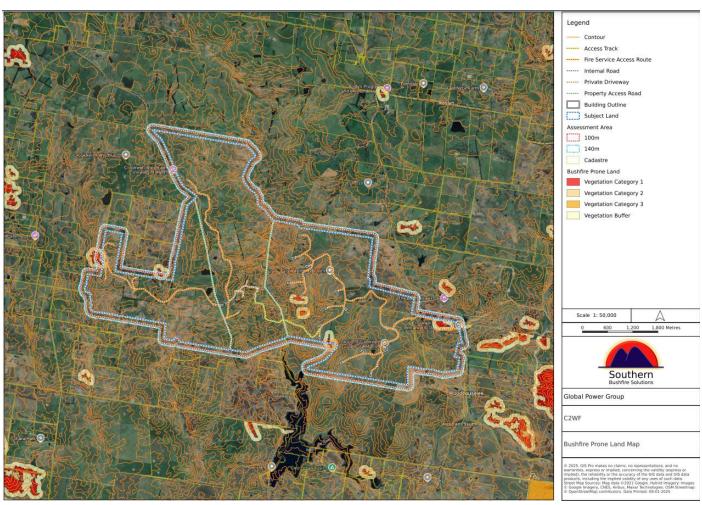


Figure 2: Bushfire Prone Land Map

2.2 Characteristics and Description of the Facility

Crookwell 2 Wind Farm Overview

The Crookwell 2 Wind Farm comprises the following key components:

- 1. An electrical substation and switchyard, which connects the wind farm to TransGrid's 330kV electrical transmission system, along with a site control room and facility building.
- 2. Twenty-eight (28) 3.4 MW turbines situated on compacted gravel hardstands, with underground cabling linking the turbines to the substation.
- 3. Internal gravel access roads providing two-way, all-weather access to each turbine. These roads are designed to support heavy vehicles exceeding 23 tonnes.
- 4. Twenty-two (22) designated planting areas, located both on-site and along Goulburn-Crookwell Road.
- 5. A network of site tracks and underground electrical and communications cables connecting the turbines, the substation, and other infrastructure.

The facility operates as a manned electricity generator capable of providing up to 91 MW of renewable energy at full capacity to TransGrid's 330kV network.

Operational Activities

During the wind farm's operation, the following activities are expected:

- 1. Generating electricity.
- 2. Switching turbines on or off based on wind resource availability.
- 3. Maintaining turbines, including nacelles, blades, and towers.
- 4. Maintaining the substation, part of which is owned and managed separately by TransGrid.
- 5. Servicing other electrical infrastructure, such as underground cables.
- 6. Maintaining access roads and other civil infrastructure.

Ownership and Operations

The wind farm is owned by Crookwell Development Pty Ltd. General Electric (GE) is contracted to operate and maintain the turbines and associated control systems. GE, which supplied and installed the turbines, manages operations in accordance with its own technical standards and guidelines.

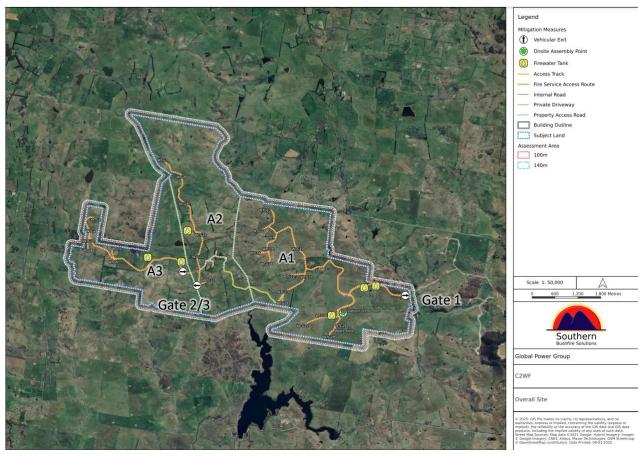


Figure 3: Overall Site plan

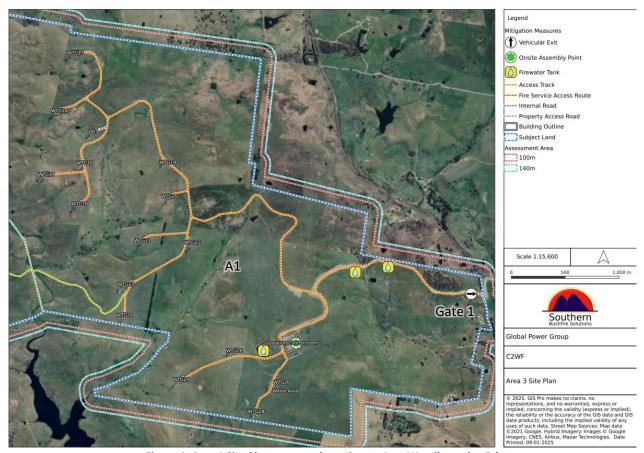


Figure 4: Area 1 Site Plan – access through gate 1 on Woodhouselee Rd

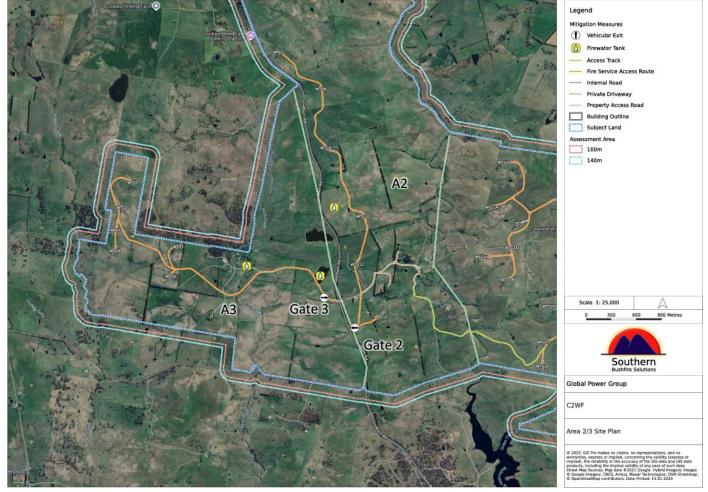


Figure 5: Area 2/3 Site Plan – Access through gate 2 and 3 via Crookwell Rd

3. Bushfire Hazard Assessment

3.1 Context

Online data reveals that the area is predominantly cleared of heavy vegetation. The landscape is dominated by grazed pastures and open grasslands with limited canopy coverage. Land use and zoning is C3 and RU2 with local development limited to the farm residences and associated structures. Wind turbines are a dominant feature in the area.

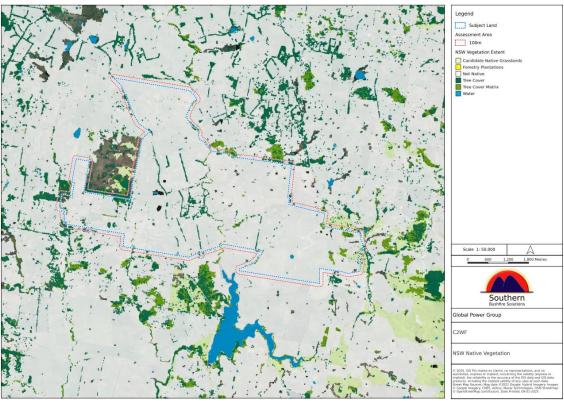


Figure 6: NSW State Vegetation Type mapping



Figure 7: Photo typical of the general landscape in the facility

3.2 Vegetation Classification

Under the *Planning for Bush Fire Protection (PBP) 2019*, the vegetation within 140 meters of the proposed development site must be identified. Using a combination of online datasets and on-site inspections, the surrounding vegetation has been classified as "Grassland," based on the classification system in *Ocean Shores to Desert Dunes* (Keith, 2004).

Grassland is defined by the NSW Rural Fire Service (2019) as:

"Vegetation dominated by perennial grasses with the presence of broad-leaved herbs on flat topography, and a lack of woody plants."

For fire modelling purposes, Grassland assumes an overall fuel load of 6 tonnes per hectare, as outlined in Table A1.12.8 of PBP.

Grassfire Characteristics

Grassfires are fast-moving and can travel up to 25 kilometres per hour in open grasslands. While they are less intense than forest fires and produce fewer embers, they generate significant radiant heat that can threaten building integrity.

The risk of grassfires is heightened in areas with dried grass over 10 centimetres high. These fires are often seasonal:

- Low intensity: Grassfires burn at lower intensity when grass curing (drying) is below 30%.
- Increased risk: Fire intensity rises as seasonal curing exceeds 50%, making grassland fuels problematic.

Appropriate mitigation measures must be taken in areas with high levels of grass curing to manage the increased fire risk effectively.



Figure 8: Typical grassland vegetation in the area with potential for ~6t/ha fuel loads

3.3 Slope Influencing Bushfire Behaviour

The "effective slope" for the bushfire assessment is the slope under the vegetation that directly influences bushfire behavior. PBP (2019) requires the effective slope to be determined under the dominant vegetation type for a distance of 100m.

The effective slope for fire impact is considered for head fire impact within 45° of perpendicular to the site and is determined as set out in Figure A1.4 in Planning for Bushfire Protection (2019).

While grassfires are heavily affected by windspeed, the slope of the land under the fire is also a critical factor for fire intensity. Grass and bushfires will generally double the rate of spread for every 10 degrees of upslope travel, however when considering fire spread across the landscape, flat ground calculations are generally used as the upslopes are balanced by the downslopes.

The site is located in generally hilly terrain with the turbines positioned along ridgetops to optimize the power generation, resulting in fire travel generally upslope towards the turbines.

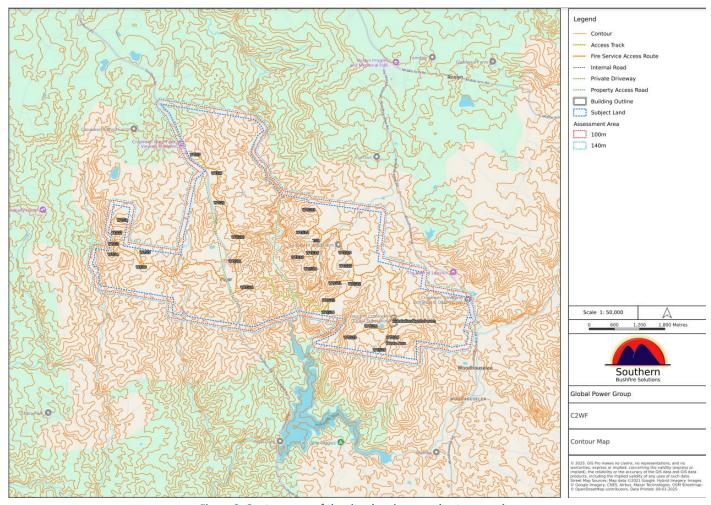


Figure 9: Contour map of the site showing complex topography

3.4 Local Fire and Weather Conditions

The fire season for the Southern Ranges fire district is typically from November through to March, with hot summer temperatures above 30 degrees and low relative humidity. The wind can be strong and gusty, typically coming from the West to North-West and the potential for rapid easterly changes late in the day.

At landscape level, bushfires typically come from the West to North-West due to the dominant wind direction. However, localised influences such as complex topography causing lee slope eddies, channeling and weather phenomena such as summertime easterly surges, and anabatic wind can dramatically alter the fire behaviour and result in bushfire travelling in any direction.

These weather patterns coupled with the potential for dry lightning storms and incidental ignitions from surrounding properties are a significant factor in the overall fire risk for the area.

For bushfire assessment purposes, the Upper Lachlan Shire Council LGA uses a Fire Danger Index (FDI) of 100 (Catastrophic Fire Danger Rating) for bushfire modelling, as specified by the NSW RFS. This index corresponds to weather conditions with a 1:50 year annual exceedance probability (2% chance of occurrence every year), reflecting the design fire conditions required by the National Construction Code.

Fire Danger Ratings provide a daily indication of the consequences of a fire, if one was to start. The higher the fire danger rating, the more dangerous the conditions. Fire Danger Ratings may be used as a trigger for action in a bush fire management plan, such as leaving bush fire risk areas on days of Extreme or Catastrophic fire danger.

FIRE DANGER RATING	WHAT YOU SHOULD DO
CATASTROPHIC	For your survival, leave bush fire risk areas. These are the most dangerous conditions for a fire. Your life may depend on the decisions you make, even before there is a fire. Stay safe by going to a safer location early in the morning or the night before. Homes cannot withstand fires in these conditions. You may not be able to leave and help may not be available.
EXTREME	 Take action now to protect your life and property. These are dangerous fire conditions. Check your bush fire plan and ensure that your property is fire ready. If a fire starts, take immediate action. If you and your property are not prepared to the highest level, go to a safer location well before the fire impacts. Reconsider travel through bush fire risk areas.
нідн	Be ready to act. There's a heightened risk. Be alert for fires in your area. Decide what you will do if a fire starts. If a fire starts, your life and property may be at risk. The safest option is to avoid bush fire risk areas.
MODERATE	Plan and prepare. > Stay up to date and be ready to act if there is a fire.
NO RATING	Fire danger ratings are used on days when you need to take action. On days of minimal risk, 'No

Figure 10: Australian Fire Danger Rating System

Rating' will be issued.

1.5 Environmental Considerations

Detailed environmental assessments have been undertaken during the construction phase of development. No further vegetation removal is required for bushfire management and minimal further environmental impact is expected. Some plantings have been provided within the development area for screening of the facility to limit the visual impact to the surrounding area. These plantings may be impacted by a low intensity fire and should be protected where possible during bushfire operations.

Care should always be taken during bushfire operations when creating containment lines or backburning operations to minimise impact on significant trees and sensitive ecological communities. Care should always be taken when using firefighting foams and retardants near waterways and riparian zones.

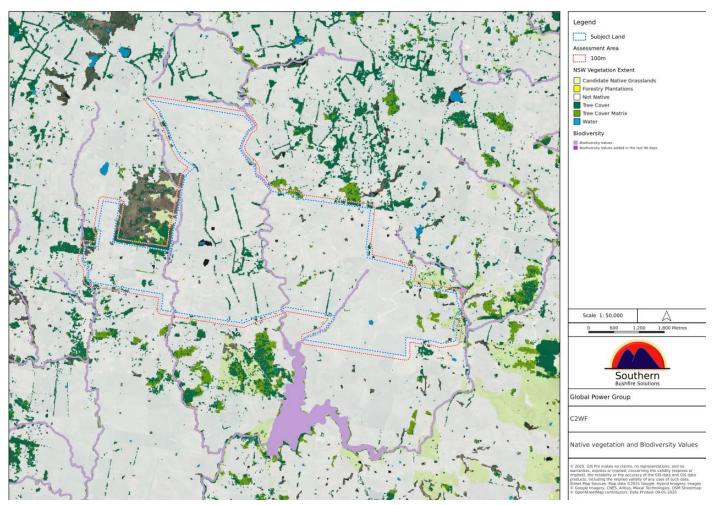


Figure 11: NSW Native vegetation and Biodiversity values map

Heritage assessments for the construction phase noted potential Aboriginal Heritage sites within the development area. These areas should be considered during bushfire operations particularly where heavy plant operations may be used for creating containment lines that may disturb heritage items. The Heritage Management Plan should be consulted for further detail.

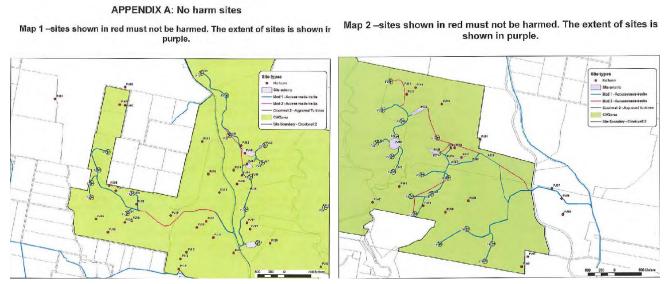


Figure 12: Appendix A of the Aboriginal Heritage Impact Permit noting multiple no harm sites within the facility.

4. Development Assessment

Wind and Solar Farms require special consideration and should be provided with adequate clearances to combustible vegetation as well as firefighting access and water supply. The following sections are a detailed assessment of the proposal against the standards required for bushfire protection measures for Wind and Solar Farms detailed in section 8.3.5 of Planning for Bushfire Protection (2019).

Comparison to the standards for residential development is made where appropriate.

4.1 Asset Protection Zones (APZ)

An Asset Protection Zone (APZ) is the most important feature in preparing a property for bushfire. The APZ is a fuel reduced area surrounding a building or structures and may prevent the spread of fire to or from the site.

The intent of the APZ detailed in PBP (2019) is:

"To minimise the risk of bushfire attack and provide protection for emergency services personnel, residents and others assisting firefighting activities" (NSW Rural Fire Service, 2019)

ASSESSMENT SUMMARY

Section 8.3.5 of *NSW Planning for Bushfire Protection (PBP)* requires a minimum 10-meter Asset Protection Zone (APZ) for structures, buildings, and infrastructure associated with solar and wind farms. The 330Kv power transmission lines are owned by TransGrid and outside the scope of this assessment, vegetation management is required to electrical distribution network standards.

Wind Turbines

The wind turbines at this facility stand approximately 95 meters tall, constructed from steel and concrete. Due to the size and nature of the footings at the base of each tower, extensive earthworks were undertaken, including the creation of hardstands to support construction and maintenance vehicles. The clear area surrounding each turbine measures approximately 40 meters by 60 meters, significantly exceeding the 10-meter minimum APZ requirement specified in PBP.

These APZs consist of compacted road base, free of obstructions, which serve as fuel-free firebreaks. This design effectively minimizes the risk of fire spreading to or from the facility.

Substation and Control Room

The substation and control room are located within a fuel-free compound measuring approximately 140 meters by 140 meters. The surface is covered with high-resistivity gravel for electrical safety.

Additional fire protection measures include a perimeter trail and a regularly mowed area surrounding the substation fence. These features provide further defendable space, ensuring enhanced safety and compliance with bushfire protection standards.

Actions required

1. Annual check of Asset Protection Zones should be conducted prior to the start of the bushfire season, and any slashing or maintenance work is to be undertaken prior to the grass curing greater than 50%. Care is the be taken to avoid the risk of ignition during any vegetation management.



Figure 13: Typical APZ at the turbine



Figure 14: Typical APZ at the turbine



Figure 15: Managed area around the Control Room and substation



Figure 16: High resistivity surfaces in and around the Control Room and substation

Firefighting Access

4.2 Access Requirements

The intent of access measures for access detailed in PBP (2019) is:

"To provide safe operational access to structures and water supply for emergency services while residents are seeking to evacuate from an area" (NSW Rural Fire Service, 2019)

The purpose of property access is to provide firefighters with safe access to properties and provide evacuation routes for firefighters and residents. Roads should provide sufficient width for firefighters to work with equipment around the vehicle without impeding occupants that are seeking to evacuate the area.

ASSESSMENT SUMMARY:

The internal access roads have been designed to accommodate the heavy traffic required for turbine construction. The primary access roads are two-way, approximately 7 meters wide, with an all-weather compacted road base capable of supporting vehicles up to 23 tonnes, including tankers. No wet areas or bridges have been identified along the primary access routes.

Directional signage is installed across the site to assist with locating areas and navigating to the numbered turbines. The combination of internal access roads and the clear areas surrounding turbines provides a relatively safe operational environment for fire crews, with regular anchor points available for protection.

Site Access and Layout

The wind farm spans a large area and has three separate access points:

1. **Gate 1 (Woodhouselee Road):** Provides access to Area 1, which includes the substation, control building, and turbines 13 to 28.

Note: There is no direct primary road connection between Area 1 and Area 2. Farm management trails may be used by lighter vehicles during emergencies, but care must be taken when crossing the creek.

2. **Gates 2 and 3 (Crookwell Road):** Provide access to Areas 2 and 3, located approximately 19km from Gate 1 via Woodhouselee Road and Crookwell Road.

Areas 2 and 3 consist solely of turbines and do not contain any normally occupied buildings. Remote workers in these areas require specific evacuation plans and safe travel procedures in case of emergencies.

Exclusions and Considerations

Private residential buildings and property access routes associated with rural landholders are excluded from the wind farm's bushfire management plan.

Actions Required

The internal access arrangement is of high standard and is regularly maintained as part of routine operation of the facility. No specific actions are required for access.



Figure 17: Typical standard of internal access roads with signage.

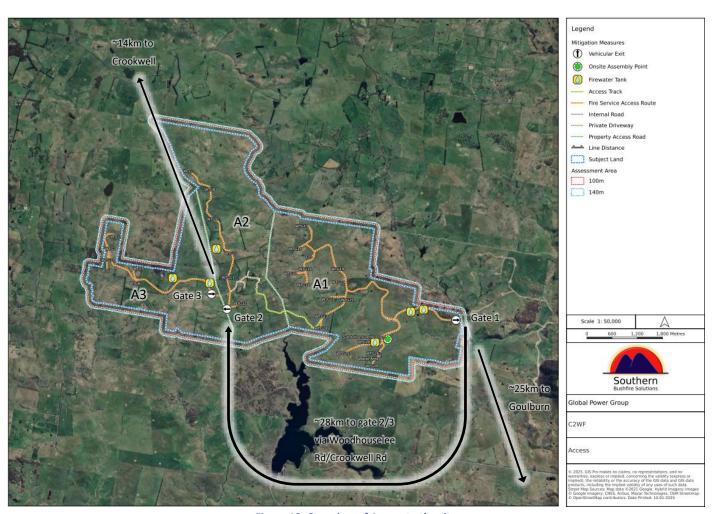


Figure 18: Overview of Access to the site

4.3 Water Supply

The intent of measures for services detailed in PBP (2019) is:

"To provide adequate services of water for the protection of buildings during and after the passage of a bushfire, and to locate gas and electricity so as not to contribute to the risk of fire to the buildings" (NSW Rural Fire Service, 2019).

An adequate supply of water is essential for firefighting. A reticulated supply is to be provided where possible, and a static water supply to be made available for non-reticulated development.

ASSESSMENT SUMMARY

The area lacks a reticulated water supply, necessitating a static water supply for firefighting purposes and water supply is not required as part of the development.

Section 8.3.5 of NSW Planning for Bushfire Protection does not specify a minimum quantity to be held on site at solar and wind farms for firefighting purposes.

A basic potable water supply is provided at the control room via two ~3000L water tanks. These water tanks are located inside the substation and have restricted access for a fire appliance. There is limited water supply available for occupants or a fire crew to defend the substation and control room facility in the event of a fire. NSW Planning for Bushfire Protection requires that properties >2ha have a 20Kl minimum static water supply held in a metal or concrete tank with appropriate access and fittings for fire fighters or occupants sheltering in place to undertake property protection.

Multiple static water supplies have been identified in the farm dams within the site, although these may be problematic for fire appliances to access as water levels drop during drought conditions. Where these dams are adjacent to the access road and are accessible for a fire appliance they have been identified on the Bushfire Management Plan.

Actions Required

1. A >20,000L static water supply is to be provided in a metal or concrete tank within close proximity to the O&M and substation facility. This tank should have an outlet fitted with a 65m m storz coupling, with hardstand and access available for a fire appliance within 4m. All associated valves and pipework should be metal.

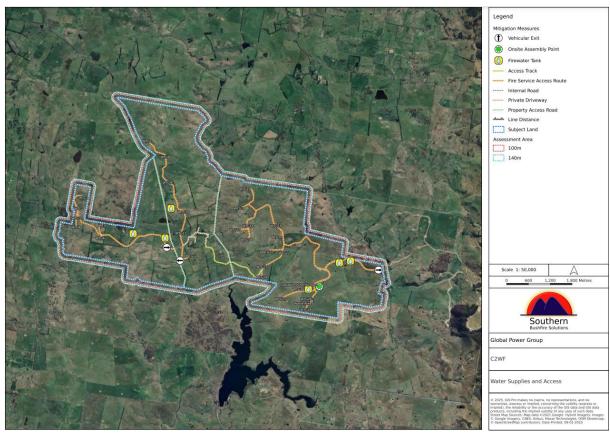


Figure 19: Overview of Static Water supplies available on the site



Figure 20: Typical farm dam on the site, adjacent to an internal access road.

4.4 Bushfire Mitigation Measures and Emergency Management

The intent of measures for services detailed in PBP (2019) is:

"To provide suitable mitigation measures to prevent or mitigate fires igniting and evacuation arrangements for occupants." (NSW Rural Fire Service, 2019)

A Bushfire Emergency Management Plan should identify all mitigation measures associated with the operation of the facility.

ASSESSMENT SUMMARY

Site Operations and Staffing

The wind farm operates as a manned facility with approximately 10 staff on-site Monday to Friday and 4 staff on weekends. Additional maintenance and contract staff are present periodically, undertaking remote work at the turbines.

The large area and dispersed nature of the facility necessitate careful planning for emergency management and bushfire response. Mobile phone service is unreliable, and the distances are too great for consistent radio communication. The site manager must maintain accountability and be aware of the number and location of all staff and contractors on the site.

Bushfire Risk Reduction Measures

High-risk activities involving hot works must follow strict safety protocols. During the bushfire danger period, the Upper Lachlan Fire Control Centre (Crookwell) must be notified of any activities that pose ignition risks. Workers conducting hot works must carry first-aid firefighting equipment, be trained in its use, and take precautions to prevent vegetation ignition.

TransGrid's elevated fire danger protocols restrict recloser activation during high fire danger conditions, reducing the risk of electrical fault-related ignition.

Review of the Bushfire Management Plan

The Bushfire Management Plan must undergo a minor review annually to maintain accuracy, with a full review every 5 years. All fire safety measures should be checked and verified before the start of the bushfire danger period to ensure continued compliance and preparedness.

Waste and Combustible Materials Management

A waste storage area near WTG26 is used for storing waste building materials, oils, and other consumables. These combustible materials are stored in bunded shipping containers per hazardous goods standards, and the waste area is maintained clear of vegetation to minimize fire risk.

Emergency Monitoring

The facility is continuously monitored through CCTV and electrical system data. In emergencies, the system can be shut down either by the on-site operations manager or remotely. An Emergency Information Container, located at the site's entry point, contains an *Emergency Information Booklet* outlining fire-related emergency shutdown procedures.

The facility manager is to actively monitor the "Hazards Near Me" website or mobile application with a 50-kilometer watch zone set around the site and take appropriate action on notification of bushfire in the vicinity, including early evacuation if necessary.

Communication and Emergency Coordination

Due to unreliable mobile phone service, an alternative communication method is essential for remote workers. Reliable communication is critical for effective emergency management during bushfires.

Evacuation and On-Site Shelter Protocols

Evacuation:

Early evacuation to a safer location is prioritized for staff safety. Recommended destinations may depend on the time available and location of the fire:

- Crookwell: Approximately 18 minutes northwest from Gate 1, 11 minutes from Gate 2/3
- Goulburn: Approximately 22 minutes southeast from Gate 1 and 2/3.

On-Site Shelter:

Late evacuation can be dangerous, and care must be taken to avoid being trapped in vehicles while evacuating. If evacuation to a safer place is considered unsafe, staff should shelter in the **control room**, which is constructed from non-combustible materials and equipped with fire-rated doors and smoke seals. Staff sheltering in the control room should:

- Close all windows and put air conditioning on recirculation.
- Notify emergency services by calling 000 to report the number and location of all staff sheltering
 on site
- Utilise first aid firefighting equipment to put out any spotfires occurring near the building and shelter inside as the fire front passes.
- Exit the building when safe, and extinguish any remaining spotfires near the building.

Remote Workers:

Remote workers unable to evacuate or reach the control room should use turbine towers as a place of last resort. Turbine towers are 95 meters tall, made of steel, and surrounded by a large, cleared area. While grassfires are unlikely to impact the structure, smoke and radiant heat may pose risks.

Actions Required

- 1. The Bushfire Management Plan is to undergo a minor review annually to maintain accuracy and all permanent staff familiarized with emergency procedures. A full review of the Bushfire Management plan is to be undertaken every 5 years or as required.
- 2. All contractors and remote workers are to be briefed of the Bushfire Management Plan as part of site induction to ensure they are familiar with evacuation and shelter in place procedures.
- 3. The site manager is to maintain accountability and be aware of the number and location of all staff and contractors on the site.
- 4. A reliable communication plan is to be developed as part of the overall emergency plan to ensure reliable communication for remote workers at the turbine sites. This communication system is to be checked regularly.
- 5. All first aid firefighting equipment is to be routinely inspected, maintained and operated as per manufacturers spcifications.
- 6. Hot works procedures are to be adhered to at all times, with consideration given to the potential for ignition of surrounding vegetation. Adequate first aid firefighting equipment (such as water extinguisher, knapsack or similar) is to be on hand for immediate use during all hot works.
- 7. All non-essential hot works are to cease during elevated fire conditions. Crookwell Fire Control Center

- are to be notified prior to undertaking any works that have the potential to ignite the surrounding vegetation.
- 8. Reduce non essential activity in remote areas during elevated fire conditions to avoid placing workers in high risk locations.
- 9. The operations manager is to monitor NSW "Hazards near me" with a watch zone set up with a 50km radius of the site to receive notification of an incident in the area and be familiar with the bushfire advice ratings.
- 10. If a fire occurs in the area, the operations manager is to actively monitor the situation and take appropriate actions are required. Remote workers should be notified to relocate to a safer place as early as possible, and evacuation of all staff as appropriate to the nature and location of the fire.
- 11. If an ignition occurs within the site, call 000 immediately and take appropriate action.



Advice

A fire has started. There is no immediate danger. Stay up to date in case the situation changes.



Watch And Act

There is a heightened level of threat. Conditions are changing and you need to start taking action now to protect you and your family.



Emergency Warning

An Emergency Warning is the highest level of Bush Fire Alert. You may be in danger and need to take action immediately. Any delay now puts your life at risk.

Figure 21: Australian Warning System Alert Levels

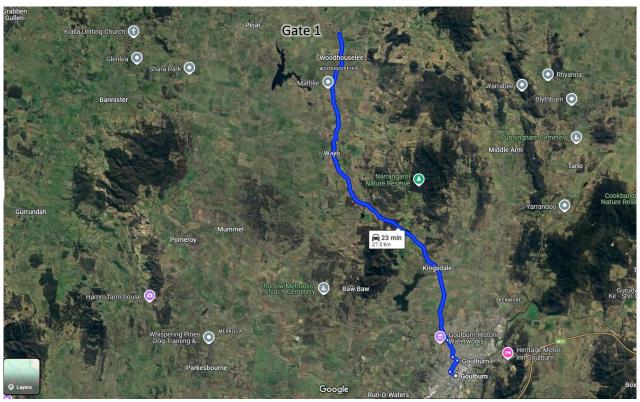


Figure 22: Evacuation route from Gate 1 to Goulburn

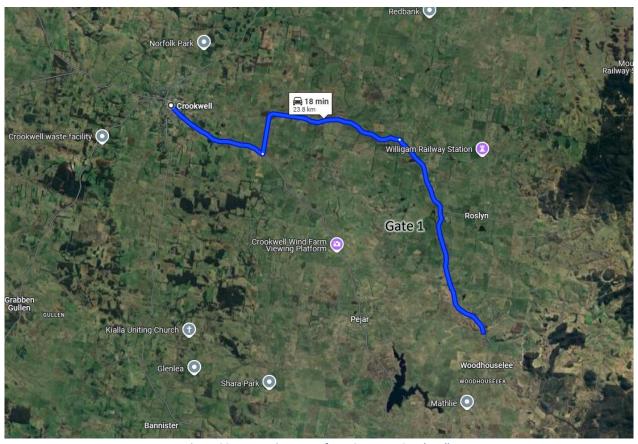


Figure 23: Evacuation route from Gate 1 to Crookwell.

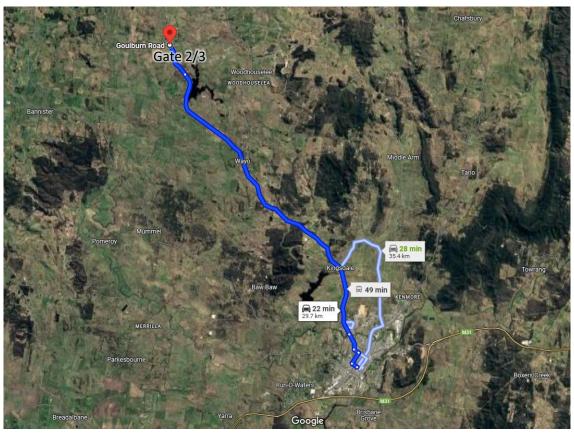


Figure 24: Evacuation Route from Gate 2/3 to Goulburn

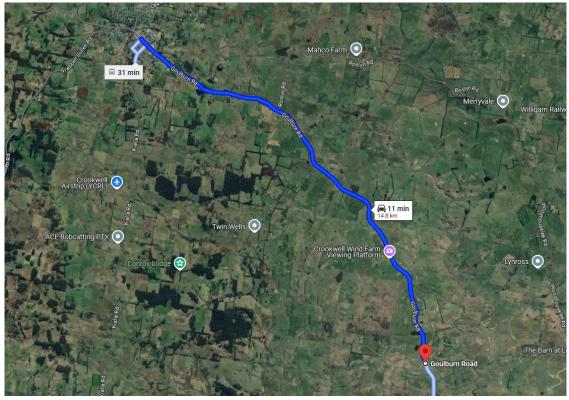


Figure 25: Evacuation route from Gate 2/3 to Crookwell

4.4 Transition to Recovery After an Event

Recovery is defined as:

"the initial step taken to return a plant to its normal condition after an abnormal operation."

A Bushfire Emergency Management Plan should identify the initial steps to return the facility to normal operations as soon as practicable after a bushfire to minimise downtime and mitigate loss.

ASSESSMENT SUMMARY

The windfarm facility is generally constructed with a high level of resilience to grass and bushfire, however caution is still required to return the facility to normal operation.

Following a bushfire event, safe access to the site must be confirmed in coordination with the Crookwell Fire Control Centre to ensure that conditions are safe for return to the area.

A comprehensive electrical inspection and operational testing of all facility components must be conducted before the site can be recommissioned. This process includes verifying the integrity and functionality of electrical systems to ensure safety and reliability.

If grazing livestock are present on the site, veterinary assessments may be necessary to evaluate the health and well-being of the animals and address any injuries or stress caused by the incident. Any livestock management issues are to be reported to the relevant property manager for action.

Post incident debriefing is important to review the incident actions, identify what went well and what didn't and implement changes to the bushfire management plan as appropriate. Counselling may also be required for affected staff.

Actions Required

- 7. Contact Crookwell Fire Control Centre to ensure the environment is safe to return to the site.
- 8. Contact all impacted staff for a welfare check, with peer support and counselling to be made available.
- 9. Undertake full electrical inspection to confirm integrity of any fire impacted infrastructure prior to reinstating the power generating system.
- 10. Contact property managers to coordinate any outstanding animal welfare and fencing issues, any injured livestock reported to property management. Issues with native wildlife may be reported to local wildlife rescue service.
- 11. Post incident debriefing to be undertaken as soon as practical and review of the bushfire management plan to implement changes as necessary.
- 12. Post incident counselling and peer support offered to any affected staff.

5. Conclusion

Crookwell 2 Wind Farm facility has been designed and constructed to exceed the minimum requirements outlined in the NSW Planning for Bushfire Protection guidelines. A comprehensive suite of Bushfire Protection Measures has been implemented, and ongoing maintenance of these measures is essential to ensure their effectiveness throughout the life of the asset.

As a manned facility in a remote location, strict protocols and procedures are required to ensure that activities conducted on-site are aligned with current environmental and fire risk conditions. It is crucial to monitor operations, particularly during periods of elevated fire danger, and maintain regular communication with the local fire control centre to mitigate any fire-related risks.

References

Australian Building Codes Board. (2019). National Construction Code Series.

Fire Protection Association of Australia. (2017). BPAD Practice note 002- Exclusion of Low Threat Vegetation.

Google Earth. (2024). Google Earth. Retrieved from Google Earth.

Keith, D. A. (2004). *Ocean Shores to Desert Dunes: the Native Vegetation of New South Wales and the ACT.*Department of Environment and Conservation (NSW).

Mecone. (2024). Mosaic. Retrieved from https://www.mecone.com.au/mosaic/

NSW Land and Property Information. (2024). NSW SIX Maps

NSW Planning and Environment. (2024). *NSW Planning Portal*. Retrieved from https://www.planningportal.nsw.gov.au/find-a-property/

NSW Rural Fire Service. (1997). Rural Fires Act. NSW Rural Fire Service.

NSW Rural Fire Service. (2002). Rural Fires Regulation.

NSW Rural Fire Service. (2005). Standards for Asset Protection Zones.

NSW Rural Fire Service. (2012). Bushfire Survival Plan.

NSW Rural Fire Service. (2015). Guide for Bushfire Prone Land Mapping: Version 5b.

NSW Rural Fire Service. (2019). Planning for Bushfire Protection.

NSW Rural Fire Service. (2019). *Planning for Bushfire Protection*. Sydney.

Ramsay, C., & Rudolph, L. (2003). Landscape and Building Design for Bushfire. CSIRO Publishing.

Standards Australia. (2018). AS 3959- Construction of Buildings in Bushfire Prone Areas.