Eraring Battery Energy Storage System

Bushfire Assessment Report

IS365800_BAR | 02

13 October 2021

Origin Energy Eraring Pty Limited

SSD-15950052 EIS Appendix N

Eraring Battery Energy Storage System

Project No:	IS365800
Document Title:	Eraring BESS Bushfire Assessment Report
Document No.:	IS365800_BAR
Revision:	02
Document Status:	Final
Date:	13 October 2021
Client Name:	Origin Energy Eraring Pty Limited
Client No:	SSD-15950052 EIS Appendix N
Project Manager:	Thomas Muddle
Author:	Petter Nyman
File Name:	IS365800_Eraring BESS_Bushfire Assesment_Rev02_V01_Tracked_checked05082021

Jacobs Group (Australia) Pty Limited
ABN 37 001 024 095
Leve 4, 12 Steward Avenue
Newcastle West NSW 2302 Australia
PO Box 2147 Dangar NSW 2309 Australia
T +61 2 4979 2600
F +61 2 4979 2666
www.jacobs.com

www.jacobs.com

Document history and status

Revision	Date	Description	Author	Checked	Reviewed	Approved
01	6/7/21	Draft for review	P Nyman	P Nyman	C Clifton	T Muddle
02	13/10/21	Final	P Nyman	P Nyman	C Clifton	T Muddle

Executive Summary

Bushfire hazard assessment

Origin Energy Eraring Pty Limited (Origin) is seeking regulatory and environmental planning approval for the construction and operation of a grid-scale Battery Energy Storage System (BESS) at the site of the Eraring Power Station (EPS), at Rocky Point Road Eraring, within the Lake Macquarie LGA approximately 40 kilometres (km) south of Newcastle (the Project). The Project area is about 25 ha and is shown in Figure 2-1.

The Project would include the construction and operation of:

- BESS compounds housing rows of enclosures housing lithium-ion type batteries and associated power conversion systems with discharge capacity of up to 700 megawatts (MW) and storage capacity of 2,800 (MWh) able to dispatch over variable durations from four hours to beyond eight hours;
- A BESS substation housing high voltage (HV) and medium voltage (MV) transformers and associated infrastructure;
- Approximately 400 metres (m) of overhead 330 kilovolt (kV) transmission line connecting the BESS substation to the existing 330 kV TransGrid switchyard; and
- Ancillary infrastructure and facilities including safety protection systems and site ancillary facilities such as laydown areas and site offices.

A full description of the Project is included in Section 3 of the Environmental Impact Statement (EIS).

Areas of bushfire prone native vegetation lie to the north and west of the Project area. The Project area currently includes a small area (<1 ha) of undisturbed native vegetation that is proposed to be retained. Other existing vegetation within the Project area is highly disturbed because of earlier development in the area.

The proximity of the Project area to nearby native vegetation (along western and northern perimeters) means that some sections of the Project area would be exposed to high levels of radiant heat (BAL-19 or above) in the event of a bushfire. This will need to be considered during the final design of the BESS and associated bushfire protection measures. Strategies include ongoing fuel management in vegetation to the north and west of the Project area, redistribution of equipment within the Project area, and/or shielding as part of the civil solution.

Bushfire risk scenarios

The bushfire season in the Central Coast region generally runs from October to March, although commencement has been declared as early as August. Days of elevated fire danger are relatively infrequent, but mostly occur between December and March. Dry electrical storms and north-westerly winds are common during the fire season.

Two main bushfire risk scenarios face the Project and have been considered by this assessment:

- A fire igniting in the surrounding vegetation north-west of the Project area on a day of elevated fire danger burns under the influence of north-westerly winds towards/through the Project area. Embers and radiant heat are carried towards the Project infrastructure. Three such bushfire incidents have occurred within the region around the Project in the last 20 years; and
- Electrical equipment failure, battery fire, or hot works cause ignition at the Project during construction or operation. Fire spreads from the Project area into surrounding vegetation to the north or west under the influence of moderate fire weather conditions with wind from the south or east.

Bushfire Management and emergency management

Appropriate measures will be in place to mitigate the bushfire risks from and to the Project, particularly those associated with the main bushfire risk scenarios. These measures would be confirmed as part of detailed design based on the measures identified in Sections 5 and 6 of this report. Existing bushfire management plans are in

place to control fuel loads in the vegetation surrounding the Project area. Final measures would be developed in consultation with RFS and DPIE and documented in construction and operational environmental and safety management plans.

Conclusion

The vegetated areas surrounding the Project are zoned for fuel management under existing EPS land management plans, as Asset Protection Zone (to the north) or Strategic Fire Advantage Zone (to the west). This means that the likelihood of bushfire and exposure to radiant heat are reduced. In the event of a bushfire, some sections within the Project area remain exposed to radiant heat above BAL-19, which is likely to threaten the integrity of conventional buildings such as dwellings.

However, the available land within the Project area is sufficiently large to enable redistribution of equipment within the Project area or shielding as part of the civil solution in the event that BESS infrastructure is not already adequately rated and protected, and thereby provide sufficient separation between the project components and radiant heat at the northern and western boundaries of the Project area.

The details on internal separation requirements and need for active firefighting requirements at the Battery would be determined in detailed design, in consultation with RFS and DPIE as per recommendations of the Preliminary Hazard Analysis (PHA). Detailed firefighting response and any need for fire water containment would be confirmed based on selection of technology provider post development approval, and provided for review by DPIE, Fire and Rescue NSW and the RFS as part of a Final Hazard Study and management documentation.

Contents

Figures

Tables

Important note about your report

The sole purpose of this report and the associated services performed by Jacobs is to assess the bushfire risk of the construction and operation of a grid-scale Battery Energy Storage System (BESS) (the Project) and provide recommendations to manage that risk in accordance with the scope of services set out in the contract between Jacobs and Origin Eraring Energy Pty Limited (Origin). That scope of services, as described in this report, was developed with Origin.

In preparing this report, Jacobs has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by Origin and/or from other sources. Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

Jacobs derived the data in this report from information sourced from Origin and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Jacobs for use of any part of this report in any other context.

Users of this Bushfire Assessment Report should note that bushfire behaviour, particularly under extreme fire weather and fuel hazard conditions, can be difficult to predict. As a result, even with appropriate risk controls in place, bushfires may pose extreme risks to personal safety, property and the environment. This Bushfire Assessment Report refers to Neighbourhood Safer Places, evacuation points or other forms of bushfire refuge. *Persons using these locations should be aware that they may still experience extreme conditions and that their safety cannot be absolutely guaranteed*.

This report has been prepared on behalf of and for the exclusive use of Origin, and is subject to, and issued in accordance with, the provisions of the contract between Jacobs and Origin. Jacobs accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.

1. Introduction

1.1 Project background

Origin Energy Eraring Pty Limited (Origin) owns and operates the Eraring Power Station (EPS) which is one of Australia's largest power stations, having a capacity of 2,880 megawatts (MW). EPS is scheduled to be among 14 gigawatts (GW) of coal-fired generation plants to be retired within the next few decades (AEMO, 2020). The retirement of the EPS will support Origin's carbon emission reduction goals. As such, Origin are now progressing an application to provide energy storage and key network services that would facilitate long term emissions reduction in the National Electricity Market (NEM) while supporting the delivery of secure and reliable electricity for consumers and businesses.

Origin is seeking regulatory and environmental planning approval for the construction and operation of a grid-scale Battery Energy Storage System (BESS) with a discharge capacity of 700 MW and storage capacity of 2,800 megawatt hours (MWh) located next to the EPS on existing Origin landholding (the Project).

The Project is a State Significant Development (SSD) under the State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP) and subject to Part 4, Division 4.7 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). As such, the Project requires the preparation of an Environmental Impact Statement (EIS) in accordance with Secretary's Environmental Assessment Requirements (SEARs) and the approval of the Independent Planning Commission under circumstances described in SRD SEPP or the NSW Minister for Planning and Public Spaces.

1.2 Purpose of this report

This Bushfire Assessment Report has been prepared in accordance with the SEARs issued for the Project on 19 April 2021 by the Planning Secretary of the NSW Department of Planning, Industry and Environment (DPIE).

The SEARs relevant to this Bushfire Assessment Report are presented in Table 1-1.

Table 1-1: SEARs – Secretary's environmental assessment requirements - Bushfire Risk Assessment

SEARs	Section addressed
▪ Hazards – including: - an assessment of potential hazards and risks including but not limited to assessment of bushfire risk against the RFS Planning for Bushfire Protection 2019, electromagnetic fields or the proposed grid connection infrastructure against the International Commission on Non-Ionizing Radiation Protection	Section 4. Other public safety risks are addressed in Chapter 6 of the EIS.

This report has been developed following guidance from the NSW Rural Fire Service (NSW RFS), particularly *Planning for Bushfire Protection* (PBP) (RFS, 2019a), as well as bushfire safety guidance developed by and for NSW electricity network operators.

1.3 Project location

The Project will be situated on land zoned SP2 Infrastructure for electricity generating purposes and within an area previously disturbed by power station activities. No re-zonings or land acquisitions are required. The Project is located within, Lots 10 and 11 DP 1050120, Rocky Point Road Eraring, within the Lake Macquarie City Council (LMCC) LGA, as illustrated in Figure 1-1. Further detail on the Project location as relevant to bushfire risks are provided in Section 4.1.

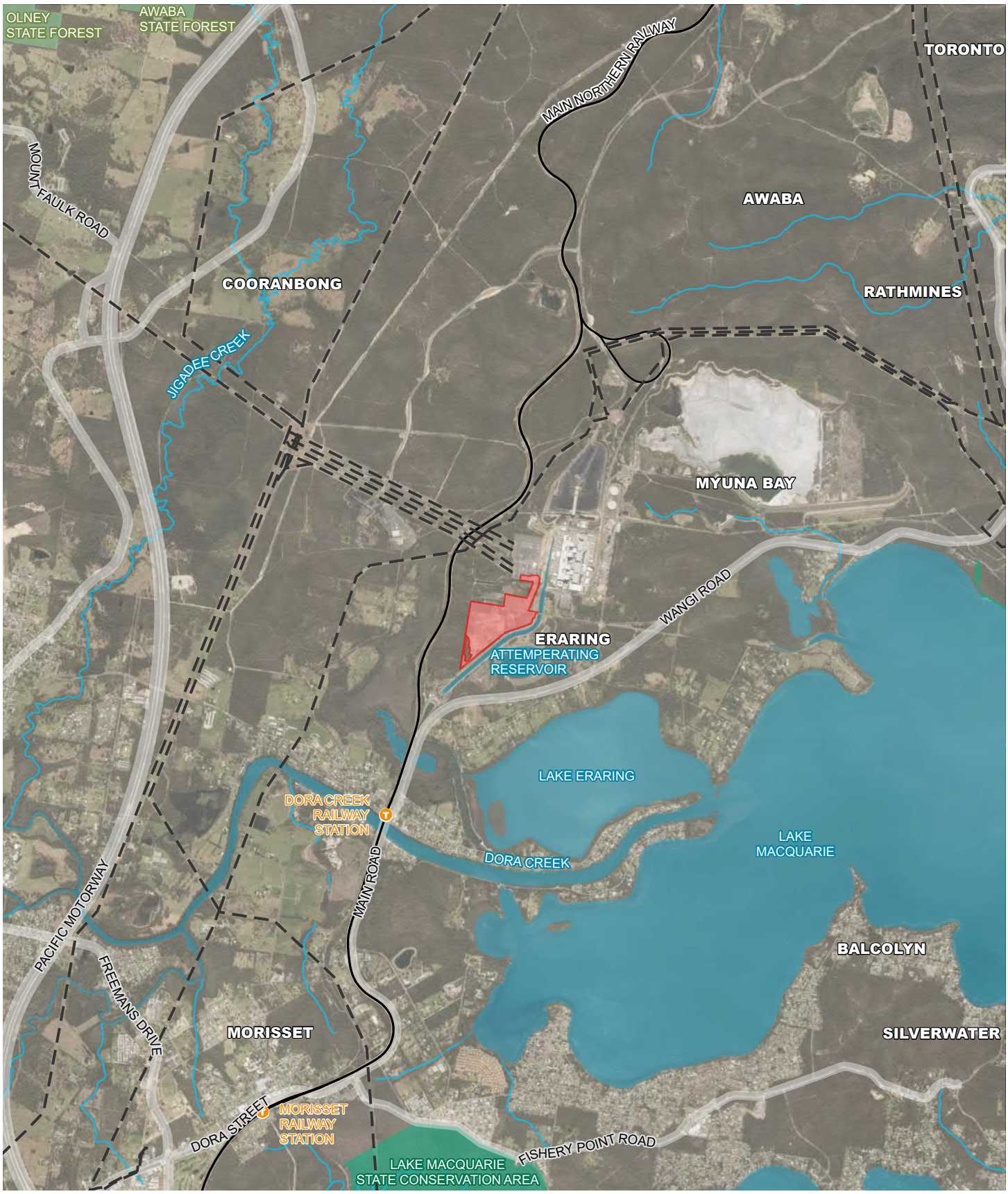


Figure 1-1 Project location

1.4 Report structure

The report structure is as follows:

- **Section 1** provides the Project background and briefly describes the Project location;
- Section 2 provides a summary of the Project
- Section 3 describes the legislative and policy requirements;
- Section 4 describes the bushfire risk factors;
- Section 5 describes the bushfire protection measures;
- Section 6 outlines Emergency management during construction; and
- Section 7 provides conclusions and recommendations.

2. Project description

2.1 Overview

Origin is seeking regulatory and environmental planning approval for the construction and operation of a grid-scale BESS with a discharge capacity of 700 MW and storage capacity of 2,800 MWh at the Project. The Eraring BESS would be among the largest battery projects in NSW and Australia in terms of peak power output and discharge duration. The Project would provide energy storage and key network services that would facilitate long term emissions reduction in the NEM while supporting the delivery of secure and reliable electricity for consumers and businesses.

The Project would be situated within the Origin landholding associated with the EPS located on the western shore of Lake Macquarie. EPS is approximately 40 km south of Newcastle and approximately 120 km north of Sydney in NSW. The total area of the Origin's landholding is approximately 1,200 hectares (ha), including EPS operational areas, Eraring Ash Dam and surrounding buffer lands consisting of bushland and grassland interspersed with roads, water management and electricity transmission infrastructure. The Project area is about 25 ha and is shown in Figure 2-1.

The Project would include the construction and operation of:

- BESS compounds comprising of rows of enclosures housing lithium-ion type batteries connected to associated power conversion systems (PCS) and high voltage HV electrical reticulation equipment;
- A BESS substation housing HV transformers and associated infrastructure;
- Approximately 400 m of overhead 330 kV transmission line connecting the BESS substation to the existing 330 kV TransGrid switchyard; and
- Ancillary infrastructure and facilities including safety protection systems and site ancillary facilities such as laydown areas and site offices.

A full description of the Project is included in Section 3 of the EIS.

The BESS will be capable of providing Energy Frequency Control Ancillary Services (FCAS), System Restart Ancillary Services (SRAS), as well as Fast Frequency Response (FFR) and synthetic inertia - security services currently under consideration in the NEM.

The Project maximum disturbance area is approximately 25 ha in size with permeant infrastructure likely to cover half this area. Construction may require temporary compounds or laydown areas outside the permanent Project area but within the Project area and would be located in existing vacant areas of the Origin landholding as illustrated in Figure 2-1.

2.2 Battery system

The BESS technology provider is not yet confirmed; however, the batteries are likely to consist of modular lithium-ion type racks, housed within battery enclosures containing protection, control and heating, ventilation and air conditioning.

Other infrastructure within the BESS compound will include:

- PCS comprising of inverters and battery transformers;
- HV reticulation including ring main unit (RMU), cables and switchboards; and
- Switch rooms and control rooms.

The PCS will be four-quadrant bidirectional type, with capability for both charge/discharge in leading and lagging reactive power scenarios. The PCS will also have grid forming capability to allow islanded operation and SRAS where required.

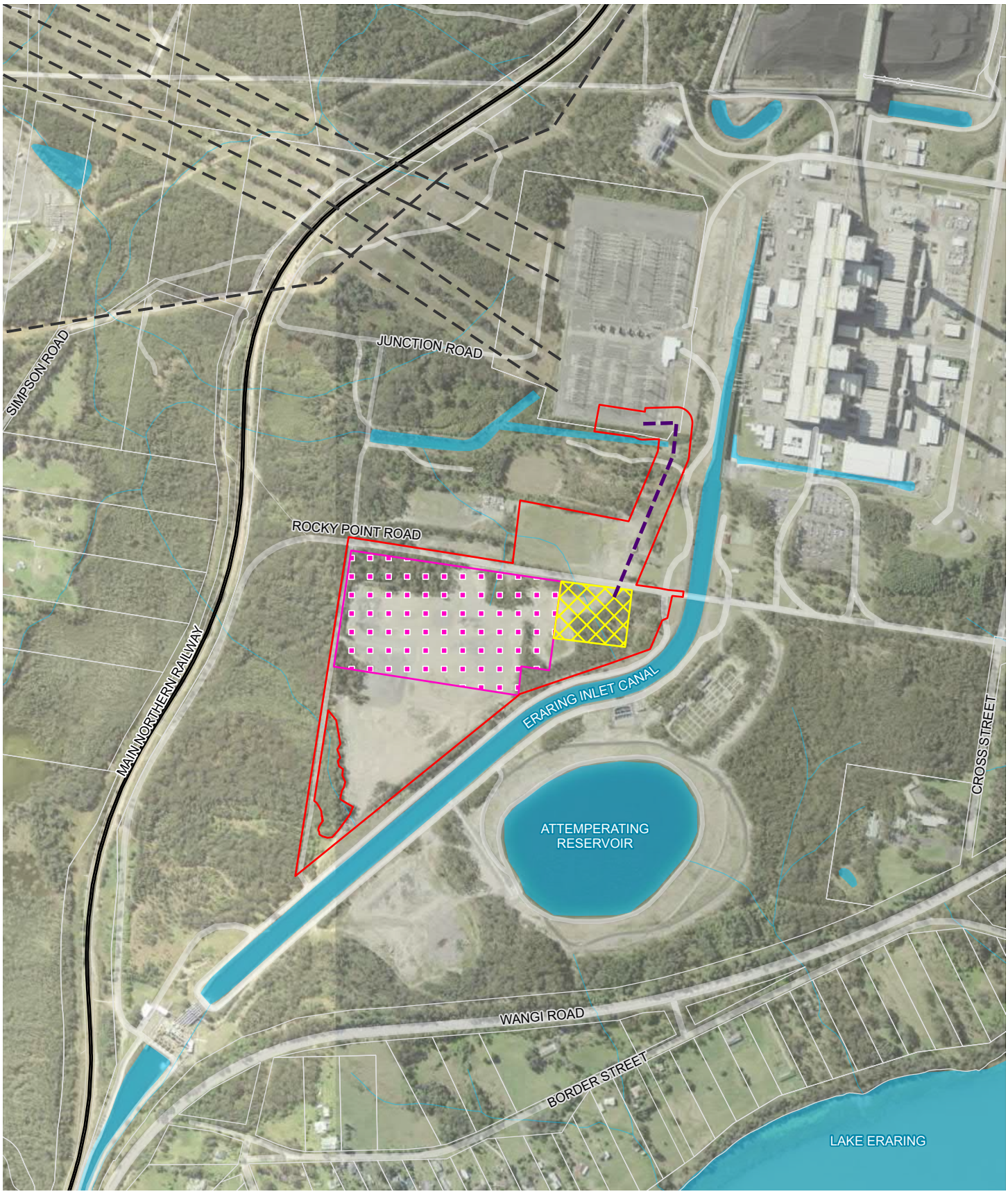


Figure 2-1 Project overview

2.3 Network connection

The Project would take advantage of the close proximity to the existing TransGrid owned 330 kV switchyard which has sufficient spare capacity for the size of the proposed BESS. The Project's connection will be electrically separate to that of EPS, so it can be operated independently of the EPS.

The following components are required to connect the BESS to the NEM:

- 33/330 kV transformers in a bunded transformer area;
- Overhead steel structure lattice towers complete with insulators and conductor(s) spanning the distance between The Project area and the existing TransGrid 330 kV switchyard;
- Associated protection and control systems.

Connection works into the TransGrid switchyard is targeting existing vacant connection bays but allowance is made for bench extension and installation of additional infrastructure.

2.4 Construction works

The construction methodology for the Project will be developed in more detail during the preparation of the detailed design. However, it is expected to involve:

- Installation and maintenance of environmental controls including drainage and sediment controls;
- Upgraded construction access track from existing internal access road to battery location;
- Vegetation clearing;
- Cut and fill to level areas and establish a hardstand pad and construction laydown areas;
- Structural works – slabs to support battery modules, power conversion systems and transformer structures;
- Delivery, installation and electrical fit-out of battery modules, power conversion systems and transformers;
- Installation of 330 kV overhead cabling from the battery transformers to the TransGrid switchyard;
- Testing and commissioning activities; and
- Removal of construction equipment and rehabilitation of construction areas.

2.5 Construction program

The Project's modular design provides significant deployment flexibility with the capacity to stage the 700 MW to meet market needs. The construction of the first stage of the BESS is expected to begin in 2022 (subject to approval) and have a duration of 18 months, with commercial operations possible by 2023. The indicative timeline for subsequent stages of the Project include:

- Stage 2 construction commencing 2023 and operations commencing 2025; and
- Stage 3 construction commencing 2026 and operations commencing 2027.

2.6 Operation

Operation will be 24 hours/365 days per week and will respond to market demand, fluctuating from discharge at full capacity for up to four hours or partial capacity for a longer duration. Maintenance activities will be ongoing (landscaping, asset protection zones, water management infrastructure, access tracks and inspection, testing and replacement of components). Operation life is expected to be between 20 to 30 years. Component replacements and/or upgraded may extend this timeframe.

2.7 Decommissioning

Following the end of economic life, above ground components would be removed and, where possible, re-purposed. Land rehabilitation will be undertaken where necessary to achieve acceptable conditions as far as reasonably practicable.

3. Legislative and policy requirements

Legislation applicable to the bushfire management of this Proposal is outlined in this section.

3.1 NSW legislation

3.1.1 Electricity Supply Act 1995

The NSW *Electricity Supply Act 1995* (ESA) requires network operators to take appropriate action to ensure public safety. This includes infrastructure considered to be a potential cause of bushfire. Appropriate action can include modifying the infrastructure, removing risky structures/items in proximity to the infrastructure, and trimming/removing vegetation. The Project would include construction of battery system, network connection and operations, which means the ESA's requirement for safe operation applies.

3.1.2 Electricity Supply (Safety and Network Management) Regulation 2014

The *Electricity Supply (Safety and Network Management) Regulation 2014* (ES(SNM) Regulation) requires a network operator to take all reasonable steps to ensure that all aspects of its network are safe. This includes preventing network assets from igniting bushfires. Bushfire risk management must be part of an operator's safety management system. As per the interpretation of the ESA, the EN(SNM) Regulation's requirement for safe network management applies to both construction and operations of the network connection.

3.1.3 Rural Fires Act 1997

The objectives of the *Rural Fires Act 1997* are to prevent bushfires and protect people, built assets and natural assets from fire damage. The Act provides for the designation of Neighbourhood Safer Places, where people may find shelter from a bushfire. It also provides for the designation and maintenance of fire trails.

The Act states that it is the duty of public authorities, landowners, and occupiers to take all notified and practical steps to prevent bushfire ignition and minimise spread on their land. Trees that are reasonably necessary for protection of threatened species may be retained in fire breaks. The Act reiterates that certain instruments under the EP&A Act, *National Parks and Wildlife Act 1974, Local Government Act 1993, Biodiversity Conservation Act 2016* and the *Local Land Services Act 2013* do not apply when responding to fire emergencies.

The Act declares the bushfire danger period to run from October to March (inclusive), which can be modified by the NSW Rural Fire Service (RFS). Total fire bans (TOBANs) may be issued by the Minister in the interests of public safety.

3.1.4 Environmental Planning and Assessment Act 1979

Section 4.14 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) identifies that consent must not be granted for development on bushfire-prone land (BPL) for any purpose unless it complies with *Planning for Bushfire Protection* (NSW RFS, 2019a; see section 3.2) or the Commissioner of the NSW Rural Fire Service has been consulted . State significant development (such as this Proposal) is exempt from this requirement.

Local government area Bushfire Management Committees (BFMCs), formed under the *Rural Fire Act 1997*, maintain and update maps of BPL in their regions.

3.1.5 Work Health and Safety Act 2011

The Commonwealth *Work Health and Safety Act 2011* (and state-based legislation, the NSW *Work Health and Safety Act 2011*) provides a national framework for protection of the health and safety of people at work, and those who may be affected by such work. Under the Act, persons conducting a business or undertaking have the primary responsibility to ensure (so far as reasonably practicable) the safety of workers, and the general public,

at a workplace. This includes ensuring, so far as reasonably practicable, the safety of workers and the general public from bushfire-related risks during construction works for the Project and its operation.

3.2 NSW guidelines

3.2.1 Planning for Bushfire Protection (PBP)

The SEARs (as per Table 1-1) mandate that this bushfire assessment follows PBP (RFS, 2019a), which seeks to provide for human safety (including of fire responders) during bushfire events and to minimise the effects of bushfires on property; while considering development potential, site characteristics and environmental protection. Achievement of these objectives is underpinned by several principles:

- Control the types of development permissible in bushfire prone areas;
- Minimise the impact of radiant heat and direct flame contact by separating development from bushfire hazards;
- Minimise the vulnerability of buildings to ignition and fire spread from flames, radiation and embers;
- Enable appropriate access and egress for the public and firefighters;
- Provide adequate water supplies for bushfire suppression operations;
- Focus on property preparedness, including emergency planning and property maintenance requirements; and
- Facilitate the maintenance of Asset Protection Zones (APZs), fire trails, access for firefighting and on site equipment for fire suppression.

PBP specifically addresses bushfire planning and protection for wind and solar farms, but not other types of electrical facility. It also addresses hazardous industry facilities and other industrial developments.

3.2.2 Guide for Bushfire Prone Land Mapping

The identification of BPL in NSW is required under the EP&A Act. It is the responsibility of local government area/rural fire district-based BFMCs. BPL mapping is typically published by the respective BFMC and the maps and metadata are developed according to guidance provided by NSW RFS (2015). BPL mapping for the state is available from the NSW Government data portal, www.data.nsw.gov.au.

BPL assessments are based on allocation of the vegetation present into one of four categories, as follows:

- *Category 1:* which includes areas of forest, woodland, heath, forested wetland and timber plantation. Highest risk category;
- *Category 2:* rainforests and “lower risk vegetation parcels”. These parcels contain remnant vegetation that is limited in its connectivity to larger areas and land parcels with land management practices that actively reduce bushfire risk (and are subject to a bushfire plan or similar). Category 2 vegetation has lower bushfire risk than category 1 and 3 vegetation;
- *Category 3:* which includes grasslands, freshwater wetlands, semi-arid woodlands, alpine complex and arid shrublands. Moderate risk category; and
- *Exclusion:* Areas of vegetation less than 1 ha and greater than 100 m separation from category 1, 2 or 3 vegetation; small patches or strips of remnant vegetation; managed grasslands; agricultural cropland; gardens; and mangroves are not mapped as bushfire prone.

BPL is defined as land with category 1, 2 or 3 vegetation and land within 100 m of category 1 or within 30 m of category 2 or 3 vegetation.

4. Bushfire risk factors

4.1 Regional context

The Project is located within, Lots 10 and 11 DP 1050120, Rocky Point Road Eraring, within the Lake Macquarie City Council LGA, as shown on Figure 2-1. Surrounding land external to the EPS consists of broadacre rural development and low-density residential properties. The largest commercial centre and population centre nearby is Charlestown (29.1 km north east), and the closest residential suburb is Dora Creek (1.2 km south). The Great Northern Railway alignment runs along the border of Dora Creek and Eraring suburbs, approximately 200 m west of the Project area.

The Project area is surrounded by the following features with the Origin landholding:

- EPS operations area, elevated TransGrid switchyard, coal yards and extensive EPS buffer lands to the north;
- Elevated attemperation reservoir to the east;
- Elevated EPS inlet canal to the south and east; and
- Mature vegetation within E2 environmental protection zoned land along a ridge line to the west.

The nearest private receptors to the Project area are located as follows:

- Rural residential dwellings approximately 600 m to the west on Gradwells Road beyond the Great Northern Railway;
- Dora creek township approximately 1.2 km to the south;
- Properties on Border Street approximately 600 m to the south which are screened by the EPS inlet canal and attemperation reservoir and beyond Wangi Road; and
- Dwellings to the north of Project area located over 4 km away beyond the EPS and mining operations.

The Project area is undulating, having been previously used as a borrow pit and for stockpiling of material for the construction of the attemperation reservoir and has subsequently been rehabilitated. The Project area is largely surrounded by native vegetation with the exception of cleared and developed land associated with the EPS and ancillary infrastructure. Parts of the Project area and the forested areas to the east (refer to Figure 4-1) are classified as high bushfire risk (BPL category 1). The northern edge of the Project area is low risk categories under the BPL (category 3 vegetation), presumable due to vegetation clearing. The EPS water inlet canal lines the east and south-east perimeter of the Project area.

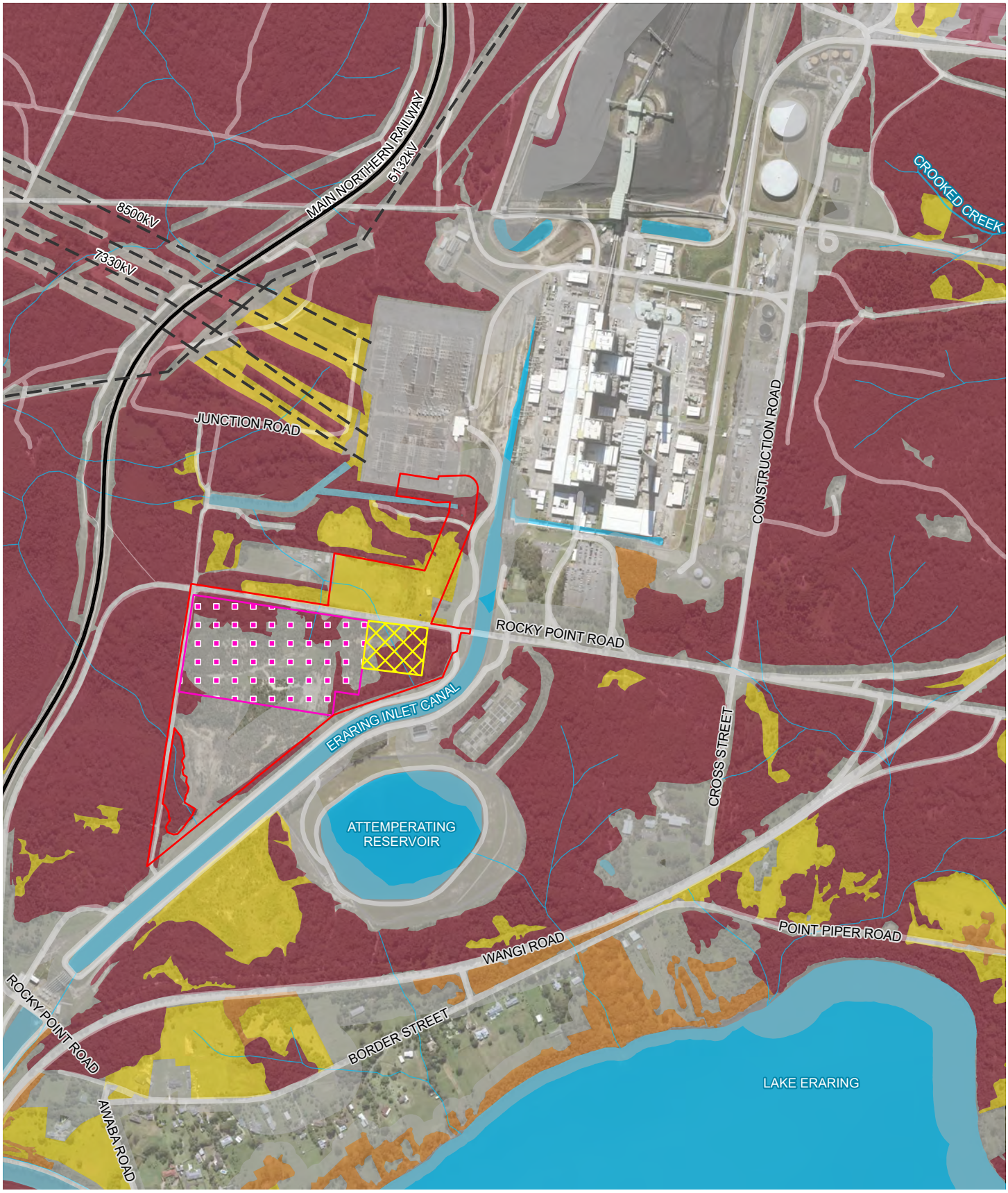


Figure 4-1 Bushfire Prone Land

4.2 Current bushfire management arrangements

Bushfire management arrangements for the region in which the Project is located are described in the Central Coast BFMC's Bushfire Risk Management Plan (BFRMP; Central Coast BFMC, 2020). The Plan seeks to:

- Reduce the number of human-induced bushfire ignitions that cause damage to life, property and the environment;
- Manage fuel to reduce the rate of spread and intensity of bushfires, while minimising environmental/ ecological impacts;
- Reduce the community's vulnerability to bushfires by improving its preparedness; and
- Effectively contain fires with a potential to cause damage to life, property and the environment.

The Central Coast BFRMP identified the Eraring power station and associated infrastructure as a priority 2B (very high risk) area, and specified several risk mitigation strategies, including:

- Hazard reduction through fuel reduction burning within Land Management Zones (LMZ) and inspection and maintenance of the APZ; and
- Building preparedness by inspecting and maintaining fire management trails.

The bushfire zoning surrounding the Project area is detailed in the LMCC 1 Map Display Area of the Central Coast BFRMP. Existing infrastructure at the EPS is set within an APZ. The role of the APZ is to protect human life, property and highly valued public assets and values. It has also been developed to enable the safe use of direct attack suppression strategies. It is assumed that new infrastructure associated with the Project area will also zoned as an APZ.

In the Central Coast BFRMP, the vegetated areas surrounding the Project area are not classified as a Strategic Fire Advantage Zones (SFAZ) or LMZ.

However, in the EPS Bushfire management Plan (AECOM, 2020) the vegetated areas surrounding the Project area are managed either as a SFAZ or APZ, which means there are specific fuel management measures in place to protect the new infrastructure from bushfire and increase the likelihood of successful containment in the forests surrounding the BESS.

The area is relatively well-served by fire response services. The nearest Fire and Rescue NSW station is located at 68 Newcastle St, Morisset, approximately 9 km to the south of the EPS. NSW RFS have a control centre at Lake Munmorah, approximately 25 km from the Project area.

4.3 Bushfire weather

4.3.1 Historical bushfire weather

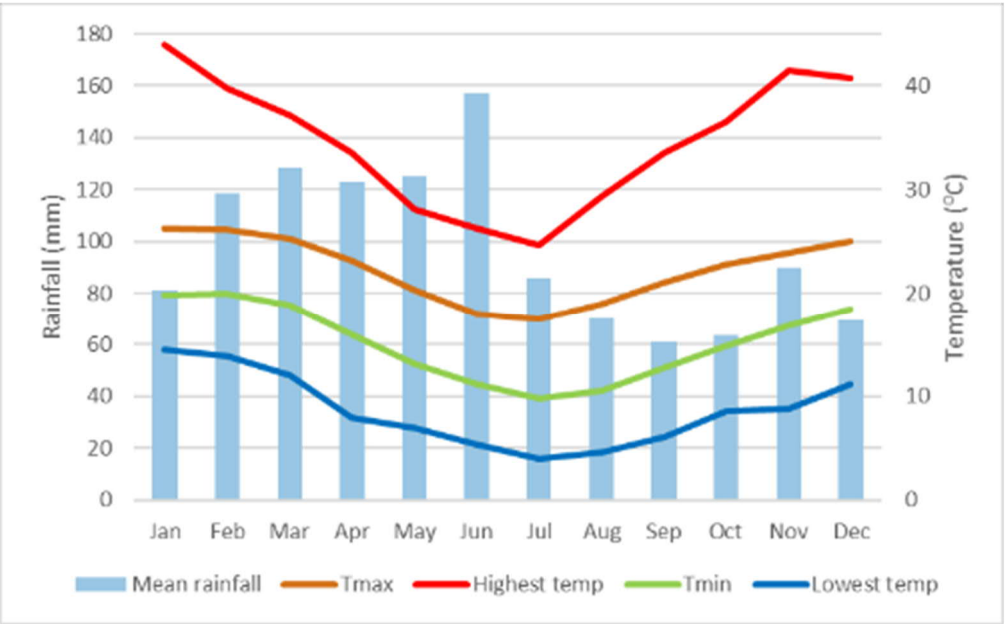
The Project area experiences a warm temperate climate. Summers are warm and relatively wet and winters are cooler and relatively dry (see Figure 4-2). The bushfire season generally runs from August to March. Prevailing weather conditions associated with the bushfire season in the Central Coast BFMC area are associated with coastal conditions, and more generally north-westerly winds accompanied by high daytime temperatures and low relative humidity. There are also occasional dry lightning storms occurring during the bushfire season (Central Coast BFRMP, 2020).

Average daily maximum temperatures range between 18°C in July and 26.2°C in January[1]. Temperatures in excess of 40°C have been recorded in the months between November and February. The hottest recorded

[1] Meteorological records are based on Bureau of Meteorology station 061366 (ORAH HEAD AWS) for the period 1995-2021. This weather station is located approximately 25 km from the BESS at Eraring. Meteorological station at Cooranbong is closer than Norah Head AWS, but has shorter lengths of record (from 2008).

temperature is 44.0°C (January 2013). Average minimum temperatures range between 9.8°C in July and 20 °C in February.

Average annual rainfall is 1154 mm. Recorded annual rainfall (1995-2020) has ranged between 834 mm (2000) and 1556 mm (2007). The highest recorded daily rainfall total is 235 mm (June 2007). The period from February to June is the wetter season.

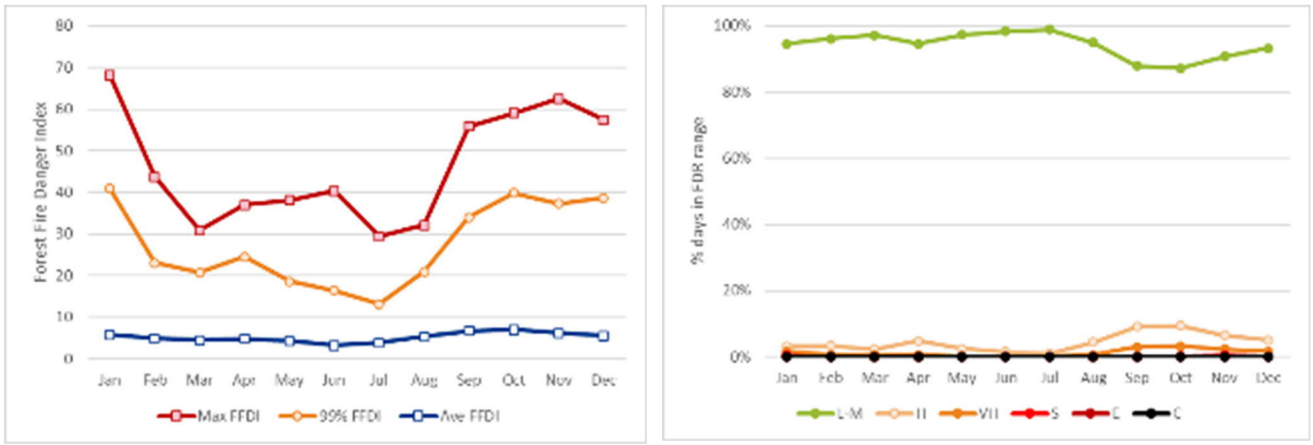


Data from: Bureau of Meteorology station 061366 (NORAH HEAD AWS) for the period 1995-2021. Records 1995-2020.

Figure 4-2: Average monthly rainfall, average daily maximum (Tmax) and minimum (Tmin) temperatures, maximum (Highest temp) and minimum (Lowest temp) recorded temperatures.

Average monthly fire danger ratings (FDR) are in the low to moderate range (Forest Fire Danger Index [FFDI] ≤12) throughout the year (Figure 4-3). However, there are days during the warm season when FDR is very high (FFDI > 25) or severe (FFDI > 50). Days of very high FDR or greater (FFDI ≥25) may occur in any month, but most common between September and January. Days with catastrophic or extreme fire danger (FFDI>75 have not been recorded.

Total Fire Bans (TOBANs) are declared by the NSW RFS. During TOBANs, potential human sources of ignition are prohibited or restricted to reduce the risk of bushfires igniting during or (rarely) immediately preceding a period of dangerous fire weather. FDR on TOBAN days is typically very high or greater.



a) Monthly values of maximum FFDI, 99th percentege of daily maximum FFDI and average daily FFDI.

b) Percentege of days with maximum daily FFDI in each fire danger rating scale (low-moderate: L-M; high: H; very high: VH; severe: S; extreme: E; catastrophic: C)

Figure 4-3: Estimated forest fire danger index (FFDI) and fire danger rating (FDR) values for NORAH HEAD AWS (AWS; 061366), based on records for 1995-2020.

4.3.2 Climate change projections for bushfire

The Project is anticipated to have a service life of approximately 30 years and should therefore be resilient to fire weather and other climatic conditions in the 2050s. Climate projections indicate the region is very likely to experience more bushfire activity over the coming decades (Dowdy et al., 2015).

Climate projections for 2050 were generated for the Project area, based on the mean model results for all CMIP5[2] models with projections for wind speed, relative humidity, daily rainfall and maximum temperature for RCP8.5[3] (high emissions scenario); as made available through SimCLIM[4]. Change factors to 2050 for each of these weather parameters were applied to the 1995-2020 data for BoM station 061366 (NORAH HEAD AWS).

The main projected changes in climate for the region under the RCP8.5 scenario are for:

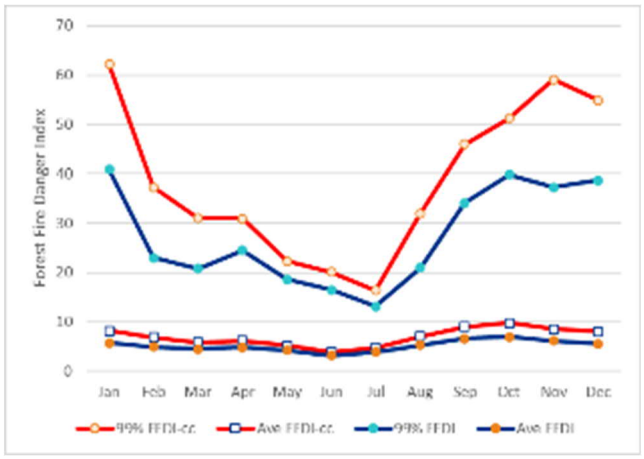
- Increased temperature: temperatures are projected to increase throughout the year, with annual average maximum temperatures approximately 1.7°C warmer by 2050;
- Decreased cool season rainfall: summer rainfall is projected to increase slightly, and cool season rainfall is projected to decline slightly. With warmer conditions, bushfire fuel availability is expected to be slightly greater at the commencement of the fire danger period than is currently the case; and
- Decreased relative humidity: changes in relative humidity can be expected due to increased temperatures and small changes in the seasonality of a rainfall. Relative humidity is projected to decrease through most of the year, particularly during spring.

These indicate conditions that favour more bushfire activity. Average FDR is projected to increase (Figure 4-4), which means more days with dangerous fire weather conditions (Table 4-1).

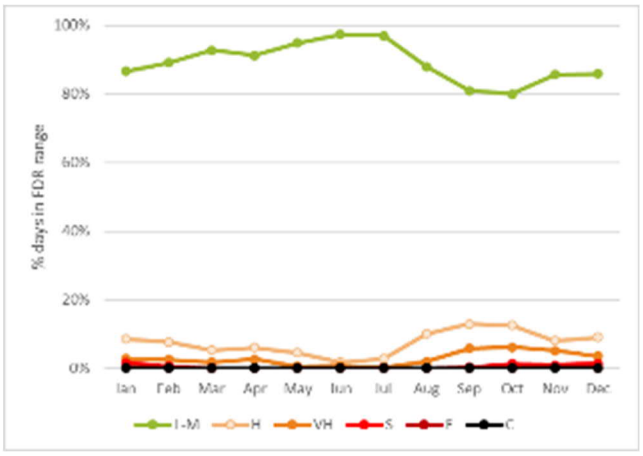
2 CMIP5: Coupled Model Intercomparison Project Phase 5. This refers to the collaborative framework resulting in a collection of models for climate change. They were used in the International Panel on Climate Change's (IPCC's) Fifth Assessment Report. CMIP5 is the most recent phase of the CMIP project at the time of writing.

3 Population and economic growth, technological change including reliance on fossil fuels, and political and social changes will all have substantial effects on greenhouse gas emissions and accumulation in the atmosphere. To account for this uncertainty, the Intergovernmental Panel on Climate Change (IPCC) developed four Representative Concentration Pathways (RCPs) to illustrate four different scenarios for global human activity and development over the coming century, and the resulting effect on global climate. The four RCPs are distillations of a large volume of future scenarios discussed in the scientific literature, chosen by a multi-disciplinary team of experts to form the basis of the Fifth Assessment Report (IPCC, 2014). RCP8.5 represents a scenario in which emissions continue to rise rapidly through most of the century. This is driven by continued population and economic growth, without a transition to low-carbon technologies (business as usual).

4 https://www. https://www.climsystems.com/



a) Monthly values of 99th percentile of daily maximum FFDI and average daily FFDI – historically (blue) and projected for 2050 under RCP8.5 (red).



b) Percentege of days with maximum daily FFDI in each FDR scale (low-moderate: L-M; high: H; very high: VH; severe: S; extreme: E; catastrophic: C) projected for 2050 under RCP8.5

Figure 4-4: Estimated forest fire danger index (FFDI) and fire danger rating (FDR) values for NORAH HEAD AWS (AWS; 061366), based on records for 1995-2019 and climate change projections for 2050 RCP8.5.

Table 4-1: Fire danger index, indicative fire behaviour and average occurrence at the project area

FDR	Fire behaviour guidance	Average number of days/y	
		Current	2050
Low-moderate FFDI<12	There is some potential for fires and those that occur will normally stop (meteorological conditions allowing) at roads, tracks and watercourses. Fires that occur can generally be extinguished by the use of hand operated water sprays and fire beaters.	344 (94%)	327 (89%)
High FFDI 12-24	Fires are capable of spreading rapidly, particularly in the absence of preventative measures and may require additional work effort to be extinguished.	16 (16%)	27 (10%)
Very high FFDI 25-50	Fires are capable of spreading rapidly, with or without preventative measures. Fire containment may require significant effort and the use of earthmoving equipment and/or backburning.	4 (1.2%)	10 (3%)
Severe FFDI 51-74	Fires are capable of being uncontrollable, unpredictable and extremely fast moving. They will NOT be contained without extensive effort on established fire lines with adequate personnel and equipment (this may include water bombing aircraft).	0.5 (0.13%)	2 (2.4%)
Extreme FFDI 75-100		0 (0%)	0.2 (0.04%)
Catastrophic FFDI>100	Fires are capable of being uncontrollable, unpredictable, and extremely fast moving, and will NOT be contained without extensive effort on very large established fire trails with extensive personnel and equipment (this will include water bombing aircraft).	0 (0%)	0 (0%)

4.5 Topography

The Project area is located on undulating terrain with elevation at the Project area ranging from 10-20 m AHD. The Project area drains to the west, into low-lying wetlands that are connected to Muddy Lake and Lake Eraring. When measured on a high resolution elevation model, the west and northwest facing slopes from the Project area towards the wetland exceed 10 degrees in patches. However, when measured over horizontal distances of 100 m, the slopes leading up towards the Project area are generally <5 degrees (See **Figure 4-5)**.

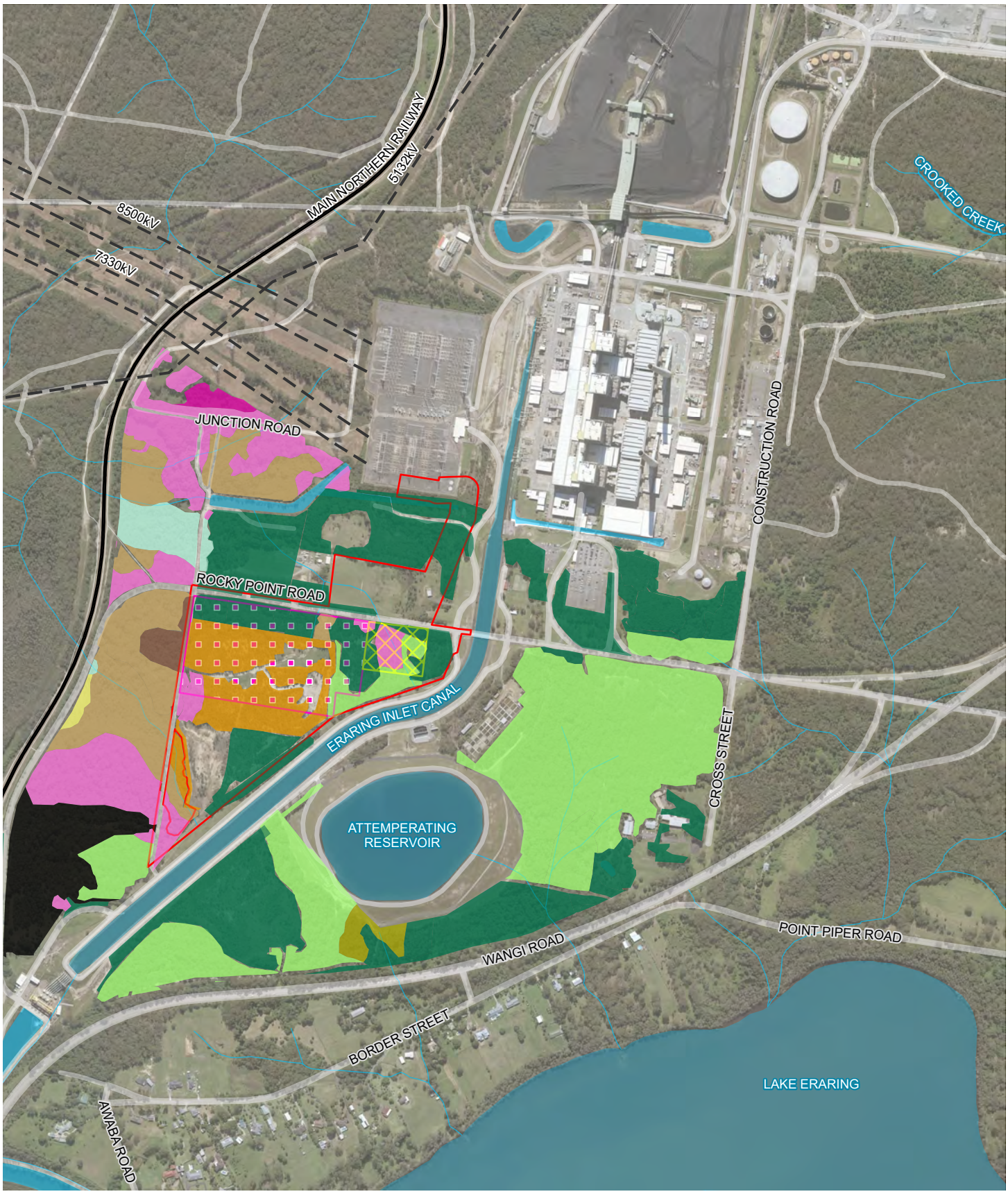
4.6 Vegetation and land uses

The Project area is adjacent to and within areas containing bushfire prone vegetation. Most vegetated land is classified as Category 1 high bushfire risk (Figure 4-1) and comprises the vegetation communities listed in Table 4-2 and shown in **Figure 4-6**. The vegetated lands extend west and northwest for about 5 km but are intersected by partially cleared rural residential areas and Muddy Lake to the west and the EPS operational areas and Transmission line easements to the north. There are significant areas of surface water, including the EPS attemperation reservoir and EPS water intake canal to the east and southeast. Transmission line corridors in the vicinity of the Project are regularly maintained to reduce the hazard posed by woody vegetation. Land to the south is largely developed, either for ancillary infrastructure associated with EPS or the residential areas of Dora Creek and Eraring.

Table 4-2: Plant community types (PCT) for the bushfire study area (NSW OEH, 2019)

PCT	Plant community type description
1727	Swamp Oak - Sea Rush - *Baumea juncea* swamp forest on coastal lowlands of the Central Coast and Lower North Coast.
1636	Scribbly Gum - Red Bloodwood - *Angophora inopina* heathy woodland on lowlands of the Central Coast.
1716	Prickly-leaved Paperbark forest on coastal lowlands of the Central Coast and Lower North Coast.
1638	Smooth-barked Apple - Red Bloodwood - Scribbly Gum grass - shrub woodland on lowlands of the Central Coast.

Figure 4-5 Slope



Project area
Battery Energy Storage System
Substation
<all other values>

Plant Community Type

1627 Smooth-barked Apple - Turpentine - Sydney Peppermint heathy woodland on sandstone ranges of the Central Coast

1636 Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast

1636 Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast low condition

1638 Smooth-barked Apple - Red Bloodwood - Scribbly Gum grass - shrub woodland on lowlands of the Central Coast

1638 Smooth-barked Apple - Red Bloodwood - Scribbly Gum grass - shrub woodland on lowlands of the Central Coast low condition

1716 Prickly-leaved Paperbark forest on coastal lowlands of the Central Coast and Lower North Coast

1716 Prickly-leaved Paperbark forest on coastal lowlands of the Central Coast and Lower North Coast low condition

1718 Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast

1727 Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast

1727 Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast low condition

Planted koala feed trees

Electricity transmission line

Railway

0 300 m

1:12,000

GDA94 MGA56

N

Data sources

Origin 2021
Aerometrex 2020, Umwelt
© Department Finance, Services and Innovation Dec 2020

Figure 4-6 Vegetation

4.7 Fire history and ignition sources

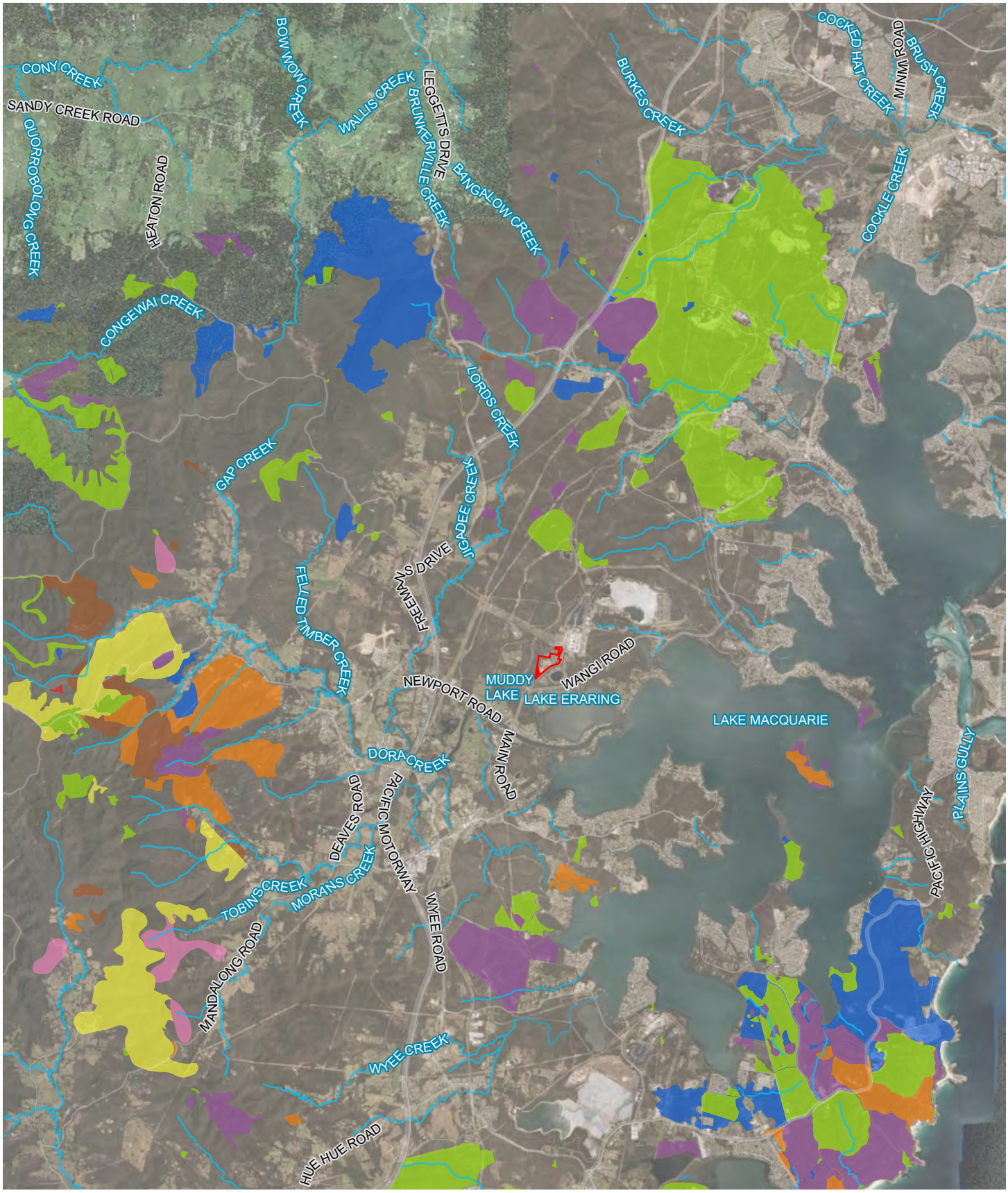
4.7.1 Wildfire

The Central Coast BFMC reports that, on average, there are approximately 843 bush and grass fires per year. About 6-8 of these develop into major fires each year, on average.

According to the Central Coast BFRMP, the main ignition sources in the landscape surrounding the Project area are:

- Illegal burning activities - ignitions are mainly concentrated in rural areas, with a greater proportion of the ignition points on large private landholdings that are adjacent to populated areas, and are mainly from deliberate or negligent ignitions. This particular activity largely occurs from autumn to spring;
- Escapes from legal burning - mainly in rural areas, occurring in similar areas to illegal burning activity. This particular activity also occurs largely in mid to late spring;
- Arson and incendiarism - most common in the bushland reserve areas adjacent to townships, with increased incidence during school holidays
- Ignition of abandoned/stolen motor vehicles - this activity occurs throughout the year, and particularly during the summer months represents serious potential for major bushfires, primarily in State Forest and National Parks areas
- Lightning - mainly associated with late spring and summer thunderstorm activity, which is normally (but not always) accompanied by rainfall; and
- Arcing distribution power lines - which during high winds, particularly those on top and west of the escarpment, can result in the ignition of bushfires.

The bushfire history of the area surrounding the Project area (shown in Figure 4-7) show that large fires (up to several thousand ha in size) can occur in this region. Wildfire activity appear to be higher in the last two decades (2000s and 2010s) compared to previous ones.



Project area

Wildfire history - decade

- 1950's
- 1960's
- 1970's
- 1980's
- 1990's
- 2000's
- 2010's
- 2020's

0 3 km

1:150,000

GDA94 MGA56

Data sources

Origin 2021
Aerometrex 2020,
© Department Finance, Services and Innovation Dec 2020
© Department of Customer Service 2020

Figure 4-7 Fire history

4.8 Key bushfire risk scenarios

The key bushfire scenarios that may affect the Proposal are:

4.8.1 Scenario 1

A fire ignites in, or burns into, the native vegetation areas to north-west of the Project area on a day of elevated fire danger, with strong north-westerly to westerly winds. Under such conditions, embers and smoke would carry towards/into the Project and EPS infrastructure and any persons present would be exposed to radiant heat from the fire burning in native vegetation.

This scenario describes circumstances where bushfires would pose the greatest risk to the Project and associated personnel. It includes the most severe fire weather conditions and describes circumstances where a bushfire would be burning through the areas with the greatest accumulation of bushfire fuels. Under such conditions, a bushfire could burn in high bushfire risk vegetation almost to the boundary of the Project.

This scenario reflects the several of the larger fires depicted in Figure 4-7. Three such bushfire incidents have occurred within the region around the Project in the last 20 years, and based on these experiences, might be expected to occur somewhere in the region once every 10-20 years, not accounting for the influence of climate change.

4.8.2 Scenario 2

Electrical equipment failure (most likely explosive failure of a transformer or thermal run-away in battery enclosures), contact (or flashover) between a conductor and vegetation, or hot works result in fire ignition at the Project area. That fire could escape into native vegetation to the west or north west and then spreads under moderated fire weather conditions influenced by relatively humid southerly or easterly winds.

Given the anticipated separation between the Project and bushfire prone vegetation (minimum 10 m APZ), and the maintenance of the area ultimately developed as a APZ with all vegetation removed, this scenario is considered to be unlikely. However, it is the scenario that provides the most likely situation for a fire igniting due to activities conducted associated with the Project to escape into the surrounding landscape. The risk of fire propagating from the Project to surrounding landscape is further considered through the Project Preliminary Hazard Assessment and would be managed to risk level as low as reasonably practicable.

4.9 Bushfire attack level exposure

Should native vegetation in the vicinity of the Project be ignited in a bushfire, it would potentially expose the BESS and associated infrastructure to radiant heat and embers. The level of exposure to bushfire attack (the bushfire attack level (BAL) is calculated using AS3959:2018 *Construction of building in bushfire prone areas;* Standard Australia, 2018). The BAL represent the potential radiant heat explore in units of kW/sqm. The interpretation of the BAL is described in Table 4-3.

Radiant heat exposure (and ember attack) above BAL-19 is likely to threaten the integrity of conventional buildings (RFS, 2019a). The northern and western boundaries of the Project area are exposed to radiant heat at this level. Under the influence of north-westerly to westerly winds on a day with elevated fire weather conditions, much of the Project area could also be exposed to ember attack generated by fire in the nearby native vegetation.

Table 4-3: Interpretation of the bushfire attack level (BAL)

BAL	BAL description (AS3959-2018 Building standards)
Outside BAL-12.5	There is insufficient risk to warrant any specific requirements but there is still some risk
BAL-12.5	There is a risk of ember attack The construction elements are expected to be exposed to a heat flux not greater than 12.5 W/sqm
BAL-19	There is a risk of ember attack and burning debris ignited by windborne embers and a likelihood of exposure to radiant heat. The construction elements are expected to be exposed to a heat flux not greater than 19 kW/sqm
BAL-29	There is an increased risk of ember attack and burning debris ignited by windborne embers and a likelihood of exposure to a high level of radiant heat. The construction elements are expected to be exposed to a heat flux not greater than 29 kW/sqm
BAL-40	There is a high increased risk of ember attack and burning debris ignited by windborne embers. A likelihood of exposure to a high level of radiant heat and some likelihood of direct exposure to flames from the fire front. The construction elements are expected to be exposed to a heat flux not greater than 40 kW/sqm
BAL-FZ	The highest level of bushfire attack as a consequence of direct exposure to flames form the fire front in addition to heat flux and ember attack

The BAL was produced from vegetated areas located to the west and north of the Project area. Assumptions in the calculation of BAL are as follows:

- As per AS3959 guidelines, the strip of vegetation along the northern boundary is excluded because the forest in this section is <20 m wide (measured on the ground and not over the canopy);
- The vegetation to the west is SFAZ (as per EPS BMP) and managed to fuel loads ~15t/ha using planned burning. This are of vegetation is classified as forest;
- The vegetation to the north is APZ (as per EPS BMP) and managed to fuel load of 8t/ha using planned burns and mechanical removal of understory veg. The low fuel load means this vegetation in this area is classified as woodland; and
- Slopes leading up the boundary of the Project area are <5 degrees. This is the case when measuring slope from over lengths of 100-150 m.

The result for the analysis is depicted in Figure 4-8.

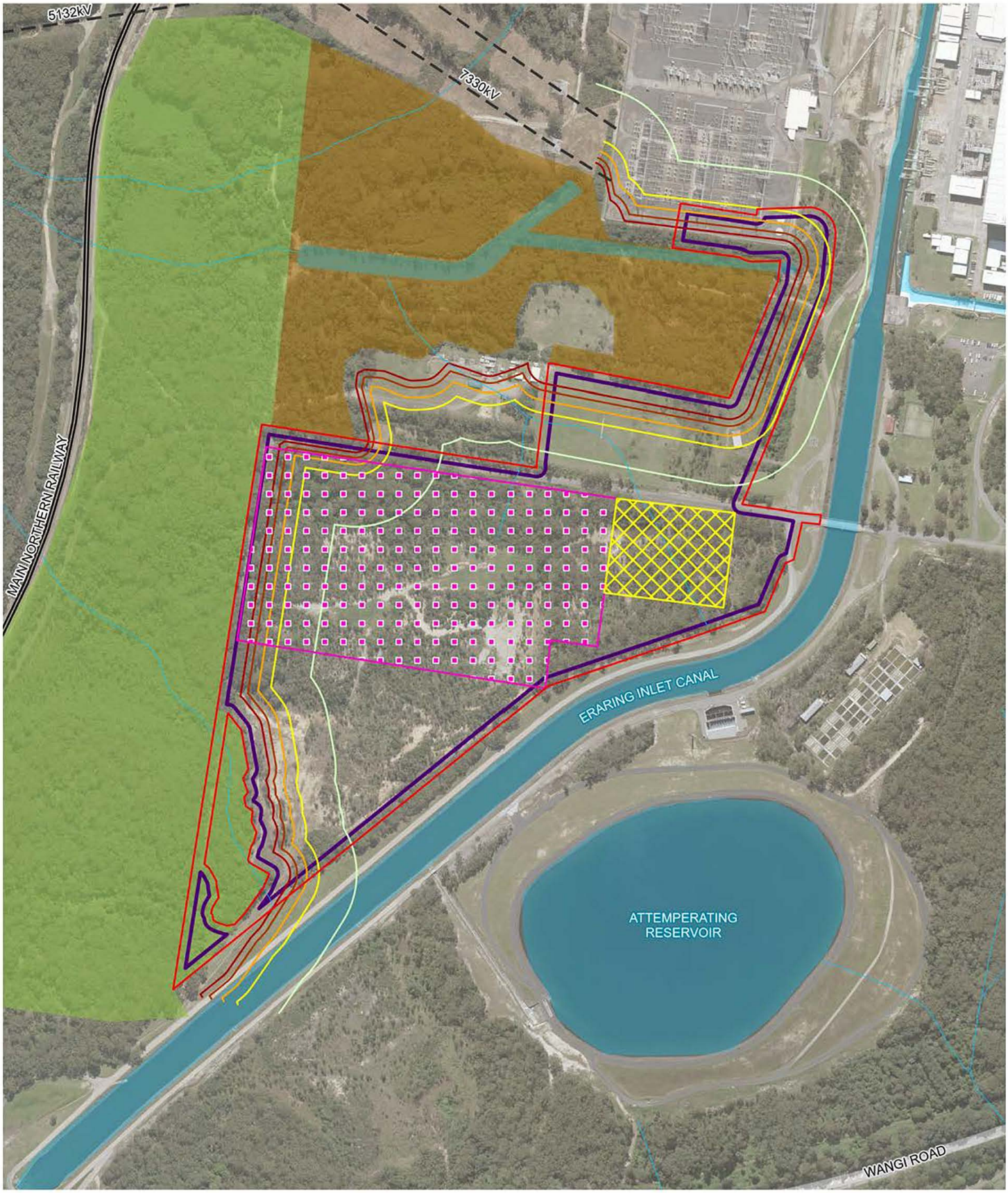


Figure 4-8 Bushfire Attack Level

5. Bushfire protection measures

Bushfire protection measures have been developed for construction and operational phases of the Project based on guidance from PBP (RFS, 2019a). Adoption of the measures described here is expected to reduce, to an acceptable level, both the risk of bushfire ignition by construction and/or operation of the assets and the risk that bushfires in the landscape pose to the assets.

5.1 Bushfire protection measures during construction

Construction activities present a different suite of fire risks to those for operations. These relate to the risks of landscape fire for construction personnel and of on site ignitions escaping from the site into the surrounding landscape. It is anticipated that these risks would be mitigated by site characteristics and specific management actions, as follows:

- *SFAZ and APZ:* Management of bushfire fuel hazard in the surrounding landscape should moderate the behaviour of a fire, should one ignite, and reduce the threat it poses to construction personnel and the construction site. Currently the vegetated areas to the west of the Project area is zones as SFAZ (fuel loads of ~14 t/ha; Monitor and maintain Overall Fuel Hazard levels to a maximum of High) in the EPS Bushfire Management Plan (AECOM, 2020; Figure 15). The vegetated area to the north of the Project area is zoned as APZ (fuel loads of ~8t/ha; Monitor and maintain Overall Fuel Hazard levels to a maximum of Moderate);
- *Site clearance:* The Project area contains bushfire prone vegetation, the majority of which is in poor condition (see). Vegetation within the Project area for each stage will be cleared as a first step in construction. During a bushfire, the radiant heat exposure would therefore be attributed to burning in vegetation surrounding the Project (see Figure 4-8). Embers entering the Project area are unlikely to find sufficient fuel for a spot fire to establish. In case of an approaching fire in the vegetation to the north and west, workers could safely retreat towards the south-east, without necessarily needing to evacuate;
- *Access:* Site access from Rocky Point Road at the northern end of the facility would be maintained throughout construction. In the event of a fire, emergency services would access the Project area via Rocky Point Road and have access to construction access tracks and existing perimeter roads for firefighting purposes;
- *Fire water supply:* Access to water for fire suppression and/or protection of structures or equipment located on site will be provided so that water supply arrangements for firefighting meet the NSW RFS requirement (NSW RFS, 2019a). Fire water for firefighting proposes would be identified in the detailed design stage in consultation with RFS and Fire and Rescue NSW. The intent is to provide adequate services of water for the protection of infrastructure during and after the passage of a bush fire;
- *Hazardous materials:* It is assumed that it may be necessary during some construction stages to store diesel fuel and other potentially flammable materials on site. Storage of such materials would follow environmental protection guidance and be located at parts of the Project area with low radiant heat exposure in the event of a bushfire (i.e. outside the BAL-12.5 zone shown in Figure 4-8). Since the entire Project area could be subject to ember attack, it will be particularly important to ensure storage areas for any hazardous materials are free of vegetation or any other combustible materials that could contribute to a fire ignition occurring. Any fuel spills should be remediated to ensure that they cannot be a source of ignition;
- *Hot works controls:* Works that have potential to generate sparks and ignite fires will be subject to the contractor's hot works safety management procedures. Hot works will not be undertaken on TOBAN days without a permit from the RFS; and
- *Emergency management:* On site bushfire emergency management arrangements will be addressed through the construction contractor's site emergency management plan. Given the level of fire risk and proximity of the Project area to fire services, bushfire-specific fire-fighting equipment (e.g. 4WD with slip on tank and pump) will not be held on site during construction. If a fire is ignited and cannot be safely contained using fire extinguishers or other materials at hand, construction crews will dial 000 and seek emergency service assistance.

5.2 Bushfire protection measures during operation

5.2.1 Strategic Fire Advantage Zone

The EPS Bushfire Management Plan identifies land surrounding the Project as being subject to fuel reduction, with vegetated areas to the west of the Project area manged as a SFAZ with target fuel loads of14t/ha maintained through hazard reduction burning (AECOM, 2020; Figure 15).

5.2.2 Asset Protection Zone

APZs provide a low fuel hazard buffer between buildings (or other structures) and a bushfire hazard. They create a space to help manage the flame, radiant heat and ember exposure of the structures and any emergency service personnel or other persons in place. They typically require the removal of native overstorey vegetation and regular maintenance of the grasses, sedges or low shrubs that form the understorey.

The EPS Bushfire Management Plan identifies surround land as subject to some level of fuel reduction, with area to the north of the Project area manged as a APZ with target fuel loads of 8t/ha maintained through hazard reduction burning and mechanical thinning of understory vegetation (AECOM, 2020).

A 10 m APZ would be established inside the Project area boundary in addition to the existing APZ in the EPS Bushfire Management Plan This approach is consistent with:

- *ISSC3 Guide for the management of vegetation in the vicinity of electricity assets (*Industry Safety Steering Committee (ISSC), 2016) specifications for APZ for substations/switchyards); and
- PBP 2019 specifications for renewable energy generation facilities[5].

An APZ is identified around the inside of the entire Project area. It may not need to be specifically maintained around most of eastern boundary or all of the southern boundary of the Project area, where the land is not designated as bushfire prone. The final APZ details would be confirmed as part of detailed design.

The APZ would be cleared of native vegetation if the Project is approved. Where existing access tracks are not available, new access tracks would be constructed within part of the APZ to provide access for fire-fighting vehicles to bushfire-prone parts of the Project area. The 10 m APZ is proposed to be constructed inside the Project area boundary. Measures would be in place to ensure fire response vehicles and personnel are separated from electrical infrastructure within the BESS compound where necessary.

5.2.3 Vegetation removal

In addition to the removal of any trees/tall shrubs from within the APZ, it is proposed that such vegetation (including grasses) is also removed from within the BESS compound. This would reduce the risk of landscape fire spreading into the Project (e.g. from embers landing within it) as well as the risk of a fire igniting within it.

5.2.4 Location of sensitive buildings and infrastructure

Some parts of the Project area, along the western and northern perimeters, are potentially exposed to radiant heat levels above BAL-19. To mitigate the risk posed by radiant heat, the buildings and other infrastructure with sensitivity to radiant heat exposure will be placed in areas within the Project area that would be exposed to less than BAL-19. This may entail redistribution of equipment within the Project area or shielding as part of the civil solution.

[5] As noted above, PBP does not specify APZ width for new gas-fired (non-renewable) electrical power plants.

5.2.5 Vehicle access

A single general access/egress point for the Project is planned off Rocky Point Road. The access forms part of the internal road network for the EPS and is security controlled. Rocky Point Road connects directly to the Wangi Road (B53) east of the Project area.

Rocky Point Road forms the northern boundary of the BESS compound and provide all weather access to the entirety of the north boundary. An existing all-weather trail forms the western perimeter of the BESS. These and other accesses roads within the BESS compound would be available for emergency services. All internal roads and maintenance tracks would be a minimum of 4 m wide and have a minimum vertical clearance of 4 m.

Where fire access tracks are to be constructed within the proposed APZ, these would be constructed to a standard that allows use by fire response vehicles (as specified in NSW RFS fire trail standards (RFS, 2019b) for Category 1 fire appliances). These tracks would help to separate fire crews from the BESS and its inherent electrical safety risks.

5.2.6 Water for firefighting

Fire water for bushfire responses would be identified in the detailed design stage in consultation with RFS and Fire and Rescue NSW. Suitable water supply arrangements shall be provided for firefighting that meet RFS requirements (NSW RFS, 2019a). Water would be available from the potable water system or other EPS water bodies as per the current EPS Bushfire Management Plan (AECOM, 2020). Where necessary, additional on site water storage would be provided and equipped with standard fittings to enable use by RFS to refill fire response vehicles in the event of failure of the potable supply.

6. Emergency management during construction

This section outlines the emergency management arrangements for the construction phase of the Project.

NSW RFS is the primary bushfire emergency response agency for any incident affecting the Project area. Fire and Rescue NSW station at 68 Newcastle St, Morisset (approximately 9 km to the south of the EPS) would respond to structure fires.

In case of a fire igniting in/around the Project:

- Personnel who are present should attempt to extinguish the fire *if safe to do so;*
- Others present on site should be alerted to the presence of the fire;
- Contact emergency services on 000; and
- Relocate personnel to a designated assembly point.

A Prepare-Act-Survive bushfire response plan would be prepared for the Project. This plan will align with the bushfire protection measures outlined in Section 5 and be developed to align with wider EPS emergency and bushfire response plans.

6.1 National bushfire warning system

Advice of bushfires igniting in the landscape surrounding the project area may be provided through the National Bushfire Warning System (NBWS) alerts. The NSW RFS uses NBWS alerts to provide information to affected areas on locations and current status of nearby bushfires, to allow people to evacuate or otherwise prepare (Figure 6-1). Information is provided through:

- Radio: alerts broadcast on the local emergency services radio station (ABC Newcastle: 1233 AM);
- Internet: NSW RFS website (www.rfs.nsw.gov.au), 'Fire Near Me' app;
- Telephone: Bushfire information line 1800 NSW RFS (1800 679 737); and
- Television, newspapers.

Note that some fires ignite and spread too quickly for a warning to be issued. Site personnel should be on the watch for smoke during the bushfire danger period.

Figure 6-1: National Bushfire Warning System advice levels

6.2 Prepare-Act-Survive

A Prepare-Act-Survive bushfire response plan should be prepared by the construction contractor according to NSW RFS guidelines and the Construction Bushfire and Emergency Management Plan for the Proposal. It should include:

- Assembly point(s)
- Evacuation triggers and routes (if required)
- Neighbourhood Safer Places and Refuges of Last Resort
- Instructions for sheltering in-place, should that become necessary.

Neighbourhood Safer Places are locations designated by fire authorities as having a higher likelihood of supporting human survival, should evacuation no longer be an option. *It must be emphasised that anyone sheltering in a Neighbourhood Safer Place during a bushfire event may still experience extreme conditions and their safety is not guaranteed.*

Designated neighbourhood safer places in the vicinity of the project are:

- Open Space, 39A Alexander Parade, Arcadia Vale, Lake Macquarie (LGA) (9 min drive south from the Project)
- Open Space, 2 Dunvegan Street, Mannering Park, Central Coast (LGA) (25 min drive south from the Project)
- Open Space, Cnr of Fishing Point Road and The Circlet, Rathmines, Lake Macquarie (LGA) (12 min drive south from the Project)

7. Conclusions and recommendations

7.1 Bushfire hazard assessment

Origin is seeking regulatory and environmental planning approval for the construction and operation of a grid-scale BESS next to the EPS at Rocky Point Road Eraring, within the Lake Macquarie City Council. The Project area is approximately 40 km southwest of Newcastle.

The Project would include:

- Constructing a grid connected BESS with discharge capacity of up to 700 MW and storage capacity of 2,800 MWh able to dispatch over variable durations from four hours to beyond eight hours;
- Establishing HV and MV transformers and associated infrastructure;
- Connecting the BESS to the existing 330 kV TransGrid switchyard by an approximate 400 m overhead 330 kV transmission line; and
- Installing safety protection systems and site ancillary facilities such as laydown areas and site offices.

Areas of bushfire prone native vegetation lie to the north and west of the Project area. The site currently includes a small area (<1 ha) of undisturbed native vegetation that is proposed to be retained. Other existing vegetation is highly disturbed as a result of earlier development in the area.

The proximity of the Project area to nearby native vegetation (along west and northern perimeters) means that some sections of the Project area would be exposed to high levels of radiant heat (BAL-19 or above) in the event of a bushfire. This will need to be considered during the final design of the BESS and associated bushfire protection measures.

7.2 Bushfire risk scenarios

The bushfire season in the Central Coast region generally runs from October to March, although commencement has been declared as early as August. Days of elevated fire danger are relatively infrequent, but mostly occur between December and March. Dry electrical storms and north-westerly winds are common during the fire season.

Two main bushfire risk scenarios face the Proposal and have been considered by this assessment:

- A fire igniting in the surrounding vegetation north-west of the Project area on a day of elevated fire danger burns under the influence of north-westerly winds towards/through the Project area. Embers and radiant heat are carried towards the Project infrastructure. Three such bushfire incidents have occurred within the region around the Project in the last 20 years; and
- Electrical equipment failure, battery fire, or hot works cause ignition at the Project during construction or operation. Fire spreads from the Project area into surrounding vegetation to the north or west under the influence of moderate fire weather conditions with wind from the south or east.

7.3 Bushfire Management and emergency management

Appropriate measures will be in place to mitigate the bushfire risks from and to the Project, particularly those associated with the main bushfire risk scenarios. These measures would be confirmed as part of detailed design based on the measures identified in Sections 5 and 6. Final measures would be developed in consultation with RFS and DPIE and documented in construction and operational environmental and safety management plans.

7.4 Conclusion

The vegetated areas surrounding the Project are zoned for fuel management, as Asset Protection Zone (to the north) or Strategic Fire Advantage Zone (to the west). This means that the likelihood of bushfire and exposure to radiant heat are reduced. In the event of a bushfire, some sections within the Project area remain exposed to radiant heat above BAL-19, which is likely to threaten the integrity of conventional buildings.

However, the available land within the Project area is sufficiently large to enable redistribution of equipment within the Project area or shielding as part of the civil solution, and thereby provide sufficient separation between the project components and radiant heat at the northern and western boundaries of the Project area.

The details on internal separation requirements and need for active firefighting requirements at the Project area would be determined in detailed design, in consultation with RFS and DPIE. Detailed firefighting response and any need for fire water containment would be confirmed based on selection of technology provider post development approval, and provided for review by DPIE, Fire and Rescue NSW and the RFS as part of a final hazard study and management documentation.

8. References

AECOM (2020) Biodiversity and Land Management Plan: Eraring Power Station. Technical report for Origin Energy Eraring Pty Ltd

Dowdy, A. et al. (2015) East Coast Cluster Report, Climate Change in Australia Projections for Australia's Natural Resource Management Regions: Cluster Reports, eds. Ekström, M. et al., CSIRO and Bureau of Meteorology, Australia.

Central Coast BFMP (2020) Central Coast Bushfire Risk Management Plan. Central Coast Bushfire Management Committee. https://www.rfs.nsw.gov.au/__data/assets/pdf_file/0008/187784/Central-Coast-Bushfire-Risk-Management-Plan-2020_Low-Res.pdf

IPCC (2014) *Fifth assessment report. Synthesis report. Summary for Policymakers.* Intergovernmental Panel on Climate Change.

ISSC (2016) *ISSC3 - Guide for the Management of Vegetation in the Vicinity of Electricity Assets.* Industry Safety Steering Committee. https://energy.nsw.gov.au/sites/default/files/2018-09/ISSC3-guideline-for-managing-vegetation-near-power-lines.pdf

NSW OEH (2019) *BioNet Vegetation Classification*, Office of Environment and Heritage, NSW Government. https://www.environment.nsw.gov.au/NSWVCA20PRapp/default.aspx.

NSW RFS (2015) *Guide for bushfire prone land mapping Version 5b*. Rural Fire Service, Government of New South Wales. https://www.rfs.nsw.gov.au/__data/assets/pdf_file/0011/4412/Guideline-for-Councils-to-Bushfire-Prone-Area-Land-Mapping.pdf.

NSW RFS (2019a) *Planning for Bushfire Protection: A guide for councils, planners, fire authorities and developers*. Rural Fire Service, Government of New South Wales. https://www.rfs.nsw.gov.au/__data/assets/pdf_file/0005/174272/Planning-for-Bush-Fire-Protection-2019.pdf

NSW RFS (2019b) *NSW RFS Fire Trail Standards*. March 2019. Rural Fire Service, Government of New South Wales. https://www.rfs.nsw.gov.au/__data/assets/pdf_file/0009/69552/CMR1479-Fire-Trail-Standards-32019.pdf

Standards Australia (2018) *Australian Standard 3959-2018 – Construction of buildings in bushfire-prone areas*. Standards Australia Limited.