Hunter Power Project

Bushfire Assessment Report

Rev 0

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Abbreviations

Term	Definition
APZ	Asset Protection Zone: an area located between bushfire prone vegetation and dwellings or other valued assets
AWS	Automated Weather Station
BAL	Bushfire Attack Level: radiant heat exposure from bushfire
BFMC	Bush Fire Management Committee: Hunter BFMC is the committee applicable to the Proposal
BFRMP	Bush Fire Risk Management Plan: plan developed by Hunter BFMC for strategic management of bushfire risk in Cessnock and Maitland local government areas
BPL	Bushfire prone land: land designated as supporting bushfire prone vegetation as defined by RFS (2015)
CMIP	Coupled Model Intercomparison Project of the Intergovernmental Panel on Climate Change (IPCC)
EIS	Environmental Impact Statement
FDR	Fire Danger Rating
FFDI	Forest Fire Danger Index
NBWS	National Bushfire Warning System
PBP	Planning for Bushfire Protection (NSW RFS, 2019a)
PCT	Plant Community Type
RCP	Representative Concentration Pathway: scenario representing addition radiant heat retained in atmosphere as a result of a defined future trajectory for greenhouse gas emissions
RFS	NSW Rural Fire Service
SEARs	Secretary's Environment Assessment Requirements
SFAZ	Strategic Fire Advantage Zone: an area (typically) located around valued assets whose bushfire fuels are managed to moderate fire behaviour and reduce bushfire risk
TOBAN	Total fire ban

Executive summary

Overview

Snowy Hydro Limited (Snowy Hydro) proposes to construct and operate a gas fired power station near Kurri Kurri, NSW ('the Proposal') on the site of the former Kurri Kurri aluminium smelter owned by Hydro Aluminium Kurri Kurri Pty Ltd (Hydro Aluminium). The Proposal would have a capacity of up to approximately 750 MW, which would be generated via two heavy duty gas turbines. Although primarily a gas fired power station, the facility would also be capable of operating on diesel as a back-up fuel. It is proposed to operate as a "peak load" generation facility that supplies electricity at short notice when there is a requirement in the National Electricity Market.

Snowy Hydro is currently seeking approval for the Proposal from the NSW Minister for Planning and Public Spaces, under the NSW *Environmental Planning and Assessment Act 1979*. Draft Secretary's Environmental Assessment Requirements (SEARs) were issued for the Proposal on 5 February 2021. This report responds to a requirement under the SEARs to assess bushfire risks for the Proposal in accordance with the NSW Rural Fire Service (RFS) guidance document, *Planning for Bushfire Protection 2019*.

Existing conditions

The Proposal Site is located approximately three km north of the town of Kurri Kurri, in the small suburb of Loxford, NSW within the Cessnock City Council local government area. The Proposal Site is almost completely devoid of native vegetation cover. Native vegetation is only present on the proposed electrical switchyard, stormwater basin and the Asset Protection Zone areas of the Proposal Site. The remnant vegetation within the proposed electrical switchyard area is classified as high or moderate bushfire risk. The land along the northern and western edges of the Proposal Site is located in buffer areas for nearby bushfire prone vegetation. The remainder of the Proposal Site is not classified as bushfire prone.

The Proposal Site experiences a warm temperate climate with warm and relatively wet summers and cooler and drier winters. Although the climate is relatively mild, days with maximum temperatures exceeding 40°C occur occasionally between the months of October and March, inclusive. The mild climate typically moderates fire weather conditions. The bushfire season generally runs between October and March, but may commence several months earlier under dry conditions. Highly elevated fire weather conditions may occur during this period, particularly on days with north-westerly or westerly winds, high temperatures and low humidity. Days with severe fire danger ratings or greater occur about eight times each year, on average. The frequency of such days is projected to increase in response to projected climate change over the operating life of the Proposal.

Fire is a regular feature of the landscape in which the Proposal is located. Two relatively large fires have burnt to the boundary of the former Kurri Kurri aluminium smelter within the last 20 years (the most recent in 2016-17).

Landscape bushfire risks in the Proposal's environs arise mainly from the large patch of bushfire prone vegetation (Coastal Swamp Oak Forest vegetation community) located to its north and west. Two main bushfire risk scenarios have been identified:

- *Scenario one:* A fire ignites in or burns into the native vegetation areas to north-west of the Proposal Site 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 Proposal Site, and 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 Proposal and personnel operating there.
- *Scenario two:* Electrical equipment failure or hot works result in fire ignition at the Proposal Site. Fire escapes 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. While this scenario is considered to be unlikely, it provides the most plausible situation for a fire igniting due to activities conducted at the Proposal Site to escape into the surrounding landscape.

Should native vegetation in the vicinity of the Proposal Site be ignited in a bushfire, it could expose the generation and/or switchyard infrastructure of the Proposal to radiant heat, embers and smoke. The level of exposure to bushfire attack, referred to as the bushfire attack level (BAL), varies with distance from the vegetation. With the exception of the proposed switchyard and some other land in the north-east of the Proposal Site, most areas would be exposed to low levels (less than 12.5 W/m^2) of radiant heat in the event of a bushfire in nearby native vegetation.

Bushfire protection measures

Bushfire protection measures have been identified for construction and operational phases of the Proposal, based on guidance from *Planning for Bushfire Protection* (PBP). 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.

The main bushfire protection measures that have application to construction and operation of the Proposal are:

- *SFAZ:* areas of relatively high bushfire risk native vegetation to the north and west of the Proposal Site are managed by RFS under the Hunter Bush Fire Risk Management Plan as strategic fire advantage zones (SFAZ). Bushfire fuel hazard in these areas is actively maintained to reduce bushfire risk, as well as radiant heat and ember attack exposure. With reduced bushfire fuel hazard, the behaviour of any fire that becomes established is likely to be moderated.
- *APZ:* which provides a buffer zone between a bushfire hazard and buildings or other structures. Asset Protection Zones (APZs) are managed to minimise fuel loads and reduce radiant heat levels, flame, ember and smoke attack. They help to provide a space for firefighters and other emergency services personnel responding to a fire event and reduce opportunities for any fire igniting on site to escape to surrounding areas. A 10 m wide APZ is proposed to be established and maintained along the boundaries of the Proposal Site adjacent to woody vegetation.
- *Vegetation removal:* all vegetation (including grasses) is to be removed from the proposed switchyard to reduce opportunities for a fire entering the Proposal Site and for a fire being ignited by electrical infrastructure (e.g. explosive failure of transformer, arcing from a conductor) escaping from the Proposal Site. Woody vegetation is to be removed from the proposed APZ. The remainder of the Proposal Site is already largely free of vegetation and will be maintained that way.
- *Location of sensitive infrastructure:* buildings and other infrastructure with sensitivity to radiant heat exposure would be placed in areas within the site that would be exposed to less than a moderate bushfire attack level of BAL-19[1].
- *Hazardous materials:* it may be necessary during some construction stages to store diesel fuel and other potentially flammable materials on the Proposal Site. Furthermore, the Proposal includes the construction of two large diesel storage tanks to support operation if gas is unavailable. Storage of diesel and any other hazardous materials will follow environmental protection guidance and be located at parts of the Proposal Site with moderate radiant heat exposure (<BAL-19) in the event of a bushfire. Since the entire Proposal Site could be subject to ember attack, storage areas for any hazardous materials would be free of vegetation or any other combustible materials that could contribute to a fire ignition.
- *Access roads:* safe operational access is provided to and within the Proposal Site for emergency services personnel. Access roads will also provide for safe egress from the site by personnel in case of a bushfire or other emergency.
- *Fire water supply:* access to water for fire suppression and/or protection of structures or equipment located on the Proposal Site would be provided.

[1] BAL-19 corresponds to a radiant heat exposure of approximately 19 W/m^2

Hot works controls would be put in place during construction to reduce the risk of fire ignition posed by activities that produce sparks or involve heat sources. On any declared total fire ban (TOBAN) days during construction, any hot works would only be undertaken with prior approval from the RFS.

Emergency and evacuation planning typically forms part of bushfire protection measures. Emergency responses to bushfire would be addressed with other hazards as part of the operator's and construction contractor's site emergency management plans.

Potential environmental impacts of proposed bushfire protection measures

Potential environmental impacts of the proposed bushfire protection measures are largely confined to the clearing of native vegetation within parts of the Proposal Site and the proposed APZ (area of native vegetation to be cleared in the APZ would be approximately 0.39 ha) and the potential for erosion and sedimentation associated with construction of the proposed APZ access track.

1. Introduction

1.1 Proposal description

Snowy Hydro Limited (Snowy Hydro) ('the Proponent') proposes to develop a gas fired power station near Kurri Kurri, NSW ('the Proposal'). Snowy Hydro is seeking approval from the NSW Minister for Planning and Public Spaces under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) for the Proposal.

The Proposal involves the construction and operation of a power station and electrical switchyard, together with other associated infrastructure. The power station would have a capacity of up to approximately 750 megawatts (MW), which would be generated via two heavy duty gas turbines. Although primarily a gas fired power station, the facility would also be capable of operating on diesel fuel as back-up as required.

The Proposal would operate as a "peak load" generation facility supplying electricity at short notice when there is a requirement in the National Electricity Market. The major supporting infrastructure that is part of the Proposal would be a 132 kV electrical switchyard located within the Proposal Site. The Proposal would connect into existing 132 kV electricity transmission infrastructure located adjacent to the proposed switchyard. A new gas lateral pipeline and gas receiving station will also be required. This would be developed by a third party and subject to a separate environmental assessment and planning approval.

Other ancillary elements of the Proposal include:

- Storage tanks and other water management infrastructure
- Fire water storage and firefighting equipment such as hydrants and pumps
- Maintenance laydown areas
- Diesel fuel storage tank(s) and truck unloading facilities
- Stormwater basin
- Site access roads and car parking
- Office/administration, amenities, workshop/storage areas.

Construction activities are proposed to commence early 2022 and the Proposal is intended to be operational by the end of 2023. Further description of the Proposal is provided in Chapter 2 of the Environmental Impact Statement.

The Proposal Site forms part of the decommissioned Kurri Kurri aluminium smelter site which is owned by Hydro Aluminium Kurri Kurri Pty Ltd (Hydro Aluminium). The Hydro Aluminium facility ceased operation in late 2012 and was permanently closed in 2014. Demolition and site remediation works on the Proposal Site are ongoing but are to be completed prior to construction of the Proposal.

The Kurri Kurri aluminium smelter site has been extensively remediated, with most of the above ground structures having been demolished, asbestos removed, and waste materials recycled. Stage 2 demolition works are currently underway and involve demolition of below ground infrastructure amongst other works.

On 16 December 2020 the Proposal was declared critical State significant infrastructure (SSI), and therefore is subject to assessment under Division 5-2 of the *Environmental Planning and Assessment Act 1979 Act* (EP&A Act).

1.2 Location

The Proposal Site is located at Loxford in the Hunter Valley region of New South Wales. It is approximately three km north of the town of Kurri Kurri, approximately 30 km west of Newcastle CBD and 125 km north of Sydney. The Proposal Site is located within the Cessnock City Council local government area (LGA) (see Figure 1.1).

1.3 Purpose of this report

This technical report, the *Bushfire Assessment Report*, has been prepared in accordance with the draft Secretary's Environmental Assessment Requirements (SEARs) issued for the Proposal on 5 February 2021 by the Secretary of the NSW Department of Planning Industry and Environment.

The SEARs relevant to this bushfire risk assessment are presented in Table 1.1. This report contains the response to the bushfire component of the hazards and risks SEARs.

Table 1.1: Secretary's environmental assessment requirements – hazards and risks

SEARs	
Hazards and Risk	An assessment of bushfire risks in accordance with *Planning for Bushfire Protection 2019* (NSW RFS, 2019a)

This report has been developed following guidance from the NSW Rural Fire Service (RFS), particularly *Planning for Bush Fire Protection* (PBP; RFS, 2019a). To the extent that they are applicable to the Proposal, the report also follows bushfire safety guidance developed by and for NSW electricity network operators.

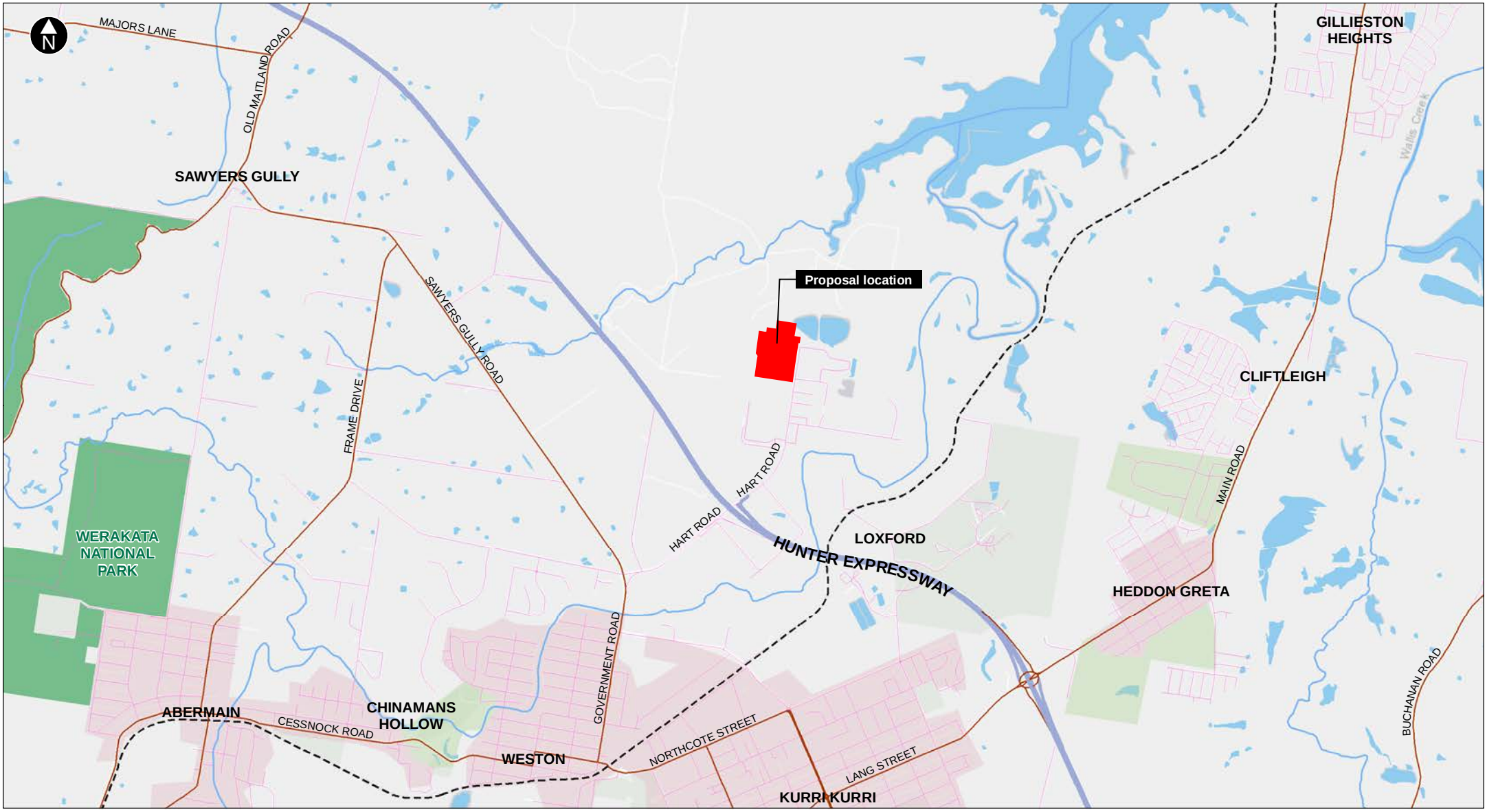


Figure 1-1 Proposal location (regional)

2. Legislative and policy requirements

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

2.1 NSW legislation

2.1.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) restricts the granting of development consent on bushfire-prone land (BPL) unless the proposed development conforms with the requirements of *Planning for Bushfire Protection* (NSW RFS, 2019a; see section 2.2). Critical state significant infrastructure (such as this Proposal) does not require development consent under Part 4 of the Act and therefore is not subject to this requirement. However, the SEARs issued for this Proposal require an assessment of bushfire risk in accordance with Planning for Bushfire Protection.

Local government area Bush Fire Management Committees (BFMCs) maintain and update maps of BPL in their regions.

2.1.2 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. Permits are required to light fires for bushfire fuel hazard reduction or to clear 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.

2.1.3 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 Proposal and its operation.

2.2 NSW guidelines

2.2.1 Planning for Bush Fire Protection

The SEARs (as per Table 1.1) mandate that this bushfire assessment follows *Planning for Bushfire Protection 2019* (NSW Rural Fire Service, 2019) (PBP). PBP 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
- Facilitate the maintenance of APZs, fire trails, access for firefighting and on-site equipment for fire suppression.

2.2.2 Guide for Bush Fire Prone Land Mapping

The identification of Bushfire prone land (BPL) in NSW is required under the EP&A Act, including a requirement for and guidance for the preparation of a bush fire prone land map identifying vegetation within LGAs that has the potential to support a bush fire. The bush fire prone land map is the trigger for the consideration of bush fire protection measures for new development (*Planning for Bush Fire Protection* (RFS, 2019) and Australian Standard 3959-2009 – *Construction of buildings in bush fire prone areas*). Guidance for identification and mapping of BPL is provided in the *Guide for Bush Fire Prone Land Mapping* (NSW Rural Fire Service, 2015).

The *Guide for Bush Fire Prone Land Mapping*, in conjunction with *Planning for Bush Fire Protection*, is designed to identify if an area can support a bushfire or is subject to bushfire attack based on the presence and type of vegetation fuel sources. 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.
- *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. BPL mapping for the Proposal Site is discussed further in Section 3.1.

3. Bushfire risk factors

3.1 Regional context

The Proposal Site is located approximately three km north of the town of Kurri Kurri in a small suburb called Loxford, within the Cessnock City Council local government area. It is situated approximately 30 km west of Newcastle CBD and 125 km north of Sydney. The Proposal Site was previously occupied by the Kurri Kurri aluminium smelter.

Except for two small areas within the proposed location of the electrical switchyard, the entire Proposal Site has been cleared of native vegetation. Parts of the proposed electrical switchyard (Figure 3.1) includes land that is currently classified as high and moderate bushfire risk (BPL categories 1 and 3, respectively). The northern and western edges of the Proposal Site are located within buffer areas for category 1 and 3 vegetation, with the remainder of the Proposal Site not classified as bushfire prone.

Landscape bushfire risks to the Proposal arise mainly from the large patch of bushfire prone vegetation (Coastal Swamp Oak Forest vegetation community) located to its north and west. Smaller fragments of this vegetation community are also located to the east of the Proposal Site.

3.2 Current bushfire management arrangements

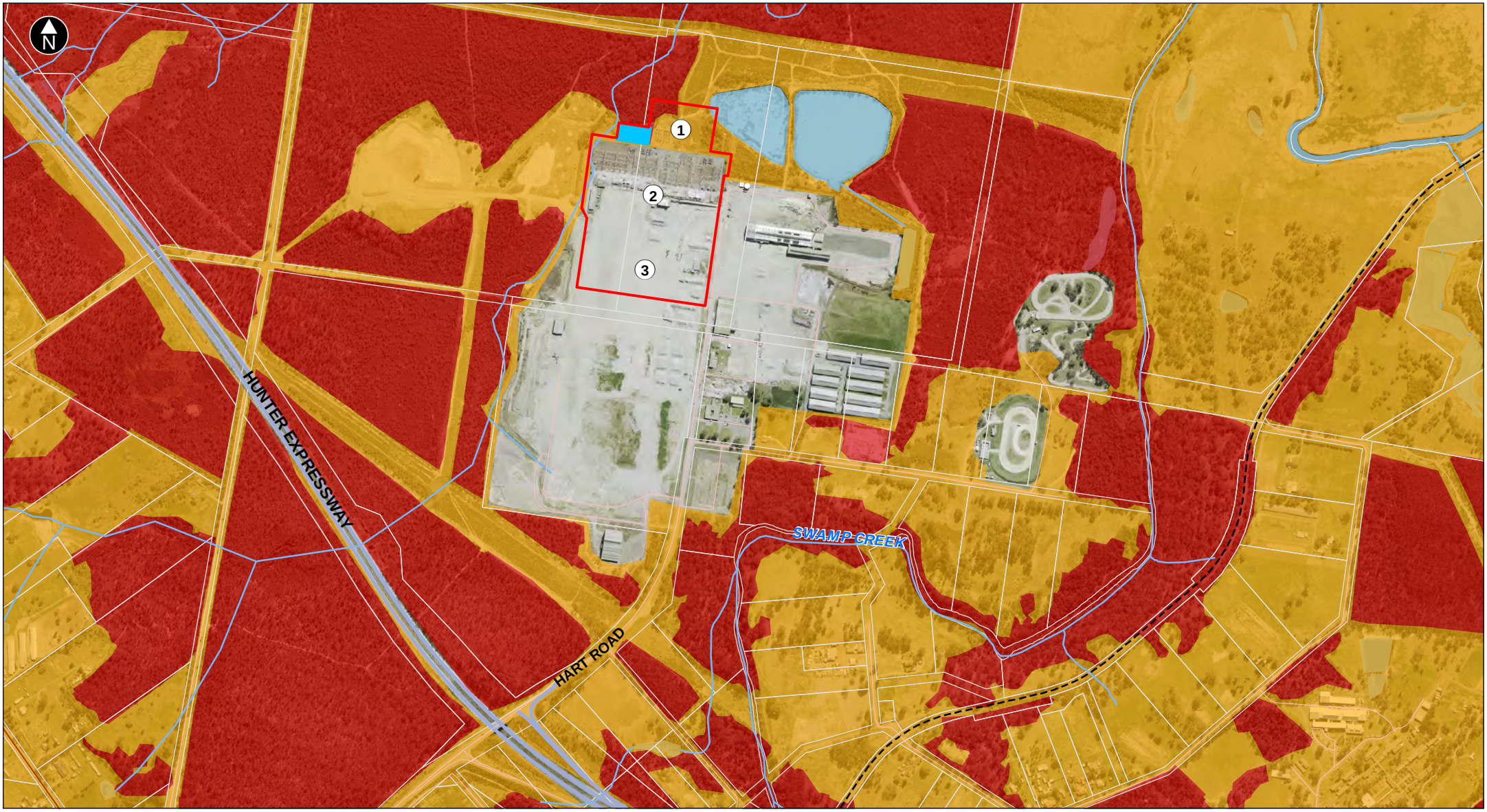
Bushfire management arrangements for the region in which the Proposal is located are described in the Hunter BFMC's Bush Fire Risk Management Plan (BFRMP; Hunter BFMC, 2009) for Cessnock and Maitland local government areas. The Plan seeks to:

- 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
- Effectively contain fires with a potential to cause damage to life, property and the environment.

The Hunter BFRMP identified the former Kurri Kurri aluminium smelter (within which the Proposal is located) as a priority 1C (extreme risk) area and specified several risk mitigation strategies, including hazard reduction and property planning. The former Kurri Kurri aluminium smelter site is set within an APZ and is surrounded by a Strategic Fire Advantage Zone (SFAZ) that extends over the surrounding native vegetation and grassland.

APZ are intended to protect human life, property and highly valued public assets and values and are developed to enable the safe use of direct attack suppression strategies. SFAZ seek to provide strategic areas that will reduce the speed and intensity of bushfires, reduce the potential for spot fire development and contain fires within management boundaries. They are managed to provide for parallel and/or indirect suppression strategies under elevated fire weather conditions. Bushfire fuel hazard within the SFAZ is intended to be maintained below high (Hunter BFMC, 2009).

The wider surrounding area around the Proposal Site is relatively well-served by fire response services. The nearest Fire and Rescue NSW station is located at Lang Lang St, Kurri Kurri, approximately four km to the south of the Proposal Site. NSW RFS have a control centre at East Maitland, approximately eight km from the Proposal Site and at Cameron Park, 20 km from the Proposal Site.



Proposal site
Detention basin
Motorway
Main roads
Roads
Railway
Waterbodies
Cadastre
Category 1: High bushfire risk
Category 3: Moderate bushfire risk

1 Proposed Switchyard Area
2 Proposed Plant Area
3 Proposed Buffer Area

0 250 500 m

1:12,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Data sources:
Jacobs 2020
Metromap (Aerometrex) 2020
NSW Spatial Services

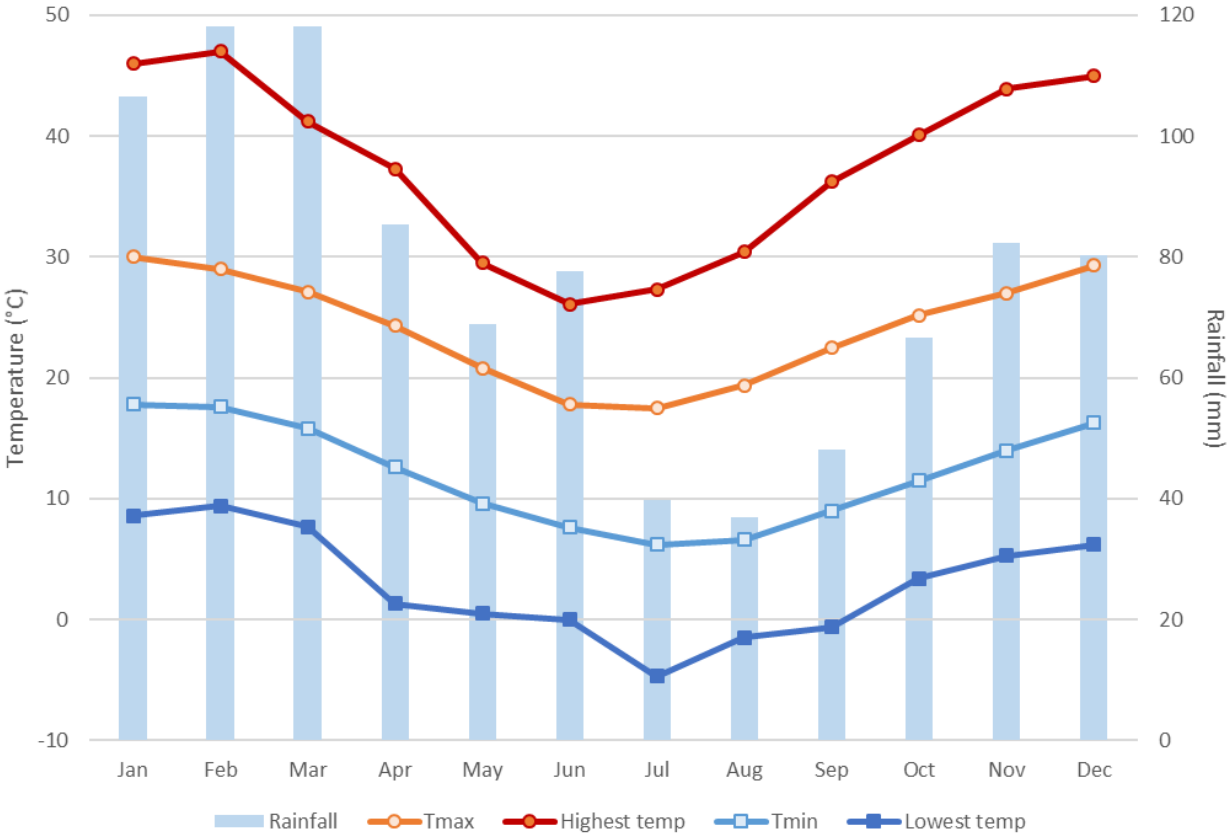
Figure 3-1 Bushfire prone land mapping

3.3 Bushfire weather

3.3.1 Historical bushfire weather

The Proposal Site experiences a warm temperate climate. Summers are warm and relatively wet and winters are cooler and relatively dry (Figure 3.2). Average daily maximum temperatures range between 18°C in July and 30°C in January[2]. Temperatures in excess of 40°C have been recorded in the months between October and March. The hottest recorded temperature is 47.0°C (February 2017). Average minimum temperatures range between 6.2°C in July and 17.8°C in January. Freezing conditions have been recorded between June and September, with the lowest recorded temperature being -4.7°C (July 1970).

The estimated average annual rainfall is 931 mm. Annual rainfall (1967-2020) has ranged between 483 mm (1980) and 1350 mm (1988). The highest recorded daily rainfall total is 243 mm (April 2015). Over 60 per cent of the yearly rainfall occurs during the warm season months of October-March.



Data from: Bureau of Meteorology station 061250 Paterson (Tocal AWS). Records 1967-2020.

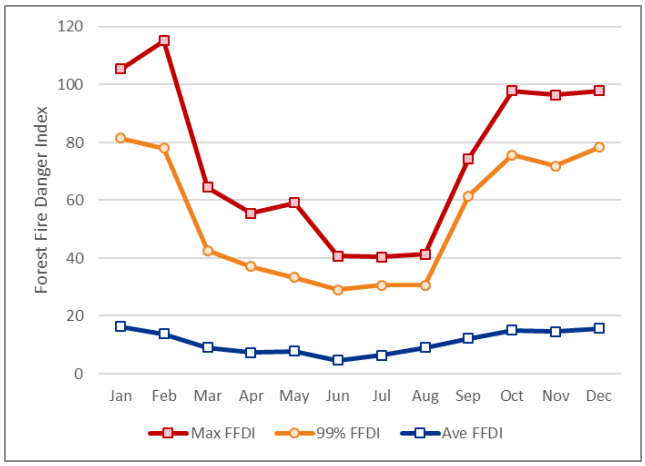
Figure 3.2: Average monthly rainfall, average daily maximum (Tmax) and minimum (Tmin) temperatures, maximum (Highest temp) and minimum (Lowest temp) recorded temperatures.

Average monthly fire danger ratings (FDR) are in the low to moderate range between March and September (Forest Fire Danger Index (FFDI) ≤12) and high throughout the remainder of the year (Figure 3.3). Days of very high FDR or greater (FFDI ≥25) may occur in any month. Days with catastrophic fire danger (FFDI>100) have been recorded in January and February (only once in each month). Days in the extreme fire danger range (FFDI 75-100) have been recorded in each month between October and February.

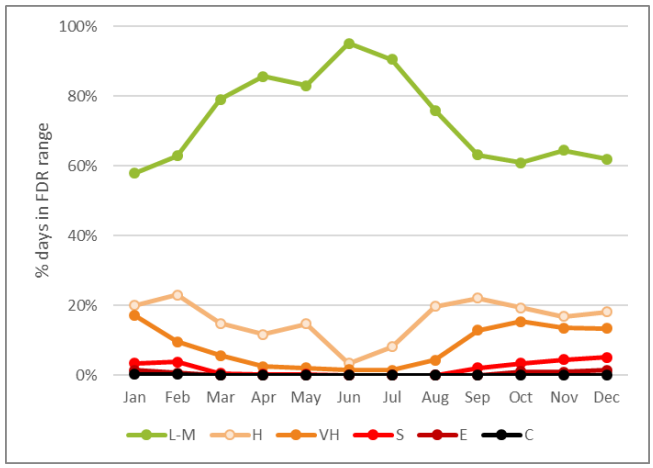
[2] Meteorological records are based on Bureau of Meteorology station 061250 Paterson (Tocal AWS) for the period 1967-2020. This weather station is located approximately 23 km from Kurri Kurri. Meteorological stations at Cessnock and Maitland are closer than Paterson, but have shorter lengths of record, particularly for temperature.

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.

The bushfire season generally runs between October and March (Hunter BFMC, 2009). Days with north-westerly winds, high daytime temperatures and low humidity are most commonly associated with dangerous fire weather conditions in Hunter BFMC region. Dry lightning storms are common in the mountains in the west of the region during the bushfire season.



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



b) Percentage 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 3.3: Estimated forest fire danger index (FFDI) and fire danger rating (FDR) values for Paterson (Tocal AWS; 061250), based on records for 2004-2019.

3.3.2 Climate change projections for bushfire

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

Climate projections for 2050 were generated for the Proposal Site, based on the mean model results for all CMIP5[3] models with projections for wind speed, relative humidity, daily rainfall and maximum temperature for RCP8.5[4] (high emissions scenario); as made available through SimCLIM[5]. Change factors to 2050 for each of these weather parameters were applied to the 2003-2019 data for BoM station 061250 (Paterson – Tocal AWS), as (humidity and windspeed) data for the standard baseline (1986-2005) were not available for this location.

3 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.

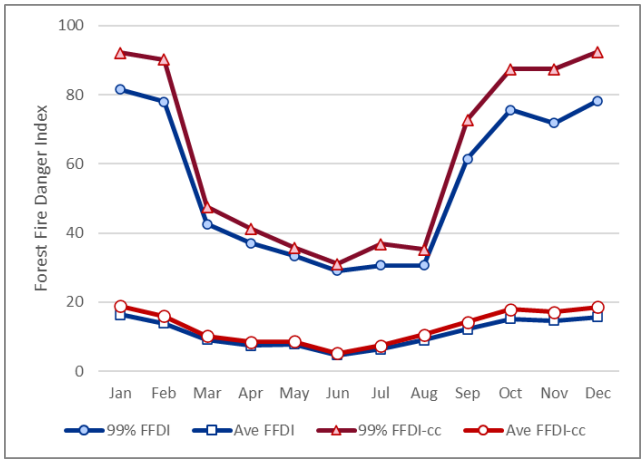
4 Population and economic growth, technological change including reliance on fossil fuels, and political and social changes will all have substantial effects on greenhouse gas emissions and accumulation in the atmosphere. To account for this uncertainty, the Intergovernmental Panel on Climate Change (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).

5 https://www. https://www.climsystems.com/

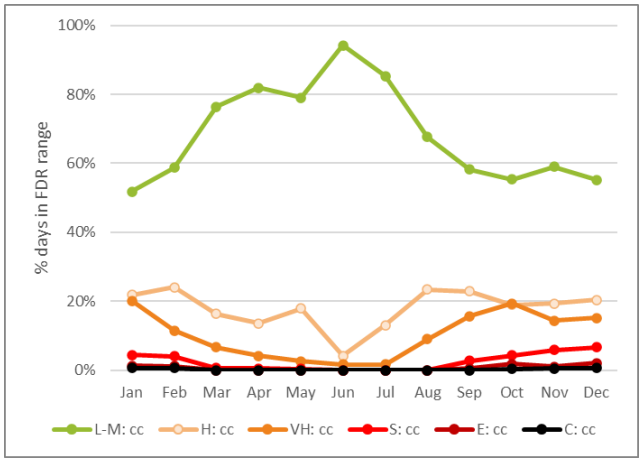
Climate models suggest that the main projected changes in climate for the region under the RCP8.5 scenario are for:

- 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
- Decreased relative humidity: changes in relative humidity can be expected due to increased temperatures and small changes in the seasonality of rainfall. Relative humidity is projected to decrease through most of the year, particularly during spring
- Small changes to wind: average wind speeds are projected to increase slightly through much of the fire season.

Combined, these projections indicate that bushfire weather will become harsher. Average FDR is projected to increase slightly (Figure 3.4, Table 3.1). Days with dangerous fire weather conditions are projected to become more frequent and occur through more months of the year. Days with severe FDR are projected to occur between September and May by about 2050 under the high emissions RCP8.5 scenario. Catastrophic fire weather conditions could occur between October and February, compared with only January and February historically.



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) Percentage 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 3.4: Estimated forest fire danger index (FFDI) and fire danger rating (FDR) values for Paterson (Tocal AWS; 061250), based on records for 2004-2019 and climate change projections for 2050 RCP8.5.

Table 3.1: Fire danger index, indicative fire behaviour and average occurrence at the Proposal Site

FDR	Fire behaviour guidance	Average number of days/y	
		Current	2050
Low-moderate FDI<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.	268 (74%)	251 (69%)
High FDI 12-24	Fires are capable of spreading rapidly, particularly in the absence of preventative measures and may require additional work effort to be extinguished.	58 (16%)	65 (18%)
Very high FDI 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.	30 (8%)	37 (10%)
Severe FDI 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).	6.9 (1.9%)	8.9 (2.4%)
Extreme FDI 75-100		1.6 (0.4%)	2.3 (0.6%)
Catastrophic FDI>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).	0.1 (0.03%)	0.8 (0.2%)

3.4 Topography

The Proposal Site was extensively disturbed during construction of the former Kurri Kurri aluminium smelter. The site is primarily flat with an elevation of approximately 14m AHD. Land to the north and east comprises low-lying and largely flat land that supports patches of native vegetation and farming land. It includes the waterways of Swamp Creek, Black Waterholes Creek and the Swamp Creek wetlands, which drain to the Wentworth swamps and are part of the Hunter River floodplain. Land outside the Proposal Site gradually slopes (and drains) to the north-east, towards Black Waterholes Creek.

3.5 Vegetation and land uses

The Proposal Site is adjacent to bushfire prone vegetation to its north and west and (currently) includes a small area of native vegetation. Most native vegetation in the vicinity of the Proposal Site is Category 1 high bushfire risk vegetation (Figure 3.1) and comprises the vegetation communities listed in Table 3.2. Bushfire hazard is primarily provided by the Parramatta Red Gum vegetation community.

In addition to the areas of native vegetation that surround the Proposal Site, the area has rural residential, agricultural and industrial land in the vicinity. The nearest residential area is Kurri Kurri, located approximately three km south and south-west of the Proposal Site.

Transmission line corridors in the vicinity of the Proposal Site are regularly maintained to reduce the hazard posed by woody vegetation. These areas support grasses, sedges and low woody shrubs. Land to the north east of the Proposal Site (~one km away) is used for farming and supports grasses and scattered patches of remnant native vegetation.

Table 3.2: Plant community types (PCT) of the bushfire study area

PCT	Plant community type description	Keith vegetation classification
1633	Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area	Dry Sclerophyll Forests
1737	Typha rushland	Freshwater Wetlands

Source: Jacobs (2021) Kurri Kurri OCGT Development - Biodiversity Development Assessment Report

3.6 Fire history and ignition sources

According to the Hunter BFRMP, the main ignition sources in the landscape surrounding the Proposal Site are:

- Arson – most common around townships, roads and trails; in grassy areas (which are more accessible than forests) and during school holidays
- Escaped planned burns
- Illegal burning activities
- Arcing distribution power lines
- Motor vehicles.

The Hunter bushfire management area (Cessnock and Maitland local government areas) records, on average, approximately 200 bushfires per year. About five of these develop into major fires each year, on average. Larger and more damaging fires in the region typically travel in an easterly direction under the influence of north-westerly or westerly winds. In some circumstances, strong southerly and/or easterly wind changes may intensify fire events.

The fire history in the area surrounding the Proposal Site is shown in Figure 3.5[6]. The larger bushfires occurred in the 2002-03 and 2016-17 seasons. These burnt from the north-west towards the south-east and affected bushland and adjacent rural land areas. They burnt to the boundary of the former Kurri Kurri aluminium smelter site. The 2002-03 bushfire burned through area of the proposed switchyard at the northern end of the Proposal Site. There are also anecdotal reports of other smaller fires in the area around the Proposal Site that are not included in NSW fire history data sets.

3.7 Key bushfire risk scenarios

The key bushfire scenarios that may affect the Proposal are:

- *Scenario one:* A fire ignites in or burns into the native vegetation areas to north-west of the Proposal Site 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 Proposal Site and 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 Proposal and personnel operating there. 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 Proposal Site.

  This scenario reflects the two main fires depicted in Figure 3.5 and, based on these experiences, might be expected to occur once every 10-20 years, not accounting for the influence of climate change.

[6] The fire history is based on fire scar information published on data.nsw.gov,au. This data set does not necessarily capture the full extent of every fire or all of the smaller fires that have been experienced historically at a particular location.

- *Scenario two:* Electrical equipment failure (most likely explosive failure of a transformer) or hot works result in fire ignition at the Proposal Site. Fire escapes 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 Proposal and bushfire prone vegetation, 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 at the Proposal Site to escape into the surrounding landscape.

3.8 Bushfire attack level exposure

Should native vegetation in the vicinity of the Proposal Site be ignited in a bushfire, it would potentially expose the generation and/or switchyard infrastructure to radiant heat and embers. The level of exposure to bushfire attack (the bushfire attack level (BAL) calculated using AS3959:2018 *Construction of building in bushfire prone areas;* Standard Australia, 2018) is depicted in Figure 3.6. The BAL for the Proposal is calculated assuming a 10 m APZ. Point A is a proposed location for a standpipe for fire water supplies. The standpipe would be located on the fire access track constructed for the APZ surrounding the Proposal.

Radiant heat exposure (and ember attack) above BAL-19 is likely to threaten the integrity of conventional buildings (RFS, 2019a). The proposed switchyard area and the north-east corner of the main generation facility within the Proposal Site are the only significant areas with exposure 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 Proposal Site could also be exposed to ember attack generated by fire in the nearby native vegetation.

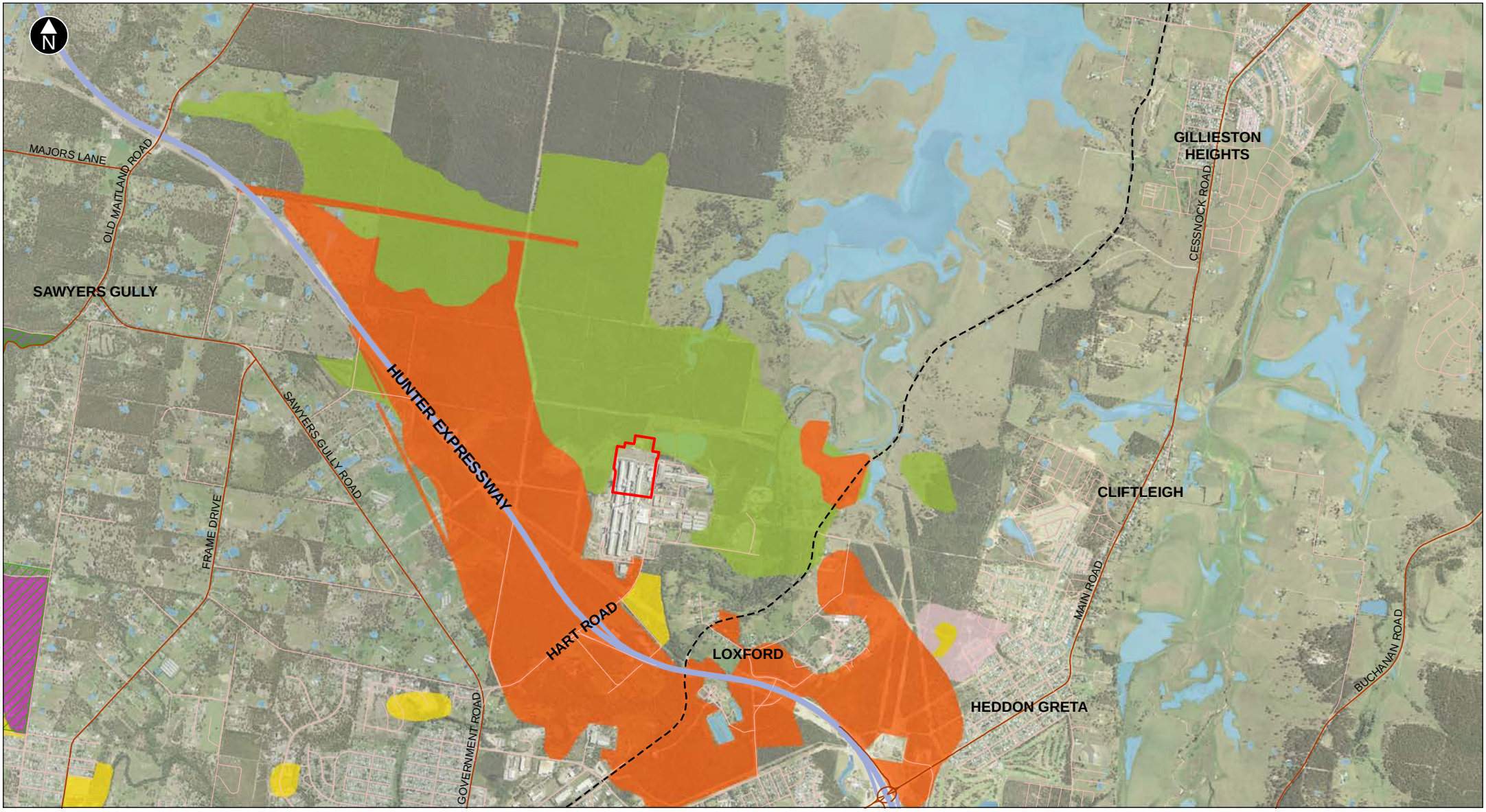


Figure 3-5 Fire history

snowy hydro renewable energy Jacobs

Date: 5/03/2021 Path: J:\IE\Projects\04_Eastern\IS354500\22_Spatial\GIS\Directory\Templates\Figures\KurriKurriEIS\Specialists\BushFire\IS354500_KKOCGT_EIS_BF_F004_FireHistory_R2.mxd
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Figure 3-6 Bushfire attack level exposure from bushfire prone vegetation in the vicinity of the Proposal Site

4. Bushfire protection measures

Bushfire protection measures have been developed for the construction and operational phases of the Proposal, 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.

The main bushfire protection measures (mostly from PBP) that have application to construction and operation of the Proposal are:

- *SFAZ:* areas of relatively high bushfire risk native vegetation to the north and west of the Proposal Site are managed by RFS under the Hunter BRMP as strategic fire advantage zones. Bushfire fuel hazard in these areas is actively maintained (including by planned burning) to reduce bushfire risk, as well as radiant heat and ember attack exposure. With reduced bushfire fuel hazard, the behaviour of any fire that becomes established is likely to be moderated.
- *APZ:* which provide a buffer zone between a bushfire hazard and buildings or other structures. APZ are managed to minimise fuel loads and reduce radiant heat levels, flame, ember and smoke attack. They help to provide a defendable space for firefighters and other emergency services personnel responding to a fire event and reduce opportunities for any fire igniting on site to escape to surrounding areas. A 10 m wide APZ is proposed to be established and maintained along the perimeter of the Proposal Site in areas where there is an interface with bushfire prone vegetation.
- *Vegetation removal:* all vegetation (including grasses) is to be removed from the proposed switchyard to reduce opportunities for a fire entering the site and for a fire being ignited by electrical infrastructure (e.g. explosive failure of transformer, arcing from a conductor) escaping from the site. Woody vegetation is to be removed from the Proposal's proposed APZ.
- *Location of sensitive infrastructure:* buildings and other infrastructure and any hazardous material storage areas with sensitivity to radiant heat exposure will generally be placed in areas within the site that would be exposed to less than BAL-19.
- *Access roads:* which provide safe operational access to and within the Proposal Site for emergency services personnel. Access roads will also provide safe egress for site personnel in case of a bushfire or other emergency.
- *Fire water supply:* access to water for fire suppression and/or protection of structures or equipment located on the Proposal Site will be provided.

Emergency and evacuation planning typically forms part of bushfire protection measures. Emergency responses to bushfire would be addressed with other hazards as part of the operator's site emergency management plan. These bushfire protection measures should be incorporated into the Proposal's Hazard Management Plan.

4.1 Bushfire protection measures during operation

4.1.1 Strategic Fire Advantage Zone

The Hunter BFRMP (Hunter BFMC, 2009) identifies a SFAZ around the former Kurri Kurri aluminium smelter (Figure 4.1). The SFAZ includes areas of native vegetation and cleared land that surround the Proposal Site. Bushfire fuel hazard in these areas is actively maintained (by RFS) by periodic hazard reduction burning in the larger blocks of native vegetation. This is designed to moderate fire behaviour and reduce the risks posed to people and infrastructure by radiant heat and embers.

It is assumed that given the significance of the Proposal's plant to the region and state, that the SFAZ will be maintained in future iterations of the BFRMP and that the RFS will continue to undertake periodic hazard reduction burning.

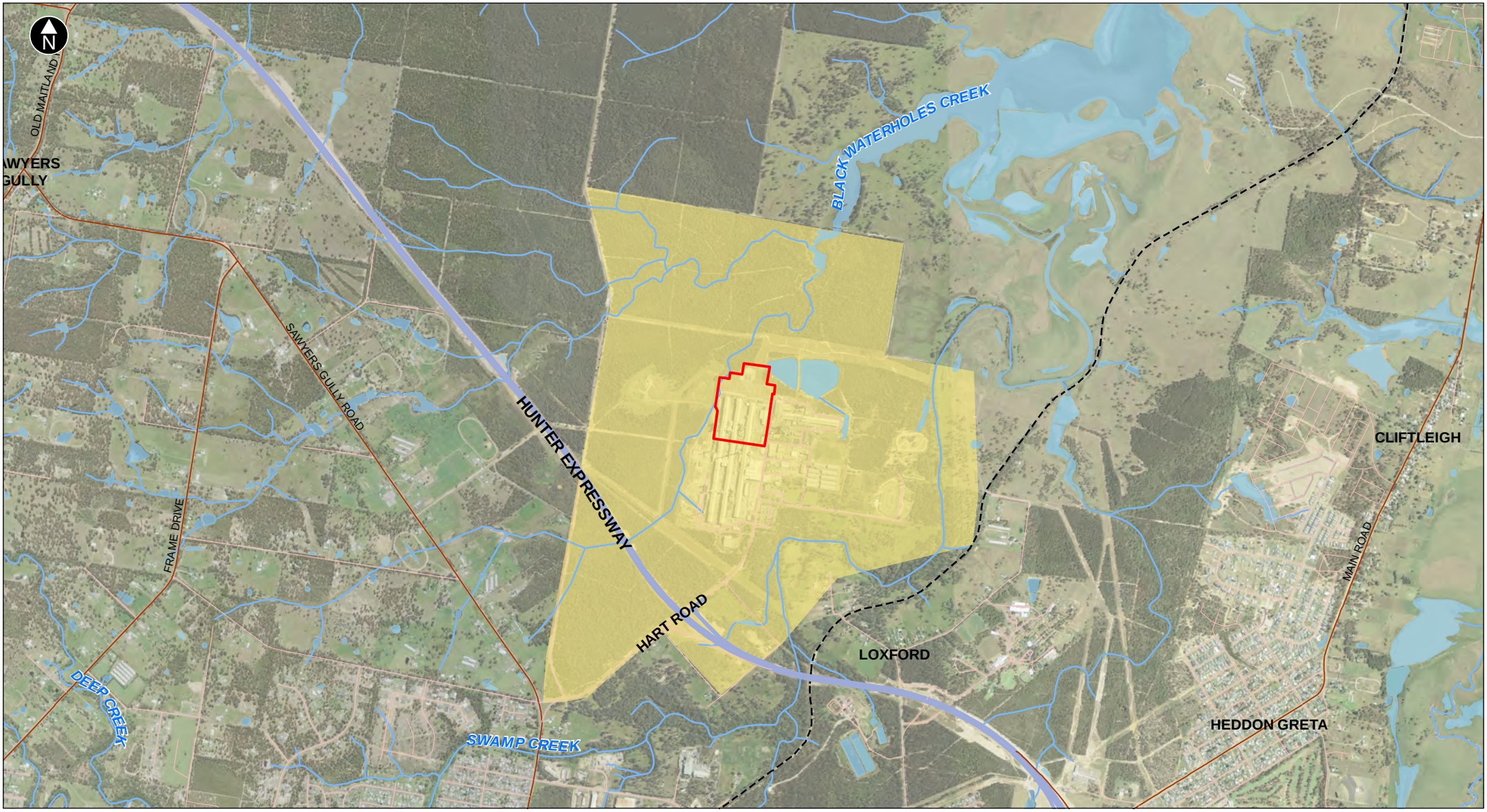

Figure 4-1 Bushfire management zoning

4.1.2 Asset Protection Zone

APZ 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.

A 10 m APZ is proposed for parts of the Proposal Site that interface with retained native vegetation, as per Figure 4.2. This 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).'
- PBP 2019 specifications for renewable energy generation facilities[7].

The APZ will either not be developed or will be reduced to 2-3 m in parts of the Proposal Site that are less directly exposed to bushfire prone vegetation (see Figure 4.2).

The APZ would be cleared of native vegetation if the Proposal is approved. Only small areas of native vegetation (0.39 ha[8]) would be cleared to establish the APZ (Figure 4.2). It is proposed that an access track be constructed within part of the APZ to provide access for fire-fighting vehicles to bushfire-prone parts of the Proposal Site that currently do not have a formed track. The APZ is proposed to be constructed outside the Proposal Site's boundary fence to ensure fire response vehicles and personnel are separated from electrical infrastructure within the Proposal Site and (particularly) the electrical switchyard area.

It is recommended that all vegetation present within the APZ be kept to a maximum height of approximately 10 cm when cured and approximately 20 cm at all other times. Periodic mowing/slashing is expected to maintain this standard.

4.1.3 Vegetation removal

In addition to the removal of any trees/tall shrubs from within the APZ, vegetation would also be removed from within the Proposal Site during construction. This would comprise the clearing of a further 1.15 ha of native vegetation for construction of the Proposal and electrical safety purposes. It would reduce the risk of landscape fire spreading into the Proposal (e.g. from embers landing within it) as well as the risk of a fire igniting within it.

The entire area Proposal Site (with the exception of a narrow landscaping buffer adjacent to Hart Road) would be maintained free of woody vegetation. Consistent with industry practice, the plant area and switchyard area would be maintained free of all forms of vegetation. This would help to prevent embers from a landscape fire causing an ignition, and also minimise the risk of any fire from the Proposal escaping into the surrounding landscape.

4.1.4 Location of sensitive buildings and infrastructure

The majority of the Proposal Site is not expected to be exposed to radiant heat from a bushfire of more than 12.5 W/m^2 (BAL-12.5; Figure 4.2). Allowing for the proposed external APZ, a relatively small part of the Proposal Site is potentially exposed to radiant heat levels above BAL-19. More than half of the proposed switchyard area has potential radiant heat exposure of BAL-19 or more.

To mitigate the risk posed by radiant heat, any sensitive elements of the Proposal will generally be located outside areas with potential exposure exceeding BAL-19.

[7] As noted above, PBP does not specify APZ width for new gas fired (non-renewable) electrical power plants.
[8] Note that the remaining area proposed to be cleared is located within the proposed switchyard area

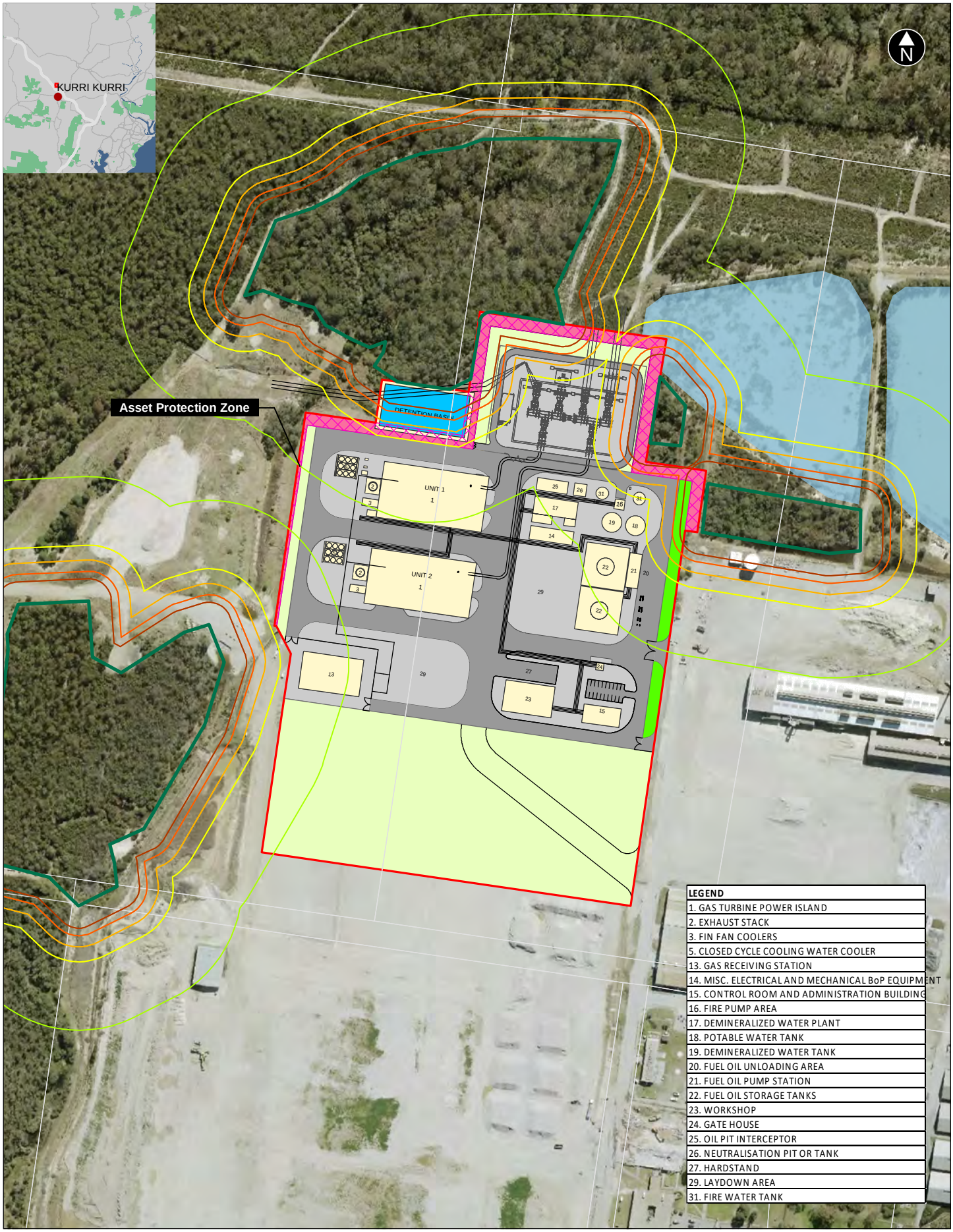

Figure 4-2 Proposal layout in relation to potential bushfire attack level/radiant heat exposure

4.1.5 Hazardous materials

The Proposal has been designed to operate using diesel fuel if gas is unavailable. It will therefore be necessary to construct diesel storage tanks on the Proposal Site. Two of these are to be constructed, as shown in Figure 4.2. These will be located in parts of the Proposal Site with potential radiant heat exposure (BAL) of 12.5-19 W/m^2. These diesel storage tanks would be constructed in line with environmental protection guidance and not have features that allow for the accumulation of embers or bushfire fuels that could ignite under ember attack.

The sensitivity of the diesel storage tanks to radiant heat exposure will be confirmed during detailed design. If the potential level of exposure is severe enough that could result in the diesel igniting or be at risk of other damage, risk mitigations will need to be deployed (e.g. potentially including sprinklers to cool the tanks in case of fire). Areas around the tanks will also be kept free of vegetation or any other combustible materials that could contribute to a fire ignition. Any fuel spills would be remediated to ensure that they cannot be a source of ignition.

4.1.6 Vehicle access

A general access/egress point for the Proposal Site is planned to be off Hart Road at the south eastern end of the Proposal Site, with the exact arrangement to be determined during the detailed design process. Hart Road connects directly to the Hunter Expressway south of the Proposal Site. Internal roads would also be developed within the Proposal Site and be available for emergency services. All internal roads and maintenance tracks would be a minimum of four metres wide and have a minimum vertical clearance of four metres.

A fire access track is to be constructed within the proposed external APZ. This 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*). This track would help to separate fire crews from the switchyard and its inherent electrical safety risks.

4.1.7 Water for firefighting

The former Kurri Kurri aluminium smelter site is currently serviced by potable water from Hunter Water, and there would be a connection into the Hunter Water potable water network for the Proposal Site. This would be supplemented by water storage tanks, to enable the Proposal to meet its peak water demands.

Fire water for bushfire responses would be provided via standpipes constructed at strategic locations within the Proposal Site and along the proposed APZ access track. Water would be supplied from the Hunter Water potable water system. On site water storage tanks would also be equipped with standard fittings to enable use by RFS to refill fire response vehicles in the event of failure of the potable supply. Concrete hard stands would be constructed at each water access point. These points would be clearly signposted.

4.2 Bushfire protection measures during construction

Construction activities present a different suite of risks to those for operation of the Proposal. 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:* management of bushfire fuel hazard in the surrounding landscape by RFS should moderate the behaviour of a fire, should one ignite, and reduce the threat it poses to construction personnel and the construction site.

- *Site clearance:* the Proposal Site is largely a "brownfields" site, with the Proposal being developed on the site of the former Kurri Kurri aluminium smelter. With the exception of a small part of the proposed switchyard area, the Proposal Site is devoid of bushfire prone vegetation. Most of the Proposal Site would have low radiant heat exposure to any fire in nearby vegetation (see Figure 3.6) and any embers entering the Proposal Site 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 of the Proposal Site, workers could safely retreat towards the south-east, and evacuate the Proposal Site if required.
- *Access:* In the event of a fire, emergency services would access the site via Hart Rd and through tracks used for construction activities. External access (prior to construction of the proposed APZ access track) would be via the existing formal and informal track network.
- *Fire water supply:* as noted above, the Proposal Site will have access to potable water from the Hunter Water network, and will be designed to meet the Proposal's requirements. A standpipe or connection point would be provided to enable fire response vehicles to refill.
- *Hazardous materials:* it may be necessary during some construction stages to store diesel fuel and other potentially flammable materials on the Proposal Site. Storage of such materials would follow environmental protection guidance and be located at parts of the Proposal Site with low radiant heat exposure in the event of a bushfire (i.e. outside the BAL-12.5 zone shown in Figure 3.6). Since the entire Proposal Site could be subject to ember attack, storage areas for any hazardous materials would be free of combustible materials that could contribute to a fire ignition. 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 except where permission has been given by the RFS.
- *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 Proposal Site to fire services, bushfire-specific fire-fighting equipment (e.g. 4WD with slip on tank and pump) will not be necessary to be held on the Proposal 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.

4.3 Potential environmental impacts of proposed bushfire protection measures

Potential environmental impacts of the proposed bushfire protection measures are largely confined to the clearing of native vegetation within the Proposal Site and proposed APZ and the potential for erosion and sedimentation associated with the proposed APZ access track. Clearing within the proposed switchyard area of the Proposal Site is incorporated into the initial planning for the Proposal and is also required for electrical safety. The only additional clearing that specifically results from bushfire protection measures is that for the proposed external APZ. The total estimated area of native vegetation that will be cleared for the Proposal is 1.54 ha, of which includes 0.39 ha within the proposed APZ.

5. Emergency management during construction

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

NSW RFS is the primary bushfire emergency response agency for any incident affecting the Proposal Site. Fire and Rescue NSW have a facility in Kurri Kurri and would respond to structure fires at the Proposal Site.

In case of a fire igniting in/around the Proposal Site:

- 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
- Relocate personnel to a designated assembly point towards the south-east of the Proposal Site.

A Prepare-Act-Survive bushfire response plan would be prepared for the Proposal. This plan will align with the bushfire protection measures outlined in Section 5.

5.1 National bushfire warning system

Advice of bushfires igniting in the landscape surrounding the Proposal Site 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 5.1). 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)
- Television and 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 5.1: National Bushfire Warning System advice levels

5.2 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:

- Mulbring Cricket Club, Child Street Mulbring (15 minute drive south from the Proposal Site)
- Miller Park, Maitland Street East Branxton (15 minute drive north-west from the Proposal Site)
- Jeffrey Park, Congewai Street Kearsley (15 minute drive south-west from the Proposal Site)
- Branxton Oval, John Rose Avenue, Branxton (20 minute drive north-west from the Proposal Site).

6. Conclusions and recommendations

6.1 Bushfire hazard assessment

The Proposal is to be constructed on the former Kurri Kurri aluminium smelter site, approximately three km north of the town of Kurri Kurri, within the Cessnock City Council local government area. The Proposal Site is approximately 30 km west of Newcastle CBD and 125 km north of Sydney.

The immediate landscape is highly disturbed, and areas of bushfire prone native vegetation lie to the north, west and east of the Proposal Site. The Proposal Site currently includes a small area of native vegetation that is proposed to be removed to allow the development to proceed.

The separation of the Proposal Site from nearby native vegetation means that, apart from the proposed switchyard area and north-east corner of the plant area, most of the Proposal Site would only be exposed to levels of radiant heat (in the event of a bushfire) that are sufficiently low and would pose minimal risk to people, buildings or other infrastructure structure.

6.2 Bushfire risk scenarios

The bushfire season in the Hunter 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 Proposal Site 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 site infrastructure. Two such bushfire incidents have occurred in the last 20 years.
- Electrical equipment failure, or hot works cause ignition at the Proposal Site during construction or operation. Fire spreads from the Proposal Site into surrounding vegetation to the north or west under the influence of moderate fire weather conditions with wind from the south or east.

Appropriate measures must be in place to mitigate the bushfire risks from and to the project, particularly those associated with these scenarios.

6.3 Bushfire protection measures during operation

Bushfire protection measures have been developed for operation of the Proposal that address the two main bushfire risk scenarios. These are based on the following:

- *SFAZ:* areas of relatively high bushfire risk native vegetation to the north and west of the Proposal are managed under the Hunter BRMP as strategic fire advantage zones. Bushfire fuel hazard in these areas is actively maintained (by periodic hazard reduction works) to reduce bushfire risk, as well as radiant heat and ember attack exposure. With reduced bushfire fuel hazard, the behaviour of any fire that becomes established is likely to be moderated.
- *APZ:* which provide a buffer zone between a bushfire hazard and buildings or other structures. APZ are managed to minimise fuel loads and reduce radiant heat levels, flame, ember and smoke attack. They help to provide a space for firefighters and other emergency services personnel responding to a fire event and reduce opportunities for any fire igniting on site to escape to surrounding areas. A10 m wide APZ is proposed to be established and maintained along the perimeter of the Proposal Site in areas where there is an interface with bushfire prone vegetation.

- *Vegetation removal:* all vegetation (including grasses) is to be removed from the proposed switchyard to reduce opportunities for a fire entering the site and for a fire being ignited by electrical infrastructure (e.g. explosive failure of transformer, arcing from a conductor) escaping from the site. Woody vegetation is to be removed from the proposed APZ.
- *Location of sensitive infrastructure:* buildings and other infrastructure with sensitivity to radiant heat exposure will be located in areas within the site that would be exposed to less than BAL-19.
- *Hazardous materials:* diesel storage tanks will be constructed on site to enable the Proposal to operate if gas is unavailable. The tanks will be located in areas with BAL exposure of 12.5-19 W/m^2. Given the relatively low flammability of diesel, it is not anticipated that any specific design mitigation will be required to protect the tanks from radiant heat. They will need to be constructed to avoid ember accumulation or the ignition of small fires. The need for further mitigations (e.g. fire sprinklers) will be considered during detailed design.
- *Access roads:* which provide safe operational access to and within the Proposal Site for emergency services personnel to supress a bushfire. In additional to internal site access tracks/roads, a fire access track is to be constructed within the proposed APZ.
- *Fire water supply:* adequate water is required for fire suppression and/or protection of structures or equipment located on the Proposal Site. This is to be provided by access to potable water supply and on-site water storage tanks. Access to fire water supplies is to be provided within the proposed APZ.

6.4 Bushfire protection measures during construction

While construction activities present a different suite of risks to those for operation of the Proposal, bushfire protection would be based on a similar suite of measures, as follows:

- *SFAZ:* management of bushfire fuel hazard in the surrounding landscape by RFS should moderate the behaviour of a fire, should one ignite, and reduce the threat it poses to construction personnel.
- *Site clearance:* the Proposal Site is a "brownfields" site that is largely devoid of bushfire prone vegetation. Most of the Proposal Site would have low radiant heat exposure to any fire in nearby vegetation and any embers entering the Proposal Site 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 of the Proposal Site, workers could safely retreat towards the south-east, without necessarily needing to evacuate.
- *Access:* in the event of a fire, emergency services would access the site through tracks used for construction activities via Hart Rd. External access (prior to construction of the proposed APZ access track) would be via the existing formal and informal track network.
- *Fire water supply:* the Proposal Site would have access to potable water from Hunter Water. A standpipe or connection point will be provided to enable fire response vehicles to refill in case of 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 site with low radiant heat exposure in the event of a bushfire. Storage areas would also be kept free of combustible materials that could be ignited by ember attack.
- *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 and only be undertaken on TOBAN days with a permit from the RFS.

  Emergency management: on site bushfire emergency management arrangements will be addressed through the construction contractor's site emergency management plan. On site bushfire fighting equipment will not be held on site during construction. If a fire is ignited and cannot be safely contained using fire extinguishers or the like, construction crews will dial 000 and seek emergency service assistance.

7. References

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