WILPINJONG COAL MINE BUSHFIRE MANAGEMENT PLAN

Supporting Documentation

Prepared for
Wilpinjong Coal Mine Pty Ltd

2nd September 2011

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Glossary of Terms

TERM	DESCRIPTION
Asset	A place, object or area (including buildings, fences, areas of vegetation, archaeological sites, powerlines etc) that needs to be protected from wildfire, because its value/s could be destroyed or damaged by fire.
Asset Protection Zone	An Asset Protection Zone (APZ) is an area around a development or asset offering protection to reduce the bushfire hazard. It can consist of an Inner Protection Area (IPA) and an Outer Protection Area (OPA). Hazard reduction techniques can include slashing, raking, bush regeneration and burning.
Ecosystem	An interactive system between living organisms (plants and animals) and their non living surroundings.
Fire hazard	The potential severity of a fire. Usually measured in terms of intensity (kW/m). The factors that influence a bushfire hazard include climate and weather patterns, vegetation (fuel quantity, distribution and moisture) and slope.
Fire regime	The history of fire in a particular area, including the frequency, intensity and season of burning.
Fire risk	Is the chance of a bushfire igniting, spreading and causing damage to assets of value to the community. Risk may be rated as being extreme, major, moderate, minor or insignificant and is related to the vulnerability of the asset.
Fuel	Any material capable of being ignited and sustaining fire, such as grass, live vegetation, leaf litter and bark. Generally measured in tonnes per hectare of dry weight.
Fuel load	Amount of fuel in a given area at a given time.
Hazard reduction	Works designed to attain planned resource management objectives, primarily the reduction of fire threat. Activities include: •Manual and mechanical thinning of vegetation (NOT broad scale clearing) •Controlled burning of a predetermined area, carried out under specified weather and environmental conditions.
Land Management Zone	Land Management Zones (LMZ) are broader areas of the landscape, which do not satisfy the criteria for Strategic Fire Management Zones (SFMZ) or Asset Protection Zones (APZ). Fire in these areas should be managed to meet conservation objectives for species, habitats, populations and cultural heritage values.
Mining lease	Means a mining lease granted under Part 5 of the Mining Act 1992, and includes a consolidated mining lease.
Prescribed burning	A controlled burn to a predetermined area, carried out under specified weather and environmental conditions, designed to achieve planned resource management objectives.

Sclerophyll forest	Sclerophyll is a type of vegetation that has hard leaves and short internodes (the distance between leaves along the stem). Arid, largely treeless areas aside, most Australian bushland is sclerophyll forest. Common plants include the proteaceae (grevilleas, banksias and proteas), tea-trees, acacias, boronias, and eucalypts.
Slashing	This is an economical method of fuel reduction. To be effective, the cut material must be removed or allowed to rot before summer starts. Slashing and mowing may leave grass in rows, increasing fuel in some places.
Strategic Fire Advantage Zone	Strategic Fire Advantage Zones (SFAZ) are usually adjacent to, and compliment, Asset Protection Zones (APZ). They are managed to protect community assets and ecological sustainability and comprise areas of lower fuel levels that may provide opportunities for containing wildfires
Trittering	Trittering or turbo mowing also mulches the vegetation leaving the fuel where it is cut.
Wildfire	An unplanned fire.

Abbreviations

TERM	DESCRIPTION
APZ	Asset protection zone
BEAC	Bushfire Environmental Assessment Code (RSF 2006b)
BMP	Bushfire Management Plan
CMA	Catchment Management Authority
OEH	Office of Environment and Heritage
ELA	Eco Logical Australia Pty Ltd
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
Ha	Hectare
LMZ	Land Management Zone
NSW	New South Wales
PBP	Planning for Bushfire Protection
RFS	Rural Fire Service
RMP	Rehabilitation Management Plan
SFAZ	Strategic Fire Advantage Zone
TSC Act	Threatened Species Conservation Act 1995

1 Introduction

Eco Logical Australia (ELA) was engaged to prepare a Bushfire Management Plan for Wilpinjong Coal Pty Ltd. The Wilpinjong Coal mine was granted Project Approval in February 2006 under 75J of the EP&A Act 1979. The total area of Wilpinjong Coal Landholding, subject to this Bushfire Management Plan is approximately 13,777ha and is shown on Figure 1.

1.1 PURPOSE AND SCOPE

Wilpinjong Coal has a regulatory obligation to maintain an effective fire response capability and to control fires on its landholding. To this end, Wilpinjong Coal is required to prepare and implement a Bushfire Management Plan (BMP).

In preparing this plan, consideration has been given to the current and future landscape of the Wilpinjong Coal Landholding. Historically, the Wilpinjong Coal Landholding was a mix of vegetated (areas of woodland and forest) and unvegetated lands with the unvegetated areas generally being those flatter areas where agriculture was the primary land use. Most of these areas are those that are proposed for mining operations (over the course of the mines life) as well as some proposed as Conservation Lands. The vegetated and more rugged lands will mostly remain undeveloped.

Given the expected lifespan of the mine (until 2026) (and the current uncertainties around the intricacies of its development) this plan seeks to establish a strategic bushfire management framework and to guide bushfire management activities for the next 5 years. As such, the plan is based on the likely scope and location of mine operations (and bushfire prone vegetation) over this time period but also with consideration of the longer term development objectives for the mine. The plan aims to put in place mechanisms for fire management that will save time, expense and help prevent potential, health, safety, environmental and community damage in the future.

1.2 OBJECTIVES

The aim of this plan is to assess fire risks and assets across and adjacent to the Wilpinjong Coal Landholding, and to identify practical management strategies to reduce the risk of fire to life and property. Operationally, the objectives of fire management within the Wilpinjong Coal Landholding are to:

- Reduce fire ignition potential; and
- Prevent the spread of fire within and beyond the Wilpinjong Coal Landholding.

From a conservation perspective, the objectives of the Wilpinjong Coal Mine BMP are to:

- Protect the flora, fauna and vegetation communities within the Wilpinjong Coal Landholding from inappropriate fire regimes and unplanned fire events; and
- Utilise fire as a management tool to maintain and enhance native ecosystems, where applicable.

1.3 FORMAT OF DOCUMENTS

The BMP consists of two documents;

1. A0 BMP Poster; and
2. Supporting Documentation (this document).

An A0 Poster has been developed for Wilpinjong Coal Mine. The aim of this approach is to display the most relevant information to guide emergency response on the poster and for the poster to be supported by a report (this document) containing supplementary information relating to management and prevention. The Poster has been developed to address the requirements of Wilpinjong Coal Mine, neighbouring landholders, the Office of Environment and Heritage (OEH) and the NSW Rural Fire Service (RFS).

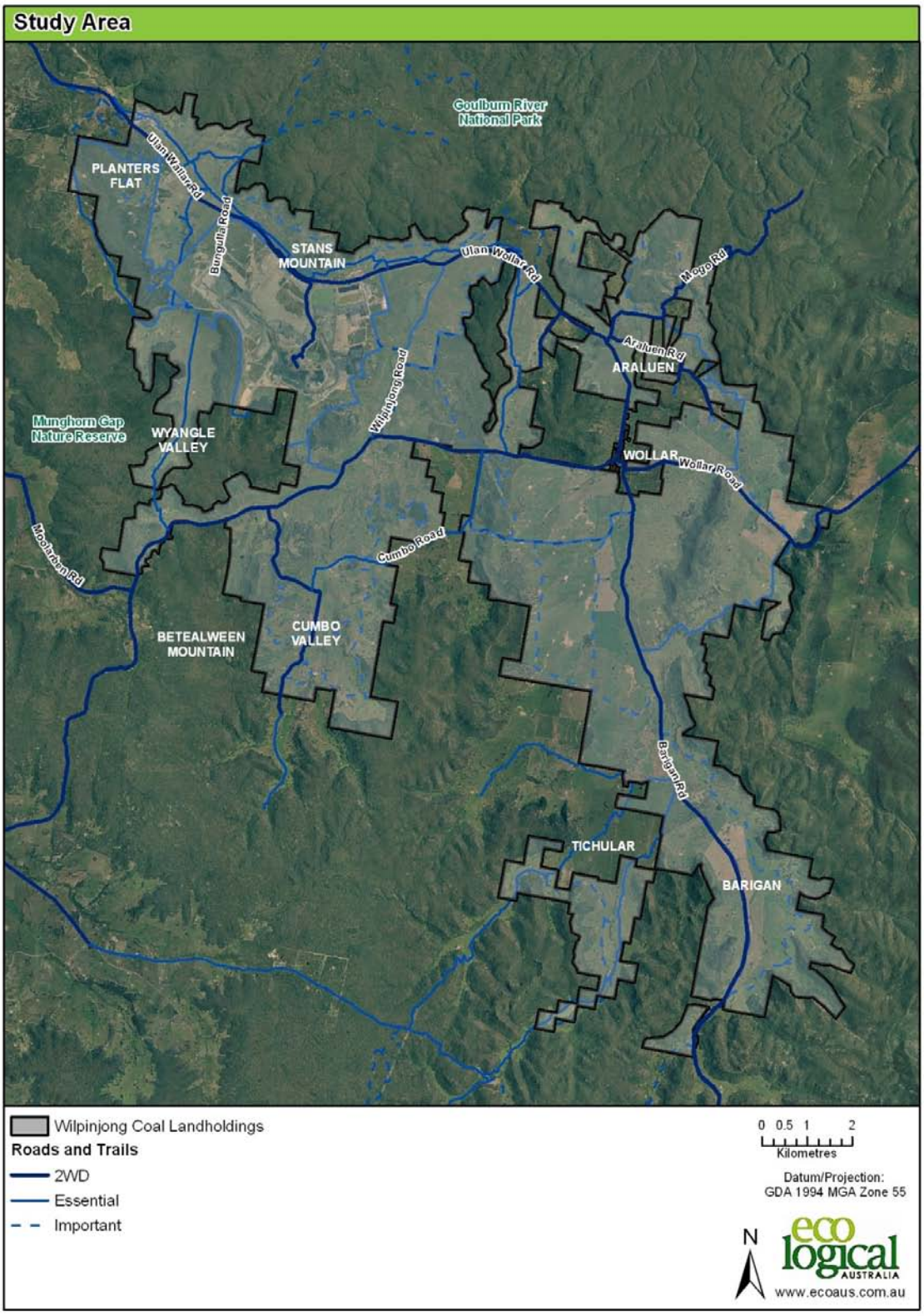

Figure 1: Study Area

2 Statutory Requirements

Fire management activities within the Wilpinjong Coal Landholding are constrained by numerous legislation, plans and guidelines.

2.1 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

The Commonwealth *Environment Protection & Biodiversity Conservation Act 1999* (EPBC Act) stipulates that approval from the Commonwealth Environment Minister is required if a development is likely to have a significant impact on matters considered to be of national environmental significance.

2.2 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) is the principal planning legislation for the state, providing a framework for the overall environmental planning and assessment of development proposals (Part 4) and activities (Part 5).

2.3 RURAL FIRES ACT 1997

The objectives of the *Rural Fires Act (RF Act) (1997)* are to provide for:

- The prevention, mitigation and suppression of fires;
- Coordination of bushfire fighting and prevention;
- Protection of people and property from fires; and
- Protection of the environment.

The RF Act outlines the responsibilities of land owners to manage their land for bushfire protection and provides a mechanism for the approval of hazard reduction works, through the issue of a bushfire hazard reduction certificate. Section 63 specifies that it is the duty of the owner or occupier of land to take the notified steps (such as any listed in a bushfire management plan) and any other practicable steps to prevent the occurrence of bush fires on, and to minimise the danger of the spread of bush fires on or from, that land.

The RF Act also provides for the formation of fire management committees and the preparation of fire management plans which includes (a) a plan of operations, and (b) a bush fire risk management plan.

The RF Act also provides provisions for bushfire suppression and hazard reduction works including interaction with the *Environmental Planning and Assessment Act 1979, National Parks and Wildlife Act 1974, Threatened Species Conservation Act* 1995 and the *Local Government Act 1993*. Section 44 of the RF Act provides for the appointment of bushfire suppression control to the Commissioner of the RFS particularly in declared emergency situations. In these situations environmental provisions of the above Acts are covered by the RF Act. Further to this, Section 100C of the RF Act specifies that the carrying out of emergency or managed bushfire hazard reduction work cannot be prohibited by the above Acts when carried out in accordance with a bushfire hazard reduction certificate.

2.4 NATIONAL PARKS AND WILDLIFE ACT 1974

Aboriginal and cultural heritage sites are protected under the *National Parks and Wildlife Act 1974 (NPW Act)*, as well as protected flora and fauna species.

2.5 THREATENED SPECIES CONSERVATION ACT 1995

The NSW *Threatened Species Conservation Act* 1995 (TSC Act) aims to protect and encourage the recovery of threatened species, populations and communities listed under the Act. The *TSC Act* is integrated with the *EP&A Act* and requires consideration of whether a development or an activity (such as mechanical hazard reduction) is likely to significantly affect threatened species, populations and ecological communities or their habitat.

2.6 WATER MANAGEMENT ACT 2002

The *Water Management Act*, 2002 aims to provide effective controls on activities that could harm sensitive waterway and foreshore environments. The Act has provisions that require a permit for excavations, fill and other works within 40m of the top of the bank for rivers, estuaries and lakes as it is recognised that they can have significant detrimental environmental impacts on habitat, water quality, flooding and erosion.

3 Bushfire Hazard Assessment

3.1 TERRAIN

The steep and variable terrain within and adjoining the Wilpinjong Coal Landholdings will have a major effect on fire behaviour. This will include the rate and direction of fire spread, fire intensity, spotting distances along with other attributes of fire behaviour. The steepness of a slope, direction of fire spread on the slope, aspect of the slope and changes in slope direction not only strongly affect wildfire behaviour, but also the selection and risk of fire suppression and mitigation strategies.

Figure 2 shows the slope across the landholdings. Extensive areas around the perimeter of the Wilpinjong Coal Landholdings have slopes >20^{o}. The potential for erratic fire behaviour and uncontrollable fire intensities exists on these slopes in most years. Further, the rugged terrain limits access with many areas only accessible by foot.

3.2 VEGETATION AND FUEL

Detailed vegetation mapping has only previously been conducted in the vicinity of the planned mining area as described within the Environmental Impact Statement (Wilpinjong Coal Pty Limited 2005). Vegetation communities known to occur include:

- Yellow Box and Blakely's Red Gum Woodlands (EEC);
- Coast Grey Box Woodlands;
- Rough-barked Apple Woodlands;
- Narrow-leaved Ironbark Forest;
- Grassy White Box Woodlands(EEC);
- Shrubby White Box Woodlands;
- Sandstone Range Shrubby Woodlands; and
- Secondary Shrubland.

As only a portion of the entire Wilpinjong Coal Landholdings have had detailed vegetation mapping, we have undertaken field assessment of fire formation (according to PBP (RFS 2006) and Keith 2004) and likely climax fuel load mapping for the entire landholdings (based on field assessment, other studies in the region (NPWS (2004), ELA 2010) and PBP (RFS 2006)). The vegetation formations and likely climax fuel loads are shown in Figures 3 and 4 respectively.

Generally the fire hazard and the intensity of the fire will increase the more flammable and dense the fuel. Vegetation formations across the site fall into the categories of 'Dry sclerophyll forests', 'Grassy Woodland' 'Tall/Short Heath', 'Grassland' and 'Regenerating Woodland/Forest' (PBP 2006, from Keith 2004). Dry sclerophyll forests dominate the slopes and uplands while the flat lowlands are dominated by grassland, grassy woodland and regenerating woodland/forest. The grassland areas generally consist of grazed/ungrazed pasture.

Likely climax fuel loads have been estimated across the Wilpinjong Coal Landholdings based on a brief field based assessment, vegetation formation mapping, vegetation community mapping and topographic location. The assessment generally conformed to the following pattern:

- Forested upslope areas had the highest estimated fuel loads of 20/25 t/ha.
- Heath and shrubby woodland and open forest areas had estimated fuel loads of 12/15 t/ha.
- Lowland grassy woodland and regenerating areas had estimated fuel loads of 10-15 t/ha.
- Grasslands were given a blanket estimated fuel load of 4-6 t/ha, however some variation existed across pasture areas due to differing management practices and history.

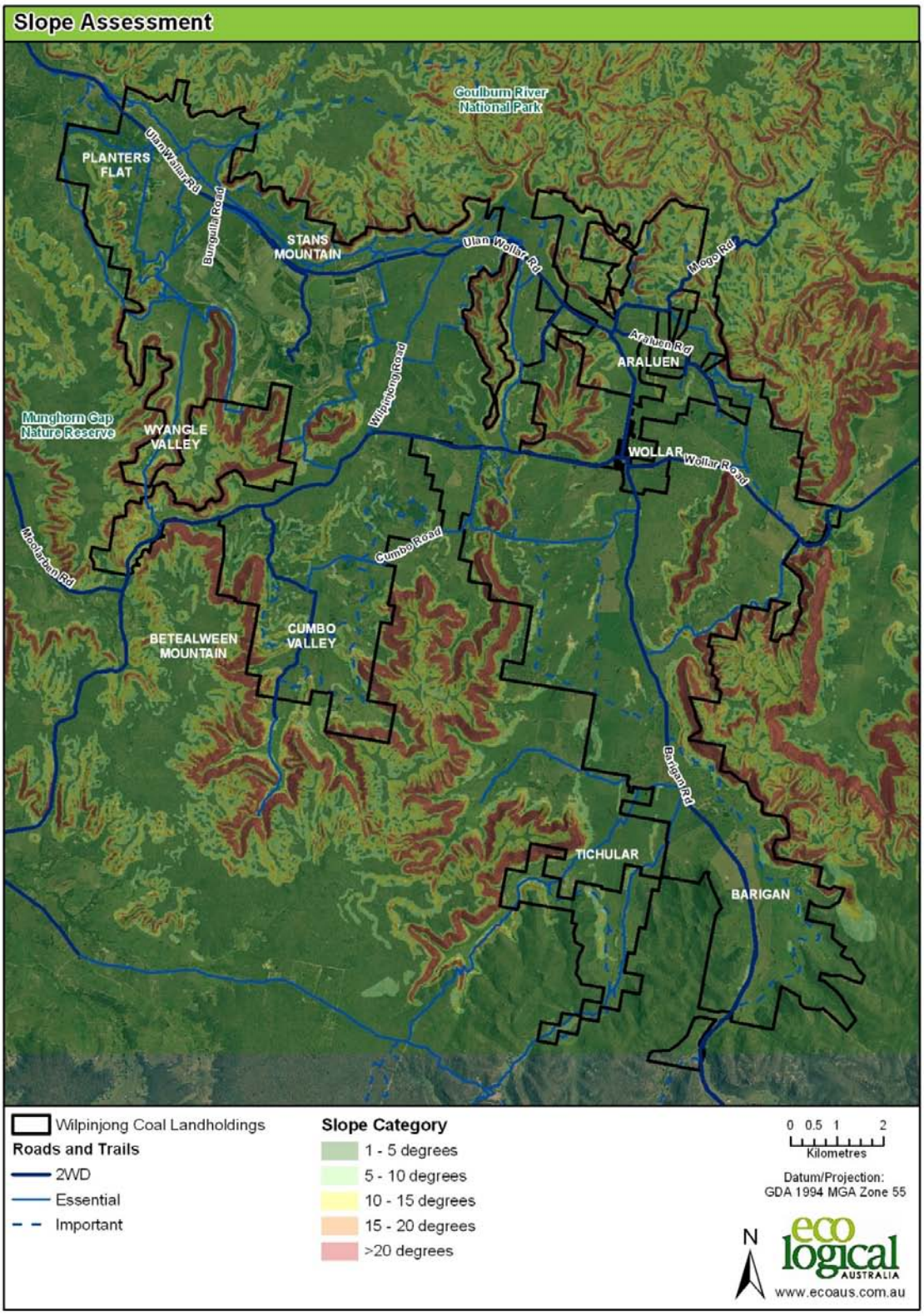

Figure 2: Slope Assessment from DEM

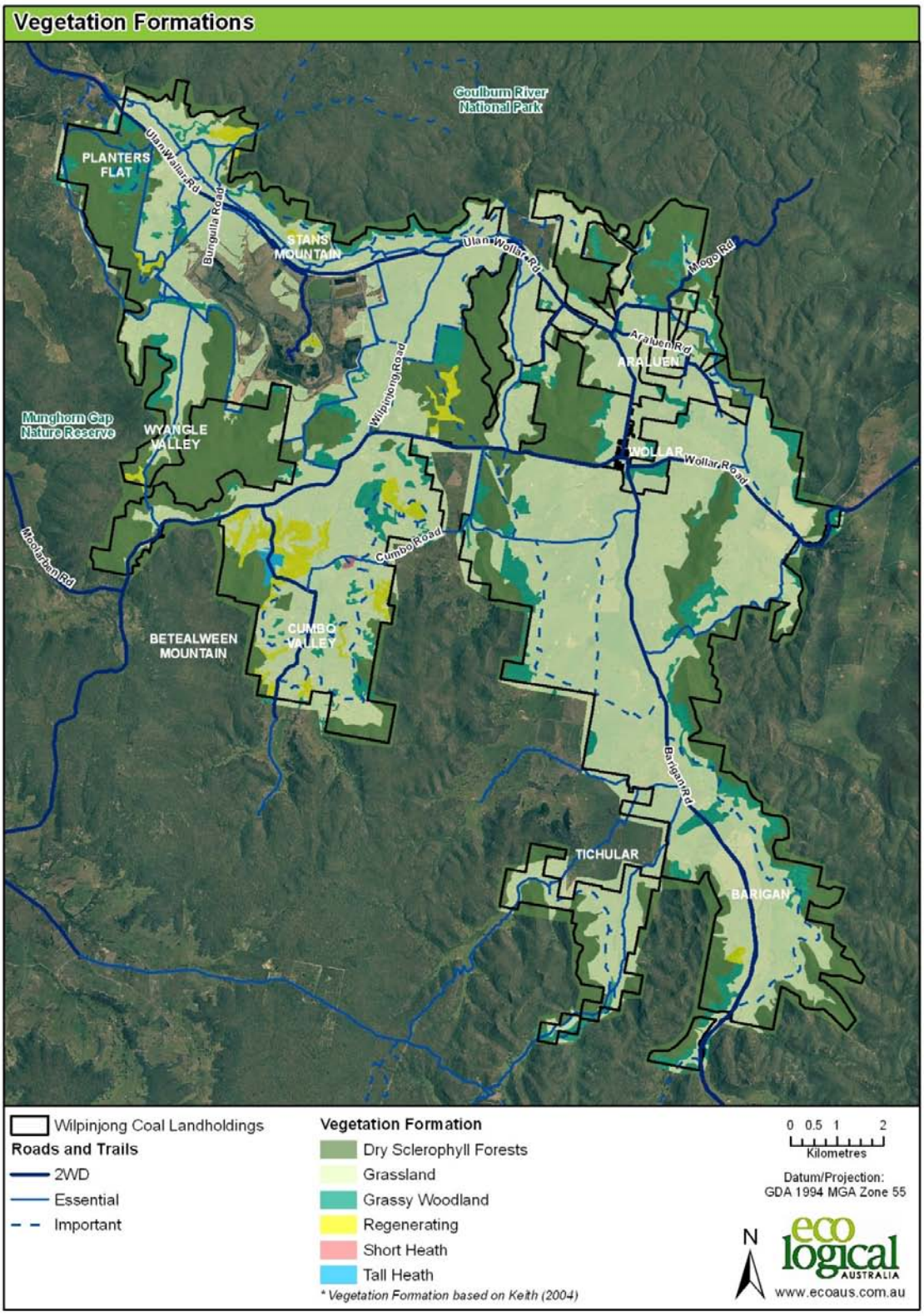

Figure 3: Vegetation Formations

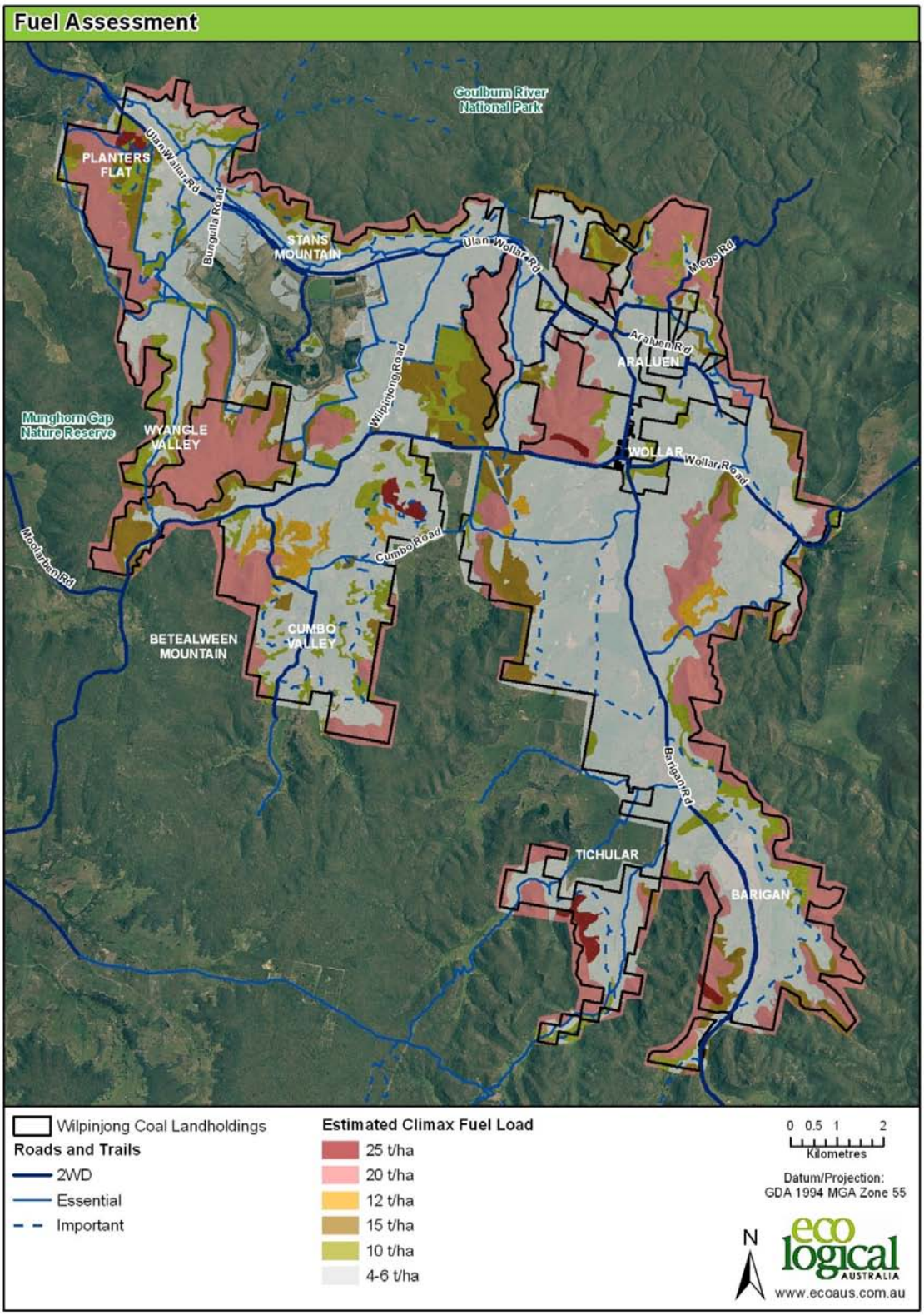

Figure 4: Fuel Load Assessment

3.3 POTENTIAL FIRE INTENSITY

Potential intensity of a bushfire under extreme weather conditions has been mapped for the Wilpinjong Coal Landholding using a Bushfire Intensity Potential (BIP) model (Figure 5). This model uses the following parameters to identify the potential bushfire intensity:

- terrain (slope and aspect);
- fuel (vegetation);
- likely weather scenario and direction of travel;
- Forest Fire Danger Index (FFDI of 80)

It calculates potential fire intensity using the McArthur (1962) fire intensity formulae. A model has been provided to display the potential fire intensity under north to south-westerly winds. The BIP model is valid until 2016 or until the next fire occurs (whichever is first) as subsequent fire history and fuel accumulation will alter the assessment.

The model of potential fire intensity shows that the greatest intensity is possible on the forested western facing slopes which are predominant in the surrounding National Park, Nature Reserve and Crown Land. Generally, the steep eastern facing slopes are shielded from the north to south-westerly winds and fires on these slopes are potentially of much lower intensity. It is noted that should a grass fire within the Wilpinjong Landholding be allowed to spread to the surrounding vegetated slopes, the fire could quickly build to a higher intensity and spread rapidly off-site.

It is important to note that the model of potential fire intensity does not provide an indication of ignition risk or the rate of spread of a bushfire. It is specifically noted that, although the grassland areas will not carry a fire of the same intensity as the forested areas, these areas potentially have the highest risk of ignition and rate of spread.

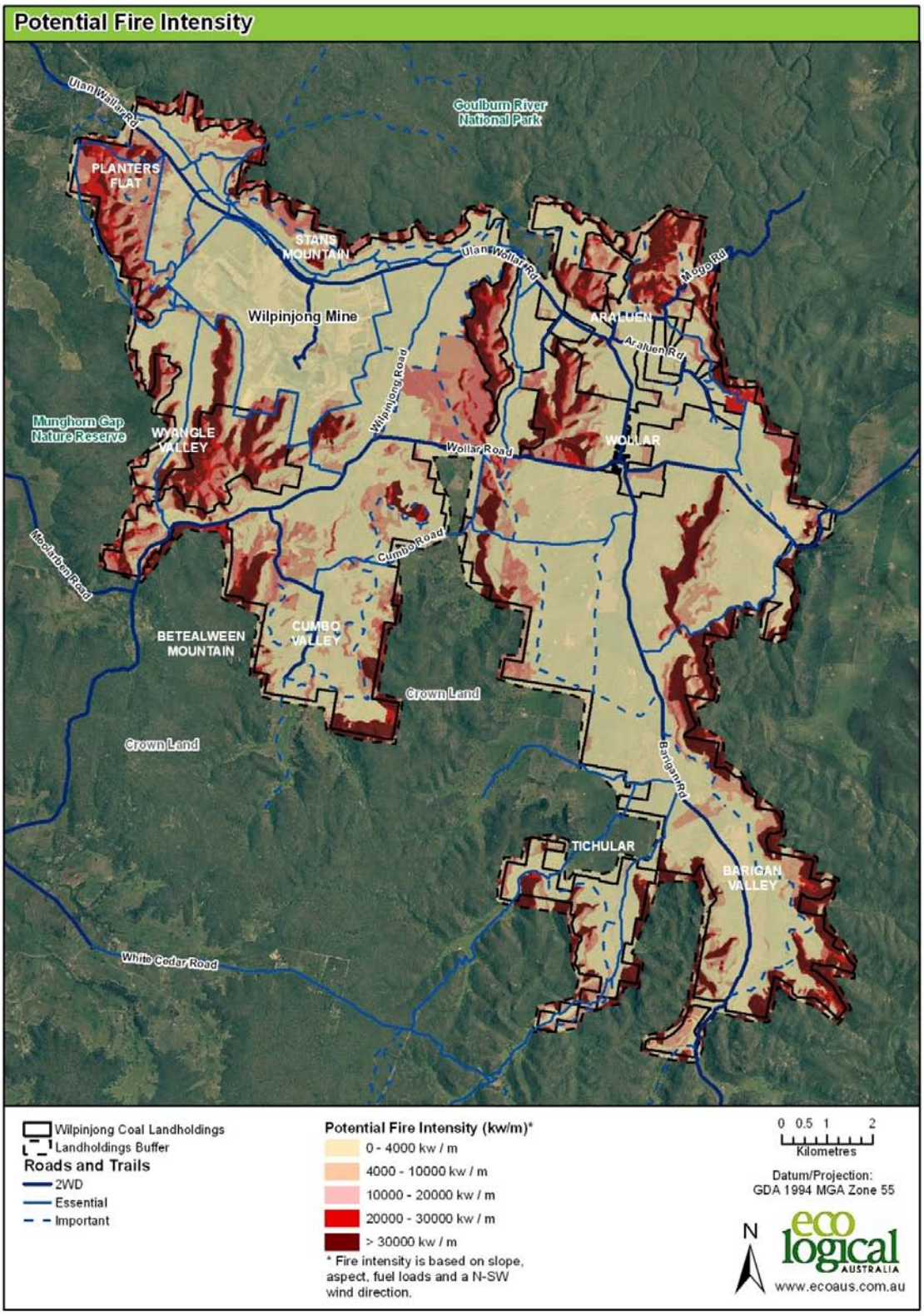

Figure 5: Potential Fire Intensity

4 Bushfire Risk Assessment

A fire risk is defined as the chance of a fire igniting, spreading and causing damage to assets of value to the community.

4.1 FACTORS WHICH AFFECT THE CHANCE OF A FIRE IGNITING

4.1.1 Climate

The climate in the area is variable and characteristically has warm summers and cold winters. Rainfall in the region is summer dominated (see Figure 6Figure 6). Electrical storms are frequent during spring, summer and early autumn (NPWS 2004).

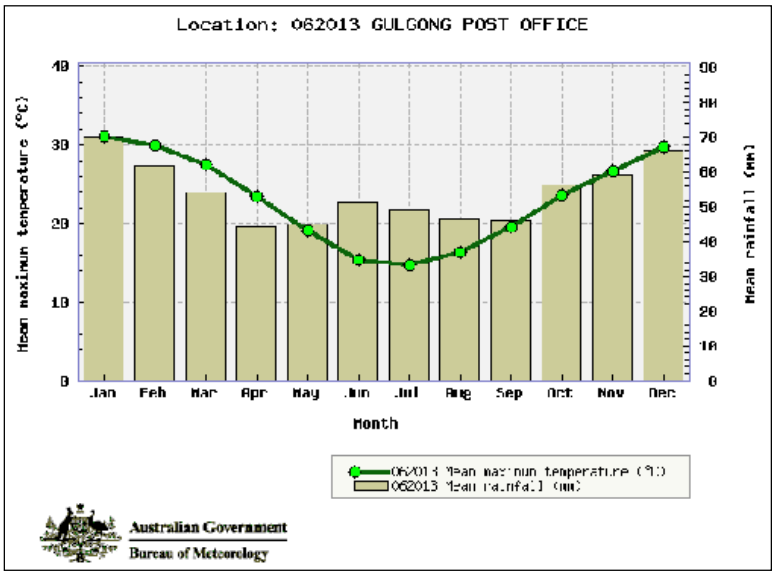

Figure 6: Average monthly temperatures and rainfall at the Bureau of Meteorology Gulgong Post Office site

The influence of the local topography, particularly the steep topography in the Munghorn Gap Nature Reserve to the south and the Goulburn River National Park to the north may create localised wind patterns and turbulence that can vary significantly from regional patterns. This may create a problem for both personal safety and the creation of control lines. It is also known that the elevated parts of the landscape are often prone to lightning strike.

4.1.2 The Fire Season

The fire season is historically from September to March. The start of normal fire seasons coincides with low humidity and strong northwest winds, which often prevail during November and December. Ignitions are common during dry electrical storms preceding periods of dry hot weather (NPWS 2004).

There has been a growing trend throughout eastern Australia for the fire season to begin earlier and finish later. It has been common in recent years for the fire danger season to begin as early as September and continue through to April.

4.1.3 Fire History

Fire history for the last 10 years was supplied for the surrounding area by the OEH and fire history older than 10 years was obtained from the document *Fire Management Plan - Goulburn River National Park and Munghorn Gap Nature Reserve* (NPWS 2004).

The only significant wildfire recorded in the area was in the Barigan area directly adjacent to the south east of Wilpinjong Mine Landholding during the 2006/07 fire season. One small fire occurred in 2009 to the north of the Wilpinjong Mine Landholdings on top of a ridge within Goulbourn River National Park, this fire was quickly controlled. A few spot fires were also recorded to the south of the Cumbo Valley between 2006 and 2008. These fires were kept to between 1 and 10 hectares. Small fires are also common along the rail line, the most recent of which was in February 2010.

Significant prescribed burns have been conducted in recent years within both the Goulburn River National Park and Munghorn Gap Nature Reserve. The 2006/07 prescribed burn within Munghorn Gap NR extended slightly into the current Wilpinjong Coal Landholdings within the western most ECA. The 2000/01 prescribed burn within Goulburn River NP was conducted along the northern boundary of the current Wilpinjong Coal Landholdings.

There was little evidence of recent fire history observed during site inspections, beyond that detailed above. It is assumed that the remainder of the Wilpinjong Coal Landholding has been excluded from fire for at least greater than 15 years.

Lightning strikes account for the majority of ignitions in the area. Sparks from trains on the Ulan railway line are also common. Arson is not considered to be a significant issue, although human ignition from farming machinery and burn-off are known to occur. Mine operations including track maintenance (slashing, grading etc) also have the potential to start fires, particularly within the grassland areas in times of drought.

Historically, a major fire is experienced in the area every 30-40 years and the last major fire affecting the region was in 1979. Major fires generally arrive from the west under south westerly to north westerly winds.

4.1.4 Rainfall

Most rainfall at Wilpinjong generally occurs in summer during the peak fire season. This means that there may be a risk of inadequate water supply (from farm dams) in early summer after a dry winter.

4.2 ASSETS THAT ARE AT RISK FROM FIRE

4.2.1 Residential Dwellings

There are a number of residential dwellings located within the Wilpinjong Coal Landholding, and these are marked on the BMP Poster. The residences are company owned and leased residential dwellings. These dwellings have been assessed for risk using a desktop analysis of proximity to hazard. All dwellings farther than 100m from vegetation other than grassland were marked as 'Low Risk'. During a bushfire, properties designated as 'Low Risk' have a chance of being subjected to ember attack however are unlikely to be subjected to radiant heat attack or direct flame contact. All dwellings within 100m of vegetation other than grassland were marked as 'Potential High Risk'. During a bushfire, properties designated as 'Potential High Risk' have a significantly increased chance of being subjected to ember attack, radiant heat attack and/or direct flame contact.

Those dwellings thought to be particularly at risk are shown in Figure 7. It is recommended that a detailed field based building by building assessment be undertaken for these dwellings if they are planned for retention.

On the BMP Poster, all residential dwellings within and in proximity to the study area are shown. It is noted that the Wollar and Araluan areas contain a higher abundance of dwellings (some vacant) across a mix of land ownership, including in part Wilpinjong Coal ownership

4.2.2 Transport Infrastructure

The transport infrastructure within the Wilpinjong Coal Landholding includes a network of internal roads (principally of earthen construction) and tracks as shown on the BMP Poster. For further details on these assets see Section 5.3.

An east-west railway line passes through the Wilpinjong Coal Landholding and loops into the centre of the operations area.

4.2.3 Service Infrastructure

Powerlines

High Voltage (66kV) powerlines currently cross the Wilpinjong Coal Landholding and are marked on the BMP Poster. The Bushfire Environmental Assessment Code (BEAC) (RFS 2006b) specifies that at least seven days prior to a planned burn, Wilpinjong Coal must liaise with the local electricity provider to determine when conditions are likely to be most suitable to carry out the burn and determine any safety requirements with regard to these powerlines.

Power Sub-station

A sub-station is located within the Wilpinjong Coal Landholding in the Barigan Valley area. The substation and surrounding land is managed by Country Energy. It is sited in a rural land context being surrounded by extensive areas of grazing land, essentially free of wooded vegetation.

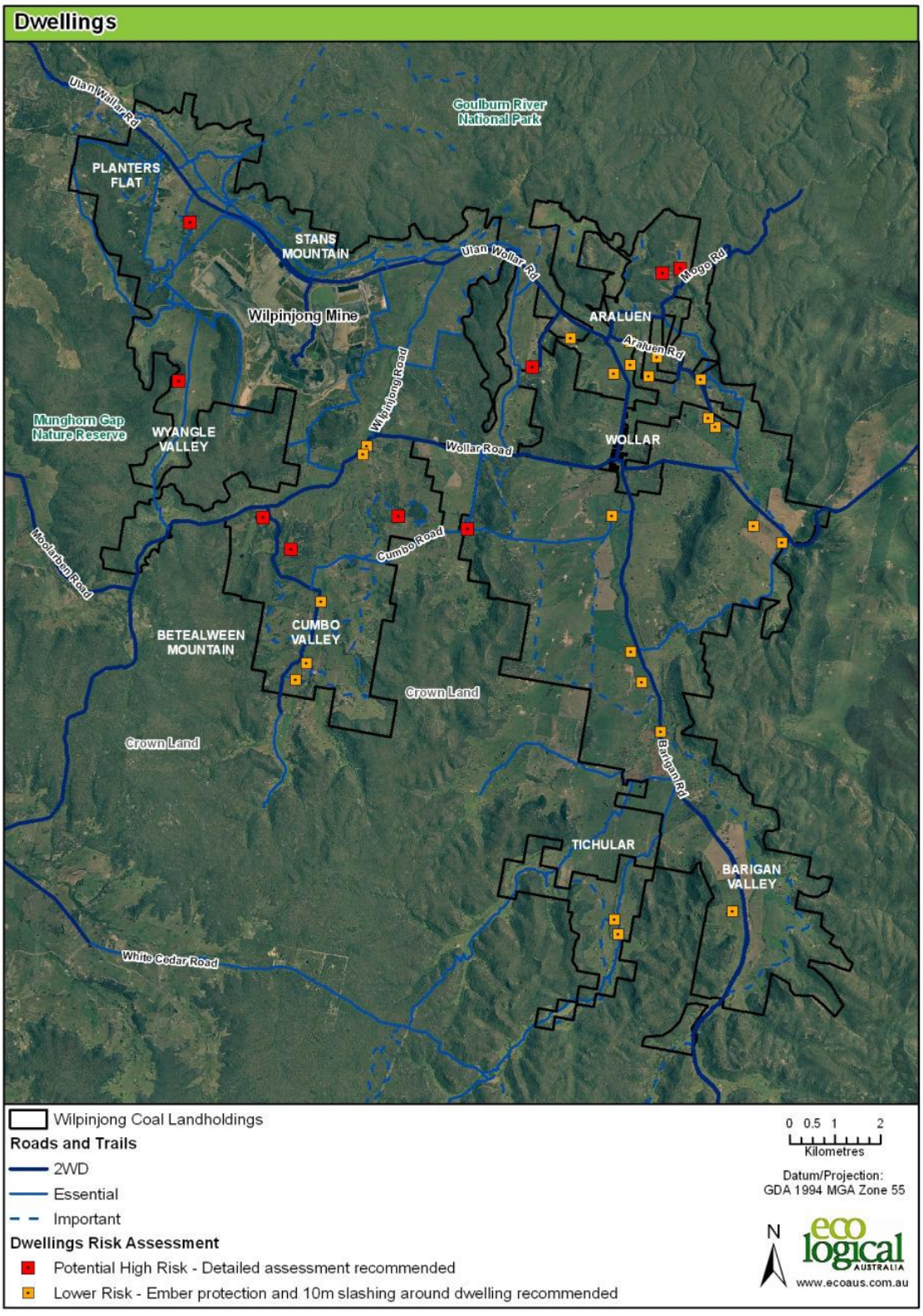

Figure 7: Wilpinjong Coal Owned Dwellings Risk Assessment

4.2.4 Mine Infrastructure

The majority of Wilpinjong Coal Mine facilities were constructed in 2006/2007 and are within the current operations area shown on the BMP Poster. Infrastructure within this area includes:

- office administration complex;
- workshop and plant wash down facility;
- fuel facility;
- sewerage treatment plant;
- product coal stockpile pad;
- explosives magazine;
- CHPP;
- ROM pad;
- water polypipe; and
- rail loading infrastructure.

The majority of this infrastructure currently has a setback of over 500m from bushfire prone vegetation. This setback is considered as sufficient although infrastructure may still be subject to ember attack. The BMP poster has proposed a Strategic Fire Advantage Zone where the bulk of mining infrastructure is located.

The explosives magazine is located in the west of the current operations area however it is understood that as mining progresses the explosives magazine will be relocated. The magazine currently only holds detonators and is kept separate from other explosive components such as ammonium nitrate fuel oil and emulsion equipment. The current setback is 70m which is likely to expose the magazine to ember attack. The explosives are to be stored and used in accordance with AS 2187.2:2006 *Explosives – Storage, Transport and Use – Use of Explosives*. AS 2187.2:2006 details the requirements for the safe storage, handling and land transport of explosives, safe storage distances from other activities and bunding requirements.

Hydrocarbons used on-site include fuels (i.e. diesel and petrol), oils, greases, degreaser and kerosene. These hydrocarbons are stored over 500m from bushfire prone vegetation as follows (as described in Wilpinjong Coal (2010b)):

- Two bunded 88,000 litre (L) diesel storage tanks are located in the fuel dispensing facility.
- Oil is stored in two 28,000 L self-bunded double-skinned oil storage tanks, located in the oil storage facility. Two shipping containers are used for the storage of oil and grease pods.
- Flammable paints are stored on a containment pallet in a fenced compound, as well as in a locked cabinet inside the workshop.
- Hydrocarbon storage facilities are constructed and operated in accordance with Australian Standard (AS) 1940:2004 *The Storage and Handling of Flammable and Combustible Liquids* and the Operational Health and Safety Act, 2000.

Some sections of a water polypipe currently run through the centre of the rail loop amongst unmanaged grass and remnant woodland. There is the potential for this polypipe to be damaged by a fire in this area, although the risk of fire is minimal due to separation from other patches of bushfire prone vegetation and the scarcity of fuel.

Changes (in type, quantity and location) of the above infrastructure are likely as the mine expands although the exact nature of these changes is not known. However, it is recommended that mine infrastructure is kept within the operations area and provided appropriate fuel reduced separation from bushfire hazards.

4.2.5 Cultural Heritage

GIS data provided by Wilpinjong Coal shows that numerous archaeological sites have been identified scattered across the Wilpinjong Coal Landholding. Evidence at these sites includes:

- Aboriginal Isolated find
- Aboriginal scarred tree
- other (debated origin) isolated find, lithic scatter or stone arrangement

- open artefact scatter
- open artefact scatter and procurement site
- rock shelter with surface artefacts (may also contain potential or confirmed archaeological deposit)
- rock shelter with potential archaeological deposit (only)
- rock shelter with rock art, (may also contain surface artefacts, and confirmed or potential archaeological deposit)
- potential archaeological deposit (PAD) (open context)
- reported place of Aboriginal cultural significance
- spring/natural pothole ('waterhole')

Any ground disturbance works or hazard reduction works must be undertaken in accordance with the relevant conditions specified in the RFS/OEH document *Conditions for Hazard Reduction and Aboriginal Heritage* (a component of the BEAC (RFS 2006b) and the *Wilpinjong Coal Mine Aboriginal and Cultural Heritage Management Plan and North Eastern Wiradjuri Cultural Heritage Management Plan* (Wilpinjong Coal 2010). The guidelines within these documents must be followed even in areas where archaeological sites are not known to occur.

4.2.6 Biodiversity

Fire is an important element of the Australian landscape and an integral part of the life cycle of many native species. Many species have adapted to a specific fire regime. Therefore, inappropriate fire regimes can have a negative impact on some species and communities.

The Rehabilitation Management Plan (RMP) (Wilpinjong Coal 2006) deals with the management of biodiversity within the Wilpinjong Coal Landholding. This document contains information on the biodiversity assets within the Wilpinjong Coal Landholding and should be consulted before any bushfire management works are undertaken.

In addition, the NSW Rural Fire Service (RFS) and Office of Environment and Heritage (OEH) have produced the *BEAC* (RFS 2006b) which contains specifications for the management of threatened species and endangered ecological communities. This BMP refers to this code in order to recommend appropriate fire intervals for vegetation and measures to protect threatened species. Where vegetation and threatened species are not covered by the Code, general recommendations provided based on the OEH threatened species website (OEH 2010). These have been presented in tabular format in Appendix 1.

4.2.6.1 Endangered Ecological Communities

Two endangered ecological communities, 'White Box, Yellow Box and Blakely's Red Gum Woodland' Endangered Ecological Community (EEC) listed under the TSC Act and 'Grassy White Box Woodlands' EEC listed under the EPBC Act, are known to be located within the Wilpinjong Coal

Landholding. Fire frequencies for these communities have been estimated as being similar to other Grassy Woodland communities. It is however noted that much of the Wilpinjong landholding (the study area) has not been subjected to detailed ecological assessment, particularly outside the active mining area. As such, it is recommended that due diligence surveys are carried out in these areas prior to any works arising from this management plan are implemented (as per Section 5.5).

4.2.6.2 Threatened Flora

A total of 2 threatened flora species and populations have been recorded within the Wilpinjong Coal Landholding. Appropriate fire thresholds for the management of these species were primarily sourced from the Threatened Species Hazard Reduction List for the *BEAC* (RFS 2006b) and the OEH Threatened Species Website.

4.2.6.3 Threatened Fauna

A total of 22 threatened fauna species have been recorded within the Wilpinjong Coal Landholding. Appropriate fire thresholds for the management of these species were primarily sourced from the Threatened Species Hazard Reduction List for the *BEAC* (RFS 2006b) and the OEH Threatened Species Website.

5 Management Approaches

5.1 MANAGEMENT ZONES

Management zones are based on the location of assets, topography, landuse and potential bushfire hazard. Management zones are separated into the following three categories:

- Asset Protection Zones (APZ);
- Strategic Fire Advantage Zone (SFAZ); and
- Land Management Zone (LMZ).

Zones have been identified and mapped across the Wilpinjong Coal Landholding areas according to the aims and objectives outlined in Section 1. These zones are shown on in Figure 8.

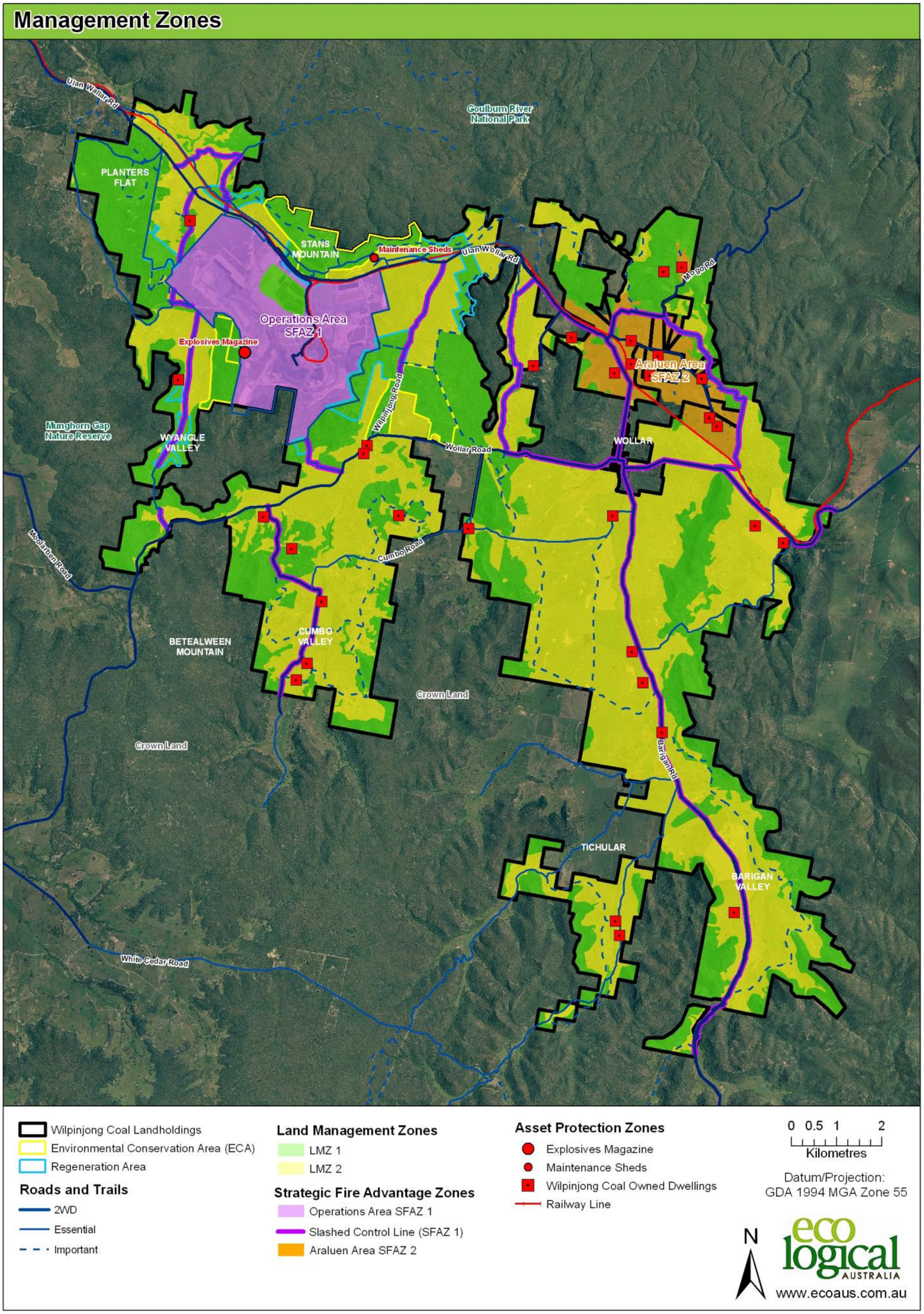

Figure 8: Management Zones

5.1.1 Asset Protection Zones (APZ)

An Asset Protection Zone (APZ) is a buffer area between a bushfire hazard and an asset which minimises the impact of fire on that asset (NSW Rural Fire Service, 2006a). The APZ should be maintained so that sources of fuel are minimised.

Table 1 outlines the management approach.

Table 1: Asset Protection Zone Management Approach

Aim	• To provide a fuel free zone around the asset in question and all-weather access for emergency vehicles
Specifications	• Fuel free zones. • Tree canopy to be discontinuous. • Grass and pasture to be regularly slashed to <10cm height • Emergency access/egress points to road system should be maintained
Management	• Mechanical, or manual hazard reduction • Slashing three times a year, before, during and after the bushfire danger period is recommended
Monitoring	• Weekly from September – February, monthly at other times of year
Priority	• Very high

Due to the siting of the majority of infrastructure within the operations area, this plan has not determined specific APZ widths for all infrastructure within this area. Instead, a blanket SFAZ has been recommended around all structures as described in Section 5.1.2 below and specific APZs are recommended for all residential dwellings, the explosives magazine, the rail line and along polypipe lines as described in Table 2.

Table 2: Designated Asset Protection Zones

Asset	Recommended APZ and Management
Wilpinjong Coal Owned Dwellings	Based on the likely construction level of dwellings within the Wilpinjong Coal Landholdings and AS3959-2009, a 100m wide Asset Protection Zone (APZ) is recommended around all dwellings. Dwellings that may not be able to achieve a 100m APZ have been indicated as Potential High Risk in Figure 7. Where the 100m APZ is not achievable, it is recommended that an asset specific assessment be conducted to determine an appropriate suite of bushfire mitigation measures.
Explosives	A 70m cleared area already exists around the explosives magazine.

Asset	Recommended APZ and Management
Magazine	This area should be slashed regularly and maintained as an APZ. Ember protection should be installed if not already provided.
Maintenance Sheds	A 10m APZ should be maintained to provide a fuel reduced zone and defendable space in addition to an appropriate bushfire fighting water supply. Provision of specific construction measures if deemed appropriate e.g. ember-proofing.
Railway Line	The recommended APZ adjacent to the railway line is 5 metres. This will reduce the potential for ignition from this source.
Polypipe	Placement of polypipe is often temporary and future placement should take bushfire risk into consideration. It is recommended that this infrastructure is preferentially located in fuel reduced locations. For existing installations, it is recommended that grass should be slashed on either side of the polypipe, the width of which should be based on consideration of hazard and risk, importance, biodiversity and length of time in location.

The creation of APZs around existing structures may require an environmental assessment to obtain a Bush Fire Hazard Reduction Certificate or other equivalent environmental approval, unless clearing has already been undertaken or the action is permissible within the existing consent.

The fuel loads within the APZ should be maintained at low levels especially during the peak fire season. It is recommended that mechanical reduction of fuel be used preferentially (especially around assets). Manual fuel reduction may be more appropriate around areas of sensitivity – i.e. at known flora, fauna or archaeological sites and within all biodiversity offset areas. All APZ works will require relevant due diligence assessment (see Section 5.5).

A program to review the fuel loads in APZs is to occur regularly and especially before the commencement of and during the fire season. A slip-on unit should accompany any slashing during the bushfire danger period to suppress any potential ignitions.

This plan does not recommend any prescribed burning for APZ creation or maintenance.

5.1.2 Strategic Fire Advantage Zones (SFAZ)

The Strategic Fire Advantage Zones (SFAZ) are intended to provide:

- strategically located fuel reduced strips to reduce the potential for wildfires to spread;
- areas where fire can more easily be suppressed; and
- strategically located fuel reduced areas to reduce vulnerability of assets which are susceptible to fire.

The existing operations area has been classified as SFAZ 1 given that the fuel load in this area has already been substantially reduced.

Control lines are indicated on the BMP Poster and in Figure 8. These lines have been strategically placed along selected essential trails to act as a barrier to the passage of grass fire and to provide strategic locations for control. These lines should be treated as SFAZ 1 to a distance of up to 5m on either side of the trail.

An already fuel reduced zone (from rural-residential activities) within the Araluen area has been classified as SFAZ 2 to provide protection to residences and to reduce the risk of ignition from this area.

Table 3 and Table 4 outline the management approach for SFAZ1 and SFAZ 2 respectively.

Table 3: Strategic Fire Advantage Zone 1 Management Approach

Aim	• To provide a fuel reduced zone around the primary operational areas • To establish fuel reduced control line areas to reduce the rate of spread and intensity of fires
Specifications	• Fuel managed area • Access/egress points to road system should be maintained
Management	• Manual/mechanical fuel reduction to be undertaken as required. • The intent is not to clear vegetation within these zones but to take advantage of the already reduced fuel load to aid fire prevention strategies • Maintenance of fire trails.
Monitoring	• Weekly from September – March, monthly at other times of year. This can be adjusted to suit weather conditions
Priority	• High

Table 4: Strategic Fire Advantage Zone 2 Management Approach

Aim	• To provide a fuel reduced zone around the residences within the Araluan area
Specifications	• Fuel managed area • Access/egress points to road system should be maintained • Provision of appropriate water supply
Management	• Manual/mechanical fuel reduction or grazing of grassland fuels to be continued or undertaken as required. • The intent is not to clear wooded vegetation within this zone but to take advantage of the already reduced fuel load of grassland vegetation and to keep fuel loads at an appropriately reduced level, particularly prior to and during the

	fire season. • Maintenance of fire trails. • Provision of appropriate fire suppression water supply, such as through the utilisation of existing or provision of additional storages and the maintenance of an appropriate supply quantity during the fire season.
Monitoring	• Weekly from September – March, monthly at other times of year. This can be adjusted to suit weather conditions
Priority	• High

5.1.3 Land Management Zones (LMZ)

Land Management Zones (LMZ) are areas that will be managed using a conservation sensitive approach to provide optimum fire frequency to maintain and improve biodiversity. The risk of wildfire may be increased in these areas due to the exclusion of grazing and the establishment of large continuous areas of native forest and woodland. This is mitigated however by the strategic placement of SFAZs, APZs and control lines (shown in Figure 8).

For the purpose of this plan, the LMZ has been divided into two separate management units 'LMZ 1' and 'LMZ 2'.Tables Table 5 and Table 6 outline the management approach for these two zones respectively.

Table 5: Land Management Zone 1 Management Approach

Aim	• To manage land primarily for conservation.
Specifications	• Includes all vegetated lands, ECAs and areas designated for regeneration within the *Wilpinjong Coal Project Rehabilitation Management Plan*. (Wilpinjong Coal Pty Limited 2006). • Area managed primarily for environmental purposes. • Recognition that rehabilitation and regeneration will result in increased fuels loads.
Management	• Maintain and establish stock fencing around these areas. • Establish and maintain fire trail network using existing trails to provide access and control lines. • Ecological burns on remnant patches within the landholding are not proposed for the next five years. However a burn program for these areas may be warranted in the future. • For fringing vegetation, consider opportunistic burns in conjunction with OEH.
Monitoring	• Monitoring fire trails, and regeneration before and after the fire season.
Priority	• Medium.

Table 6: Land Management Zone 2 Management Approach

Aim	• To maintain existing land uses open space and grazing. • Minimisation of ignition risk.
Specifications	• Areas to be managed for open space, conservation or grazing as required.
Management	• Maintain and establish stock fencing around areas to be managed for conservation. • Consider implementation of a grassland burning regime with the objective of minimising ignition risk. • Establish and maintain fire trail network using existing trails to provide access and control lines.
Monitoring	• Monitoring, tracks and fuel loads before during and after the fire season.
Priority	• Medium.

Prescribed Burning Guidelines

5.1.3.1.1 Prescribed burning of grassland within LMZ 2 for ignition risk purposes

The specification of a detailed strategic burn regime for LMZ 2 is outside the scope of this plan. Such a burn regime will need to be developed by Wilpinjong staff annually as the risk associated with grassland fuels changes rapidly associated with time of year and curing, nature of the growing season, fire history, changes to Wilpinjong Coal operations and management regimes *e.g.* grazing. Therefore selection of prescribed burning areas within LMZ 2 requires flexibility to respond to these changes; the following provides guiding principles on how burn areas are to be selected:

1. **Identify the objectives of the burn and prioritise their selection based upon those that**:
    a. directly protect life and property;
    b. indirectly protect life and property;
    c. reduce bushfire risk to mine operations; and
    d. help conserve biodiversity and other environmental values.

    Note: the above list is in priority order. Additional information on each of the above priorities is provided below.

2. **Burns that directly protect life and property** include those:
    a. abutting a bushfire vulnerable asset (*e.g.* building, structure) in any direction from the asset; and

b. located within two hundred metres of a building or bushfire vulnerable asset on the north-western, western and south-western side;

3. **Burns that indirectly protect life and property** include those:

   a. minimising the risk of accidental and deliberate ignitions *e.g.* along roadsides, outdoor work areas and places that people regularly use;

   b. strategically located to minimise risk of fire escape from the study area (give priority to where such escapes may pose the greatest threat;

   c. strategically located to minimise risk of developing a larger scale fire;

   d. Strategically located to ensure fire suppression activities are more efficient, effective and safe *e.g.* around key fire advantages such as water supplies, fire control lines, helipads, lookouts, *etc*

4. **Burns that reduce bushfire risk to mine operations** include those:

   a. Reducing the risk of large scale fires starting and spreading;

   b. Reducing the risk to surveying or other preparatory work for expansion into new operating sites/areas;

   c. Reduce the risk to rehabilitation sites, particularly during the period prior to when the habitat is fire tolerant *e.g.* eucalypts are tall enough to re-sprout, plants have set seed in at least two previous years;

   d. Reduce the risk of wildfire smoke interruption of mine activities;

5. **Burns that help conserve biodiversity and other environmental values** include those that:

   a. Maintain a fire interval appropriate for the native species present *e.g.* to set seed (Note: native grass communities require fire intervals of about 3 – 10 years);

   b. Provide a buffer to reference areas kept in a long unburned state e.g. 'islands' of forested/wooded vegetation;

   c. Protect significant biological/ecological features e.g. Endangered Ecological communities;

   d. Protect fodder for stock within and adjoining the study area;

The longevity of the benefit of fuel reduction burning within LMZ 2 is limited due to the rapid regrowth potential of grassy fuels. Burned areas should be monitored to ensure that burns achieve an appropriate duration of reduced fuel loads. If the benefits of LMZ 2 burning are found to have limited duration then the spatial pattern of burning and the extent of burning become more critical. It may be that widespread small scale burns creating a fine grain mosaic pattern is more useful than less frequent broader scale burning; this must be closely monitored and burn plans modified to suit.

Selection of burn areas should also compliment fuel management of nearby and adjoining areas e.g. on other lands, patterns of grazing. Typically a mosaic pattern of lower fuel areas should be established to mitigate the spread of fire from west to east.

5.1.3.2 Prescribed burning within LMZ 1 for ecological purposes

Opportunistic ecological burns within LMZ 1 may be conducted in conjunction with OEH and the RFS if the neighbouring Goulburn River National Park, Munghorn Gap Nature Reserve or Crown Land is planned to be burnt. This strategy is recommended due to the patchy distribution of woodland and forest vegetation across the Wilpinjong Coal Landholdings. This wooded vegetation is predominantly located on steep fringing slopes adjacent to the surrounding Reserves, Parks and Crown Land, making it logistically difficult to burn these areas without such collaboration.

No specific ecological burns have been prescribed over the next five years for vegetation patches within the landholding. However, in future revisions of the plan, prescribed ecological burns could be considered for the south-eastern ECA dependant on the regeneration within this area and for the parcel of wooded vegetation west of Planters Flat.

Detail is provided in Appendix 1 to assist in the development of a burn program should one be developed in the future or if a burn is planned in collaboration with OEH or the RFS.

5.2 PREVENTION OF IGNITION

Prevention of fire outbreaks are the primary focus of fire control strategies. The key personnel responsible for reporting and monitoring fire hazards and for the prevention of fire are:

- **All employees** have a general duty of care to observe for and report fire hazards within the Wilpinjong Coal Landholding and on mine access roads

- **Wilpinjong Coal Mine Land Manager** is responsible for overall monitoring of fire hazard within Wilpinjong Coal landholdings

The key to minimising fire ignition is to increase the awareness of the risks of ignition. Table 7 documents the actions required to raise awareness amongst Wilpinjong Coal Mine employees and contractors to help prevent fire ignition. These strategies are especially important during the fire season when weather patterns are conducive to the spread of fire.

Table 7: Actions to Minimise Ignition Risk

Factors Effecting Ignition Risk	Action to Minimise Source
Cigarettes thrown from cars	• Consider signs which alert road users to the risks and likely effects of disposing cigarettes from cars • On-going toolbox talks conducted
Higher fuel loads	• Review fuel accumulation annually • Annually maintain critical fire trails and access roads. Remove surface vegetation from trails with dozer or grader blade • Review need for mechanical hazard reduction prior to fire season and implement in conjunction with the RFS • Invite the RFS annually (preferably at start of fire season) to inspect fire controls, access etc
High/Extreme/Catastrophic Fire Danger Days	• Installation of a Fire Danger Index sign at the main entrance to the mine site. • Prohibiting high risk activities during extreme/catastrophic fire danger days
Trespassers	• Secure total landholding from trespass to maximum extent practicable (e.g. boundary fencing, minimise number of access points, locked gates, patrols/inspections)

Factors Effecting Ignition Risk	Action to Minimise Source
Lightning strike	• Survey study area for ignitions immediately after dry storms have passed through • Review fire hazard situation annually • Annually maintain critical fire trails and access roads. Remove surface vegetation from trails with dozer or grader blade • Invite RFS annually (preferably at start of fire season) to inspect fire controls, access etc
Powerlines	• Liaise with TransGrid to ensure maintenance of powerlines.
Railway line	• Ensure adequately maintained 5m APZ around this source.
Car accidents and car fires	• Ensure adequately maintained road and trail network
Welding and maintenance	• Maintain high level of employee awareness (e.g. toolbox talks) • Ensure adequate buffer zone between activities and fuel source • All hot work activities to have a spotter and a fire extinguisher within work zone. • No hot work activities on Extreme or Catastrophic Fire Danger Days
Fuel and exhaust fires	• Maintain high level of employee awareness (e.g. toolbox talks) • Ensure adequate buffer zone between activities and fuel source • Ensure all plant or equipment have spark arrestors and are operating without causing backfiring etc
Exploration drilling	• Maintain high level of employee/contractor awareness (e.g. toolbox talks) • Consideration of fire in risk assessment prior to commencing drilling • If possible, avoid Extreme and Catastrophic fire danger days

Factors Effecting Ignition Risk	Action to Minimise Source
Employees, contractors and consultants	• Maintain high level of employee/contractor awareness (e.g. toolbox talks) • Restrict access by mine employees, contractors and outsiders to non-operational areas • Consideration of fire in risk assessment prior to commencing drilling • Availability of fire suppression equipment, where appropriate
Clearing ignitions	• Maintain high level of employee awareness (e.g. toolbox talks) • Do not undertake mechanical clearing works Extreme and Catastrophic fire danger days • Ensure 24hr fire contact information for Wilpinjong Coal Mine is provided • Purchase a water tank slip-on unit, provide training for staff in collaboration with the RFS, provide them with suitable personal protective equipment and maintain a list of trained personnel.
Hazard reduction and biodiversity burns	• See Appendix 1
Fencing, stock management, other land management activities	• Maintain communications with community/neighbours, where appropriate • Ensure 24 hr fire contact information for Wilpinjong Coal Mine is provided to neighbours and the local community • Consideration of fire in risk assessments

5.2.1 Fuel Reduction

The reduction of fuel loads by mechanical means and through the use of fire is a primary means of prevention of uncontrollable wildfire. The primary means of fuel reduction within the Wilpinjong Coal Landholding will be through mechanical or manual clearing. Any fuel reduction should be conducted at a time when it is likely to cause minimal impact to breeding threatened fauna. The best time should be decided after careful consideration of the species likely to be present within the affected vegetation community outlined in Table 11, Table 12 and Table 13. Further details are provided in Table 8.

Table 8: Operational Guidelines for Mechanical / Manual Hazard Reduction

Operational Guidelines for Mechanical / Manual Hazard Reduction*		
Issue	**Type of Action**	**Guidelines**
Riparian Areas.	Hand tools and machinery	• Manual work must be excluded from all vegetation adjacent to a water body (i.e. the riparian buffer zone) within 10m.
	Slashing Machinery, Graders, Ploughs, Dozers, Tree Removal	• Mechanical work must be excluded from all vegetation adjacent to a water body (i.e. the riparian buffer zone) within 20m.
	Prescribed Burning	• Not permitted in vegetation adjacent to a water body (i.e. the riparian buffer zone) within 20 m.
Native Vegetation	Creation/Maintenance of APZ	• Any part of a tree within 5 metres of the building may be removed/pruned). • The canopy throughout the APZ should be discontinuous (2-5m separation). • Skirting should be used in preference to tree removal where appropriate. • Any pruning or branch removal refer RFS Standards for APZ or AS 4373 - 1996 Pruning of amenity trees. • Fire Interval thresholds and permits apply for use of prescribed burning—see the BEAC.
Biodiversity	All Actions	• See Table 11, Table 12 and Table 13.
Aboriginal Heritage	All Actions	• See relevant conditions specified in the *Ulan Aboriginal Heritage Management Plan* (in prep).
Historic Heritage	All Actions	• Conditions must be imposed to protect the site. See RFS/NSW Heritage Office Guidelines for Bush Fire HR Works Affecting Heritage Items.

Operational Guidelines for Mechanical / Manual Hazard Reduction*		
Issue	**Type of Action**	**Guidelines**
Weeds	All Actions	• Conditions must be imposed to prevent the spread of noxious weeds. • No herbicides within 100 metres of the known location of any species listed in the Threatened Species Hazard Reduction List, unless the List states otherwise. • No herbicides near water bodies if likely to result in water pollution. • Other conditions apply – see the BEAC.
Soil Erosion (Mechanical clearing inc. control lines)	Hand tools and hand held machinery	• Permissible all other areas.
	Slashing Machinery	• Not on slopes >18°. On slopes > 10° slashing must not leave vegetation shorter than 10 cm from the ground surface.
	Graders Ploughs Dozers	• Not permitted on slopes > 10°. • No reshaping the soil surface or re-direction of surface water runoff. • All topsoil must remain on the soil surface. • Machinery work should be conducted parallel to contours.
	Tree Removal and Pruning	• Only permitted within APZs. • Where trees are removed on slopes >10°, the root structure must be left undisturbed. • No tree removal on slopes > 18°. • Pruning is only permitted on slopes > 18° if at least 75% of the original canopy cover is retained.
Soil Erosion (Prescribed Burning)	Moderate Intensity Fire	• Not to be used on soil surface slopes > 18°.
*Based on the Bush Fire Environmental Assessment Code (BEAC) (2006).		

5.2.2 Community Consultation

Ongoing community consultation should be undertaken to foster fire prevention and cooperation between Wilpinjong Coal and neighbouring landholders. This should include meetings prior to the fire season as well as strategic communication throughout the fire season for the purpose of communicating work plans, boundary maintenance issues or other common interests with the community. As part of this consultation, a mine representative should attend all biannual RFS Bushfire Management Committee Meetings.

Of particular importance is the fire awareness of mine property lessees and in particular, lessees within the Cumbo, Barrigan Valleys and the Araluen area. The following measures are recommended to aid evacuation and manage the risk of ignition:

- A 'FireWise' fire safety awareness training session should be organised with the RFS and all lessees encouraged to attend. This training should be focused on increasing awareness, identifying risk and being prepared.
- It should be communicated to lessees that there must be no burn-off without the prior authorisation of Wilpinjong Coal, and this should be written into future lease agreements.
- It is recommended that assistance is provided to residences within the Cumbo, Barrigan Valleys and the Araluen area to prepare individual Emergency Response Plans and that the responsibility for creation and implementation of these plans rests with the occupiers of the residences

5.3 ACCESS

Roads and trails within the Wilpinjong Coal Landholding were classified as 2WD Road, Essential, Important, Dormant or Restricted Operations for the purposes of this BMP. These are shown on the accompanying poster. In addition, proposed fire trails have been mapped based, where possible, on the location of current tracks otherwise on logical access and control line concepts. Note that trails within the Wilpinjong Coal Landholding were mapped based on desktop aerial photo interpretation and limited ground validation. Access arrangements should be confirmed by all users in advance.

2WD Roads are defined as public roads surrounding the Wilpinjong Coal Landholding or providing direct access to the Wilpinjong Coal Landholding, which are able to be traversed by normal road-going traffic (including RFS vehicles).

2WD Roads include:

- Slate Gully Road;
- Ulan Wollar Road;
- Wollar Road;
- Upper Cumbo Road;
- Cumbo Road;
- Moolarben Road;

- Barigan Road;
- Mogo Road;
- Araluen Road;
- Araluen Lane; and
- The Main Access Road

Essential trails are trails that provide major access through the Wilpinjong Coal Landholding for four wheel drive vehicles (including RFS vehicles) and are seen as essential for controlling the spread of fire. Important trails are trails that provide secondary access and compliment the essential trails. Dormant trails are those observed during field inspection or mapping that are disused, not maintained or not specifically required to be maintained for fire management purposes. Restricted Operations trails are those trails within the active mining area. Due to potential dangers, these trails are only accessible by mine employees or persons with a authorised mine employee escort.

Informal access to much of the Wilpinjong Coal Landholding is also currently available given the lack of wooded vegetation, although this is not recommended during an emergency situation due to the potential for hidden hazards such as wombat holes, stumps, boulders and the like.

It is important that mine staff, local residents and emergency services personnel are able to easily navigate within the Wilpinjong Coal landholdings during a bushfire emergency. The high likelihood of heavy smoke during a bushfire emergency makes this especially important. As such, it is recommended that trail names are clearly signposted at every intersection for all 2WD, Essential and Important roads and trails in order to aid navigation.

Gates are located at many road intersections. It is noted that during a response to fire it should be assumed that all gates are locked. The standard response of the RFS is to cut a link in the chain of any locked gate through which access is required.

5.3.1 Construction/upgrade of Fire trails

The BMP Poster identifies a network of fire trails. It is vital that these trails be maintained according to the standard set out in PBP (RFS, 2006a) and NSW Soil Conservation Service (1994) so that there is a clear and well set out network of fire trails that will serve as access points, evacuation routes and effective control lines. Consideration should be given to the construction of appropriate turning/passing bays to allow safe and efficient response to fire.

In addition to the trails marked on the BMP Poster, it is recommended that a fire trail be maintained around the entire perimeter of the operations area. This trail should be separate to any operations trails or haul roads and will need to be realigned as the operations area expands.

An annual maintenance schedule for all roads and trails is to be incorporated into the normal works program. This should be undertaken before the fire season to ensure that the condition of each trail is consistent with that mapped within this plan.

Any works involving ground disturbance or vegetation removal will require appropriate due diligence assessment (see Section 5.5).

5.4 WATER SUPPLY

There are a number of farm dams and bores across the Wilpinjong Coal Landholding. A number of these dams are regularly filled and capacity level checked (marked on the Bush Fire Management Plan Poster) and in addition, two large dams are located within the operations area.

Water carts are readily available to service within the operations area and water fill points have been established in accessible locations. Fire hydrants should be provided for all infrastructure and meet the requirements of AS2419 (SAI Global, 1994).

5.4.1 Construction/upgrade of Water Supply

The BMP Poster identifies a number of recommended water fill point locations. These locations are approximate and on-ground knowledge should be used to determine the most practical location. It is important that these water fill points be maintained so that there is a ready access to water across all Wilpinjong Coal Landholdings.

A maintenance schedule for all water fill points is to be incorporated into the normal works program. This should be undertaken before and at regular intervals during the fire season to ensure that the available water fill points are consistent with those mapped within this plan.

Any works involving ground disturbance or vegetation removal will require appropriate due diligence assessment (see Section 5.5). If extraction of groundwater is required, a groundwater licence will be required as specified in Sections 51 and 67 of the Water Act 1989.

5.5 PROPOSED WORKS - ECOLOGICAL AND ARCHAEOLOGICAL REQUIREMENTS

Throughout this BMP, a number of recommendations have been proposed which may result in disturbance to specific sections of the Wilpinjong Coal Landholding when carried out. These works include creation and maintenance of APZs and fire trails and fuel reduction within SFAZs and LMZs. Prior to these non-emergency works commencing, archaeological and/or ecological due diligence assessments may be required (as outlined below).

Due diligence assessments by relevant experts will be required, as per clearing procedures, whenever proposed non-emergency works will involve, ground disturbance or the removal/modification of vegetation of any type. This is the case even in areas where no significant ecological or archaeological features have previously been recorded.

Any non-emergency ground disturbance or vegetation modification works within the ECAs must also be undertaken in accordance with the relevant conditions specified in the RFS/OEH document *Conditions for Hazard Reduction and Aboriginal Heritage* (a component of the BEAC (RFS 2006b), the RMP (Wilpinjong Coal 2006), the *Wilpinjong Coal Mine Aboriginal and Cultural Heritage Management Plan and North Eastern Wiradjuri Cultural Heritage Management Plan* (Wilpinjong Coal 2010) and follow the species specific conditions relating to hazard reduction as shown in section 5.1.3.2.

The guidelines within these documents must be followed even in areas where archaeological sites are not known to occur.

In addition, some activities involved in the control of wildfire may have an adverse effect on biodiversity and archaeological sites. Examples include use of heavy machinery to construct control lines, or use of fire retardant chemicals. The reasonable application of these activities in an emergence situation does not require assessment. However, potential damage should be avoided wherever possible, using guidelines provided in the BEAC and in Section 5.2.1.

In riparian areas, non-emergency mechanical work must be excluded from all vegetation adjacent to a water body as defined in the BEAC.

6 Implementation Plan

A recommended implementation plan is provided in Table 9 below.

Table 9: Recommended implementation plan

Task	Purpose	Frequency	Timing	Responsibility
Frequency - Once				
Ensure that a current copy of the BMP Poster and Supporting Report is held by the local RFS brigades.	Allow the RFS to respond rapidly to fire within the Wilpinjong Coal Landholdings	Once	2011 and whenever the plan is updated	Wilpinjong Coal Environment and Community Advisor
Construct or upgrade trails in areas with inadequate access.	Ensure adequate access for emergency response and management tasks in accordance with specifications	Once	2011	Wilpinjong Coal Land Manager
Install trail name signage at every intersection for all Essential and Important trails.	To aid emergency navigation.	Once	2011	Wilpinjong Coal Land Manager
Purchase a water tank slip-on unit, provide training for staff in collaboration with the RFS and maintain a list of trained personnel & provide them with suitable personal protective equipment.	To accompany any hazard reduction works and to control small fires.	Once	2011	Wilpinjong Coal Land Manager
Facilitate a FireWise training session with Wollar RFS and encourage all lessees to attend.	Reduce the chance of ignition caused by lessees.	Once	2011	Wilpinjong Coal Environment and Community Advisor

Task	Purpose	Frequency	Timing	Responsibility
Install a fire danger index sign at the entrance to the mine site.	Raise awareness amongst Wilpinjong Coal Mine employees and contractors of Extreme and Catastrophic fire days to help prevent fire ignition.	Once. To be updated daily in conjunction with the RFS	2011	Wilpinjong Coal Environment and Community Advisor
Frequency - Daily/Ongoing				
Patrol entire site or go to a vantage point, when available, at key times on Extreme and Catastrophic bushfire weather days and check for smoke or risks.	To ensure potential ignition sources are mitigated and to also locate fires quickly to allow for a quick response.	Daily	When available during Extreme and Catastrophic bushfire weather conditions	Wilpinjong Coal Land Manager
Raise awareness of ignition risk.	Raise awareness amongst Wilpinjong Coal Mine employees and contractors to help prevent fire ignition.	As per Table 7	Ongoing	All managers and Area Wardens
Frequency - Monthly				
Confirm adequacy of water supply and onsite fire fighting resources and implement appropriate works where deemed inadequate.	Adequate water supply for fire fighting use.	Monthly during fire season	Prior to and during fire season (1 October to 31 March)	Wilpinjong Coal Land Manager
Track monitoring.	Monitor condition of tracks and accessibility.	Monthly	Monthly during fire season and immediately following periods of heavy rain or high wind	Wilpinjong Coal Land Manager
Frequency - Annually/Bi-annually				

Task	Purpose	Frequency	Timing	Responsibility
Consider the need for an ecological burn within LMZ 1	To enhance biodiversity and/or assist regeneration and to compliment other regional burning proposals.	Annually	As per Appendix 1	Wilpinjong Coal Environment and Community Advisor
Consider the need for a strategic burn within LMZ 2	To reduce the ignition potential of grassland within LMZ 2 and risks to adjoining assets/values.	Annually	Prior to fire season (1 October to 31 March)	Wilpinjong Coal Land Manager
Audit fire fighting equipment	To ensure equipment is in proper working order and condition, and to identify any logistical changes that need to be made	Annually	Prior to fire season (1 October to 31 March)	Wilpinjong Coal Land Manager
Track maintenance	Maintain condition of tracks in accordance with specifications	Bi-annually	Prior to fire season. Also following periods of heavy rain	Wilpinjong Coal Land Manager
Undertake community consultation with neighbouring landholders and lessees.	To foster fire prevention and cooperation between Wilpinjong Coal and the local community	Annual and as needed	In September. Prior to the fire season.	Wilpinjong Coal Environment and Community Advisor
Frequency - Varied				
Review fuel loads and any required fuel reduction.	Assess the need for Hazard Reduction Activities	As per Management Zone	As per Management Zone	Wilpinjong Coal Land Manager

Task	Purpose	Frequency	Timing	Responsibility
Review this plan and BMP poster	To ensure relevant information in current for land managers and emergency response personnel	Every 5 years or whenever there are significant changes to the landscape such as due to fire activity or significant development of the mine.	2016 or when needed	Wilpinjong Coal Environment and Community Advisor

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APPENDIX 1

The following detail is provided to assist in the development of a burn program for LMZ 1 should one be developed in the future or if a burn is planned in collaboration with OEH or the RFS.

All burning within the LMZ is to be within the ecological thresholds as shown in Table 10.

Table 10 Vegetation Formations within Wilpinjong Coal Landholdings and their Fire Thresholds

Keith (2004) Classification	Fire Freq Min (yrs)	Fire Freq Max (yrs)
Dry sclerophyll forests (Shrub/Grass sub formation)	5-7	30-50
Grassy Woodland	5	40
Tall/Short Heath	7	30
Grassland	2	10
Regenerating Woodland/Forest*	15	Unknown
Fire Intervals from DEC 2004 "Guidelines for Ecologically Sustainable Fire Management. NSW NP&WS. *Fires within areas of regenerating/rehabilitated vegetation should be excluded for at least 10-15 years to allow the buildup of a soil seedbank.		

Wildfire may occur within the project area during the life of this plan and this will create variability in fire interval, fire season, fire intensity and pattern of burn. All prescribed burns are to be low intensity in recognition that wildfire will periodically provide intensity variation and medium to high intensity prescribed burning is very difficult to manage.

Variation in the ignition pattern is required to ensure that the burn regime does not create heavily 'altered' patches of similar fire regimes *e.g.* 'fire shadow' or 'high impact' areas. Whilst downhill burns are typically used in prescribed fire ignition, an occasional uphill burn may be useful, provided that the resultant fire intensity can be managed safely.

Prescribed burning needs to take into account the effects on invasive weeds. Fire regimes and fire management can exacerbate the spread of weeds *e.g.* through earth moving equipment. Fire management activities and particularly prescribed burning can also assist with weed control. The management of bushfire should be complimentary to current and future ecological restoration and aim to avoid exacerbation of the problem, for example:

- Minimize seedbank disturbance and competitive release;
- Pre-fire weed control should commence as early as possible and leading up to the prescribed burn;

- Post-wildfire weed control programs should commence within one month and completed within 12-18 months of a fire;

6.1.1.1 Conditions suitable for prescription burns

Autumn (April - May) is proposed as the best season to burn for this site. Generally, the most favourable periods for prescribed burning occur when there are:

- Dry surface fuels (moisture levels of 10 to 20 percent);
- A high level of moisture recovery in fine fuels at night;
- High soil moisture; and
- A low probability of dry north-westerly winds.

6.1.1.2 Burning safeguards

Burns need to be planned well in advance and in conjunction with Wilpinjong Mine Operation Managers.

A pre-burn assessment is required. The assessment requires the weather to be monitored in the days prior to the burn. Weather data should be checked on a regular basis in the week leading up to the time of burning to ensure the burn prescription objectives remain achievable under the weather conditions forecast;

Notification of neighbours and RTA may be required to avoid smoke nuisance, adhere to burn permit requirements and manage hazards from smoke;

The following smoke management guidelines are to be applied to reduce impacts from any prescribed burn.

- Before a prescribed burn, environmental conditions are to be assessed to ensure that favourable wind conditions will exist such that smoke is carried away from sensitive areas such as main roads, and operations areas;
- Appropriate prescriptions for weather patterns are detailed within prescribed burn plans so as to minimise the coincidence of burning days of high brown haze and photochemical smog risk (i.e. atmospheric inversion);
- Residents in the region are to be notified well in advance of plans for prescribed burns;
- Debris, such as tyres or dumped rubbish are to be removed from the bushland area before burns are commenced;
- Aggressive mop-up of fires should be implemented to minimise the smouldering stage of suppression. To facilitate this, crews are to be briefed before implementation of prescribed burns; and.
- Close liaison is maintained with the Bureau of Meteorology and RFS Regional Officers so as to:

- ensure an appropriate weather opportunity exists;
- minimise opportunities for the smoke plumes impacting on sensitive areas;
- minimise the cumulative impact of burning on days when temperature inversions are anticipated; and
- minimise the cumulative impacts of a number of prescribed burns within the region.

Specific measures are required to minimise impact on flora and fauna. Burns that may potentially affect threatened fauna and flora must be carefully designed and implemented. Wherever possible, leave filter strips of unburned vegetation about 20 m wide along major watercourses. Species and community specific conditions are also shown in Table 11, Table 12 and Table 13 below.

Table 11: Threatened Fauna Fire Ecology

Threatened Fauna Fire Ecology					
Common Name	**Scientific Name**	**Breeding season**	**BEAC Conditions re the use of Fire***	**BEAC Conditions re Mechanical Hazard Reduction***	**Comment/ recommended action**
Gang-gang Cockatoo	*Callocephalon fimbriatum*	Oct-Jan	No burning of Allocasuarina thickets	No removal of Allocasuarina thickets	Utilise a mosaic burn regime; Avoid too frequent fire; Avoid high intensity fire; Protect specific habitat elements (Allocasuarina thickets, tree hollows)
Pied Honeyeater	*Certhionyx variegatus*	Jun-Nov	None	None	The clearing of nectar-producing shrubs (*Eremophila* spp.; *Grevillea* spp.; *Brachysema* spp.) reduces food supplies and may interrupt broadscale nomadic movements.
Varied Sittella	*Daphoenositta chrysoptera*	Jun-Apr	Utilise mosaic burn	No slashing, trittering or tree removal	Avoid large fires in preferred habitat areas; Avoid frequent fires in high quality habitat areas; Use mosaic burn strategy; Prescribed burns preferred outside breeding season; Protect species specific habitat elements (tree hollows, dense foliage, ground cover.
Little Lorikeet	*Glossopsitta pusilla*	May-Sep	Utilise mosaic burn	No slashing, trittering or tree removal	Avoid large fires in preferred habitat areas; Avoid frequent fires in high quality habitat areas; Use mosaic burn strategy; Prescribed burns preferred outside breeding season; Protect species specific habitat elements (tree hollows, dense foliage, ground cover.

Threatened Fauna Fire Ecology					
Common Name	**Scientific Name**	**Breeding season**	**BEAC Conditions re the use of Fire***	**BEAC Conditions re Mechanical Hazard Reduction***	**Comment/ recommended action**
Painted Honeyeater	*Grantiella picta*	Spring to autumn	Utilise mosaic burn	No slashing, trittering or tree removal	Avoid large fires in preferred habitat areas; Avoid frequent fires in high quality habitat areas; Use mosaic burn strategy; Prescribed burns preferred outside breeding season; Protect species specific habitat elements (tree hollows, dense foliage, ground cover.
Little Eagle	*Hieraaetus morphnoides*	Aug – Oct	None	None	Occupies habitats rich in prey within open eucalypt forest, woodland or open woodland. Prescribed burns preferred outside breeding season;
Square-tailed Kite	*Lophoictinia isura*	Jul - Feb	None	None	Avoid prescribed burns near watercourses during breeding season;
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	Jun - Dec	Utilise mosaic burn	No slashing, trittering or tree removal	Avoid large fires in preferred habitat areas; Avoid frequent fires in high quality habitat areas; Use mosaic burn strategy; Prescribed burns preferred outside breeding season; Protect species specific habitat elements (tree hollows, dense foliage, ground cover.
Regent Honeyeater	*Anthochaera phrygia*	July - Jan	None listed	None listed	Preferred habitat is Box-Ironbark woodland and riparian forests of River Sheoak. Forages on Eucalypt nectar and mistletoe Protect large, old trees with high mistletoe abundance. Protect areas of preferred habitat from high intensity of frequent fire.
Giant Barred Frog	*Mixophyes iteratus*	late spring to summer	No burning within 100 metres of streams	No slashing, trittering or tree removal	Ensure fire does not affect water quality of streams. Avoid reduction of leaf-litter and fallen log cover near streams.

Threatened Fauna Fire Ecology					
Common Name	**Scientific Name**	**Breeding season**	**BEAC Conditions re the use of Fire***	**BEAC Conditions re Mechanical Hazard Reduction***	**Comment/ recommended action**
Pink Robin	*Petroica rodinogaster*	Oct – Jan	None	No slashing, trittering or tree removal	The impact of fire on this species is unknown, but regular fires are assumed to not be beneficial. Avoid burning rainforest and tall, wet forest habitat, particularly near gullies
Diamond Firetail	*Stagonopleura guttata*	Aug-Jan	None listed	No slashing, trittering or tree removal	Avoid large and/or frequent fires in preferred habitat areas. Use mosaic burn strategy. Prescribed burns preferred outside breeding season.
Powerful Owl	*Ninox strenua*	Autumn - mid-winter	No fire around known roost sites	No slashing, trittering or tree removal of or around known nesting sites.	Protect large hollow bearing trees and known roost sites from intense fire. Fire regimes which may alter the vegetation structure of large areas of woodland/forest should be avoided.
Brown Treecreeper	*Climacteris picumnus*	May – Dec	Utilise mosaic burn	No slashing, trittering or tree removal	OEH lists threats from lack of regeneration of eucalypt overstorey in woodland due to overgrazing and too-frequent fires, which remove ground logs that are a foraging resource. Recovery >20 – 50 years for replacement of logs from old trees.
Brush Tailed Rock Wallaby	*Petrogale penicillata*	All year	None	No slashing, trittering or tree removal	Fire removes ground cover and shrubs which provide foraging resources. Avoid fire in and around rocky areas.
Eastern bent wing bat	*Miniopterus schreibersii oceanensis*	Spring - summer	No fire around known roost sites	No slashing around maternity caves	Protect roosting sites in winter and breeding season. Fire regimes which may alter the canopy of large areas of woodland/forest should be avoided.
Speckled Warbler	*Pyrrolaemus sagittata*	Aug – Jan	None	No slashing, trittering or tree removal	OEH lists threats from modification and destruction of ground habitat and too-frequent fire. Fire removes ground cover which provides nesting and foraging resources. Recovery <5 years depending on ground cover recruitment. Loss of ground logs also a long-term impact. Strictly no fires during breeding season.

Threatened Fauna Fire Ecology					
Common Name	**Scientific Name**	**Breeding season**	**BEAC Conditions re the use of Fire***	**BEAC Conditions re Mechanical Hazard Reduction***	**Comment/ recommended action**
Glossy black cockatoo	*Calyptorhynchus lathami*	Mar - Aug	No burning of Allocasuarina thickets	No burning of Allocasuarina thickets	Avoid excessive burning that would reduce the abundance and recovery of she-oaks and old Eucalypts (as they are known to nest in the hollows of Eucalypts). Most importantly, the cockatoos primary food source, stands of Drooping Sheoak (*Allocasuarina verticillata*), should be retained, Mosaic burns should aim to maintain a diverse age range of she-oak age groups.
Hooded Robin	*Melanodryas cucullata*	Jul – Nov	None	None	OEH lists threats from modification and destruction of ground habitat and too frequent fire. Fire removes ground cover and shrubs which provide foraging and nesting resources. Recovery <5 years depending on recruitment of shrubs and ground cover. Loss of ground logs also a long-term impact.
Scarlet Robin	*Petroica boodang*	Jul – Jan	Utilise mosaic burn	No slashing, trittering or tree removal	Abundant logs and coarse woody debris are important structural components of its habitat. Avoid high intensity fires to protect these habitat elements. Prescribed burns preferred outside breeding season
Turquoise Parrot	*Neophema pulchella*	Aug - Sep	None	None	Protect all hollow bearing trees, hollow bearing fence posts and known roost sites from intense fire. Requires dense ground cover for foraging. Avoid fire regimes which may thin the understory of large areas of woodland/forest.
Squirrel Glider	*Petaurus norfolcensis*	Variable	Utilise mosaic burn	No slashing, trittering or tree removal	Protect hollow bearing trees and known roost sites from intense fire. Utilising mosaic burns will create a regenerating understory which is ideal foraging habitat.

*Threatened Species Hazard Reduction List for the BEAC (RFS 2006b)

** Information primarily based on the OEH Threatened Species Website.

Table 12: Threatened Flora Fire Ecology

Threatened Flora Fire Ecology			
Scientific Name	**Species Specific Conditions relating to the use of Fire***	**Conditions relating to Mechanical Forms of Hazard Reduction***	**Additional Comments / recommended actions.**
Eucalyptus camaldulensis (population in the Hunter Catchment)	None	None	*Eucalyptus camaldulensis* is fire sensitive. Fire kills regeneration and even mature trees are susceptible if the fire is intense enough since *E. camaldulensis* lacks a lignotuber (CSIRO 2004). No fire for the life of this plan. No slashing, trittering or removal.
Eucalyptus cannonii	No fire more than once every 5 years	No slashing, trittering or removal	Mature trees survive hot fires, resprouting from epicormic buds. Frequent fires may kill seedlings and weaken mature trees.
*Threatened Species Hazard Reduction List for the BEAC (RFS 2006b)			

Table 13: Endangered Ecological Community Fire Ecology

Endangered Ecological Community Fire Ecology	
Community	**Fire Ecology**
White Box, Yellow Box and Blakely's Red Gum Woodland	Threatening processes currently listed on Schedule 3 of the TSC Act 1995 that may impact on or occur in Box-Gum Woodland include, "*high frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition."* The Threatened Species Scientific Committee (2006) mention altered fire regimes as a threat to the integrity of the ecological community. *"The general exclusion of fire from small fragments increases the likelihood that species which existed under a more frequent fire regime may be lost. Kangaroo Grass is known to benefit from a frequent fire regime, and weeds seem to be less prevalent in frequently burnt patches. Whereas fires most likely burnt in a mosaic in the past, as a result of fragmentation, unmanaged fires now tend to burn an entire patch at once, leaving no refuge for fire sensitive plants and animals to survive and subsequently recolonise."* Fire ecology of this community is currently not well known, it is likely to respond well to fire regimes suited to grassy woodland communities as shown in Table 10.
Grassy White Box Woodlands	Inappropriate burning practices are listed as a threatening process on the DEWHA website. Fire ecology of this community is currently not well known, it is likely to respond well to fire regimes suited to grassy woodland communities as shown in Table 10.

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