**Photograph 15.4** Viewpoint 1 - view looking south-east from Medway Road towards the rail loop

**Photograph 15.5** Viewpoint 2 – view looking south from Medway Road towards the rail loop

## Table 15.2 Viewpoints 1 and 2 – views looking south-east and south towards the rail loop from Medway Road

| | |
|---|---|
| **Viewpoint details** | These viewpoints are on the northern side of Medway Road and west of the Hume Highway. They will have views south towards the rail loop and coal loading facility. |
| **View type and context** | The landscape is dominated by flat open paddocks, presenting a rural character. There arewide and unobstructed views across this part of the project area. Visual detractors include overhead power lines, fencing and street signage. |
| **Viewpoint selection** | These views are typical of views from residences and the roadway of Medway Road opposite the rail loop. Three houses north of Medway Road will overlook the rail loop and noise wall. These viewpoints represent the 'worst case' scenario. |
| **Magnitude of change** | The rail loop will have little vertical projection. The noise wall with tree screening will be seen along the the project's frontage to Medway Road. Views will change as there are no existing railway, built structures or screening plantings in these views. Viewers will experience a medium magnitude of change. Motorists travelling along Medway Road will experience loss of views across the rural landscape.<br>Views from Lot 1 on DP 738446 will experience the least impact as existing mature vegetation provides a landscaped buffer to views outside the property in a southerly direction (see Photograph 5.6).<br>Residences further west and to the northof Medway Road are on higher land. Views from these properties will not alter as much as those properties at grade fronting Medway Road as theland use in the rail loop will continue to be agricultural. As these properties are at a higher elevation they will experience views above the noise wall towards a relatively familiar agricultural setting. |
| **Visual sensitivity** | The sensitivity of motorists travelling along Medway Road is moderate. Although the change in view is temporary, the view is unobstructed across flat open rural grazing land. Residences will have a moderate to high sensitivity as the change in view is permanent. Some private residences will have higher sensitivity due to their elevation and lack of mature vegetation to obscure the views towards the project area. |
| **Evaluation of significance** | Based on a combination of the magnitude of change and visual sensitivity, the significance is moderate to high in varying degrees to motorists and private residences on the northern side of Medway Road. |
| **Mitigation** | Native tree planting along Medway Road has commenced. Planting will obscure the noise wall from the roadway and private residences on the northern side of Medway Road. It will take 5-15 years for the trees to mature and some of the trees will be almost mature when construction starts, which will reduce the magnitude of change from high to moderate. The noise wall will also reflect the character of the rural surroundings through the use of appropriate colours, materials and surface treatments. |

**Photograph 15.6** Existing mature vegetation within Lot 1 on DP 738446 which will minimise visual impacts of the noise wall and rail loop (looking north from viewpoint 2)

**Photograph 15.7** Viewpoint 3 - southern side of Medway Road looking south west towards the Hume Highway underpass

## Table 15.3 Viewpoint 3 – northern side of Medway Road looking south-west towards the Hume Motorway underpass

| | |
|---|---|
| **Viewpoint details** | This viewpoint (see Photograph 15.7) is on the southern side of Medway Road and provides a direct view towards the proposed railway, Rail Maintenance Facility, northern provisioning point, topsoil stockpiles and the Hume Motorway underpass. |
| **View type and context** | The landscape is dominated by flat open paddocks,. There are mature tree plantings along the eastern embankment of the Hume Motorway and some scattered trees throughout the landscape. |
| **Viewpoint selection** | This viewpoint is the closest and most visible position to the project on the eastern side of the Hume Highway. |
| **Magnitude of change** | Viewers will have transient views towards the railway, sheds and stockpiles. The magnitude of change will be medium, although once these project elements are constructed some of the already planted trees will have reached maturity, providing substantial screening. |
| **Visual sensitivity** | This viewpoint will have a moderate visual sensitivity due to its rural character. The existing vegetation has limited capacity to absorb change. The Hume Highway in the background already interferes with the scenic quality from this viewpoint, subsequently reducing the visual sensitivity. |
| **Evaluation of significance** | Unmitigated visual impacts from this viewpoint will be moderate. Although the railway and sheds will introduce new built elements, the distance from the road will reduce its visual influence. Tree planting along Medway Road will provide a substantial landscape buffer. |
| **Mitigation** | The tree planting (see Photograph 15.7) will enhance the scenic quality of this viewing direction. This will provide a landscaped buffer to the railway, sheds and topsoil stockpiles and will reduce the magnitude of change from moderate to low. The colour of the shed will be reduce its visual impact. |

**Photograph 15.8** **Viewpoint 4 - view from Medway Road looking south towards rail maintenance facility and railway line**

**Table 15.4** **Viewpoint 4 - view from Medway Road looking south towards rail maintenance facility and railway line**

| | |
|---|---|
| **Viewpoint details** | This viewpoint is on the southern side of Medway Road, approximately 700 m to the east of the Hume Highway. The relevant is south towards the sheds, railway and topsoil stockpiles. |
| **View type and context** | The landscape is dominated by flat grazing land with scattered vegetation, providing a scenic rural view from Medway Road on the eastern side of the Hume Highway. There are mature trees in the background, with a few isolated examples in the foreground. |
| **Viewpoint selection** | This view is typical for private residences on the northern side of Medway Road near this location. |
| **Magnitude of change** | Excluding the effect of recent tree planting, viewers would have partially obstructed views towards the railway, sheds and topsoil stockpiles. Viewers will view intermittently running trains due to the flat topography. Existing vegetation will provide a limited capacity to absorb change. The magnitude of change will be medium. |
| **Visual sensitivity** | The viewpoint for motorists and residents has a moderate visual sensitivity due to its rural character and distance from rail infrastructure. |

**Table 15.4 Viewpoint 4 - view from Medway Road looking south towards rail maintenance facility and railway line**

| | |
|---|---|
| **Evaluation of significance** | Unmitigated visual impacts will be low to moderate. The passage of trains will alter the visual amenity. However, views of the trains will be temporary, with trains not generally stationary in one location along the track for lengthy periods of time, and limited to four trains per day. Primary changes at this viewpoint are the railway which will follow the flat land. As the vertical projection of the railway track will be minimal there will be little interruption to the views.<br>Visual impacts will not be significant given the distance to the railway and existing flat topography. the existing tree planting along Medway Road will provide a buffer to the rail infrastructure in the background. |
| **Mitigation** | Trees have already been planted to reduce potential visual impacts to low. |

**Photograph 15.9 Viewpoint 5 - view looking south on the Old Hume Highway at the railway bridge location**

## Table 15.5 Viewpoint 5 - view looking south along the Old Hume Highway towards the railway crossing

| | |
|---|---|
| **Viewpoint details** | This viewpoint is on the Old Hume Highway looking south towards the proposed railwaycrossing. |
| **View type and context** | Views towards the railwayand bridge crossing will be screened by existing trees. Views will be transient to motorists travelling along the Old Hume Highway. |
| **Viewpoint selection** | Views are typical of the view for motorists travelling south along the Old Hume Highway and potentially from the frontages of a limited number of rural-residential properties on the eastern side of the road. Properties either side of the road at this point are owned by Hume Coal. The bridge will not be visible from the nearest privately owned residence. This viewpoint was selected on the basis that this part of the Old Hume Highway is the nearest public road to the south of the project. |
| **Magnitude of change** | Motorists will view the bridge. The bridge crossing is a considerable distance from residential properties and in an existing vegetated area, therefore the magnitude of change will be low. |
| **Visual sensitivity** | The viewpoint for motorists is considered to have low visual sensitivity due to the temporary views and existing dense vegetation in the foreground to soften the visual impact of new built structures in the landscape. |
| **Evaluation of significance** | Visual impacts of the bridge are considered to be low, given that the bridge will only be temporarily viewed as motorist pass underneath it. |
| **Mitigation** | No mitigation measures will be necessary. |

## Photograph 15.10 Viewpoint 6 - view looking north from Oldbury Road

### Table 15.6 Viewpoint 6 - view looking north from Oldbury Road

| | |
|---|---|
| **Viewpoint details** | This viewpoint provides a view in a northerly direction towards the project area on the eastern side of the Hume Highway. |
| **View type and context** | Views towards the project will be screened by intervening topography and tree planting. |
| **Viewpoint selection** | Views are typical of the view for motorists travelling along Oldbury Road and from a number of rural-residential properties on the northern and southern side of the road. It is representative of views from the south-east of the project. |
| **Magnitude of change** | Viewers will not have views of the project due to distance, intervening topography and existing tree plantings. Therefore, views from this location are unlikely to change. |
| **Visual sensitivity** | The viewpoint for motorists and residents will have low to moderate visual sensitivity to visual change due its rural character. |
| **Evaluation of significance** | Visual impacts from this viewpoint will be negligible as the project will not be seen due to intervening topography and vegetation. |
| **Mitigation** | No mitigation measures will be necessary. |

**Photograph 15.11** **Viewpoint 7 - view looking north-west towards the proposed location of the Berrima Road bridge crossing associated with the preferred option**

**Table 15.7 Viewpoint 7 - view looking along Berrima Road towards the Berrima Road bridge crossing**

| | |
|---|---|
| **Viewpoint details** | This viewpoint faces north-west from Berrima Road towards the bridge crossing. |
| **View type and context** | This viewpoint is dominated by flat grazing land with scattered vegetation. There are few intervening built elements in the landscape that would reduce the visual prominence of the bridge crossing. Further to the west is the Berrima Cement Works which provides a substantial industrial backdrop to viewers from Berrima Road, as well as the Berrima feedmill to the south-east. |
| **Viewpoint selection** | The view is typical of the view for motorists travelling along Berrima Road, near the project area's eastern boundary. |
| **Magnitude of change** | Viewers will have direct views to the bridge crossing, therefore the magnitude of change will be medium to high. |
| **Visual sensitivity** | The viewpoint for motorists and residents will have a low visual sensitivity due to its existing rural/semi-industrial character. Viewers will not be highly sensitive to the change in view due to the close proximity of large built structures associated with existing industrial uses within the locality. |
| **Evaluation of significance** | The visual impact from this viewpoint will be low as, whilst the bridge crossing will be a new built element in the landscape, viewers will not be highly sensitive to the change. |
| **Mitigation** | No mitigation is considered necessary, alhtough the visual effects could be further reduced through bridge and native foreground vegetation. |

## 15.6 Cumulative impact assessment

### 15.6.1 Overview

The 2002 edition of the GLVIA defines cumulative landscape and visual effects as those that:

> 'Result from additional changes to the landscape or visual amenity caused by the proposed development in conjunction with other developments (associated or separate to it), or actions that occurred in the past, present or are likely to occur in the foreseeable future.'

As described in Section 15.3, a number of agricultural, industrial, extractive and manufacturing facilities occur in the locality. Of these, Berrima Cement Works, Omya, the Berrima Feed Mill, cattle sale yards and the Hume Highway have a visual significance in the immediate locality due to their height. Given the visual impacts arising from the proposed rail project are generally low (as outlined in Section 15.5), the cumulative impact of the project and the existing development within the locality will be minimal.

### 15.6.2 Current development applications

A development application has been submitted to construct a function centre at the Zen Oasis Restaurant approximately 1.2 km north of the rail loop.

The proposed development will not be visually prominent as it will not significantly increase the size of the existing structure and will be landscaped. The proposed development in combination with the rail loop will not significanty impact the viewscape as they will be distant from each other and the function centre will not be a large structure.

The visual impacts of the project on the function centre will be low. The railway line will only be intermittently visible from the ground level of the function centre. The function centre includes small window openings on the second floor level of the southern elevation, facing the project area, which would only allow partial views of the railway line.

### 15.6.3 Night lighting

Boral Cement Works is a source of significant lighting and to a lesser degree, the Berrima Feedmill, which is east of the cement works at the intersection of Berrima Road and Douglas Road. Other sources of night lighting in the immediate vicinity of the project area include residential properties, farm machinery and vehicles on roads, however this is minimal due to the distance between the sources.

Lighting at the Rail Maintenance Facility will be in accordance with *Australian Standard (AS) 4282:1997 - Control of obtrusive effects of outdoor lighting.*

## 15.7 Management and mitigation measures

Screening in the form of foreground and mid-ground tree and shrub planting is an effective way of reducing exposure of a receptor to various aspects of built elements. Once established, plantings will provide a permanent and natural screen to the various project elements from either roadways or private landholdings. A tree planting schedule outlining the type of species, age to maturity and maximum growth height is provided in Table 7.1 of the VIA (see Appendix M).

Figure 15.3 illustrates the tree screen planting by Hume Coal. It is anticipated that once construction starts, it will provide substantial screening to a majority of the project.

Other mitigation measures include:

- appropriate colour selection for the noise wall (refer to Photomontage 15.2), buildings and sheds; and
- minimisation of night lighting.

Lighting protocols will be developed which adopt the following principles:

- establish operational protocols for setting up of mobile lighting plant (if required) such that lighting is directed away from external private receptors;
- establish design and operational protocols such that lighting sources are directed below the horizontal to minimise potential light spill;
- design light systems that minimise wastage;
- screening of lighting where possible for viewers internal and external to the project; and
- avoid lighting of light coloured surfaces which have greater reflectivity.

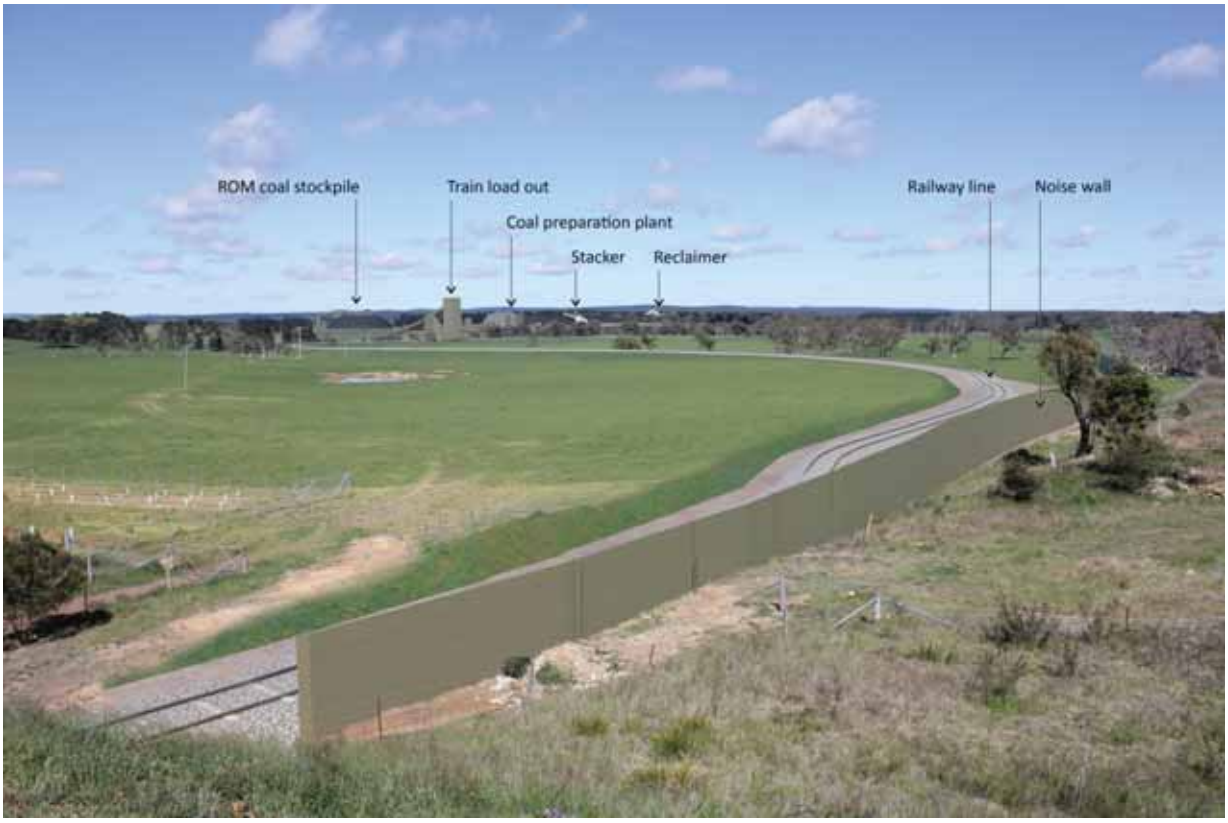
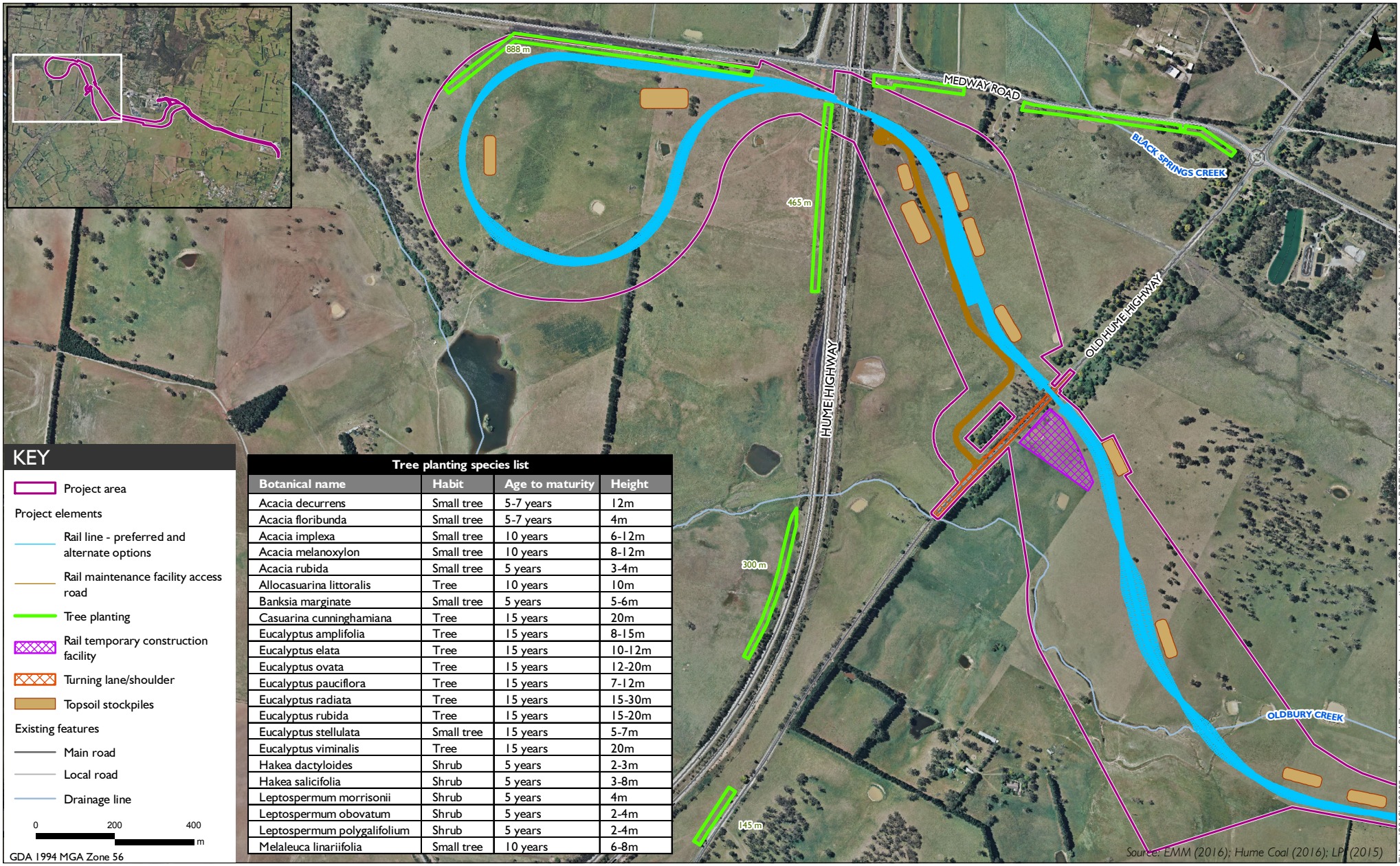



**Figure 15.2** **Proposed noise wall adjacent to rail line along Medway Road (represented as a photomontage). View from Hume Highway/Medway road intersection looking south-west.**




**Tree planting species list**

| Botanical name | Habit | Age to maturity | Height |
|---|---|---|---|
| Acacia decurrens | Small tree | 5-7 years | 12m |
| Acacia floribunda | Small tree | 5-7 years | 4m |
| Acacia implexa | Small tree | 10 years | 6-12m |
| Acacia melanoxylon | Small tree | 10 years | 8-12m |
| Acacia rubida | Small tree | 5 years | 3-4m |
| Allocasuarina littoralis | Tree | 10 years | 10m |
| Banksia marginate | Small tree | 5 years | 5-6m |
| Casuarina cunninghamiana | Tree | 15 years | 20m |
| Eucalyptus amplifolia | Tree | 15 years | 8-15m |
| Eucalyptus elata | Tree | 15 years | 10-12m |
| Eucalyptus ovata | Tree | 15 years | 12-20m |
| Eucalyptus pauciflora | Tree | 15 years | 7-12m |
| Eucalyptus radiata | Tree | 15 years | 15-30m |
| Eucalyptus rubida | Tree | 15 years | 15-20m |
| Eucalyptus stellulata | Small tree | 15 years | 5-7m |
| Eucalyptus viminalis | Tree | 15 years | 20m |
| Hakea dactyloides | Shrub | 5 years | 2-3m |
| Hakea salicifolia | Shrub | 5 years | 3-8m |
| Leptospermum morrisonii | Shrub | 5 years | 4m |
| Leptospermum obovatum | Shrub | 5 years | 2-4m |
| Leptospermum polygalifolium | Shrub | 5 years | 2-4m |
| Melaleuca linariifolia | Small tree | 10 years | 6-8m |

## Tree planting scheme

Berrima Rail Project
Environmental impact statement

Figure 15.3

## 15.8 Conclusion

The impacts on views from private residential properties, a main transport route and streets near the project area were assessed. The project will not result in significant visual impacts in the long term as the extensive screen plantings mature. Additionally, the railway will be at ground level and trains will be infrequent.

There will be more significant impacts in the short term until the screen plantings mature. Some viewpoints will experience a higher magnitude of change, particularly those along Medway Road, due to the introduction of a noise wall and rail infrastructure into a landscape which, unlike areas to the east, did not previously contain an existing railway.

# 16 Hazard and risk assessment

## 16.1 Assessment objectives

This hazard and risk assessment has been prepared to:

- determine if the project is a hazardous or offensive development under SEPP 33;
- assess the general risks from the project to people, property and the environment against DP&E's qualitative risk criteria in *Hazardous Industry Planning Advisory Paper No 4: Risk Criteria for Land Use Safety Planning* (DoP 2011a);
- determine risks associated with locating the railway on bushfire prone land; and
- determine the risk of encountering contamination during construction of the rail line and associated infrastructure.

Risks have been assessed in accordance with *Australian/New Zealand Standard International Organisation for Standardisation 31000:2009 Risk Management – Principles and guidelines* (AS/NZS ISO 31000:2009).

The assessment focuses on risks to public assets, that is, people, property and the environment. Risks specific to the rail operator's workforce and property will be considered in detail as part of the design phase hazard assessments.

## 16.2 Hazard control measures

A range of hazard control measures will be implemented during construction and operation of the project in line with Section 17 of the NSW *Work Health and Safety Act 2011*, which requires employers to eliminate risks to health and safety so far as is reasonably practicable and to minimise those risks so far as is reasonably practicable if they cannot be eliminated. Each of these control measures will be appropriate for the level of hazard they are designed to control, and generally follow the Work Cover (2008) 'hierarchy of hazard controls' (eliminate the risk, substitute the risk with something else, engineering controls and administrative controls). Engineering and administrative controls comprise:

- Engineering controls:
  - design — project components will be designed and constructed to comply with relevant standards;
  - enclosure — project components will be enclosed as appropriate. For example, fuel tanks will be bunded; and
  - isolation — project components will be located away from sensitive receivers where required.

- Administrative controls:
    - operating procedures;
    - scheduled maintenance; and
    - training and reinforcing correct work procedures.

Engineering controls will be implemented where practical to remove, substitute or minimise hazards, that is the design of processes or structures will aim to minimise the hazards. However, not all hazards can be engineered out, and administrative controls may also be required.

Hazard control measures will be described in further detail in safety management plans that will be developed for the project in accordance with the NSW *Work Health and Safety Act 2011* and NSW *Work Health and Safety Regulation 2011*. The safety management plans will detail all relevant engineering and administrative controls.

## 16.3 Hazardous and offensive development

Potentially hazardous or offensive development is defined in SEPP 33 as development which poses a significant risk to, or which would have a significant adverse impact on, human health, life, property or the biophysical environment, if it were to operate without employing any control measures. This includes developments for the handling, storing or processing of hazardous materials.

A development is classified as a hazardous or offensive development if the thresholds in DoP (2011b) are exceeded. These thresholds are provided in a series of tables and figures in DoP (2011b) which compare the quantities of stored or used hazardous materials to the distance from publicly accessible areas. DP&E also uses the hazardous materials classifications in *Australian Code for the Transport of Dangerous Goods by Road and Rail Edition 7.3* (NTC 2014).

### 16.3.1 Construction

The railway construction compound will be on land owned by Hume Coal and adjacent to the Old Hume Highway (Figure 16.1). There is a parcel of privately owned land to the north-west of the compound.

The exact requirements for storage of fuels, oils and gases in the compound will be calculated during detailed design of the railway. However, there is sufficient area in the compound to locate the storage areas to the south whilst maintaining separation distances to publically accessible areas to remain outside the potentially hazardous regions of the following figures in DoP (2011b):

- Figure 6 – Class 2.1 flammable gases under pressure;
- Figure 7 – Class 2.1 flammable gases liquefied under pressure;
- Figure 8 – Class 3PGI flammable liquids; and
- Figure 9 – Class 3PGII and III flammable liquids.

Additionally, quantities of other hazardous substances stored in the compound, for example liquefied petroleum gas, will be less than the screening thresholds in Table 3 of DoP (2011b).

Hazardous substances will be transported in accordance with *Australian Code for the Transport of Dangerous Goods by Road and Rail Edition 7.3* (NTC 2014) and stored in accordance with:

- Diesel – not classified as a dangerous good (for transport purposes) under NTC (2014) as its flash point is above 60°C. Notwithstanding, it will be stored in accordance with *Australian Standard 1940:2004 The Storage and Handling of Flammable and Combustible Liquids* (AS 1940:2004).

- Petrol – classified as a Class 3 flammable liquid under AS 1940:2004 and NTC (2014) and will generally not be stored onsite other than in light vehicle fuel tanks.

- Other hydrocarbons (oil, grease, degreaser and kerosene) – oil and kerosene are classified as Class C2 combustible liquids under AS 1940:2004 and Class 3 flammable liquids under NTC (2014). They will be stored in accordance with AS 1940:2004.

- Gases – LPG and oxy acetylene are classified as Class 2.1 flammable gases in NTC (2014). LPG will be stored in accordance with *Australian Standard/New Zealand Standard 1596:2008 The Storage and Handling of LP Gas* and oxy acetylene will be stored in accordance with AS 1940:2004.

- Thermite – which is a Class 1.4S hazardous substance according to NTC (2014) and will be transported, stored and handled in accordance with its material data safety sheet.

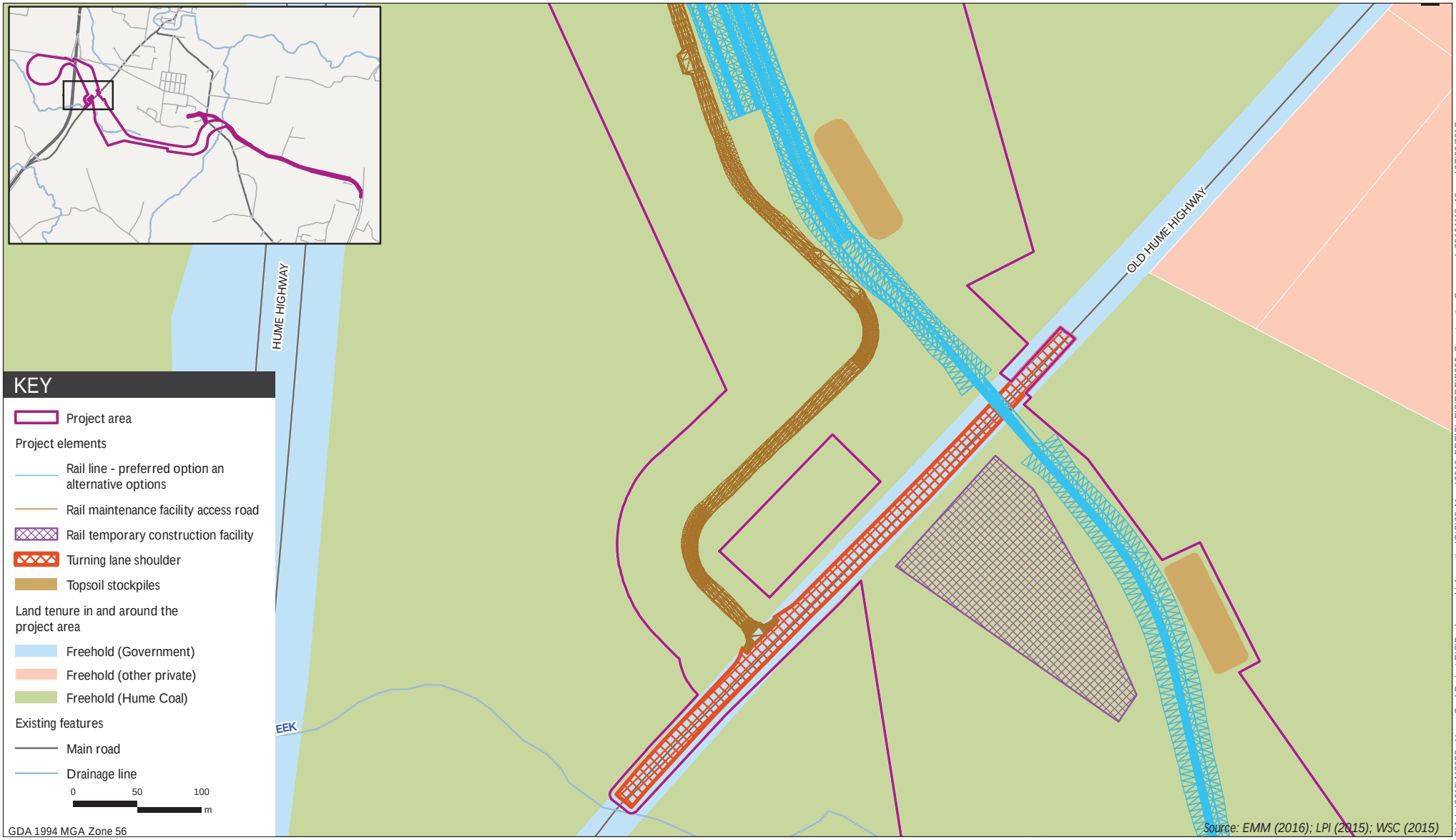
When stored in the construction compound as described above, the hazardous substances present will not qualify the project as a potentially hazardous or offensive development.

### 16.3.2 Operations

Operation of the rail line will not require the storage or use of hazardous materials except for the hydrocarbons stored on trains for their operation, and minor quantities of hydrocarbons and flammable gases used during track maintenance.

In addition, as described in Section 16.4, measures will be adopted to reduce risks to human health, life, property or the biophysical environment from events such as train derailments.

For the reasons given above, operation of the railway will not qualify it as a potentially hazardous or offensive development.




Railway construction compound location

Berrima Rail Project
Environmental Impact Statement

Figure 16.1

## 16.4 Risks from the project

This section identifies hazard scenarios for atypical events, such as a train derailment, that could occur during the construction or operation of the project. It describes qualitative criteria for rating the consequences, likelihoods and risks of these scenarios. Risk ratings are compared to the DoP (2011a) qualitative risk criteria to determine if the project, in the presence of controls, represents an acceptable risk.

### 16.4.1 Risk assessment method

The risk assessment comprised:

- examining rail line construction and operation as each stage has distinctly different risk profiles;
- identifying potential hazards and incident types (leaks/spills, fire/explosion, loss of public safety, property damage and security breach);
- identifying scenarios presenting a risk to individuals, society and/or the environment;
- identifying potential controls that could effectively manage the above risks, incidents and scenarios; and
- determining a qualitative consequence and likelihood rating for each scenario with appropriate engineering and/or administrative controls in place.

The risks identified for the project were rated using the *Australian/New Zealand Standard International Organisation for Standardisation 31000-2009 Risk Management – Principles and Guidelines* (AS/NZS ISO 31000-2009). Two factors were considered for each scenario: the potential consequences (ie the severity of the impact) and the likelihood that the impact will occur.

The criteria used to rate the potential consequences of impacts to the environment, individuals and society are provided in Table 16.1. The criteria used to rate the likelihood that the impact will occur are provided in Table 16.2.

**Table 16.1 Qualitative measures of consequence**

| Level | Potential consequences to individuals | Potential consequences to the environment and society |
|---|---|---|
| 1 | Minor injury or short-term health effect (eg requiring first aid). | Limited environmental impacts to a small area of low significance. |
| | | Low level repairable damage to commonplace structures. |
| | | Short-term local social issues or disruptions. |
| 2 | Minor injury or short-term health effects requiring restricted work. | Minor short-term environmental impacts not affecting environmental systems. |
| | | Moderate damage to items of local cultural significance or minor damage to items of regional significance. |
| | | Minor medium-term social impacts on local population. |

## Table 16.1 Qualitative measures of consequence

| Level | Potential consequences to individuals | Potential consequences to the environment and society |
|---|---|---|
| 3 | Major injury or health effects (eg lost time injuries or permanent disabilities). | Medium-term environmental impacts affecting local environmental systems. |
| | Minor injury or health effects to multiple people. | Moderate damage to items of regional cultural significance. |
| | | Ongoing local social issues. |
| 4 | Permanent total disability. | Long-term environmental impacts with significant effects locally and some effects regionally. |
| | Major injuries or health effects to multiple people. | Irreparable damage to items of regional cultural significance. |
| | | Widespread local social issues and moderate regional social issues. |
| 5 | Fatality or multiple fatalities. | Regional long-term environmental impacts on critical species, habitat or environmental systems. |
| | | Irreparable damage to items of national cultural significance. |
| | | Ongoing major regional social impacts. |

## Table 16.2 Qualitative measures of likelihood

| Level | Likelihood |
|---|---|
| A | Practically impossible |
| B | Not likely to happen |
| C | Possible or could happen |
| D | Likely to happen at some point |
| E | Almost certain to happen |

The risk rating is determined by comparing the consequences and likelihood ratings using the matrix provided in Table 16.3. Where the potential consequences of a risk are minor and the likelihood that it will occur is low, it is rated as a level 3 (low) risk. Conversely, where the potential consequences of a risk are major and the likelihood that it will occur is high, it is rated as a Level 1 (high) risk. Level 2 (medium) risks are those that fall between these extremes.

## Table 16.3 Risk rating

| | Likelihood | | | | |
|---|---|---|---|---|---|
| **Consequence** | A | B | C | D | E |
| 5 | **Level 2 (medium)** | | | | **Level 1 (high)** |
| 4 | | | | | |
| 3 | | | | | |
| 2 | | | | | |
| 1 | **Level 3 (low)** | | | | |

Risk levels comprise:

- Level 1 (high), where risks are likely to be unacceptable and additional management measures, major redesign or relocation of project components will be required;
- Level 2 (medium), where there will be some risk, but one that can be managed effectively by the adoption of appropriate measures, or cannot be managed effectively but its consequences would be generally seen as acceptable by society; and
- Level 3 (low), where risks are manageable and thus the likelihood of unacceptable consequences is low.

### 16.4.2 Risk assessment

The preliminary hazard identification and risk assessment for the project is presented in Table 16.4.

Five scenarios were identified covering the full range of potential risks that could occur during construction and operation of the railway. Taking into account all of those scenarios, the results were that risks will be Level 3.

Level 3 risks can be effectively managed with proven controls. Thus, these risks would have no unacceptable consequences. For example, train derailments and collisions with people on and near the tracks will be avoided by having a signposted speed limit of 20 km/h, and compounds will be security fenced and signposted to prevent unauthorised entry by members of the public. The signs will clearly identify that the construction site is dangerous and that penalties for trespassing apply.

## Table 16.4 Hazard identification and risk assessment

| ID | Project component | Incident type | Scenario | Proposed controls | Consequences | Probability | Risk rating |
|---|---|---|---|---|---|---|---|
| 1 | Construction phase | Leak/spill | Vehicle roll-over, collision, poor maintenance or operator error results in spill of fuels, other hydrocarbons, chemicals and dangerous goods leading to property damage, injury or environmental harm. | Use of licensed transport contractors for delivery of dangerous goods (Australian Standards and NSW legislation), emergency management and response plans/training/equipment, environmental management plan, contractor transport management plan for dangerous goods and oversized deliveries, hazardous material manifest/material safety data sheet, spill kits, bunded stores, emergency agency response. | 1 | C | 3 |
| 2 | | Fire/explosion | Vehicle roll-over, collision, poor maintenance or operator error results in vehicle fire, fuel storage fire, electrical fire or fuel/gas explosion leading to property damage, injury or environmental harm. | As for Item 1 and provision/maintenance/use of fire extinguishers, hot work permits, use of water carts to extinguish fires. | 2 | B | 3 |
| 3 | | Security breach (eg theft, unauthorised entry) | Unauthorised entry to construction site by members of the public results in injury (eg interaction with mobile equipment). | Clear marking of site boundaries and fencing of working areas, emergency management and response plans/training/equipment, emergency agency response, after hours security patrols, clear notification of penalties for trespassing, lock up of compounds. | 3 | B | 2 |
| 4 | Rail spur (operating phase) | Safety loss | Train derailment or collision results in injury and property damage. | Train speed limits (20 km/h), railway design in accordance with relevant guidelines, emergency management and response plans/training/equipment, emergency agency response. | 3 | B | 3 |
| 5 | | Safety loss | Train hits a person leading to injury. | Emergency management and response plans/training/equipment, emergency agency response, train speed limits (20 km/h). | 3 | B | 3 |

## 16.5 Hazard and risk criteria

### 16.5.1 Hazardous materials

DoP (2011a) provides qualitative risk criteria. Risks from hazardous materials are compared to these criteria below.

a. All avoidable risks should be avoided by investigating alternative locations and technologies.

Hazardous material storages that could present an offsite risk will be located away from publicly accessible areas and environmental features, such as waterways, so that there will be a low risk to individuals, property and the environment.

b. The risk from a major hazard should be reduced irrespective of the cumulative level of the whole development. The likelihood of the risk occurring should be made very low by adopting all feasible measures.

No major hazards associated with the hazardous materials have been identified as a result of the project.

c. The consequences of risks which are likely to occur should be contained within the boundaries of the development.

Hazardous material storages and tanks in the construction compound will be constructed and located so that potential incidents are contained within the site.

d. Existing high risks at developments should not be contributed to by risks from additional developments.

The new rail spur and loop will be adjacent to the Berrima Cement Works. A search for SEPP 33 related documents accompanying development applications for the Berrima Cement Works showed that only one SEPP 33 screening document has been prepared for the facility since 2002. This accompanied a 2015 application to use waste derived fuels and determined that the proposed development would not be hazardous or offensive development. Therefore, there are no exiting high risks at the Berrima Cement Works which will be contributed to by the rail spur and loop.

### 16.5.2 Risks from the project

There will be some risks to the environment and people from the project: injuries from unauthorised entry to the project area; train derailments or collisions; and train impacts with trespassers. These risks will be fully considered during detailed project design and re-assessed in the ongoing risk assessment process to ensure that risks are as low as reasonably practical.

Risks from the project are compared to the DoP (2011a) criteria below.

a. All avoidable risks should be avoided by investigating alternative locations and technologies.

No Level 1 or Level 2 risks have been identified. Proposed control measures to manage any risk are in Table 16.4. These risks will be further investigated during detailed project design to reduce them as much as reasonably practical.

b. The risk from a major hazard should be reduced irrespective of the cumulative level of the whole development. The likelihood of the risk occurring should be made very low by adopting all feasible measures.

No major hazards from the construction or operation of the project have been identified nor are likely to occur.

c. The consequences of risks which are likely to occur should be contained within the boundaries of the development.

The consequences of risks from the project will generally be contained within the boundaries of the development. These risks will be minimised to be as low as reasonably practical via a range of engineering and administrative controls.

d. Existing high risks at developments should not be contributed to by risks from additional developments.

The new rail spur and loop will be adjacent to the Berrima Cement Works. A search for SEPP 33 related documents accompanying development applications for the Berrima Cement Works showed that only one SEPP 33 screening document has been prepared for the facility since 2002. This accompanied a 2015 application to use waste derived fuels and determined that the proposed development would not be hazardous or offensive development. Therefore, there are no exiting high risks at the Berrima Cement Works which will be contributed to by the rail spur and loop.

## 16.6 Bushfire prone land

Three sections of the railway will be in the 100 m vegetation buffer surrounding Vegetation Category 1 on the Wingecarribee bushfire prone land map (Figure 16.2). No habitable structures or structures in which personnel will work associated with the railway will be on the bushfire prone land. Therefore, a comprehensive bushfire hazard assessment in accordance with the Rural Fire Service's (2006) *Planning for bush fire protection* guidelines is not required.

Section 63(2) of the NSW *Rural Fires Act 1997* requires the owners of land to prevent the ignition and spread of bushfires on their land. The recommended measures in this section, and further refined measures in a subsequent emergency management plan for the project, will ensure that the risk of bushfire ignition and spread will be as low as practically possible.

A fire or explosion during construction of the railway could initiate a bushfire. The risk of this occurring will be reduced by adoption of the following measures:

- emergency management measures will be included in the construction environmental management plan;
- a communication system will be established, enabling rapid response to emergencies;
- vehicles and equipment will not be refuelled in areas of vegetation, especially when the fire danger rating is very high or above;
- fire extinguishers will be maintained in the construction compound, vehicles and refuelling areas;
- there will be no smoking in, or adjacent to, vegetated areas of the project;

- risk reduction, such as slashing, will be undertaken where appropriate, such as along the project area boundaries;
- spill response kits will be available should there be a spill of flammable substances;
- works will be subject to hot work permits, especially when the fire danger rating is very high or above; and
- emergency services will be contacted if there is a fire.

The risk of a bushfire being ignited by operation of the railway will be low as there will be services corridors on either side of the tracks which will be clear of vegetation. Therefore, sparks and other ignition sources from trains and track maintenance will be unlikely to result in a vegetation fire. Notwithstanding, the above measures will be implemented during track maintenance and operations.

## 16.7 Contaminated lands

The potential for the project to disturb potentially contaminated land is assessed in accordance with SEPP 55. SEPP 55 provides a state wide planning approach to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human and environmental health.

Clause 7(3) of SEPP 55 requires the applicant to carry out an investigation where a change in land use is proposed. The main objective of the investigation is to identify any past or present potentially contaminating activities that could pose a risk to future intended land uses. This then allows a decision to be made whether the site is suitable for the proposed use or whether the proposed use will exacerbate potential contaminated land issues.

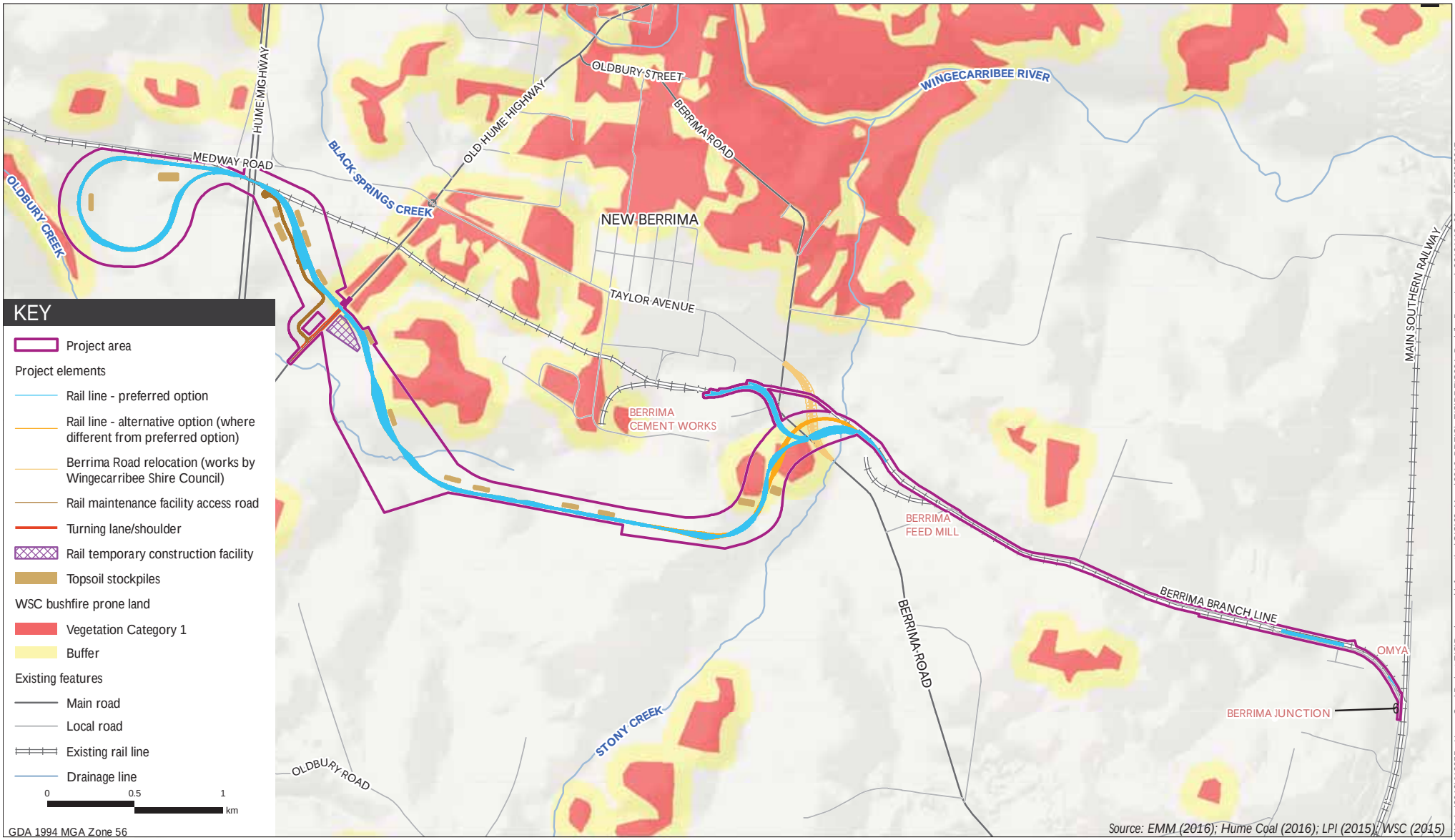
The area comprising the direct and construction disturbance footprint is assessed for contamination potential, ie where new construction works are proposed. The project area is zoned IN1 General Industrial, IN3 Heavy Industrial, RU2 Rural Landscape, SP2 Infrastructure, E2 Environmental Conservation and E3 Environmental Management. The heavy industrial land is associated with the Berrima Cement Works, comprising a shale quarry, holding dams, cement mill and processing plant, and is located to the immediate north of the disturbance area. The area zoned light industrial is not developed.

Clause 7(4) of SEPP 55 specifies categories of land that have the potential to be contaminated via reference to Table 1 of the contaminated land planning guideline, *Managing Land Contamination Planning Guidelines: SEPP 55 – Remediation of Land* (Department of Urban Affairs and Planning 1998). Agricultural land use, extractive industries and manufacture practices are listed in Table 1 and are known to be undertaken in or adjacent to the project area. Therefore the land uses in the project area do not preclude the potential for contamination to be present.

### 16.7.1 Review of historical aerial imagery

Review of aerial imagery for the study area, from 1949 onwards, indicates that the main land uses were rural enterprises and heavy industrial uses associated with Berrima Cement Works. The Berrima Cement Works, previously Southern Portland Cement commenced production in 1929, (Boral 2016). In 1974 the Cement Works becomes part of the Blue Circle Southern Cement group and the initial first four kilns have been phased out of production. Two additional kilns have since been constructed and Blue Circle Southern was acquired by the Boral Group in 1987.

A description of the historical aerial imagery is included in Table 16.5, and the aerial images included as Figures 16.3-16.6.

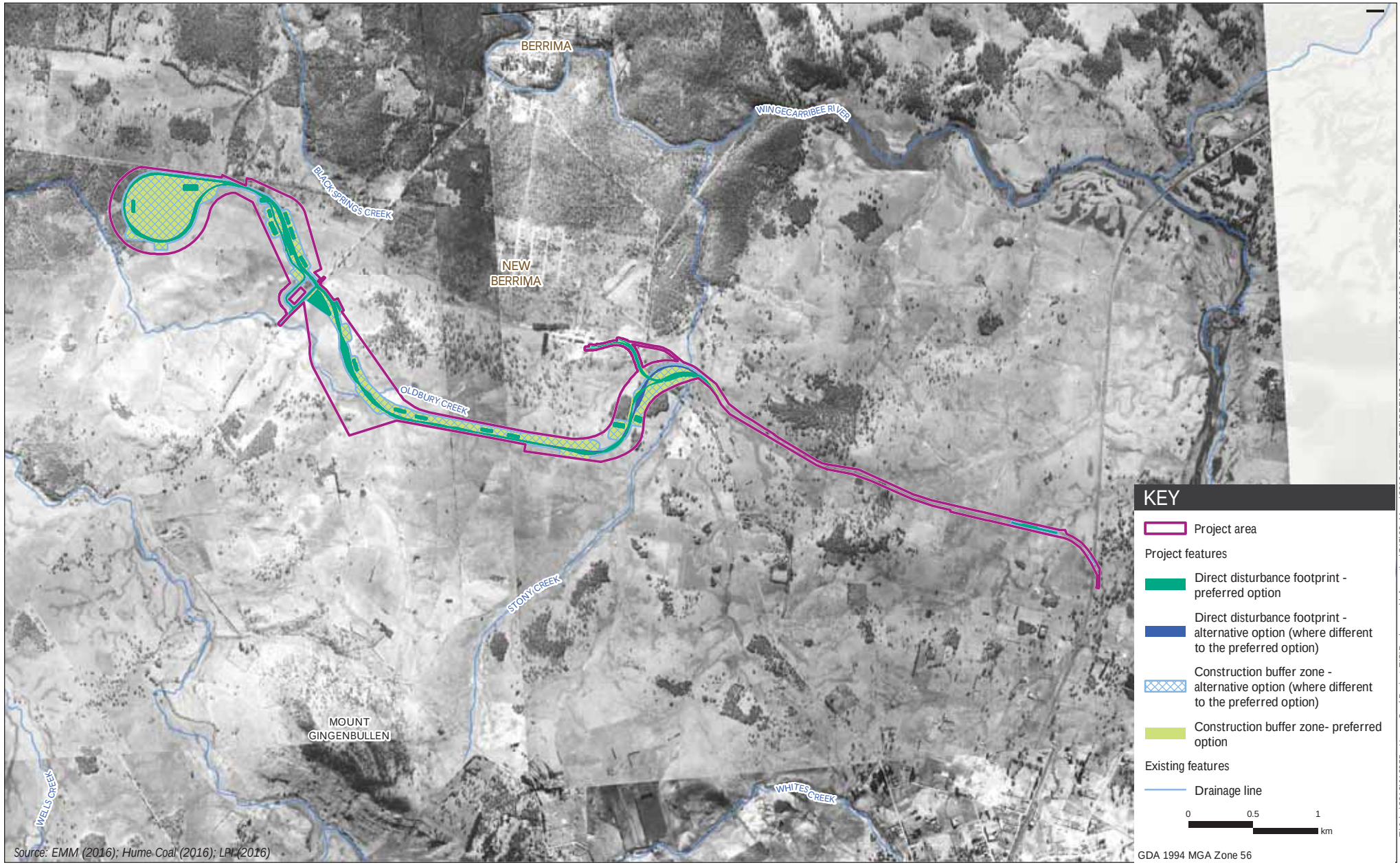



Bushfire prone land

Berrima Rail Project

Environmental impact statement

Figure 16.2

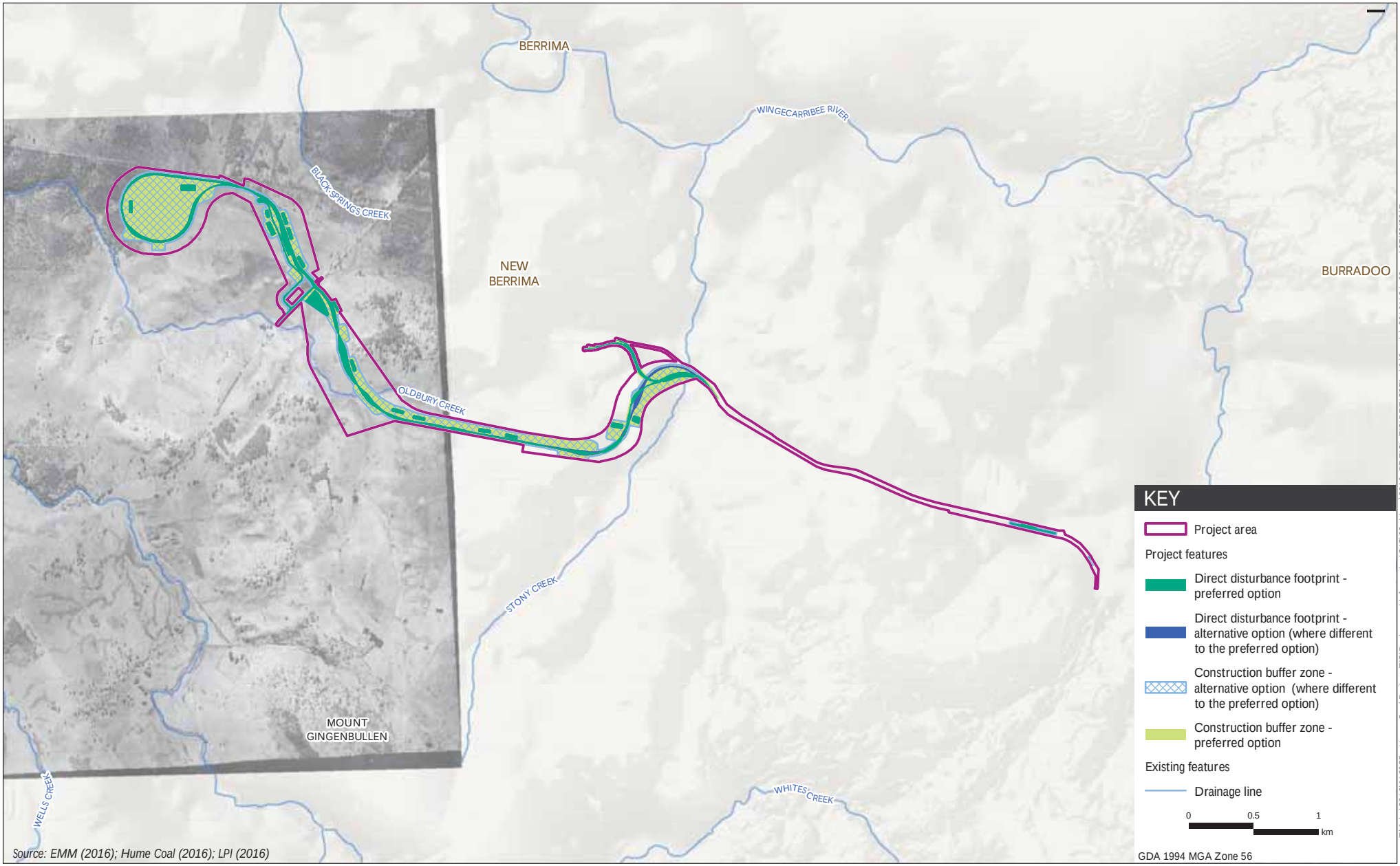



T:\Jobs\2012\J12055 - Hume Coal Project EIS\Background information\GIS\02_Maps\2016_BREIS_EIS\BREIS072_1944aerial_20161124_08.mxd 27/02/2017

1944 historical aerial imagery

Berrima Rail Project
Environmental Impact Statement

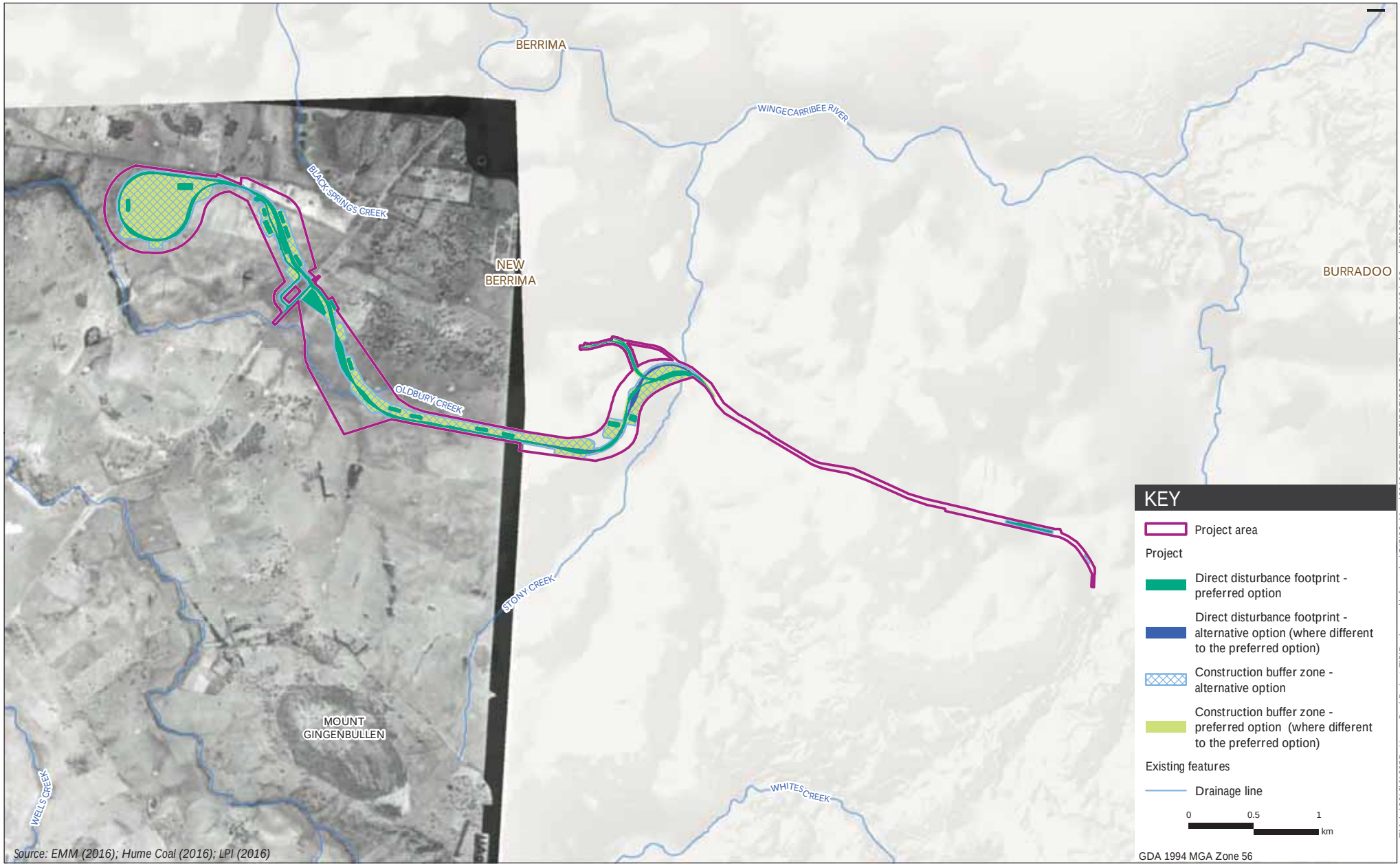
Figure 16.3




1949 historical aerial imagery

Berrima Rail Project
Environmental Impact Statement

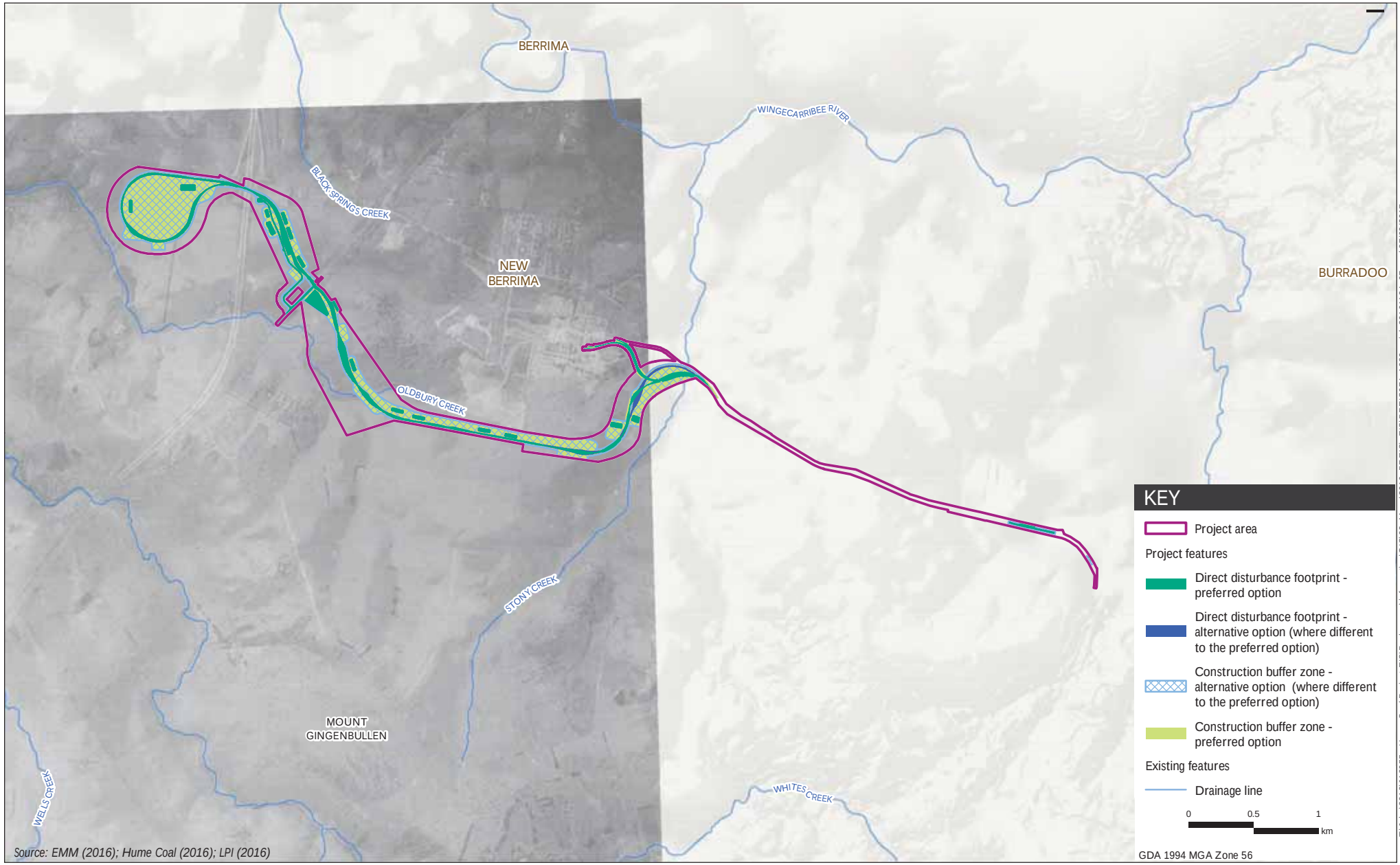
Figure 16.4




T:\Jobs\2012\J12055 - Hume Coal Project EIS\Background information\GIS\02_Maps\2016_BREIS_EIS\BREIS073_1974aerial_20161124_08.mxd 27/02/2017

# 1974 historical aerial imagery

Berrima Rail Project
Environmental Impact Statement
Figure 16.5




1989 historical aerial imagery

Berrima Rail Project
Environmental Impact Statement

Figure 16.6

**Table 16.5 Review of historical aerial imagery**

| Year | Observations |
|---|---|
| 1944 | Land in the west is predominately cleared and used for agriculture. The Hume Highway is present as an unsealed road, along with minor arterial roads. In the east the Berrima Cement Works is visible comprising a number of industrial buildings and two small clearings assumed to be associated with quarrying. There are a small number of residential properties at the town of Berrima to the north. |
| 1949 | As above. |
| 1974 | The extent of vegetation clearing has increased slightly (especially around the rail loop area) and a number of small dams are visible. |
| 1989 | The amount of vegetation cover is unchanged. The location of the Hume Highway has shifted west slightly and is now a sealed road. The Berrima Cement Works plant and quarry pits are a prominent feature in the landscape. Also to the north of the study area (approximately 700 m), a small section of land between the Hume Highway and the Berrima Cement Works has been cleared for the Berrima Sewage Treatment Works. |

Reference to Chapter 11 (historic heritage) notes a dilapidated railway bridge spanning Stony Creek, 60 m from the proposed rail loop. The bridge was built in the 1920s as part of the Southern Blue Metal Company's branch line that served a blue metal quarry at Mount Gingenbullen. It only operated for a few years and was dismantled in 1942 and likely moved inert goods mainly comprising quarried products.

### 16.7.2 Contaminated land registers

#### i NSW EPA contaminated land: record of notices

NSW EPA's contaminated land public record of notice under Section 58 of the CLM Act contains a list of publically available sites for which the EPA has issued regulatory notices under the CLM Act, and includes the details of current and former regulatory notices issued. The sites listed indicate that the notifiers consider that site to be contaminated and warrant reporting to EPA. A site will be on the contaminated land record of notices only if the EPA has issued a regulatory notice under the CLM Act.

A search of this register (on 13 July 2016) for the Wingecarribee LGA did not return any information on regulatory notices issued for the disturbance area or within the surrounding 3 km.

#### ii NSW EPA contaminated land: sites notified

NSW EPA's list of contaminated sites notified to the EPA under Section 60 of the CLM Act, provides an indication of the management status of that particular site. Properties are required to be notified to the EPA under Section 60 of the CLM Act if there is reason to suspect the land is contaminated, and one or more of the notification triggers in the Duty to Report guidelines exist at the site. Upon receipt of a Section 60 notification, the EPA assesses the contamination status of the site to determine whether the contamination is significant enough to warrant regulation by the EPA.

A search of the most recent register (dated 1 March 2016) for the suburbs of New Berrima, Berrima and Medway did not return any information on reported contamination or any regulatory notices. The search showed that the Shell Service Station and Moss Vale Refuelling Facility in Moss Vale have been notified to the EPA. These sites are over 4 km southeast of disturbance areas associated with railway construction and will not be impacted.

### iii NSW EPA: environment protection licences

The NSW EPA's public register under Section 308 of the POEO Act contains information on environmental protection licences. Environment protection licences are issued by the EPA to owners or operators of various industrial premises where the site activities are indicated as potential contaminating activities under Schedule 1 of the POEO Act. An EPL typically includes conditions that relate to pollution prevention, monitoring and reporting.

The following listings around the disturbance area identified during a search of the most recent register (version dated 3 July 2015) for the Wingecarribee LGA:

- Berrima Cement Works: EPL 1698, allowing cement and lime production, land based extraction activity and recovery of general waste. The site comprises a shale quarry, open stockpiles, a large area of processing plant (comprising Kiln 6, ancillary materials handling, processing equipment and cement mills), stormwater and holding dams and a laydown area in the northern portion of the site. There is one dry process kiln in operation which blends raw materials at high temperature to produce clinker. The clinker is ground and blended with mineral addition to produce the cement powder.

- Berrima Sewage Treatment System: ELP 3575, allowing sewage treatment processing at a small plant. The treatment plant comprises four treatment dams (assumed to be lined) and associated above ground plant. There is also a small section of graded land, possibly used to dry semi-solid waste.

- Berrima Feed Mill: EPL 11261, allowing general agricultural processing (animal and bird feed manufacture). The feed mill comprises above ground plant with a sealed loading section.

## 16.7.3 Contamination characterisation

Basic site information detailed above relating to potential contaminating land activities was assessed to identify potential contaminants, potentially affected media and potential areas of contamination. The disturbance area is semi-rural, characterised by cleared grazing properties, small-scale farming, rural roads and the Hume Highway. Potential contaminating activities associated with farming include inappropriate storages of fuels and chemicals, dumping of wastes and rubbish, broken septic tanks and/or application of fertilisers or pesticides. However there are no developments in the disturbance area. Therefore, the likelihood of chemical and fuel storages and septic tanks is low.

There is no history of other land use in the project area such as chemical works or storages, or commercial land filling activities which are commonly associated with contamination (DUAP/EPA 1998). There are industrial land uses around the disturbance area including: the Berrima Cement Works, Berrima Sewage Treatment System and Berrima Feedmill. There is no evidence to suggest contaminating land use practices have occurred at the disturbance area or surrounds as per the EPA contamination registers. However as with any industrial site minor incidences of point source contamination could be present in association with hydrocarbon spills or leakage.

The main potential mechanism for possible contaminant mobilisation from the surrounding industrial sites would be via overland flow. A Water Management Plan was prepared for the Cement Works in 2008 (Boral 2014). Two large dams collect stormwater runoff from the site preventing uncontrolled discharges from the site. Discharge from these dams is to the Wingecarribee River via Stony Creek during periods of high rainfall, this would occur through the western end of the Berrima Rail Project disturbance area. However oil collection booms and settling ponds within the Cement Works site prevent the release of hydrocarbons and solids, meaning any potential overland flow from the Cement Works is likely to have a low contamination potential.

### 16.7.4 Summary

This preliminary site contamination investigation concludes there is no material evidence of wide spread or ongoing contamination activities and/or contamination sources, and hence no contamination constraints are evident. Accordingly, it is considered that the site is likely to be uncontaminated and is suitable for the proposed uses.

Nevertheless, more detailed investigations will be undertaken of those parts of the site where people will work and where project activities could expose excavated materials to the environment. The preliminary investigation has shown that any materials likely to be present on the site are capable of being remediated either by removal, isolation or treatement. Therefore, even if some unexpected contamination is founds, the site could be made suitable for the proposed uses.

Two further safeguards will occur; if evidence of contamination is encountered during the construction phase of works (for example, stained or odorous soil, or buried waste material), work in the area will cease and advice will be sought from an appropriately qualified environmental consultant.

In addition, the construction phase of works will be managed to ensure that no contamination is introduced to the project area via adherence with the CEMP. Importantly, any imported fill for use in the project will be certified as ‘clean fill’.

## 16.8 Conclusion

The project will represent a low risk to the public as:

- dangerous goods used during construction will be stored in quantities less than trhe screening thresholds in Table 3 of DoP (2011b);
- operation of the project will not require the storage or use of significant queantities of hazardous goods;
- no elevated risks (medium or high) to public safety were identified during the risk assessment;
- measures will be implemented to prevent ignition of a bushire, or prevent the spread of a buishfire if accidentally ignited; and
- there is no evidence of contaminated land in the project area and, therefore, construction of the project is unlikely to expose any contaminated land.

# 17 Summary of Commitments

## 17.1 Introduction

This chapter provides a consolidated summary of the management and measures that will be implemented during the construction, operation and decommissioning of the project to avoid, manage, mitigate and/or monitor potential impacts identified within this EIS.

## 17.2 Construction environmental management plan

Environmental management during construction of the project will be in accordance with a CEMP. The CEMP will detail the site-specific management measures and procedures to be implemented during construction, as specified in this EIS, for mitigating and managing impacts including traffic management, noise, air quality, biodiversity, heritage, flooding and drainage, soils, visual amenity, hazards and risks, and waste management.

The CEMP will be prepared in consultation with relevant stakeholders, and will be consistent with the conditions of the project development consent and other planning approvals, should they be granted.

## 17.3 Commitments summary

Environmental management and mitigation measures described at the end of each chapter (7-16) are summarised in Table 17.1.

**Table 17.1 Commitments summary**

| Commitment | EIS section |
|---|---|
| **Noise and vibration** | |
| *Construction* | 7.6.2 |
| • Noise and vibration will be managed in accordance with the relevant measures outlined in the CEMP. | |
| • Construction noise levels will be monitored at early stages to validate the predicted construction noise levels, and subsequently re-evaluate the predicted construction noise levels at assessment locations. | |
| • Affected landholders will be consulted prior to and during construction where exceedance of NMLs have been predicted, and will be notified of proposed mitigation measures that will be used to manage construction noise levels. Notification procedures will be documented in the CEMP. | |
| *Operation* | 7.6.1 |
| • Operation of the rail line will be in accordance with management measures documented in a noise management plan, to be prepared for the project. | |
| • Use by Hume Coal of the latest generation (at the time of development consent) AC locomotives and wagons with electronically controlled pneumatic brakes. | |
| • Construction of a noise attenuation barrier to the north of the rail loop and a shed at the northern provisioning point. | |
| **Air Quality** | 8.6.1 |
| • All Hume Coal train coal wagons (full and empty) will be covered during transport. | 8.2.5 |
| • Air quality will be managed during construction in accordance with the procedures documented in the CEMP. | |

## Table 17.1 Commitments summary

| Commitment | EIS section |
|---|---|
| **Traffic and transport** | |
| • An improved intersection incorporating turning lane and shoulder widening on both sides of the Old Hume Highway will be constructed to provide safe left and right turning vehicle access to the rail infrastructure worksites on either side of the Old Hume Highway. | 9.4.1 |
| • For longer term operations access, the initial temporary turning lane and shoulder widening of the Old Hume Highway will be reconfigured to provide a type CHR(S) intersection for access to the rail maintenance sidings. | 9.4.2 |
| **Aboriginal heritage** | 10.7.2 |
| • The grinding groove site (HC_138) adjacent to the rail loop footprint will be fenced and signage erected for the duration of the project. | |
| • Two sites (HC_176 and HC_177) and will be subject to archaeological excavation. Subsequent assessment will be made as to whether avoidance of the surrounding landscape around these sites (currently identified as PAD) require avoidance. | |
| • An Aboriginal Heritage Management Plan will be prepared and implemented for the project, including:<br>o procedures that will apply in the event that known or suspected human skeletal remains are encountered during construction;<br>o procedures that will apply in the event of discovery of new Aboriginal sites in the project area; and<br>o identified Aboriginal artefacts in the project direct footprint will be managed generally in accordance with the management measures outlined in the EIS, subject to consultation with the RAPs. | 10.7.3 |
| **Historic heritage** | 11.7 |
| • Archival recording of heritage items identified in the EIS in the area prior to change will be undertaken. | |
| • The Remembrance Driveway trees will be avoided during construction works. These trees will be fenced and clearly identified. | |
| • Historic heritage items will be managed in accordance with the procedures documented in the CEMP. | |
| • The Southern Highlands Branch of the Australian Garden History Society will be consulted regarding the trees to be removed in the Boral cement garden prior to construction works commencing in the garden. | |
| **Biodiversity** | |
| • Biodiversity will be managed generally in accordance with the measures outlined in the EIS and CEMP. | 12.5.2 |
| • Appropirate weed management control measures will be implemented during the construction phase of the project. | |
| • Paddy's River Box trees in the project construction footprint will be identified and marked for their protection during construction, except for the one tree to be removed under the preferred option. | |
| • Appropriate drainage infrastructure (such as culverts) will be installed within the rail loop embankment to ensure that existing overland flow paths through the rail loop area are maintained throughout the life of the project to Paddy's River Box inside the rail loop. | |
| • Hume Coal will prepare a Biodiversity Offset Package in consultation with OEH and DP&E, and will submit the draft to the Secretary for approval within 12 months of development consent being granted. | 12.6 |

## Table 17.1 Commitments summary

| Commitment | EIS section |
|---|---|
| **Flooding and drainage** | |
| • An erosion and sedimentation control plan, developed in accordance with the guidance provided in the Blue Book, will be prepared and implemented as part of the CEMP to ensure the erosion and sedimentation induced by construction activities will not adversely affect the surrounding environment. | 13.3.7 |
| **Soils and land resources** | |
| • The CEMP will detail the soil stripping, stockpiling and reapplication procedures so that rehabilitated surfaces are capable of supporting grazing. | 14.11 |
| **Visual** | |
| The following measures will be implemented to mitigate visual impacts of the project:<br>• appropriate colour selection for the noise wall, buildings and sheds;<br>• minimisation of night lighting at the rail maintenance facility in accordance with the relevant Australian Standards; and<br>• once established, an effective tree screen will be maintained along Medway Road and the Hume Highway as described in the EIS. | 15.7 |

# 18 Justification and conclusion

## 18.1 Introduction

The SEARs specify that the EIS must address the "reasons why the development should be approved, having regard to environmental, economic and social considerations, including the principles of ecologically sustainable development". This chapter addresses this requirement.

## 18.2 Need for the project

The Berrima Rail Project will enable coal produced by the Hume Coal Project to be transported to its customers. As described in Chapter 2, the project involves the construction of a new rail spur and loop connected to the Berrima Branch Line, upgrades to the Berrima Junction, and use of this rail infrastructure. The upgrade to Berrima Junction is required to reduce operating constraints at the junction with the addition of Hume Coal trains and to reduce the risk of delayed trains in the system by allowing two trains to pass at the junction.

Without the Berrima Rail Project, the Hume Coal Project would not be developed. The transport of product coal by trucks via the existing road network was considered as an alternative to rail transport in the feasibility studies conducted for the Hume Coal mine. As described in Section 3.1.1, these studies concluded road transport is not a viable option for the mine due to the high operating costs associated with this option, the environmental impacts associated with trucking coal and the safety risks of introducing additional trucks to the road network. Further, Macquarie Pass was found to be unsuitable for B-doubles.

A detailed justification for the Hume Coal Project having regard to biophysical, economic and social considerations is provided in the Hume Coal EIS (EMM 2017a).

## 18.3 Social justification

During the peak construction phase, approximately 40 full time equivalent positions will be created. During operations, the project will create approximately 16 additional full time equivalent positions, namely train drivers, and maintenance workers at the maintenance facility.

The project will improve safety conditions with the removal of the Berrima Road level crossing, thus reducing the risks of traffic accidents. While only a small increment of risk reduction will be achieved it will nevertheless be of benefit to all road users, and particularly locals who use the level crossings more frequently.

The project will enable the Hume Coal Project to be developed. As explained in the Hume Coal Project EIS (EMM 2017a) considerable social and economic benefits will result. These are an indirect benefit of the project; however to avoid double counting are not detailed here.

Potential adverse impacts associated with the influx of construction workers may include the crowding out of tourist and other short-term accommodation, as well as anti-social behaviour by workers during recreation time. These potential problems will be overcome by the provision of an on-site accommodation village for all construction workers for both the Berrima Rail Project and the Hume Coal Project.

Based on the above, the positive impacts associated with construction of the project will outweigh the potential negative ones.

## 18.4 Economic justification

Train operations on the Berrima Branch Line associated with existing rail users represents 59% of the practical operating capacity of the line, or 38% of the maximum line capacity. The additional Hume Coal trains will increase the line's operations to 50% of the maximum line capacity (77% of the practical operating capacity) on the busiest days. The upgrade to the Berrima Junction will enable this increased use of the existing rail infrastructure, including the ARTC-controlled sections of railway, resulting in a higher financial return from this infrastructure. It will almost eliminate the risk of trains becoming stranded on other sections of track and hence being unable to enter the private Berrima Branch line.

The project will therefore result in the greater use of the existing rail infrastructure, enabling increased use of a previous public financial investment. This will result in higher payments to the NSW Government for the purchase of the additional train paths required by the operators. The net financial benefit to the public will not impose any material operating costs on other users of the rail network as the increase in usage will not breach capacity limits, meaning levels of service will not deteriorate.

Further, as described above in Section 18.3, approximately 40 full time equivalent positions will be created during the peak construction periods of the project. Non-local construction workers will reside in the local area in the purpose built construction accommodation village, and will create local flow-on economic benefits through greater expenditure on goods and services to maintain the village.

In summary, the project will have significant economic benefits. It will also facilitate "orderly and economic use of land", that is the rail corridor, and "encourage the ...provision of communication and utility services" and thereby satisfy the applicable objects of the EP&A Act.

In addition, and as noted above, without the Berrima Rail Project the Hume Coal Project would not be developed. The economic benefits and costs of the Hume Coal Project have been assessed in detail as part of the EIS for that project (EMM 2017a), finding it to be economically beneficial. That is, the coal project's benefits exceed its costs, measured in today's values (known as net present value or NPV).

The total direct economic benefit of the Hume Coal Project to NSW is estimated at $316 million in NPV terms. The net or after cost benefit of the project, which takes into account the costs associated with GHG emissions and the foregone agricultural value added due to land being removed from agricultural production, is $295 million.

The Berrima Rail Project will enable the operation of the Hume Coal Project, and is therefore an essential component of enabling the economic benefits of the Hume Coal mine to be realised.

## 18.5 Environmental justification

The environmental assessment of the project has been conducted in accordance with the SEARs and leading practice environmental standards. This process involved consultation with relevant stakeholders to identify issues to be addressed in the EIS, conducting technical assessments as required by the SEARs, quantification of potential environmental impacts, and the identification and application of environmental management and mitigation measures to address residual impacts. Project impacts have been discussed in detail in Chapters 7-16 of the EIS, with a summary of the significant findings below.

The rail alignment and project footprint have been specifically designed to minimise impacts on native vegetation and threatened species habitats. Both preferred and alternative options will result in minor residual impacts on native vegetation and potential Squirrel Glider habitat. The preferred option will also remove one Paddy's River Box tree, while the alternative option would retain it. An offset strategy has been prepared to compensate for these small residual impacts.

In relation to heritage, the project has also been designed to avoid the areas of highest Aboriginal archaeological sensitivity. This, combined with the large undisturbed areas in the surrounding region containing comparable archaeological sites, means that the cumulative impact of the project will be very low given the general richness of the archaeological landscape and the limited amount of ground disturbance required for the infrastructure. Similarly, no listed historic heritage items will be physically affected by the project. The impact of the rail loop on the setting of the Mereworth house and garden is considered to be moderate, largely because the rail loop will be partially screened by existing trees in the paddocks to the north.

Noise from construction activity associated with the project is predicted to be above the relevant noise management level at some residential locations. Measures to effectively manage construction noise will be described in the CEMP for the project, which will include measuring construction noise levels at early stages to validate the predicted construction noise levels, re-evaluating the predicted construction noise levels at nearby residences and, where required, refining the proposed noise management and mitigation measures to reduce levels below the NMLs. These measures may include limiting construction within a certain distance of residences where practical and selecting quieter equipment or a reduced equipment fleet.

One residential location is predicted to be impacted by noise from the operation of trains on the Berrima Branch Line, above the trigger level for voluntary mitigation rights in accordance with VLAMP. VLAMP describes the process for applying mitigation measures, which must be reasonable and feasible and proportionate to the predicted impact, and directed towards reducing the impacts of the development.

Air emissions from operation of the project will be well below applicable air quality criteria at all nearest residential locations. Assessment of cumulative impacts associated with the combination of emissions from the Berrima Rail Project, the Hume Coal Project, neighbouring emission sources and existing ambient background concentrations has also demonstrated that no exceedance of air quality criteria will occur at any receptor location. Hume Coal has committed to an industry first in NSW of covering train wagons to ensure that air quality impacts from the movement of both full and empty coal wagons is effectively minimised. In addition, energy efficient locomotives will be used.

In summary, the project will have minimal adverse environmental impacts. It has been carefully located and designed to avoid areas of value or sensitivity, and includes all practical measures to reduce construction and operational impacts. All applicable standards and criteria specified by the EPA and other regulators will be satisfied meaning no impacts will occur that are at unacceptable levels.

## 18.6 Ecologically sustainable development

The principles of ESD, for the purposes of the EP&A Act, are provided in clause 7(4) of Schedule 2 of the EP&A Regulation. It states:

> The principles of ecologically sustainable development are as follows:
>
> (a) the precautionary principle, namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:
>
> (i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and
>
> (ii) an assessment of the risk-weighted consequences of various options,
>
> (b) inter-generational equity, namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations,
>
> (c) conservation of biological diversity and ecological integrity, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,
>
> (d) improved valuation, pricing and incentive mechanisms, namely, that environmental factors should be included in the valuation of assets and services, such as:
>
> (i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,
>
> (ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,
>
> (iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

In addition, the Commonwealth's *National Strategy for Ecologically Sustainable Development* defines ESD as 'using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased'.

The project's compatibility with each of the above factors is considered below.

### 18.6.1 Precautionary principle

The project fully addresses the precautionary principle. A detailed understanding of the issues and potential impacts associated with the project has been obtained via consultation and technical assessment by appropriately qualified specialists to a level of detail commensurate with the scale of the project, the characteristics of the project area and surrounds, and the legislative framework under which the project is permitted. An iterative design process has been undertaken to ensure impacts are avoided wherever possible. The result of this process is that for all potential impacts no serious or irreversible harm will occur.

### 18.6.2 Inter-generational equity

The project will not adversely affect inter-generational equity.

The only beneficial land use that could be affected is agriculture. In this regard the disturbance footprint of the project at approximately 30 ha is minor compared to the large agricultural land in the local area and broader Southern Highlands region. Agricultural capability of the land will be reinstated in those areas when the new rail line and loop is removed once no longer required.

No meaningful loss of cultural resources will occur. The project has been designed to avoid areas of high Aboriginal heritage sensitivity, and avoids all listed historic heritage sites in the area. Similar to cultural resources, most impacts on natural resources will be avoided or mitigated. A residual impact on 2.1 ha of ecological resources will occur as a result of the project, and an offset strategy has been developed to mitigate this impact. Surface waters will also be managed to achieve a neutral or better outcome in all creeks and rivers that receive runoff from the project area.

### 18.6.3 Conservation of biological diversity and maintenance of ecological integrity.

As described above, the project will result in minor residual impacts on 2 ha of native vegetation and potential Squirrel Glider habitat. The preferred option will also remove one Paddy's River Box tree, while the alternative option would retain it. An offset strategy has been prepared to compensate for these small residual impacts.

#### i Improved valuation and pricing of environmental resources

The principle of improved valuation, pricing and incentive mechanisms deems that environmental factors should be included in the valuation of assets and services. The cost associated with using or impacting upon an environmental resource is seen as a cost incurred to protect that resource.

Hume Coal has committed to a number of mitigation measures, as summarised in Chapter 17, to address residual impacts identified in the EIS. Hume Coal will bear the cost of the mitigation measures, thus internalising the costs of these measures.

### 18.6.4 Sharing of responsibility

An object of the EP&A Act is to promote the sharing of the responsibility for environmental planning between the different levels of government. All Commonwealth, State and local government agencies that have an interest in the project have been engaged prior to, and during the preparation of this EIS. Further engagement will occur during preparation of a response to submissions document following exhibition and pre determination phases. Thus all levels of government have been involved to date and this will continue through to determination of the project.

### 18.6.5 Increased public involvement

It is also an object of the EP&A Act to 'provide increased opportunity for public involvement and participation in environmental planning and assessment'.

The EIS for the project has been undertaken in conjunction with a comprehensive stakeholder engagement program as described in Chapter 5, which included engaging with the local and regional community. The engagement activities undertaken included formal and informal stakeholder engagement forums, such as phone calls, and meetings, and community information sessions. Thus there has been opportunity for public involvement and participation.

## 18.7 Conclusion

The Berrima Rail Project has been assessed in this EIS in accordance with the EP&A Act and Regulations, the SEARs, and in consultation with relevant government agencies and stakeholders.

The project will enable the transportation of coal from the proposed Hume Coal Project whilst maintaining usage by the three existing users of the Berrima Branch Line and via the upgrade of, and extension to, existing rail infrastructure. In addition to facilitating the transportation of bulk goods, the project will improve operational functionality at the Berrima Junction for all users of the Berrima Branch Line, improve safety conditions on Berrima Road with the removal of the level crossing, create 40 fulltime equivalent positions during the peak construction period, and provide a financial benefit to the community through the increased use of a previous public investment in rail infrastructure on the public sections of the rail network.

The project has been carefully designed through the investigation of numerous alternative locations to avoid areas of value or sensitivity, and includes all practical measures to reduce construction and operational impacts. The project, resulting from this thorough design process, represents the best of the alternatives available when all relevant economic, environmental and social impacts and benefits are taken into consideration. Consequently, it will have minimal adverse impacts. All applicable standards and criteria specified by relevant regulators will be satisfied meaning no impacts will occur that are at unacceptable levels. The net overall outcome of environmental, economic and social impacts is positive and therefore it is considered the project is orderly development and will be in the public interest.

# References


ACIL Tasman, 2011, *Maldon – Dombarton Rail Link Feasibility Study, Final Working Paper 1: Demand and Engineering.* Report prepared for Department of Infrastructure and Transport, June 2011.

Aquila Ecological Surveys 2010, *New Berrima Clay/Shale Quarry Fauna Assessment.* Report prepared for Austral Bricks.

Atkinson, J 1975, *An Account of the State of Agriculture and Grazing in New South Wales,* Sydney University Press, Sydney.

Atlas of Living Australia (ALA) 2016, The Atlas of Living Australia, viewed March 2016, www.ala.org.au.

Australia International Council on Monuments and Sites (Australia ICOMOS) 2013, *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance.*

Austroads 2013, *Guide to Road Design Part 5B: Drainage – Open Channels, Culverts and Floodways*.

BAEconomics 2016, Economic impact assessment of the Hume Coal Project, Red Hill ACT.

Baker, DE and Eldershaw, VJ 1993, *Interpreting soil analyses*, Department of Primary Industries, Queensland.

Bibbly, C, Burgess, N and Hill, D 1992, *Bird Census Techniques,* Academic Press, London.

Boral Cement Limited 2002, Boral Berrima Cement Works and (Medway) Colliery, viewed June 2016, http://www.boral.com.au/article/berrima_cement_about_berrima.asp.

- 2014, *Berrima Works Water Management Plan – September 2014*.

Bureau of Meteorology (BoM) 2003, *The Estimation of Probable Maximum Precipitation in Australia: Generalised Short-Duration Method (GSDM)*.

- 2006, *The Estimation of Probable Maximum Precipitation in Australia: Generalised Southeast Australia Method (GSAM)*.

- 2016a, Monthly Climate Statistics: Moss Vale Hoskins Street, viewed July 2016, http://www.bom.gov.au/climate/averages/tables/cw_068045.shtml.

- 2016b, Atlas of Groundwater Dependent Ecosystems, viewed March 2016, www.bom.gov.au/groundwater/gde.

Cardno MBK 2000, *Timber Beam Bridges: Study of Relative Heritage Significance of RTA Controlled Timber Beam Road Bridges in NSW*. Report prepared by Cardno MBK for RTA NSW.

Commonwealth Scientific and Industrial Research Organisation (CSIRO) 2009, *Australian Soil and Land Survey Field Book*.

Corben, C 2011, *Analook for Windows*.

Department of Environment (DoE) 2013, *EPBC Act Policy Statement 1.1 Significant Impact Guidelines: Matters of National Environmental Significance*, viewed July 2016, www.environment.gov.au.

- 2015, *National Greenhouse Accounts Factors – Australian National Greenhouse Accounts*.

- 2016a, *Protected Matters Search Tool,* viewed March 2016, www.environment.gov.au.

- 2016b, *Conservation Advice for Paddy's River Box,* viewed July 2016, www.environment.gov.au.

Department of Environment and Climate Change (DECC) 2012, *Biometric Vegetation Types Database,* viewed March 2016, www.environment.nsw.gov.au.

Department of Environment and Conservation (DEC) 2004, *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities*.

- 2005, *Draft Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation*.

Department of Environment and Resource Management (DERM) 2011, Guidelines for applying the proposed strategic cropping land criteria, viewed 22 November 2013, www.nrm.qld.gov.au/land/planning/pdf/strategic-cropping/scl-guidelines.pdf.

Department of Environment, Climate Change and Water (DECCW) 2008, *Soil and Land Resources of the Hawkesbury-Nepean Catchment.*

- 2010a*, Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW*.

- 2010b, *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW*.

- 2010c, *Aboriginal Cultural Heritage consultation requirements for proponents*.

- 2010d, *Guidelines for developments adjoining land and water managed by the Department of Environment, Climate Change and Water*.

Department of Environment, Water, Heritage and the Arts (DEWHA) 2010a, *Survey guidelines for Australia's threatened bats*.

- 2010b, *Survey guidelines for Australia's threatened birds*.

Department of Land and Water Conservation (DLWC) 1998, *Guidelines for the Use of Acid Sulfate Soil Risk Maps,* 2nd edition.

- 2000, *Soil and Landscape Issues in Environmental Impact Assessment*.

Department of Planning and Environment (DP&E), 2011a, *Hazardous and Offensive Development Application Guidelines: Applying SEPP 33*.

- 2011b, *Hazardous Industry Planning Advisory Paper No 4: Risk Criteria for Land Use Safety Planning*.

- 2013, *Interim protocol for site verification and mapping of biophysical strategic agricultural land*, New South Wales Government.

- 2015, Biophysical Strategic Agricultural Land Maps, viewed 2 June 2015, www.planning.nsw.gov.au/en/Policy-and-Legislation/Mining-and-Resources/Safeguarding-our-Agricultural-Land.

Department of Planning (DoP) 2011a, *Hazardous Industry Planning Advisory Paper No 4: Risk Criteria for Land Use Safety Planning*, NSW Government.

- 2011b, *Hazardous and Offensive Development Application Guidelines: Applying SEPP 33*.

Department of Primary Industries (DPI) 2013, Policy and guidelines for fish habitat conservation and management: Update 2013, viewed July 2016, www.dpi.nsw.gov.au.

- no date, Key Fish Habitat map for Wingecarribee Shire, viewed July 2016, www.dpi.nsw.gov.au.

Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) 2011a, *Survey guidelines for Australia's threatened mammals*.

- 2011b, The Draft referral guidelines for the Macquarie Perch, viewed July 2016, www.environment.gov.au.

Department of Urban Affairs and Planning (DUAP) and NSW Environment Protection Authority (EPA) 1998, *Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land.*

EcoLogical 2003, *Wingecarribee Biodiversity Strategy.* Report prepared for Wingecarribee Shire Council.

EMM 2015, *Hume Coal Project – Biophysical Strategic Agricultural Land Verification Assessment*, August 2015. Report prepared by EMM for Hume Coal Pty Limited.

- 2017a, *Hume Coal Project Environmental Impact Statement*. Report prepared by EMM for Hume Coal Pty Limited.

- 2017b, *Hume Coal Project Aboriginal Cultural Heritage Assessment*. Report prepared by EMM for Hume Coal Pty Limited.

- 2017c, *Historic Heritage Assessment and Statement of Heritage Impact: Hume Coal Project*. Report prepared by EMM for Hume Coal Pty Limited.

Engineers Australia 1987, *Australian Rainfall and Runoff.*

- 2001, *Australian Rainfall and Runoff*.

Ferreira, AD, Viegas, DX and Sousa, ACM 2003, 'Full-scale measurements for evaluation of coal dust release from train wagons with two different shelter covers', *Journal of Wind Engineering and Industrial Aerodynamics*, 91, pp. 1271-1283.

Geoff Cunningham Natural Resource Consultants (Cunningham) 2010, *New Berrima Clay/Shale Quarry Flora Assessment.* Report prepared for Austral Bricks.

Gray, JM and Murphy, BW 2002, *Predicting Soil Distribution*, Joint Department of Land and Water Conservation (DLWC) and Australian Society for Soil Science Technical Poster, DLWC, Sydney.

Gye, E 1957, 'Stables transformed into lovely home', *The Australian Women's Weekly*, Wed 16 January, pp. 39-42.

Heritage Branch Department of Planning 2009, *Assessing Significance for Historical Archaeological Sites and 'Relics'*.

Isbell, RF 2002, *The Australian soil classification,* CSIRO Publishing, Melbourne.

Jack, RI 1993, *Bong Bong Township: A report to Wingecarribee Shire Council, December 1993,* Report prepared for Wingecarribee Shire Council.

- 1997, 'Wingecarribee Shire Heritage Study and Thematic History', *Historic Environment*, 13 (3 & 4), pp. 36-41.

Jervis, J 1986, *A History of the Berrima District 1798-1973,* Library of Australian History in association with Wingecarribee Shire Council, North Sydney.

Keipert, NL 2005, *Effect of different stockpiling procedures on topsoil characteristics in open cut coal mine rehabilitation in the Hunter Valley, New South Wales*. Submitted thesis for the degree of Doctor of Philosophy, Department of Ecosystem Management at The University of New England.

Kevin Mills and Associates 2010, *Green Valley Sand Quarry Flora and Fauna Assessment.* Report prepared for Rocla Quarries.

Koettig, M 1981, *Hoddles Crossing to Alpine: Archaeological survey of the proposed F5 extension.* Report prepared for the Department of Main Roads, NSW.

Landcom 2004, *Managing Urban Stormwater: Soils and Construction: Volume 1,* 4th edition.

Landscape Institute and Institute of Environmental Management and Assessment *2013, Guidelines for Landscape and Visual Impact Assessment (GLVIA)* Third Edition.

Lawson, E 1989, *Louisa Atkinson: The Distant Sound of Native Voices*, English Department University College Australian Defence Force Academy, Canberra.

Long, A 2005, *Aboriginal Scarred Trees in New South Wales: A Field Manual,* Department of Environment and Conservation, Hurstville.

McKenzie, NJ, Grundy, MJ, Webster, R and Ringrose-Voase, AJ 2008, *Guidelines for Surveying Soil and Land Resources,* 2nd edition, CSIRO Publishing, Melbourne.

Milford, HB, McGaw, AJE and Nixon, KJ (eds) 2001, *Soil Data Entry Handbook*, 3rd edition, NSW Department of Land and Water Conservation.

Moffit, RS 1999, *Southern Coalfield Regional Geology 1:100,000*, 1st edition, Geological Survey of NSW, Sydney.

Murphy, BW, Eldridge, DJ, Chapman, GA and McKane, DJ 2007, 'Soils of New South Wales' in Charman, PEV and Murphy, BW (eds), *Soils: Their Properties and Management*, 3rd edition, Oxford University Press, Melbourne.

National Committee on Soils and Terrain (NCST) 2009, *Australian Soil and Land Survey Handbook*, 3rd edition, CSIRO Publishing, Melbourne.

National Transport Commission (NTC) 2014, *Australian Code for the Transport of Dangerous Goods by Road and Rail,* Edition 7.3, Commonwealth of Australia, Canberra.

NSW Agriculture 2002, Agfact AC25: Agricultural Land Classification.

NSW Environment Protection Authority (EPA) 2016, Approved Methods for the Modelling and Assessment of Air Pollutants in NSW.

NSW Government 2015, Guidelines for economic assessment of mining and coal seam gas proposals, December 2015.

NSW Heritage Office 1998, *How to Prepare Archival Records of Heritage Items*.

- 2004*, Investigating Heritage Significance*.

NSW Heritage Office and Department of Urban Affairs and Planning 1996, *NSW Heritage Manual.*

- 2002, *Statements of Heritage Impact*.

NSW Office of Environment and Heritage (OEH) 2010, Mereworth House and Garden (SHR: DP 1138694 and DP839314), viewed 1 April 2016, http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=2680351.

- 2011, The final determination for Southern Highlands Shale Woodland in the Sydney Basin Bioregion, viewed March 2016, www.environment.nsw.gov.au.

- 2012, *The land and soil capability assessment scheme: Second approximation,* 2nd edition.

- 2013, Land and Soil Capability Mapping of NSW. Version 2.5 (map data), viewed 25 May 2015, http://mapdata.environment.nsw.gov.au.

- 2014, *Framework for Biodiversity Assessment: NSW Biodiversity Offsets Policy for Major Projects*.

- 2015a, AdaptNSW: About NARCliM, viewed March 2016, http://climatechange.environment.nsw.gov.au/Climate-projections-for-NSW/About-NARCliM.

- 2015b, NSW Soil and Land Information System (SALIS), viewed 18 May 2015, www.environment.nsw.gov.au/eSpadeWebApp/.

- 2016a, Vegetation Information System (VIS) database, viewed March 2016, www.environment.nsw.gov.au.

- 2016b, Atlas of NSW Wildlife, viewed March 2016, www.environment.nsw.gov.au/atlasapp/.

NSW Rural Fire Service (RFS) 2006, *Planning for Bushfire Protection Guideline*, NSW Government.

Oberg, L 1980, 'Limestone Railways of the NSW Southern Highlands', *The Australian Railway Historical Society,* Bulletin 508, February.

Ozark Heritage Management P/L, May 2015, 'Berrima Colliery, Wingecarribee Local Government Area Southern Highlands, NSW'. Report prepared for International Environmental Consultants on behalf of Boral Limited.

Peverill, KI, Sparrow, LA and Reuter, DJ (eds) 1999, *Soil Analysis: Interpretation Manual*, CSIRO Publishing, Collingwood.

Phillips, S and Callaghan, J 2011, 'The spot assessment technique: a tool for determining localised levels of habitat use by Koalas', *Australian Zoologist*, 35 (3), pp. 774-780.

Ratcliffe, R 1990, *Australia's Master Gardener – Paul Sorenson and his Gardens*.

Rambol Environ 2017 *Hume Coal Project Air Quality Impact and Greenhouse Gas Assessment*.

Read, S and Australian Garden History Society (AGHS) 2008, *Paul Sorensen in the Southern Highlands and Illawarra*, paper presented at the AGHS National Conference, East Bowral, 21 August.

Remembrance Driveway Committee Inc. 2016, History of the Remembrance Driveway, viewed July 2016, http://www.remembrancedriveway.org.au/history/default.asp.

Roads and Traffic Authority (RTA) 2010, *Traffic Control at Work Sites*.

Singleton, CC 1959, 'The Southern Portland Cement Ltd Railway', *The Australian Railway Historical Society,* Bulletin 256, February.

Southern Highland News (SHN) 2012, Coal + limestone + clay = cement, viewed August 2016, http://www.southernhighlandnews.com.au/story/149661/coal-limestone-clay-cement/.

- 2013, End of an era as mining halted in Berrima, viewed August 2016, http://www.southernhighlandnews.com.au/story/1887517/end-of-an-era-as-mining-halted-in-berrima/#slide=1.

Stace, HCT, Hubble, GD, Brewer, R, Northcote, KH, Sleeman, JR, Mulcahy, MJ, and Hallsworth, EG 1968, *A Handbook of Australian Soils*, Rellim, Glenside.

Sydney Catchment Authority (SCA) 2011, *Neutral or Beneficial Effect on Water Quality Assessment Tool.*

Sydney Mail and New South Wales Advertiser 1882, 'The Berrima Coal Mine', 25 March, p.481, viewed 1 April 2016, http://trove.nla.gov.au/newspaper/article/162032842.

Sydney Morning Herald (SMH) 1882,'The Berrima Coal Mine' 20 March, p.6, viewed 1 April 2016, http://trove.nla.gov.au/ndp/del/article/13507461.

- 1916, 'Railway deviation: Picton-Mittagong construction of a new line' 26 February, p.20, viewed 1 April 2016, http://trove.nla.gov.au/ndp/del/article/28782446.

Threatened Species Scientific Committee (TSSC) 2006, Approved Conservation Advice for White Box Yellow Box Blakely's Red Gum Derived Native Grassland, viewed March 2016, www.environment.gov.au.

- 2011, Approved Conservation Advice for Upland Basalt Eucalypt Forest of the Sydney Basin Bioregion, viewed March 2016, www.environment.gov.au.

Tindale, N 1974, *Aboriginal Tribes of Australia: their terrain, environmental controls, distribution, limits, and proper names*, Australian National University Press, Canberra.

Total Earth Care 2007, *Aboriginal Heritage and Archaeological Study, Moss Vale 'Enterprise Zone'*. Report prepared by Oliver Brown for Connell Wagner on behalf of Wingecarribee Shire Council.

Transport for NSW (TfNSW) 2014, *Level Crossing Strategy Council, Yearly Report 2013–14*, December 2014.

Trigg, SJ and Campbell LM 2009, *Moss Vale 1:100 000 Geological Map*, 1st edition, Geological Survey of New South Wales, Maitland.

United States Environmental Protection Agency (US-EPA) 1998, 'Chapter 11.9: Western Surface Coal Mining' in *AP42 Emission Factor Database*.

- 2009, *Emission Factors for Locomotives*.
- 2011, *Documentation for Locomotive Component of the National Emissions Inventory Methodology*.

Wingecarribee Shire Council (WSC) 2010, *Wingecarribee Local Environmental Plan.*

Work Cover NSW 2008, *Health and Safety notes: Hierarchy of Hazard Controls,* NSW Government, Sydney.

# Abbreviations

| | |
|---|---|
| ACHA | Aboriginal cultural heritage assessment |
| ACHMP | Aboriginal cultural heritage management plan |
| ACT | Australian Capital Territory |
| AGHS | Australian Garden History Society |
| AHD | Australian Height Datum |
| AHIMS | Aboriginal Heritage Information Management System |
| AHIP | Aboriginal Heritage Impact Permit |
| ALA | Atlas of living Australia |
| AQIA | Air quality impact assessment |
| ARI | Average recurrence interval |
| AR&R | Australian Rainfall and Runoff |
| ARTC | Australian Rail Track Corporation |
| ASC | Australian Soil Classification |
| ASL | Above sea level |
| Austral | Austral Brick Company Pty Ltd |
| B | Boron |
| BHP | Broken Hill Proprietary Company |
| BNAC | Buru Ngunawal Aboriginal Corporation |
| BoM | Bureau of Meteorology |
| Boral | Boral Cement Ltd |
| BSAL | Biophysical strategic agricultural land |
| Ca | Calcium |
| CEC | Cation Exchange Capacity |
| CEMP | Construction Environmental Management Plan |
| CHL | Commonwealth heritage list |
| CPP | Coal preparation plant |
| CHR | Commonwealth heritage register |
| CHR(S) | Channelised lane right turn (short) |
| Cl | Chloride |
| CLM Act | NSW *Contaminated Land Management Act 1997* |
| cm | centimetres |
| CMP | Conservation management plan |
| Crown Lands Act | NSW *Crown Lands Act 1989* |
| Cu | Copper |
| Cubbitch Barta | Cubbitch Barta Native Title Claimants Aboriginal Corporation |
| DA | Development application |
| dB | decibels |

| | |
|---|---|
| dbh | diameter at breast height |
| DEC | NSW Department of Environment and Conservation |
| DECC | NSW Department of Environment and Climate Change |
| DECCW | NSW Department of Environment, Climate Change and Water |
| DERM | Queensland Department of Environment and Resource Management |
| DEWHA | Commonwealth Department of Environment, Water, Heritage and the Arts |
| DLWC | NSW Department of Land and Water Conservation |
| DoE | Commonwealth Department of the Environment |
| DoEE | Commonwealth Department of the Environment and Energy |
| DoP | NSW Department of Planning (now DP&E) |
| DP&E | NSW Department of Planning and Environment |
| DP&I | NSW Department of Planning and Infrastructure (now DP&E) |
| DPI | NSW Department of Primary Industries |
| Drinking Water SEPP | *State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011* |
| dS | deciSiemens |
| DTM | digital terrain model |
| $EC_{se}$ | Electrical conductivity – saturated extract |
| EEC | Endangered ecological community |
| EIS | Environmental impact statement |
| EMM | EMM Consulting Pty Limited |
| EP&A Act | NSW *Environmental Planning and Assessment Act 1979* |
| EP&A Regulation | NSW Environmental Planning and Assessment Regulation 2000 |
| EPA | NSW Environmental Protection Authority |
| EPBC Act | Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* |
| EPI | Environmental planning instruments |
| EPL | Environment protection licence |
| ESD | Ecologically sustainable development |
| ESP | Exchangeable sodium percentage |
| eSPADE | Soil profile attribute data environment |
| FBA | Framework for Biodiversity Assessment |
| FM Act | NSW *Fisheries Management Act 1994* |
| Forestry Act | NSW *Forestry Act 1916* |
| g | grams |
| GAHA | Gundungurra Aboriginal Heritage Association Inc |
| GADDC | *Guidance on the Assessment of Dust from Demolition and Construction* (Institute of Air Quality Management 2014) |
| GIS | Geographic information system |
| GPS | Global positioning system |
| GSG | Great soil groups |
| ha | hectares |
| HC | Heritage Council |
| Heritage Act | NSW *Heritage Act 1977* |

| | |
|---|---|
| Hume Coal | Hume Coal Pty Limited |
| Hz | Hertz |
| IBRA | Interim Biogeographic Regionalisation of Australia |
| ICNG | *Interim Construction Noise Guideline* |
| ICOMOS | International Council on Monuments and Sites |
| IFD | Intensity frequency duration |
| ILALC | Illawarra Local Aboriginal Land Council |
| IMT | indurated mudstone/tuff |
| Infrastructure SEPP | *State Environmental Planning Policy (Infrastructure) 2007* |
| Inghams | Inghams Enterprises Pty Limited |
| INP | *NSW Industrial Noise Policy* |
| IR | Infrared |
| K | Potassium |
| kg | kilograms |
| km | kilometres |
| $km^2$ | square kilometres |
| KNAC | Koomurri Ngunawal Aboriginal Corporation |
| KTP | Key threatening process |
| LCA | Landscape conservation area |
| LCIP | Level Crossing Improvement Program |
| LEP | Local environmental plan |
| LGA | Local government area |
| LiDAR | Light detection and ranging |
| LPG | Liquefied petroleum gas |
| LSC | Land and soil capability |
| m | metres |
| $m^2$ | square metres |
| $m^3$ | cubic metres |
| MCA | Major catchment area |
| meq | milliequivalents |
| mg | milligrams |
| Mg | Magnesium |
| Mining Act | NSW *Mining Act 1992* |
| Mining SEPP | *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* |
| mm | millimetres |
| Mn | Manganese |
| MNES | Matters of national environmental significance |
| Mtpa | Million tonnes per annum |
| MUSIC | Model for Urban Stormwater Improvement Conceptualisation |
| MVEC | Moss Vale Enterprise Corridor |
| N | Nitrogen |

| | |
|---|---|
| N (Sol.) | Nitrite + Nitrate |
| Na | Sodium |
| NARCLiM | NSW and ACT Regional Climate Modelling |
| NATA | National Association of Testing Authorities |
| NCA | noise catchment areas |
| NCST | National Committee on Soil and Terrain |
| NHL | National Heritage List |
| NIAC | Northern Illawarra Aboriginal Collective Inc |
| NML | noise management levels |
| NMP | Noise management plan |
| $NO_2$ | Nitrogen dioxide |
| $NO_x$ | Oxides of nitrogen |
| NPW Act | NSW *National Parks and Wildlife Act 1974* |
| NSW | New South Wales |
| NT | National Trust of Australia |
| NTC | National Transport Commission |
| NV Act | NSW *Native Vegetation Act 2003* |
| NW Act | NSW *Noxious Weeds Act 1993* |
| OEH | NSW Office of Environment and Heritage |
| Omya | Omya Australia Pty Ltd |
| P | Phosphorus |
| PAC | Planning Assessment Commission |
| PAD | Potential archaeological deposits |
| PAWC | Plant available water capacity |
| PBP guidelines | Planning for bush fire protection 2006 |
| PCT | Plant community type |
| PEL | Pacific Environment Limited |
| $PM_{10}$ | Fine particulate matter 10 microns in diameter or less |
| $PM_{2.5}$ | Fine particulate matter 2.5 microns in diameter or less |
| PMF | Probable maximum flood |
| POEO Act | NSW *Protection of the Environment Operations Act 1997* |
| POSA | POSCO Australia |
| PRM | probabilistic rational method |
| RAP | Registered Aboriginal party |
| RBL | rating background level |
| RING | *Rail Infrastructure Noise Guideline* |
| RMS | NSW Roads and Maritime Services |
| RMS | Root mean square |
| RNE | Register of the National Estate |
| RNP | *Road Noise Policy* |
| Roads Act | NSW *Roads Act 1993* |
| Rocla | Rocla Materials Pty Ltd |

| | |
|---|---|
| RTA | NSW Roads and Traffic Authority |
| RTS | Response to submissions |
| Rural Fires Act | NSW *Rural Fires Act 1997* |
| SALIS | NSW Soils and Land Information System |
| SAT | Spot assessment technique |
| SCA | Sydney Catchment Authority |
| SCCRS | Sydney-Canberra Corridor Regional Strategy |
| SEARs | Secretary's environmental assessment requirements |
| SEPP | State Environmental Planning Policy |
| SEPP 33 | *State Environmental Planning Policy No. 33 – Hazardous and Offensive Development* |
| SEPP 44 | *State Environmental Planning Policy No. 44 – Koala Habitat Protection* |
| SEPP 55 | *State Environmental Planning Policy No 55 – Remediation of Land* |
| SEWPaC | Department of Sustainability, Environment, Water, Population and Communities (now DoEE) |
| SHI | State Heritage Inventory |
| SHR | State heritage register |
| SMH | Sydney Morning Herald |
| SMULSC | Soil monitoring unit and land and soil capability |
| SoHI | Statement of Heritage Impact |
| SSD | State significant development |
| TEC | Threatened ecological community |
| TfNSW | Transport for NSW |
| TSC Act | NSW *Threatened Species Conservation Act 1995* |
| TSP | Total suspended particulates |
| TSSC | Threatened Species Scientific Committee |
| US-EPA | United States Environmental Protection Agency |
| VDV | vibration dose values |
| VIS | NSW Vegetation Information System |
| VLAMP | Voluntary Land Acquisition and Mitigation Policy |
| VOCs | Volatile organic compounds |
| VPA | Voluntary planning agreement |
| Water Act | NSW *Water Act 1912* |
| WM Act | NSW *Water Management Act 2000* |
| WSC | Wingecarribee Shire Council |
| Yamanda | Yamanda Aboriginal Association |
| YP | Yellow podzolic soils |
| Zn | Zinc |