HUMECOAL
PROJECT

VOLUME 9

Hume Coal Project

Environmental Impact Statement

Appendices P to R

Prepared for Hume Coal Pty Limited
March 2017

EMM

VOLUME 1 **Main Report**

VOLUME 2 **Appendices A to C**
Appendix A Schedule of lands
Appendix B Secretary's Environmental Assessment Requirements
Appendix C Study team

VOLUME 3A **Appendix D**
Appendix D Berrima Rail Project Environmental Impact Statement
– Main report
– Appendices A to D

VOLUME 3B **Appendix D**
Appendix D Berrima Rail Project Environmental Impact Statement
– Appendices E to H

VOLUME 3C **Appendix D**
Appendix D Berrima Rail Project Environmental Impact Statement
– Appendices I to J

VOLUME 3D **Appendix D**
Appendix D Berrima Rail Project Environmental Impact Statement
– Appendices K to M

VOLUME 4A **Appendix E**
Appendix E Water Impact Assessment Report
– Main report
– Appendices A to E

VOLUME 4B **Appendix E**
Appendix E Water Impact Assessment Report
– Appendices F to O

VOLUME 5 **Appendices F and G**
Appendix F Soil and Land Assessment Report
Appendix G Agricultural Impact Statement

VOLUME 6 **Appendix H**
Appendix H Biodiversity Assessment Report

VOLUME 7 **Appendices I to L**
Appendix I Noise and Vibration Assessment Report
Appendix J Health Impact Assessment Report
Appendix K Air Quality and Greenhouse Gas Assessment Report
Appendix L Subsidence Assessment Report

VOLUME 8 **Appendices M to O**
Appendix M Traffic and Transport Assessment Report
Appendix N Visual Amenity Assessment Report
Appendix O Rehabilitation and Closure Strategy

VOLUME 9 **Appendices P to R**
Appendix P Hazard and Risk Assessment Report
Appendix Q Economic Impact Assessment Report
Appendix R Social Impact Assessment Report

VOLUME 10 **Appendices S to U**
Appendix S Aboriginal Cultural Heritage Assessment Report
Appendix T Statement of Heritage Impact
Appendix U Site Verification Certificate

Appendix P

Hazard and Risk Assessment Report

Hume Coal Project

Environment Impact Statement | Appendix P | Hazard and Risk Assessment Report

Prepared for Hume Coal Pty Limited | 7 March 2017

Hume Coal Project

Environment Impact Statement | Appendix P
| Hazard and Risk Assessment Report

Prepared for Hume Coal Pty Limited | 7 March 2017

Ground Floor, Suite 01, 20 Chandos Street
St Leonards, NSW, 2065

T +61 2 9493 9500
F +61 2 9493 9599
E info@emmconsulting.com.au

www.emmconsulting.com.au

Hume Coal Project

Final

Report J12055RP1 | Prepared for Hume Coal Pty Limited | 7 March 2017

Prepared by	**Mark Roberts**	Approved by	**Paul Mitchell**
Position	Senior environmental scientist	Position	Director
Signature		Signature	
Date	7 March 2017	Date	7 March 2017

Document Control

Version	Date	Prepared by	Reviewed by
V1	26/02/2016	Mark Roberts	Paul Mitchell
V2	21/09/2016	Jarred Kramer, Mark Roberts	Paul Mitchell
V3	27/10/2016	Mark Roberts	Paul Mitchell
V4	9/11/2016	Mark Roberts	Paul Mitchell
V5	23/02/2017	Mark Roberts	Paul Mitchell
V6	7/03/2017	Mark Roberts	Nicole Armit

EMM

T +61 (0)2 9493 9500 | F +61 (0)2 9493 9599

Ground Floor | Suite 01 | 20 Chandos Street | St Leonards | New South Wales | 2065 | Australia

www.emmconsulting.com.au

Executive Summary

ES1 Overview

This hazard and risk assessment has been prepared by EMM Consulting Pty Ltd (EMM) for the Hume Coal Project to determine:

- if the project is a hazardous or offensive development under State Environmental Planning Policy No. 33 (Hazardous and Offensive Development) (SEPP 33) based on the hazardous materials to be stored and used on-site, and potential offensive emissions from the project;
- the risks from the project to people (not including the project's workforce), property and the environment, assessed against the Department of Planning and Infrastructure's qualitative risk criteria in *Hazardous Industry Planning Advisory Paper No 4: Risk Criteria for Land Use Safety Planning* (DoP 2011a); and
- risks to people, property and the environment from subsidence associated with the project and bushfires ignited in, or which enter, the project area.

ES2 Project location and components

The project area is west of Moss Vale and south-west of Berrima in the Southern Highlands of NSW. It is in the Wingecarribee Local Government Area and the Moss Vale subregion of the Sydney Basin Biogeographic Region.

The project involves developing and operating an underground coal mine and associated mine surface infrastructure, comprising:

- surface infrastructure area incorporating coal preparation plant (CPP);
- mine access and ventilation systems and shaft(s);
- water management and treatment facilities;
- overland conveyor system;
- rail load-out facilities;
- communications and electricity reticulation infrastructure; and
- environmental management and monitoring equipment.

Product coal will be transported by rail to Port Kembla for shipment to export markets and/or by rail to domestic markets.

ES3 Hazardous materials

Hazardous materials which are to be used on site were identified, and respective quantities and storage locations considered. The information was compared to SEPP 33 criteria to determine if the project qualifies as a hazardous development.

Emissions which have potential to be offensive to surrounding land users were considered to determine if the project will be potentially offensive development.

The comparison showed that the project will not be a hazardous or offensive development.

ES4 Risks

Risks have been determined in accordance with *Australian/New Zealand Standard International Organisation for Standardisation 31000:2009 Risk Management – Principles and Guidelines*.

Hazards associated with scenarios based on atypical but still possible events (eg accidents) were identified. The inherent risks from these scenarios were assessed in the presence of conventional and/or proven engineering and administrative controls.

Comparison of the risks associated with the use of hazardous materials on site to the Department of Planning and Infrastructure's (DP&I 2011a) risk criteria shows that the project generally represents a low risk. However, in some instances there are medium risks associated with parts of the project and these risks will need to be managed to achieve acceptable outcomes through the application of the hierarchy of hazard controls. The preliminary risk assessment presented in this report will be reviewed and refined throughout the project design, construction, operational and closure phases.

Subsidence and bushfire risks were also considered. Subsidence is predicted to be negligible to imperceptible as the mining method will comprise first workings only (refer to Appendix L of the EIS). Therefore, subsequent impacts to people, for example from subsidence impacts to roads resulting in dangerous driving conditions, will be negligible. Risks associated with bushfire will be low provided management measures are implemented.

The only project components on bushfire prone land according to the Wingecarribee bushfire prone land map are the far western section of the stockpile pad and water management area in the surface infrastructure area (Figure 1.3). These are either not susceptible to fire (water dam) or will be in a cleared area with ample access for fire fighting vehicles and personnel evacuation. In the case of the stockpile pad, there is approximately 70 m of cleared paddock between the edge of the pad and the native bushland. Furthermore, the stockpile's dust suppression water sprays would be able to be called into service to wet the stockpile in the event of a bush fire in the vicinity. Therefore, fires are unlikely in these areas, however, if a fire does occur, it is unlikely to spread beyond the immediate area.

Table of contents

Table of contents *(Cont'd)*

Tables

Figures

1 Introduction

1.1 Objectives

This hazard and risk assessment (HRA) has been prepared by EMM Consulting Pty Limited (EMM) to assess the hazards associated with the Hume Coal Project (the project) as required by the Secretary's Environmental Assessment Requirements (SEARs) issued on 20 August 2015, which specified that the EIS:

> Include an assessment of the likely risks to public safety, paying particular attention to potential subsidence risks, bushfire risks, and the handling of any dangerous goods.

Accordingly, the objective of this report is to:

- determine if the project is a hazardous or offensive development under State Environmental Planning Policy No. 33 (Hazardous and Offensive Development) (SEPP 33) based on the hazardous materials to be stored and used on-site (Chapter 2);
- assess the general risks from the project to people, property and the environment against DP&E's qualitative risk assessment criteria in *Hazardous Industry Planning Advisory Paper No 4: Risk Criteria for Land Use Safety Planning* (DP&I 2011a). This advisory paper provides criteria to guide assessments of the acceptability of public safety risks from a development (chapters 3 and 4);
- summarise potential risks associated with subsidence (Chapter 5);
- assess risks associated with bushfires ignited on, or adjacent to, Hume Coal owned land (Chapter 6); and
- address the SEARs.

Government agencies were invited to provide additional risk and hazard related requirements, however, none were provided.

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

This HRA is the initial stage of the project's hazard assessment process. It provides relevant information to allow government agencies to determine if risks associated with the project are acceptable from a public safety perspective. If determined to be potentially hazardous or offensive industry under SEPP 33, a preliminary hazard assessment is required to be prepared to accompany an application for the development.

As described in *Major Hazards Planning* (DP&E 2015), the subsequent more detailed analysis of hazards/risks shown in Figure 1.1 will be undertaken. Risks will be analysed prior to the construction phase of the project and regular hazard audits are proposed during the construction and operational stages of the project to ensure that hazards and risks associated with the project are identified and managed in accordance with best practice guidelines.

This report deals with risks to public safety; risks specific to the project's workforce and to Hume Coal's property will be considered as part of the detailed design phase hazard assessments.

This report does not present the outcomes of the subsidence assessment in detail; refer to Appendix M (Subsidence Assessment Report) of the Hume Coal Project EIS for a detailed description of potential subsidence impacts.

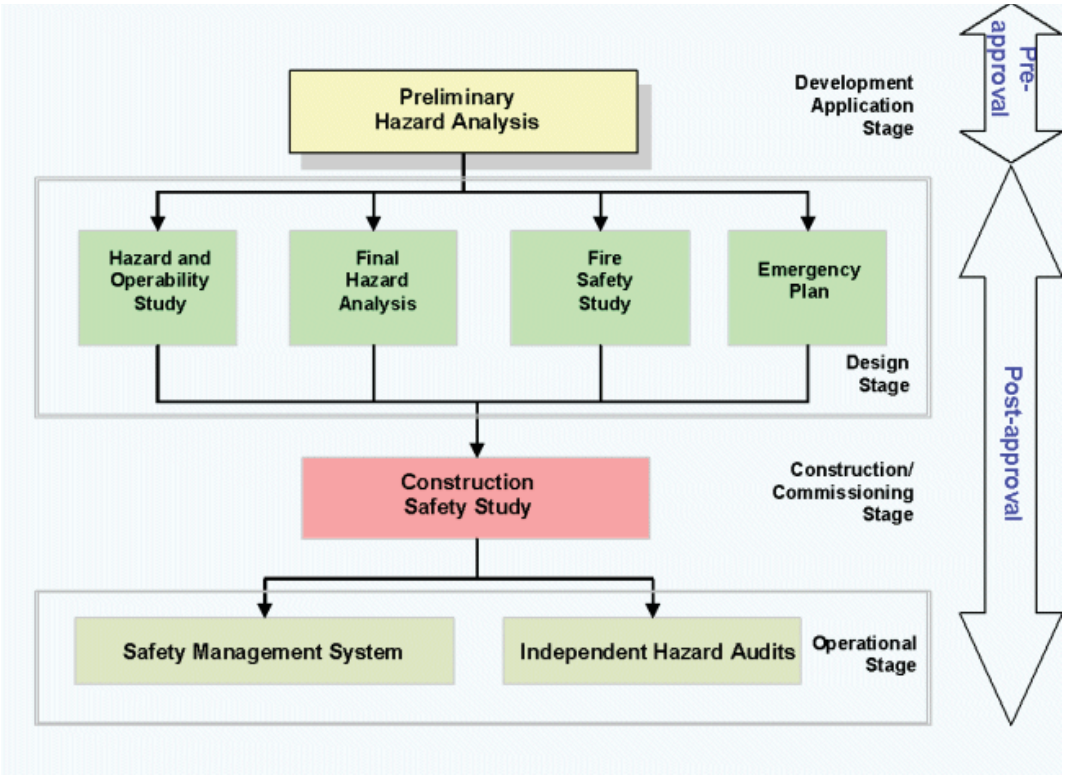


Figure 1.1 The hazard assessment process (DP&E 2015)

1.2 Project summary

The project involves developing and operating an underground coal mine and associated infrastructure over a total estimated project life of 23 years. Indicative mine and surface infrastructure plans are provided in Figure 1.3 and Figure 1.4. A full description of the project, as assessed in this report, is provided in Chapter 2 of the main EIS report (EMM 2017a).

In summary it involves:

- Ongoing resource definition activities, along with geotechnical and engineering testing, and other fieldwork to facilitate detailed design.
- Establishment of a temporary construction accommodation village.
- Development and operation of an underground coal mine, comprising of approximately two years of construction and 19 years of mining, followed by a closure and rehabilitation phase of up to two years, leading to a total project life of 23 years. Some coal extraction will commence during the second year of construction and hence there will be some overlap between the construction and operational phases.

- Extraction of approximately 50 million tonnes (Mt) of run-of-mine (ROM) coal from the Wongawilli Seam, at a rate of up to 3.5 million tonnes per annum (Mtpa). Low impact mining methods will be used, which will have negligible subsidence impacts.

- Following processing of ROM coal in the coal preparation plant (CPP), production of up to 3 Mtpa of metallurgical and thermal coal for sale to international and domestic markets.

- Construction and operation of associated mine infrastructure, mostly on cleared land, including:

    - one personnel and materials drift access and one conveyor drift access from the surface to the coal seam;

    - ventilation shafts, comprising one upcast ventilation shaft and fans, and up to two downcast shafts installed over the life of the mine, depending on ventilation requirements as the mine progresses;

    - a surface infrastructure area, including administration, bathhouse, washdown and workshop facilities, fuel and lubrication storage, warehouses, laydown areas, and other facilities. The surface infrastructure area will also comprise the CPP and ROM coal, product coal and emergency reject stockpiles;

    - surface and groundwater management and treatment facilities, including storages, pipelines, pumps and associated infrastructure;

    - overland conveyors;

    - rail load-out facilities;

    - a small explosives magazine;

    - ancillary facilities, including fences, access roads, car parking areas, helipad and communications infrastructure; and

    - environmental management and monitoring equipment.

- Establishment of site access from Mereworth Road, and construction of minor internal roads.

- Coal reject emplacement underground, in the mined-out voids.

- Peak workforces of approximately 414 full-time equivalent employees during construction and approximately 300 full-time equivalent employees during operations.

- Decommissioning of mine infrastructure and rehabilitating the area once mining is complete, so that it can support land uses similar to current land uses.

The project area, shown in Figure 1.2 is approximately 5,051 hectares (ha). Surface disturbance will mainly be restricted to the surface infrastructure areas shown indicatively on Figure 1.4 though will include some other areas above the underground mine, such as drill pads and access tracks. The project area generally comprises direct surface disturbance areas of up to approximately 117 ha, and an underground mining area of approximately 3,472 ha, where negligible subsidence impacts are anticipated.

A construction buffer zone will be provided around the direct disturbance areas. The buffer zone will provide an area for construction vehicle and equipment movements, minor stockpiling and equipment laydown, as well as allowing for minor realignments of surface infrastructure. Ground disturbance will generally be minor and associated with temporary vehicle tracks and sediment controls as well as minor works such as backfilled trenches associated with realignment of existing services. Notwithstanding, environmental features identified in the relevant technical assessments will be marked as avoidance zones so that activities in this area do not have an environmental impact.

Product coal will be transported by rail, primarily to Port Kembla terminal for the international market, and possibly to the domestic market depending on market demand. Rail works and use are the subject of a separate EIS and State significant development application for the Berrima Rail Project.

1.3 General site description

The project area is approximately 100 km south-west of Sydney and 4.5 km west of Moss Vale town centre in the Wingecarribee LGA. The nearest area of surface disturbance will be associated with the surface infrastructure area, which will be 7.2 km north-west of Moss Vale town centre. It is in the Southern Highlands region of NSW and the Sydney Basin Biogeographic Region.

The project area is in a semi-rural setting, with the wider region characterised by grazing properties, small-scale farm businesses, small scale farm business, natural areas, forestry, scattered rural residences, villages and towns, industrial activities such as the Berrima Cement work and Berrima Feedmill, and some extractive industry and major transport infrastructure such as the Hume Highway.

Surface infrastructure is proposed to be developed on predominately cleared land owned by Hume Coal or affiliated entities, or for which there are appropriate access agreements in place with the landowner. Over half of the remainder of the project area (principally land above the underground mining area) comprises cleared land that is, and will continue to be, used for livestock grazing, small-scale farm businesses and hobby farms. Belanglo State Forest covers the north-western portion of the project area and contains introduced pine forest plantations, areas of native vegetation and several creeks that flow through deep sandstone gorges. Native vegetation within the project area is largely restricted to parts of Belanglo State Forest and riparian corridors along some watercourses.

The project area is traversed by several drainage lines including Oldbury Creek, Medway Rivulet, Wells Creek, Wells Creek Tributary, Belanglo Creek and Longacre Creek, all of which ultimately discharge to the Wingecarribee River, located around 1.5 km north of the project area. The Wingecarribee River's catchment forms part of the broader Warragamba Dam and Hawkesbury-Nepean catchments. Medway Dam is also adjacent to the northern portion of the project area.

Most of the central and eastern parts of the project area have very low rolling hills with occasional elevated ridge lines. However, there are steeper slopes and deep gorges in the west in Belanglo State Forest.

Existing built features across the project area include scattered rural residences and farm improvements such as outbuildings, dams, access tracks, fences, yards and gardens, as well as infrastructure and utilities including roads, electricity lines, communications cables and water and gas pipelines. Key roads that traverse the project area are the Hume Highway and Golden Vale Road. The Illawarra Highway borders the south-east section of the project area.

Industrial and manufacturing facilities adjacent to the project area include the Berrima Cement Works and Berrima Feed Mill on the fringe of New Berrima. Berrima Colliery's mining lease (CCL 748) also adjoins the project area's northern boundary. Berrima colliery is currently not operating with production having ceased in 2013 after almost 100 years of operation. The mine is currently undergoing mine closure activities.

1.4 State significant development application

The project is classified as State significant development under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). A preliminary environmental assessment report was submitted to the NSW Department of Planning and Environment (DP&E) on the 26 June 2015 (application number SSD 7172). The SEARs for the project were issued on the 20 August 2015.

1.5 Hazard control plans

A range of hazard control plans will be implemented during construction and operation of the project. Each of these control plans 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).

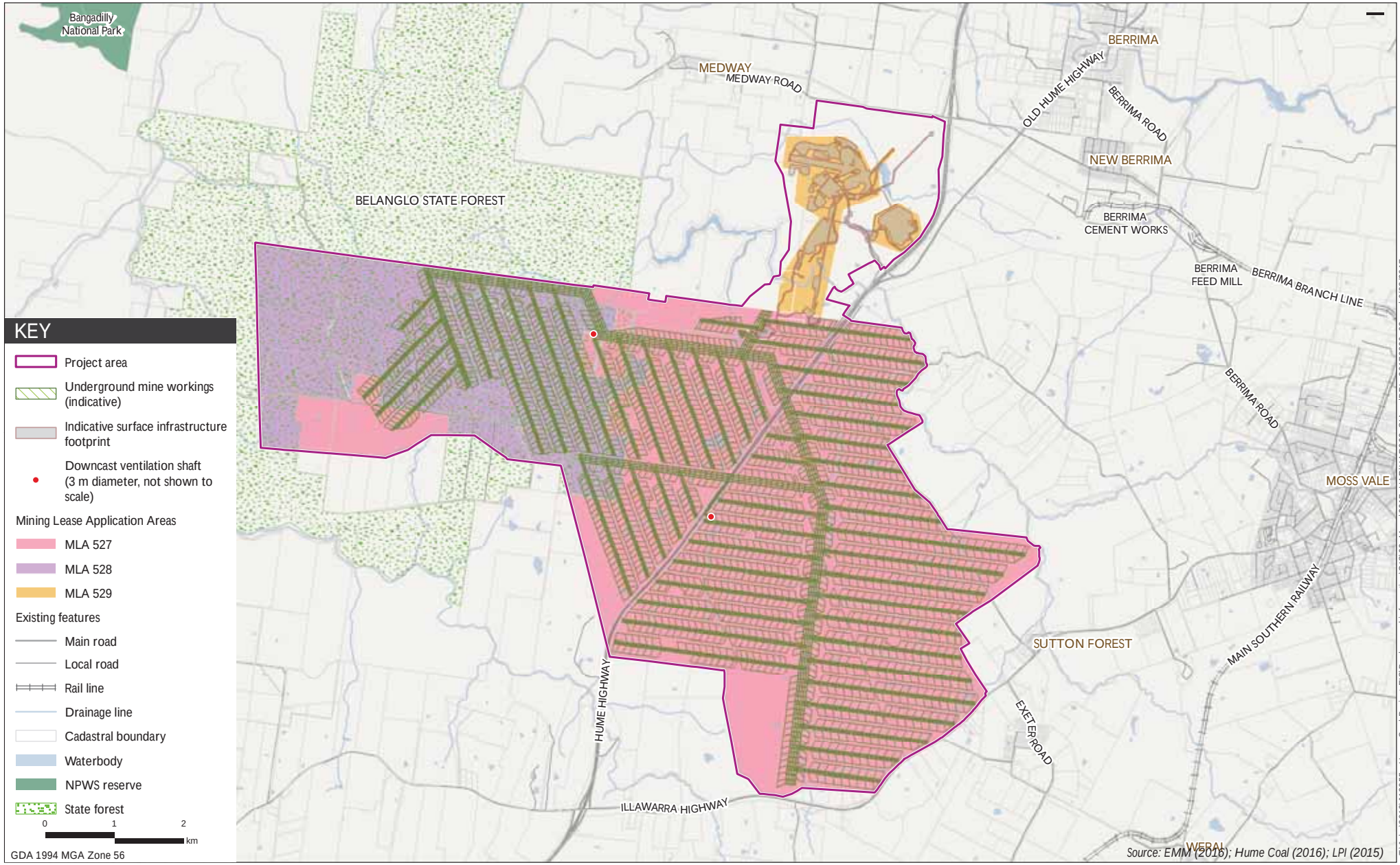
Engineering controls will be implemented where practical to remove or minimise hazards, that is the design of processes or structures will aim to minimise the hazards. However, not all hazards can be engineered out and administrative controls may also be required.

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 (Mines and Petroleum) Act 2013*, NSW *Work Health and Safety Act 2011*, NSW Work Health and Safety (Mines and Petroleum) Regulation 2014 and NSW Work Health and Safety Regulation 2011. The safety management plans will describe all relevant engineering and administrative controls.

1.6 Definitions

Definitions used in this HRA are as follows:

- on-site areas — areas that will be under the control of Hume Coal and that will not be accessible to the general public;
- hazard — a situation or thing that has potential to harm a person (WorkCover 2011). For the purpose of this assessment the definition is expanded to include a potential source of harm to property and/or the environment; and
- risk — the effect of uncertainty on objectives (AS/NZS ISO 31000:2009). Note 4 in clause 2.1 of AS/NZS ISO 31000:2009 expands on this definition as follows – risk is often characterised by reference to potential events and consequences, or a combination of these.

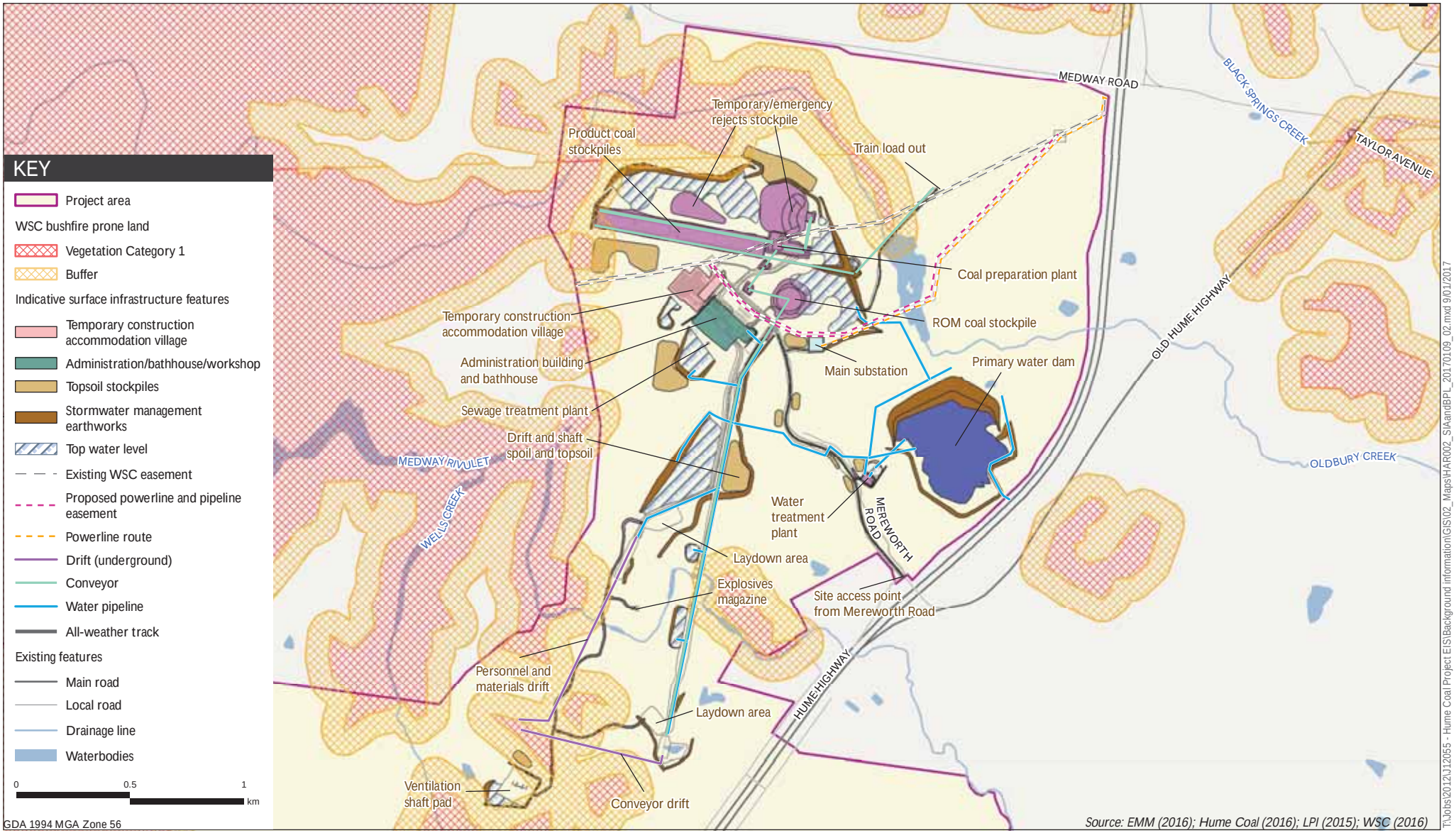


Indicative project layout

Hume Coal Project

Hazard and Risk Assessment

Figure 1.2



Indicative surface infrastructure layout

Hume Coal Project
Hazard and Risk Assessment

Figure 1.3

2 Hazardous materials

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

A development is classified as a hazardous or offensive development if the thresholds in the former NSW Department of Planning's (DoP) (2011b) *Applying SEPP 33* are exceeded. These thresholds are provided in a series of tables and figures in DoP (2011b) which compare the quantities of stored and/or used hazardous materials to the distance from publicly accessible areas. As transportation of hazardous materials to and from a proposed development may be hazardous also, DoP (2011b) provides quantity screening thresholds in Table 2. DP&E uses the hazardous materials classifications in *Australian Code for the Transport of Dangerous Goods by Road and Rail Edition 7.3* (NTC 2014).

The bulk hazardous materials that will be used by the project are diesel, flammable liquids (petrol, oil, grease, degreaser, paints, cleaning and coal processing reagents), gases (liquid petroleum gas – LPG, acetylene and water dosing/treatment chemicals) and minor quantities of explosives. These materials will be stored at a number of locations (Figure 1.3) and these materials and their SEPP 33 thresholds are described below (regarded as a preliminary screening by DP&E). The explosives will be stored far enough away from publically accessible areas to prevent the project from qualifying as hazardous development.

2.1 Diesel

Australian Standard 1940:2004 The Storage and Handling of Flammable and Combustible Liquids (AS 1940:2004) classifies diesel as a combustible liquid (Class C1). However, diesel is not classified as a dangerous good (for transport purposes) under NTC (2014) as its flash point is above 60°C.

There will be approximately 50,000 L of diesel storage capacity on-site during construction and operations. It will be stored in bunded tanks at the surface infrastructure area. Diesel will be stored and handled on-site in accordance with AS 1940:2004.

Diesel is not a hazardous material and, therefore, its storage and use on-site will not qualify the project as potentially hazardous or offensive development.

2.2 Flammable liquids

2.2.1 Petrol

Petrol is classified as a Class 3 flammable liquid under AS 1940:2004 and NTC (2014). Small quantities of petrol will be stored in the fuel tanks of light vehicles, jerry cans and some hand tools and other small equipment such as chain saws and lawn mowers.

Petrol will be stored and handled on-site in accordance with AS 1940:2004.

The storage and use of small quantities of petrol on-site will not qualify the project as potentially hazardous or offensive development.

2.2.2 Other hydrocarbons (oil, grease and degreaser)

Oil is classified as a Class C2 combustible liquid under AS 1940:2004 and a Class 3 flammable liquid under NTC (2014). Approximately 6.4 t of other hydrocarbons will be stored and used on-site during operations.

These substances will be stored in the workshop and storage warehouse near the centre of the surface infrastructure area. This area will be approximately 800 m inside the boundary of Hume owned land, which is approximately 650 m more than the SEPP 33 'potentially hazardous region' threshold (140 m from the boundary – the arrow on Figure 2.1 shows that the substances will be stored beyond the maximum distance from the boundary which could qualify the project as potentially hazardous). Small quantities of oils will also be stored in the oil tanks of plant and equipment, vehicles and some hand tools and other small equipment.

Used materials will be collected by licensed waste contractors for off-site recycling or disposal.

Given the above, the storage and use of other hydrocarbons on-site will not qualify the project as potentially hazardous or offensive development.

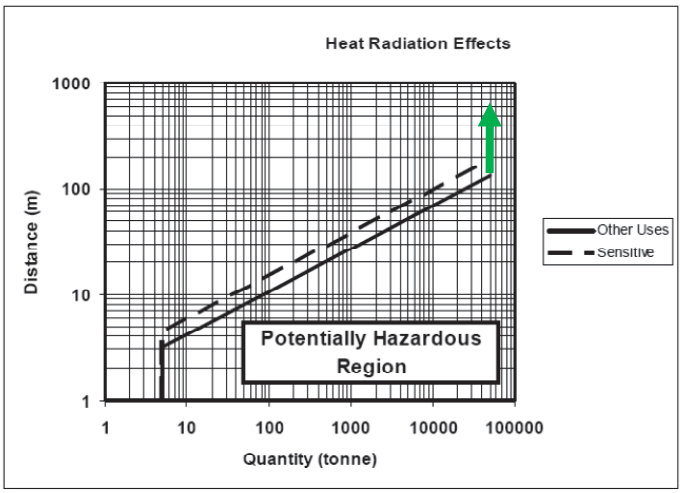


Figure 2.1 SEPP 33 criteria for Class 3PGII & III flammable liquids (DoP 2011b)

2.2.3 Paints, cleaning and coal processing substances

Some paints, cleaning and coal processing substances can be Class 3 flammable liquids under NTC (2014). These substances will be stored in the workshop and storage warehouse, or CPP, near the centre of the surface infrastructure area. This area will be approximately 800 m inside the boundary of Hume owned land, which is approximately 650 m more than the SEPP 33 'potentially hazardous region' threshold (140 m from the boundary, as shown by the arrow on Figure 2.1).

Materials will be stored in accordance with AS 1940:2004.

Coal processing substances will be used at the CPP for coal washing and processing. The substances will be selected closer to the start of operations, however, substances likely to be used and their hazard potential (based on their material safety data sheets) are noted below:

- NALCOAG 3268 – Not classified as hazardous according to Safe Work Australia. This product is not classified as a dangerous good according to national or international regulations.
- ULTRION 8187 – Classified as hazardous according to the Safe Work Australia as it is irritating to eyes in concentrated form. Not classified as a dangerous good according to national or international regulations. The hazard associated with this product is relevant to the workplace but not relevant to public safety as it will be used in a closed area distant from the boundary of Hume owned land.
- NALFLOTE 9840 PLUS – Not classified as hazardous according to Safe Work Australia. This product is not classified as a dangerous good according to national or international regulations.
- HI-TEX 82230 – Not classified as hazardous according to Safe Work Australia. This product is not classified as a dangerous good according to national or international regulations.
- CoalEX 88007 – Classified as hazardous according to the Safe Work Australia as it is irritating to eyes in concentrated form. Not classified as a dangerous good according to national or international regulations. The hazard associated with this product is relevant to the workplace but not relevant to public safety as it will be used in a closed area distant from the boundary of Hume owned land.

Storage and use of paints, cleaning and coal processing substances will not qualify the project as potentially hazardous or offensive development.

2.3 Gases

The following gases are proposed to be stored and used at the project:

- An LPG tank with a capacity of 5 m^3 (Class 2.1 flammable gas).
- Up to five small capacity (approximately 1 m^3) acetylene cylinders during construction and one or two 4.1 m^3 to 8.7 m^3 capacity acetylene cylinders (up to 0.02 t) during operations.

The screening threshold for LPG stored above ground is 16 m^3, which is more than the 5 m^3 proposed storage capacity at the project.

The potentially hazardous region for 0.02 t of Class 2.1 flammable gases other than LPG is 15 m and less from public areas. However, the flammable gas storage area will be approximately 800 m from the boundary of Hume owned land. Therefore, the storage of LPG and acetylene will be less than the SEPP 33 thresholds and will not qualify the project as potentially hazardous.

LPG will be stored in accordance with *Australian Standard/New Zealand Standard 1596:2008 The Storage and Handling of LP Gas* and acetylene will be stored in accordance with AS 1940:2004.

2.4 Explosives

2.4.1 Construction

Up to 5 t of detonators and packaged emulsion explosives will be stored separately on-site for use during construction of the drifts and shaft pre-sink. NTC (2014) classifies detonators as Class 1.1 explosives.

The potentially hazardous region for 5 t of explosives is approximately 240 m and less from the storage area (see Figure 2.2). The explosives storage will be approximately 300 m from the nearest boundary of Hume owned land. This distance is outside the potentially hazardous region.

Explosives storage will be designed and constructed in accordance with *Australian Standard 2187:1998 Explosives – Storage, Transport and Use: Storage.*

2.4.2 Operations

Approximately 400 kg of packaged emulsion explosives with electric detonators may be stored on-site to assist with excavation on the infrequent occasions where mechanical mining is not practical. The explosives will be stored as per those used for construction, which will be outside the potentially hazardous region shown on Figure 2.2.

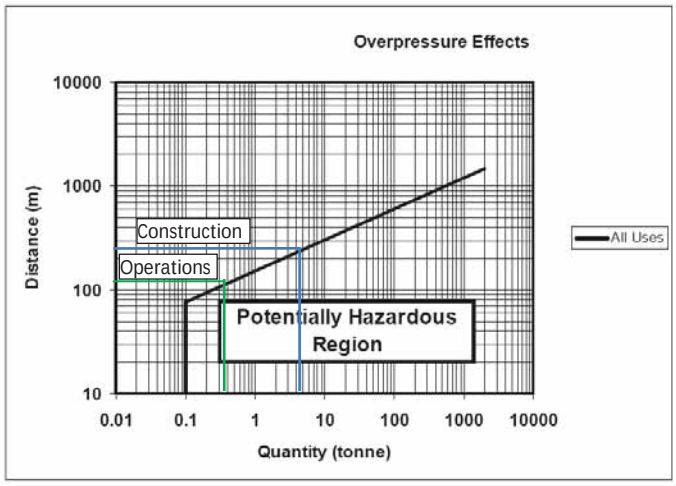


Figure 2.2 SEPP 33 criteria for Class 1.1 explosives (DoP 2011b)

Given the above, storage and use of explosives on-site will not qualify the project as a potentially hazardous development as quantities and storage distances will be below the DoP (2011b) threshold.

2.5 Radioactive material

Minute quantities of radioactive material (Coal Scan and lasers) will be on-site in purpose built canisters on the conveyors or in the washplant in the CPP, which will be approximately 780 m from the boundary of Hume owned land. Transport of radioactive material by contractors will be guided by Australian Radiation Protection and Nuclear Safety Agency 2008 *Code of practice for transport of radioactive material.* Storage and handling of radioactive materials will be guided by Australian Radiation Protection and Nuclear Safety Agency 2012 *Holistic safety guidelines v1.*

2.6 Coal dust

Appendix 3 of DoP (2011b) lists industries that may be potentially hazardous, which includes coal handling due to the potential for coal dust explosions to occur. This could occur in the underground workings of a coal mine and/or in a coal handling facility.

A coal dust explosion occurs when the following factors in an underground coal mine occur simultaneously (DPI 2001):

- oxygen is present to sustain combustion – there is sufficient oxygen in ventilated roadways to sustain combustion;
- dust is of sufficient composition to sustain an explosion;
- dust is raised into the air – a substantial airblast is required to lift dust into the air, which can be in the form of a methane explosion; and
- there is a means of igniting the dust – usually from an initial methane explosion or detonation of explosives. Direct ignition is possible but not likely.

The main potential initiators of a coal dust explosion are a methane explosion or detonation of explosives. The Wongawilli seam has a very low gas content, typically less than 0.5m^3/t, and typically comprising 100% CO_2 (which is incombustible). Explosives will be used sparingly, in controlled circumstances and only involve minor amounts. Procedures for use of explosives underground typically involve the liberal application of stone dust (an explosion suppressant dust) in the immediate area beforehand. Furthermore, the regular application of stone dust to all accessible areas of the mine is a statutory requirement, along with regular sampling of coal dust and stone dust concentrations throughout the mine, to provide for reapplication of stone dust before the coal dust can reach potentially explosive concentrations. These measures in combination mean a coal dust explosion is extremely unlikely to occur.

Notwithstanding the low inherent risk, the exits of the personnel and materials drift and conveyor drift have been designed to face north, away from the Hume Highway and private property to the east and northeast, so that any potential over-pressure shock wave would be directed away from publicly accessible areas under the extreme worst-case scenario.

The nearest drift exit will be over 800 m from hydrocarbon storage areas in the surface infrastructure area and approximately 300 m north of, and facing away from, the explosives magazine. Therefore, the shock wave from an uncontrolled underground explosion, should one make it to the surface, will not consequently initiate an explosion in other areas of the project.

Therefore, the presence of coal dust in the underground workings does not qualify the project as potentially hazardous or offensive development.

The risk of a coal dust explosion related to handling of coal in the CPP is very unlikely as there is no source of air blast to lift the coal dust into the air. Furthermore modern, well maintained CPPs have limited opportunities for coal dust generation, and are regularly cleaned. Therefore, handling of coal will not qualify the project as a potentially hazardous or offensive development.

2.7 Transport

Table 2 of DoP (2011b) provides transport screening thresholds to determine if transportation of hazardous goods will qualify the project as hazardous development. These thresholds are compared to quantities proposed to be transported to the project in Table 2.1.

It is demonstrated in Table 2.1 that transportation of hazardous goods associated with the project will not qualify the project as a hazardous or offensive industry as annual truck movements and quantities of dangerous goods to be transported are well below the relevant thresholds.

Table 2.1 Transport screening thresholds

Substance	Dangerous good class	Annual truck movements	Quantity per load	Annual SEPP 33 threshold truck movements	SEPP 33 threshold minimum quantity (bulk)
Chlorine	2.3	12	200 L	>100	1 t
Acetylene	2.1	52	15 bottles, less than 2 t	>500	5 t (if in bottles rather than a bulk tank)
LPG	2.1	17	5 m^3	>500	2 t (if in a bulk tank)
Coal processing reagentss	3PGIII	12	0.5 t	>1000	10 t

Notes: *1.* Refrigerant gas is not included as Class 2.2 gases and therefore do not have safe transport thresholds.

2. Transport of radioactive material by contractors will be guided by *Australian Radiation Protection and Nuclear Safety Agency 2008 Code of practice for transport of radioactive material* and explosives will be transported in accordance with *Workplace Relations Minister's Council 2009 Australian code for the transport of explosives by road and rail third edition. Australian Government.*

2.8 Offensive development

SEPP 33 states that a potentially offensive industry is a development which, if it were to operate without employing any measures to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would emit a polluting discharge in a manner which would have a significant adverse impact in the locality or on the existing or likely future development on other land.

Without the implementation of management measures, the project will have potential to emit noise, dust and water pollution that would impact the locality and existing or future development of adjacent land.

The following sections consider these potential emissions and the measures that will be implemented to prevent the emissions or reduce their impacts.

2.8.1 Noise

The noise and vibration impact assessment report for the project is in Appendix I of the EIS, with the impacts and management measures summarised below.

Construction noise levels from the project during standard construction hours will exceed the noise affected noise management level (NML) at several assessment locations across the various construction stages. However the 'highly affected' noise limit of 75 dB will not be exceeded at any time, and therefore there will not be a significant impact. The NML is not a criterion; it is simply a trigger for when construction noise management is to be considered and implemented. Hume Coal will manage construction noise levels where NMLs are exceeded.

The operational noise assessment identified that during adverse weather conditions and with all feasible and reasonable mitigation applied:

- eight assessment locations (nine dwellings) within the area modelled are predicted to experience residual noise levels between 3 to 5 dB above project specific noise levels (PSNLs) and are therefore entitled to voluntary mitigation upon request; and

- two assessment locations within the area modelled are predicted to experience residual noise levels greater than 5 dB above PSNLs and are therefore entitled to voluntary acquisition upon request.

Alternatively, Hume Coal proposes to enter into amenity agreements with these landholders.

The sleep disturbance assessment concluded that the predicted internal noise levels at the assessment locations will be well below those likely to cause awakenings.

A noise management plan will be prepared for the project, with contents described in the noise and vibration impact assessment report.

2.8.2 Air quality

The air quality assessment report for the project is in Appendix K of the EIS, with the impacts and management measures summarised below.

The results of the dispersion modelling conducted for the construction and operational phases of the project highlight the following:

- predicted concentrations and deposition rates of particulate matter, diesel combustion and odour air pollutants related to the project-only are well below applicable air quality impact assessment criteria, and minor relative to existing ambient background conditions;

- the construction phase of the project will generate higher impacts in the immediate surrounding environment relative to the operational project due to a greater proportion of surface based material handling, and truck transportation;

- when project incremental concentrations are combined with concentrations from neighbouring emission sources, the combined concentrations are well below applicable impact assessment criteria; and

- analysis of cumulative impacts, accounting for the combination of project and neighbouring emission sources with ambient background levels, highlights that exceedance of applicable NSW EPA impact assessment criteria would be unlikely to occur as a result of the project, beyond those that would occur in the absence of the project (ie days influenced by bushfires, dust storms, etc).

The project will not have a significant impact on air quality. Notwithstanding, an air quality management plan will be prepared for the project, with management measures described in the air quality impact assessment report.

2.8.3 Water quality

The water impact assessment report (water assessment) for the project is in Appendix E of the EIS, with surface water quality impacts and management measures summarised below.

As the project will be in the Sydney drinking water catchment the project must display a neutral or beneficial effect (NorBE) to water quality under State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011. The NorBE criteria require that annual pollutant loads must be 10% less than the pre-development case for total suspended solids (TSS), total phosphorus (TP) and total nitrogen (TN). Even though other pollutants do not have NorBE criteria, the requirement that annual pollutant loads must be 10% less than the pre-development case was applied to other pollutants that could be emitted by the project, comprising major ions (calcium, chloride, magnesium, sodium and sulphate); dissolved metals (aluminium, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver and zinc); and physical parameters (electrical conductivity, pH, total dissolved solids).

Construction and rehabilitation phase impacts of the project on surface water quality are expected to be neutral by implementing best practice erosion and sediment control management measures in accordance with relevant legislation and guidelines. The mine water management system has been designed so that no coal contact water is directly released to the receiving environment.

The project activities that have the potential to impact on surface water quality during operation are as follows:

- Releases from non-coal contact sediment basins SB03 and SB04 to Oldbury Creek following pumping of the first flush (the first flow of runoff into a dam during rainfall) to the primary water dam (PWD) for reuse.
- Runoff from mine access roads that drain into the Medway Rivulet catchment.
- The interception of natural baseflow groundwater due to underground mining which may change the loading and concentration of some water quality parameters in the surface waters.

The modelling demonstrates that the release of water from SB03 and SB04 to Oldbury Creek will meet the NorBE criteria for TSS, TP and TN compared to the existing agricultural catchment for these contaminants.

The modelling also demonstrates that other contaminants will reduce by over 10% compared to the base case (existing discharges from agricultural activities). Water quality discharge limits will be set for the other contaminants and there will be routine and in-line monitoring of water quality in releases from SB03 and SB04 to check that the water in the basins complies with the discharge limits.

For SB03, SB04 and the WTP (if required), the water quality discharge limits will be developed to protect the environmental values in the Hawkesbury-Nepean Basin and to achieve a NorBE on water quality.

The modelling also demonstrated that swales and/or small sediment basins can be used to provide an effective treatment system for the runoff from the access roads to meet the NorBE criteria.

Assessment of the impact of intercepted baseflow was based on a comparison of contaminant concentrations in groundwater and surface water from the monitoring results. The results indicate that there is potential for an increase in aluminium concentrations in surface water due to a reduction in groundwater baseflow to streams; however, comparison to guideline values for aquatic ecosystems, drinking water, irrigation or livestock suggest changes in surface water aluminium concentrations are unlikely to affect the beneficial use of surface water in the project area for irrigation or livestock.

With regard to the requirements of the NSW Aquifer Interference Policy in relation to groundwater quality, it is not anticipated that the project will result in a lowering of the beneficial use category of the groundwater source beyond 40 m from the activity, provided the mitigation measures in the Water Impact Assessment Report (Appendix E of the EIS) are implemented. Therefore, the project will not result in offensive discharges to groundwater users.

2.8.4 Summary of potentially offensive development

The above sections demonstrate that, even though the project could result in offensive emissions, these emissions can be prevented or reduced to acceptable levels with the implementation of management measures.

DoP (2011b) states that compliance with NSW Environment Protection Authority requirements should be sufficient to demonstrate that a proposal is not an offensive industry. The project will be required to apply for an environment protection license from the EPA as it is a scheduled activity (mining for coal) under Schedule 1 of the NSW *Protection of the Environment Operations Act 1997*. Therefore, if the EPA deems that a license can be granted, which is likely given that potential impacts of the project can be prevented or suitably managed, the project will not be offensive industry.

2.9 Will the project be hazardous or offensive?

It is stated on Page 18 of DoP (2011b) that if the screening thresholds are exceeded, the proposed development should be considered potentially hazardous and SEPP 33 will apply. The above preliminary screening of potentially hazardous substances is summarised in Table 2.2, which demonstrates that the screening thresholds will not be exceeded and the project does not qualify as potentially hazardous industry. Therefore, SEPP 33 does not apply to the project and a preliminary hazard assessment is not required.

The storage and use of hazardous materials will be undertaken in accordance with the following Australian Standards:

- *Australian Standard 1940:2004 The Storage and Handling of Flammable and Combustible Liquids*;
- *Australian Standard 1596:2008 The Storage and Handling of LP Gas;* and
- *Australian Standard 2187:1998 Explosives – Storage, Transport and Use – Storage.*

Section 2.8 demonstrates that emissions from the project will be prevented or reduced to acceptable levels with the implementation of management measures. Further, Hume Coal will apply for an environment protection license from the EPA for the project. Therefore, the project does not qualify as potentially offensive industry and a preliminary hazard assessment is not required.

Table 2.1 Summary of hazardous substance preliminary screening

Substance	NTC (2014) class	On-site storage capacity	Storage location	Distance to boundary of Hume owned land	DoP (2011b) threshold	Potentially hazardous development?
Diesel	Not a hazardous substance under NTC (2014)	50,000 l	Fuel facility in surface infrastructure area	Approximately 800 m	N/A	No
Petrol	Class 3	Minor quantities - far less than the limiting quantity on Figure 8 of DoP (2011b)	Surface infrastructure area	Approximately 800 m	Potentially hazardous region is between 1 m and 140 m but the fuel will only be stored in jerry cans and fuel tanks of vehicle s and equipment	No
Oil, grease, degreaser	Class 3	6.4 t	Workshop and storage warehouse in surface infrastructure area	Approximately 800 m	Potentially hazardous region is between 1 m and 140 m	No
Paints, cleaning, coal processing substances	Paints and cleaning substances – Class 3, coal processing substances – not hazardous substances	Variable but far less than the limiting quantity on Figure 8 of DoP (2011b)	Workshop, storage warehouse and CPP in surface infrastructure area	Workshop and storage warehouse – Approximately 800 m, CPP not considered as coal processing substances not hazardous	Potentially hazardous region is between 1 m and 140 m	No
LPG and oxy acetylene	Class 2.1	LPG – 5 m^3, acetylene – 0.02 t	LPG – in tank near workshop in mine infrastructure area, oxy acetylene – near workshop in surface infrastructure area	Approximately 800 m	Potentially hazardous quantity is 16 m^3 and above for LPG and 15 m for 0.02 t acetylene	No
Explosives	Class 1.1	Maximum 5 t during construction and operations	Isolated explosives magazine approximately 1,100 m south of surface infrastructure area	Approximately 300 m	For 5 t of Class 1.1 explosives is approximately 240 m from boundary of Hume owned land	No
CoalScan	Class 7	Trace quantities in CoalScan equipment	Conveyors or in the washplant in the CPP	Approximately 780 m	Compliance with Australian codes	No – will be transported and stored in accordance with documents in Section 2.5 of this HRA

Transport

As shown in Table 2.1 the transportation of hazardous substances will not exceed threshold truck movements or quantities.

3 Risks from the project

This section identifies hazard scenarios for atypical but possible events (eg accidents) that could occur during the project's construction, operation and closure phases. It describes qualitative criteria for rating the consequences, likelihoods and risks of these scenarios. Risk ratings are compared to DP&I's (2011a) qualitative risk assessment criteria to determine if the project, in the presence of controls, would be acceptable from a public risk perspective.

3.1 Method

The elements of risk analysis described in AS/NZS ISO 31000:2009 have been used in this HRA. A risk workshop was conducted on 12 October 2015, which was attended by Greig Duncan (project director), Alex Pauza (Bachelor of Engineering (Mining)), Luke Edminson (Bachelor of Environmental Science), Nicole Armit (Bachelor of Engineering (Environmental)), Jarred Kramer (Bachelor of Engineering (Environmental)) and Mark Roberts (Bachelor of Environmental Science). The following tasks were undertaken during the workshop and subsequent discussions:

- the project was divided into a series of components (Section 3.2);
- hazards and incident types were identified for each component (Section 3.3);
- scenarios presenting a risk to individuals, society and/or the environment were identified (Section 3.5);
- potential controls were identified (Section 3.5);
- a consequence and likelihood rating was qualitatively determined for each scenario taking into account engineering and administrative controls that would be applied (Section 3.4); and
- the risk associated with each incident was determined by comparing the consequence and likelihood rating (Section 3.4).

3.2 Project components

The project was divided into the following components for hazard identification and assessment purposes (Figure 1.1 and Figure 1.2):

- public roads;
- mine area including drifts and upcast ventilation shaft;
- SIA;
- CPP; and
- water infrastructure (dams, pipelines, pump station).

3.3 Incident types

Incident types, sub-types and combinations of these that could occur at each component of the project were identified. They are as follows:

- leaks and/or spills;
- fire and/or explosion;
- safety loss (eg accidents, collisions and dust plume);
- security breach (eg theft and unauthorised entry);
- property damage;
- groundwater contamination; and
- impacts to native wildlife.

3.4 Risk criteria

Qualitative ratings were assigned to the potential consequences of incidents to individuals, society and/or the environment (Table 3.1) and to the likelihood of these incidents occurring (Table 3.2). The likelihood and consequence ratings were combined to determine the risk rating (Table 3.3).

Table 3.1 Qualitative measures of consequence

Descriptor	Potential consequences to individuals	Potential consequences to the environment and society
1	Minor injury or short-term health effect (eg requiring first aid).	Limited low significance 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.
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	Total permanent 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.

Table 3.1 Qualitative measures of consequence

Descriptor	Potential consequences to individuals	Potential consequences to the environment and society
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 3.2 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

Table 3.3 Risk rating

	Likelihood[2]				
Consequence[1]	A	B	C	D	E
5	LEVEL 2				LEVEL 1
4					
3					
2					
1	LEVEL 3				

Notes: 1. Consequences from Table 3.1.

2. Likelihood levels from Table 3.2.

3.5 Results

The results of the preliminary hazard identification and risk assessment for the project are in Table 3.4.

Table 3.4 Hazard identification and risk assessment

ID	Project component	Incident type	Scenario	Proposed controls	Consequence	Likelihood	Risk rating
1	Public roads	Leak/spill	Delivery vehicle roll-over, collision, poor maintenance and/or operator error results in a spill of fuels, hydrocarbons, chemicals and dangerous goods leading to property damage, injury or environmental harm.	Management measures in traffic assessment to be implemented, 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, hazardous material manifest/material safety data sheet, emergency agency response.	5	B	2
2		Leak/spill	Delivery vehicle roll-over, collision, poor maintenance and/or operator error results in the discharge of radioactive material (radiation sources limited to that required for certain detectors and equipment, and such materials will contain minor quantities of radioactive material and will be encapsulated in resin) leading to injury.	As for Item 1 and contractor compliance with NSW Radiation Control Regulation 2003, radiation licence, devices contain minor quantities of radioactive material that are encapsulated in resin.	4	C	2
3		Fire/explosion	Delivery vehicle accident, poor maintenance and/or operator error results in fire or explosion (note low grade explosives used and only delivered a few times a year).	As for Item 1 and use of licensed contractors, transport of explosives in accordance with NSW *Explosives Act 2003,* NSW Explosives Regulation 2013*, AS 2187.1-1998 Explosives – Storage, transport and use, and Australian Code for the Transport of Explosives by Road and Rail.*	5	B	2
4		Fire/explosion	Delivery vehicle roll-over, collision, poor maintenance and/or operator error results in fire or explosion which leads to a bushfire.	As for Item 1 and Item 3.	5	B	2
5		Safety	Dust plume results in reduced visibility on public roads (note – RMS requirement to assess this).	Underground mine which will not result in a dust plume, minimal disturbance area, sprays on coal stockpiles, internal transport roads will be sealed, coal wagons will be covered, sufficient buffer between working areas and public roads, appropriate coal stockpile control measures (eg potential veneering).	4	A	3

Table 3.4 Hazard identification and risk assessment

ID	Project component	Incident type	Scenario	Proposed controls	Consequence	Likelihood	Risk rating
6		Safety	Collisions and accidents on public roads results from fatigued employees travelling to or from mine during construction.	Provision of accommodation for construction workforce on-site, fatigue management policy.	5	B	2
7		Safety	Collisions and accidents on public roads results from fatigued employees travelling to or from mine during operational phase.	All operational employees must live within 45 minutes of the mine, fatigue management policy.	5	B	2
8		Safety	Overloaded, uncovered or poorly placed loads in vehicles results in dust and debris on public roads which could lead to an accident.	As for item 1 and cover loads, follow vehicle's maximum loading specifications, use of suitable tie down straps, wetting down of any loaded materials susceptible to lift off.	4	B	2
9		Safety	Intoxicated and drug impaired workers driving on public roads results in collisions and accidents.	Provision of accommodation on-site for construction workforce, drug and alcohol policy (minimum random testing), workforce education and enforcement, fit-for-work standard, contractor and employee inductions, 'order 41' medical.	5	B	2
10	Underground mine	Safety	Underground mining results in subsidence which destabilises public infrastructure and buildings, cliff-lines, natural features and culturally significant sites.	Negligible subsidence impacts due to low impact (non-caving) mining method (first workings only), extraction under the Hume Highway is limited to roadways (tunnels) for access only. Limited public infrastructure within underground mining footprint. Houses and items of local and state significance will not be undermined.	1	B	3
11		Explosion	Underground mining results in explosion exiting drift portals with potential to damage public infrastructure and property.	Drifts have been specifically designed so that an explosion would not be towards residences to the east along with an incline angle of 60 degrees.	3	B	3
12		Property damage	Ground vibration from mining activities results in property damage.	Drifts located only on Hume owned property (shallowest workings), limited use of explosives, size of each blast will be small (in the order of less than 100 kg), depth to workings is a minimum of 70 m reducing risk of off-site vibration impacts, recommendations of vibration assessment will be implemented, no web panels beneath Hume Highway.	1	A	3

Table 3.4 Hazard identification and risk assessment

ID	Project component	Incident type	Scenario	Proposed controls	Consequence	Likelihood	Risk rating
13		Groundwater contamination	Alteration of geochemistry, and/or introduction of contaminants as a result of an underground spill result in contamination of bores used by the public.	Environmental management plan, incident response plan, treatment of reject prior to re-emplacement underground, panels will be sealed and filled with water and will become anoxic, groundwater will be routinely monitored, hydrocarbons stored underground will be in small quantities and in bunded areas in accordance with relevant Australian Standards, following cessation of mining any equipment containing hydrocarbons will be removed from the mine.	3	B	3
14	SIA/CPP, including roads	Leak/spill	Vehicle roll-over, collision, poor maintenance and/or operator error results in spills or leaks close to sensitive environmental area eg creek.	As for Item 2, incident response procedure, SIA and CPP precincts are designed to be 'nil discharge' areas through the use of bunding, diversions etc., roads designed to appropriate standards, speed limits.	3	B	3
15		Fire/explosion	On-site fire or explosion results in bushfire.	Storage of explosives in accordance with NSW *Explosives Act 2003*, NSW Explosives Regulation 2013, *AS 2187.1-1998 Explosives – Storage, transport and use, Australian Code for the Transport of Explosives by Road and Rail*, emergency management and response plans/training/equipment, emergency agency response, minimal explosives to be stored on-site, explosives magazine will be fully bunded to contain any explosive force and surrounded by an asset protection zone (APZ), any hot work on-site will require a hot work permit, firefighting system throughout the mine infrastructure area and CPP (Wongawilli Seam has a low propensity for spontaneous combustion), fire officer, trained brigades, fire substation on-site, fire extinguishers on all mobile plant and equipment, welding management plan, fire suppression on electrical switch rooms, maintenance of vegetation (mowing of grass immediately around infrastructure areas), creation of asset protection zones.	5	B	2
16		Security breach (eg theft, unauthorised entry)	Public mistakenly entering the mine via new mine access resulting in public injury.	Clear marking of site boundaries and delineation of entry point, controlled entry point, CCTV, sign in/out procedure, fencing, gated entry points.	2	A	3

Table 3.4 Hazard identification and risk assessment

ID	Project component	Incident type	Scenario	Proposed controls	Consequence	Likelihood	Risk rating
17		Entry of persons with right of access	Other stakeholders with right of entry (eg Council, farm contractors) sustain injury due to changed right of access arrangements or presence of construction equipment.	Communication procedure, traffic controls and barricades, warning signs.	3	B	3
18		Security breach (eg theft, unauthorised entry)	Unauthorised entry to mine area by people not associated with the mine results in injury (eg electrocution, drowning, accident from mobile equipment).	Clear marking of site boundaries and fencing of working areas, surrounded by privately owned farming land, emergency management and response plans/training/equipment, emergency agency response, after hours security patrols, clear notification of penalties for trespassing, lock up of built structures.	5	B	3
19		Fire/explosion	On-site fire or bushfire ignites coal stockpiles resulting in noxious emissions off-site.	Fire suppression system, sufficient buffer between vegetated areas/flammable materials storages and coal stockpiles (coal is relatively non-combustible in a non-pulverised form), wetting of coal during hot and dry weather.	1	A	3
20		Leak/spill	Rupture, poor maintenance or operator error at a tank results in leak or spill of fuels, hydrocarbons or dangerous goods leading to property damage, injury or environmental harm.	Appropriate siting of tanks away from waterways, storage of all fuels, hydrocarbons and dangerous goods in accordance with relevant Australian Standards, appropriate containment structures ie bunding to Australian Standards, safe work methods, emergency management and response plans/training/equipment, environmental management plan, hazardous material manifest/material safety data sheet, operator training, spill response equipment and training, appropriate leak detection measures on buried diesel pipes.	1	B	3
21		Leak/spill	Pollution from sewage spill at amenities block results in health and environmental impacts.	Design of amenities in accordance with *AS/NZS 3500.2:2015 – Plumbing and drainage – Sanitary plumbing and drainage*, location of amenities away from sensitive receivers where practical, appropriate containment structures ie bunding, good on-site drainage design, appropriate maintenance of amenities, safe work methods, use of licensed contractors (Australian Standards and NSW legislation), emergency management and response plans/training/equipment, environmental management plan, operator training, spill response equipment and training, contractor incident investigation.	2	C	3

Table 3.4 Hazard identification and risk assessment

ID	Project component	Incident type	Scenario	Proposed controls	Consequence	Likelihood	Risk rating
22		Leak/spill	Unplanned off-site discharge of coal or coal wash.	Location of coal handling facilities away from sensitive receivers where practical, good on-site drainage design, appropriate maintenance of coal handling facilities, appropriate containment structures ie bunding, emergency management and response plans/training/equipment, environmental management plan, operator training, safe work methods, use of licensed contractors (Australian Standards and NSW legislation), spill response equipment and training, contractor incident investigation.	2	C	3
23		Fire/explosion	Vehicle roll-over, collision, poor maintenance or operator error in infrastructure area results in fire or explosion which leads to off-site fire, property damage or injury.	As for Item 3.	3	B	3
24		Fire/explosion	On-site fire or explosion results in bushfire.	As for Item 17.	5	B	2
25		Fire/explosion	Mishandling of explosives results in explosion leading to off-site property damage, injury or fire.	As for Item 17, separate transport and storage of detonators and explosives, safe work methods, use of licensed contractors (Australian Standards and NSW legislation), transport management plan, hazardous material manifest/material safety data sheet/substance evaluation form, operator training, spill response equipment and training, contractor incident investigation, emergency agency response.	5	B	2
26		Fire/explosion	Lightning strike, malicious act, poor maintenance or operator error at magazine results in explosion leading to off-site property damage, injury or fire.	Design of magazine in accordance with *AS/NZS 1768 2007 – Lightning Protection*, siting of magazine away from mine boundary and areas of vegetation, separate storage of detonators and explosives, appropriate maintenance of magazine and as for items 16 and 17.	5	A	3

Table 3.4 Hazard identification and risk assessment

ID	Project component	Incident type	Scenario	Proposed controls	Consequence	Likelihood	Risk rating
27		Security breach (eg theft or unauthorised access)	Theft and malicious use of explosives results in explosion leading to off-site property damage, injury or fire.	As for Item 17 and 18. CCTV, designated personnel with entry code to explosives magazine.	5	B	2
28		Security breach (eg theft or unauthorised access)	Theft and malicious use of materials, equipment, fuels, hydrocarbons, chemicals and dangerous goods results in explosion or fire leading to off-site property damage or injury.	As for Item 17 and 18.	5	B	2
29		Property damage	Livestock escaping and sustaining injury and/or loss.	Regular fence inspections by environmental team, gate etiquette included in employee inductions, cattle grids at gates.	1	B	3
30		Impacts to native wildlife	Native fauna injured or lost.	Regular fence inspections by environmental team, gate etiquette included in employee inductions, APZ reduce habitat near to infrastructure measures, call WIRES.	1	D	3
31		Impacts to native wildlife	Threatened native fauna injured or lost.	Regular fence inspections by environmental team, gate etiquette included in employee inductions, APZ reduce habitat near to infrastructure measures, call WIRES, pre-clearance surveys.	2	B	3
32	Water infrastructure (dams, pipelines, pump station, etc.)	Leaks/spills	Rupture, failure, poor maintenance, operator error or sabotage at water pipeline or pump results in property and environmental damage or injury, equipment failure.	Fencing of sensitive above ground pipeline areas, good drainage design, appropriate maintenance, environmental management plan, spill response equipment and training, operator training and as for Item 20, CCTV, regular inspections including ultrasound to identify weakness in structural integrity.	3	B	3
33		Leaks/spills	Groundwater or surface water contamination from temporary rejects storage.	Emergency management and response plans/training/equipment, environmental management plan, spill response equipment and training, emergency agency response, bunding of temporary rejects storage, monitoring of surface run-off containment areas during episodes of heavy and prolonged rain. Inspection of structural integrity of spill containment dams etc.	3	B	3

Table 3.4 Hazard identification and risk assessment

ID	Project component	Incident type	Scenario	Proposed controls	Consequence	Likelihood	Risk rating
34		Leaks/spills	Damage to property and environment from dam failure.	Dam design and maintenance in accordance with the Australian National Committee on Large Dams (ANCOLD) (2003) *Guidelines on Dams Safety Management*, emergency management and response plans/training/equipment, environmental management plan, spill response equipment and training, emergency agency response, inspection of structural integrity of spill containment dams etc.	4	B	2
35		Safety	Unauthorised entry to mine area by people not associated with the mine results in drowning.	As for Item 18, CCTV, fencing, security guards.	5	B	2
36		Leak/spill	Rupture, poor maintenance, operator error or sabotage at tank in train provisioning area results in leak or spill of fuels, hydrocarbons, chemicals and dangerous goods leading to property damage, injury or environmental harm.	As for Item 20 and 22.	3	B	3
37	Public infrastructure	Fire/explosion	Uncontrolled subsidence results in damage to Moomba to Sydney natural gas pipeline, which passes through the underground mining footprint, leading to rupture and explosion.	As described in Section 5, mining will comprise first workings only, which means there will be no caving of the roof strata as no wide/unsupported voids will be created. As noted in Table 5.1, gas pipelines have previously been successfully undermined with no loss of utility where maximum vertical subsidence values fall in the range of 760 mm to 1000 mm, however, the predicted maximum subsidence from the project is 20 mm.	4	A	3

Thirty seven scenarios were identified and these resulted in the following risks:

- 22 level 3 risks;
- 15 level 2 risks; and
- 0 level 1 risks.

The level 2 risks and the project components with which they were associated are as follows:

- eight were associated with transport (materials or workers) on public roads;
- five were associated with fires/explosions and security breach at the SIA/CPP; and
- two were associated with spills/leaks and unauthorised entry to water infrastructure.

The level two risks are discussed below.

3.6 Identified risks

3.6.1 Road transport

The road transport risks are generally consistent with the societal risks associated with road transport.

The risk of traffic accidents involving vehicle roll-overs and/or collisions resulting in injuries, spills, fire or explosion will be minimised through a range of administrative controls (including selection of appropriate contractors and transport management systems).

The risk of traffic accidents as a result of fatigue and/or impairment will be reduced during construction by the use of a construction accommodation village that will house the majority of the construction workforce in close proximity to the worksites. Administration controls will also be applied during construction and operations including the consideration of fatigue when designing the shift rosters; implementation of drug and alcohol testing programs; and the requirement for operations phase employees to live within 45 minutes of the mine.

Road transport risks are likely to remain level 2 risks following the implementation of all controls as a major injury and/or fatality would still be a potential consequence of these types of incidents.

3.6.2 Fire and explosions

The risks associated with fires and explosions in the SIA/CPP will be minimised by transporting, storing and using explosives in compliance with relevant legislation, codes of practice and Australian Standards. This includes appropriate construction of storage areas and provision of adequate buffers between storages and publicly accessible areas. Never the less, these risks are likely to remain level 2 risks as a fatality, major injury and/or major property damage is a potential consequence of fire or explosions.

3.6.3 Unauthorised entry to mine infrastructure area and water infrastructure

The risk resulting from unauthorised entry by people not associated with the mine, for example for theft and malicious use of combustibles, could result in major injury or death. Measures to control access to the mining and infrastructure areas will be devised during detailed design. The measures initially implemented will be re-assessed to reflect changes to the operation over time.

3.6.4 Dam failure

If the primary water dam fails the resulting release of water could damage property and the environment. Dam design and maintenance in accordance with ANCOLD (2003) will reduce the likelihood of a dam failure. However, the consequences of a dam failure will remain medium as the risk of an uncontrolled rush of water cannot be eliminated and can be destructive.

4 Hazard and risk criteria

4.1 Hazardous materials

This HRA has identified potential hazards and assessed risks to the public, external property and the environment. The comparison of proposed hazardous materials' quantities and storage locations with SEPP 33 criteria in Section 2 shows that the project will not be classified as a potentially hazardous or offensive industry.

DP&I (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 off-site risk will be located away from publicly accessible areas and environmental features, such as waterways, so that there is 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.

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 SIA and CPP 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.

New developments and extensions to existing developments are proposed on land adjacent to the project. Adjacent proposals with assessments of risks and hazards in their statements of environmental effects or environmental impact statements are summarised below.

- DP&E's Major Project Assessments website
    - New Berrima Shale/Clay Quarry – a preliminary screening against the thresholds in *Applying SEPP 33 2nd Edition* determined that the proposal will not be potentially hazardous or offensive development (R.W. Corkery & Co 2010).
    - Berrima Cement Works – the preliminary hazard assessment attached the most recent application determined that the proposal will not be potentially hazardous or offensive development (SLR 2015).
    - Sutton Forest Quarry – only documentation supporting an application for Director-General's requirements submitted at this stage, which predicts the proposal will not be potentially hazardous or offensive development.

- Wingecarribee Shire Council DA tracker (1/01/2010 to 25/10/2016):
    - Installation of a liquefied natural gas facility (at Sallys Corner Road/Hume Highway intersection, Sutton Forest) – in Sutton Forest but not adjacent to project area.

Given the above, it is unlikely that adjacent developments will contribute to risks at the project, nor the project contribute to risks at neighbouring developments.

4.2 Risks associated with the project

Overall Risks from the project are low. However, there are some elevated risks associated with road use; injury from entry to the project area of people not associated with the project; and fires and explosions. The project has been designed to minimise the occurrence of these risks and/or their consequences. These risks will be further examined as part of detailed project design and re-assessed in an ongoing hazard assessment process to ensure that risks are kept as low as reasonably and practically possible.

Risks from the project are compared to the DP&I (2011a) criteria below:

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

No level 1 risks have been identified and 16 level 2 risks have been identified. Proposed control plans are in Table 3.4. Detailed project design work will investigate controls to further reduce level 2 risks. This will include investigating alternative locations and technologies.

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.

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. Exceptions include the potential for bushfire which is assessed in the *Hume Coal Project Bushfire Assessment* (EMM 2017) and risks associated with road transport which are by definition off-site risks. These risks will be minimised to be as low as reasonably possible via a range of engineering and administrative controls.

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

Refer to Section 4.1; adjacent existing developments and proposed developments are not potentially hazardous or offensive. Therefore, incidents with potential to have impacts on adjacent projects, for example the Hume Coal Project, are unlikely to occur at these developments.

5 Subsidence risks

Subsidence impacts are described in detail in Appendix L, with impacts summarised below to demonstrate that subsidence presents a low risk to people, property and the environment.

A first workings mining method has been adopted for the project as it offers the maximum level of protection to both the overlying Hawkesbury Sandstone and to surface features. As no secondary extraction will be undertaken, no caving of the roof strata due to the formation of wide unsupported voids will occur.

The subsidence assessment concluded that surface lowering is likely to develop relatively uniformly across the underground mining area at the very low level of up to 20 mm. The drivers for significant surface subsidence due to groundwater depressurisation are not generally present such that any associated movements are likely to be very small.

The very low -worst case predictions for vertical subsidence: maximum tilt, curvature and horizontal strain associated with the project' the prevention of potential secondary curvature effects, and the compressive horizontal stresses within the near-seam overburden being almost fully maintained via the proposed mine design are all significant mitigating factors in relation to surface damage potential. Surface lowering is likely to develop relatively uniformly across the underground mining area at the very low level of up to 20 mm. 20 mm is the generally accepted limit below which subsidence will have a negligible or imperceptible impact on surface features.

Findings relative to man-made and natural surface features are summarised in Table 5.1.

Table 5.1 Summary of subsidence impacts

Feature	Description	Impact
Man-made		
Buildings	The maximum predicted tilt for the project is 0.26 mm/m, which is less than the tilt (5 mm/m) above which remedial work may be required on buildings.	Negligible
Roads	The mine plan for the project has specifically taken into account the presence of the Hume Highway transecting the project area, with the extent of mine workings under the highway limited to intermittent crossings to provide first working access headings. There is local evidence of roads and highways being successfully undermined with no significant impact and at significantly higher vertical settlement, tilt and horizontal strain values than those predicted for this project.	Negligible
Bridges	A number of bridges and culverts are present in the wider project area and subsidence levels due to mining have been predicted to be negligible (ie less than 20 mm of surface lowering).	No impacts
Transmission towers	The most significant features are the 130 kV and 330 kV transmission lines in the southern portion of A349, which are well outside of the underground mining area. Problematic subsidence impacts relative to transmission lines, which include power pole instability and cable issues, commence at tilt levels in the order of 20 mm/m, however, the maximum predicted tilt for the project is 0.26 mm/m.	No impacts

Table 5.1 Summary of subsidence impacts

Feature	Description	Impact
Gas pipelines	The Moomba to Sydney natural gas pipeline passes through the underground mining footprint. Gas pipelines have previously been successfully undermined with no loss of utility where maximum vertical subsidence values fall in the range of 760 mm to 1000 mm, however, the predicted maximum subsidence from the project is 20 mm.	No impacts
Water pipelines, telecommunication cables and optical fibre cables	There is local and regional water supply infrastructure in the project area including the Highlands water source pipeline, however, this pipeline is outside the proposed mining area. Evidence shows that the predicted maximum values of maximum vertical subsidence, tilt and horizontal strain for this project will not give rise to mining subsidence that has the potential to damage, or impede the utility of, any of this infrastructure.	No impacts
Wire fences	Fences are tolerant of tilts up to 10 mm/m and strains to 5 mm/m without significant impacts occurring, however, the maximum predicted tilt for the project is 0.26 mm/m.	No impacts
Vineyards	There are two small vineyards in the project area. There are many examples of vineyards occurring above long wall mining operations in Australia, which have far greater subsidence impacts than those predicted for the project.	Negligible
Aboriginal items	Aboriginal items above the mining areas are unlikely to be impacted by subsidence given the predicted negligible to imperceptible levels of subsidence.	No impacts
Historic items	All know historic features are outside the mining area.	No impacts
Natural		
Cliffs	The types of cliffs and steep rock exposures identified within the project area do not conform to any of the characteristics of cliff lines requiring protection from pillar or longwall extraction (ie greater than 50 m high, overhanging and may have Aboriginal significance, or contain hanging swamps).	Negligible
Flora and fauna	Given that subsidence from the project will be negligible to imperceptible, subsidence impacts on vegetation such as shearing of roots and local ponding will not occur.	No impacts
Water resources	Given that subsidence from the project will be negligible to imperceptible, subsidence impacts on surface water features such as realignment of drainage lines, bed scouring and cracking of stream beds will not occur.	No impacts

As shown in Table 5.1, the predicted negligible to imperceptible subsidence is likely to have no impacts or only negligible impacts to man-made and natural features. Therefore, subsequent impacts to people, for example from subsidence impacts to roads resulting in dangerous driving conditions, will be negligible.

6 Bushfire risks

6.1 Overview

The SEARs require bushfire risks to be assessed. The only project components on bushfire prone land according to the Wingecarribee bushfire prone land map are the far western section of the stockpile pad and water dam of the CPP. These will be within the 100 m vegetation buffer surrounding Vegetation Category 1 on the map and are either not susceptible to fire (earthworks structure) or will be in a cleared area with ample access for fire fighting vehicles and personnel evacuation. No CPP, surface infrastructure area or accommodation village structures will be on bushfire prone land.

As no structures which can accommodate people are on bushfire prone land, a bushfire hazard assessment in accordance with the NSW Rural Fire Service (RFS) and Department of Planning's (2006), *Planning for Bush Fire Protection – A Guide for Councils, Planners, Fire Authorities and Developers,* is not needed.

The upcast vent shaft in the Belanglo State Forest will be surrounded by vegetation. The shaft will be designed to be able to be isolated from the underground workings if there is a bushfire in the area.

6.1.1 Environmental management

As with all rural settings, there is a risk that bushfires could occur in the area. As such, there is a risk that a bushfire could damage project infrastructure. The potential for project-related activities to ignite a bushfire also needs to be considered. A bushfire management plan will be prepared that will contain measures to minimise the risk of bushfire damaging the project or the project initiating a bushfire.

A fire or explosion in the mine infrastructure area or CPP could initiate a bushfire. The risk of this occurring will be reduced by implementation of the following measures:

- vehicle refuelling will be confined to designated refuelling bays (there will not be any vegetation in these areas), especially when the fire danger rating is 'very high' or above;
- fire extinguishers will be provided in buildings, vehicles and refuelling areas;
- there will be no smoking permitted on site during construction and operations;
- spill response kits will be available should there be a spill of flammable substances.

In addition, the severity of fires will be reduced by implementing the following:

- a bushfire management plan will be prepared and implemented as part of the mine's operating procedures;
- risk reduction, such as slashing, will be undertaken where appropriate, such as along fence-lines; and
- the RFS will be contacted if there is a fire.

The project will be in the Southern Highlands RFS district, with the nearest brigades being at Berrima and Moss Vale. Hume Coal will participate with RFS in bushfire risk assessments for the area surrounding the project if requested.

7 Conclusion

7.1 Hazardous materials

Hazardous materials that will be used on-site were identified along with the quantity and the locations where they will be stored. Potential emissions from the project were considered to determine if the project will be potentially offensive industry. This information was compared to SEPP 33 criteria to determine if the project is classified as a hazardous or offensive development. This comparison showed that the project will not be a hazardous or offensive development. Therefore, SEPP 33 does not apply to the proposal and a preliminary hazard assessment is not required.

7.2 Risks

Risks have been determined in accordance with the *Australian/New Zealand Standard International Organisation for Standardisation 31000:2009 Risk Management – Principles and Guidelines*.

Hazards associated with scenarios based on atypical but possible events (eg accidents) were identified. The risks from these scenarios in the presence of engineering and administrative controls were determined.

Comparison of the risks to the DP&I (2011a) risk criteria shows that the project generally represents a low risk. However, where there are elevated risks associated with parts of the project, these risks will be managed to achieve acceptable outcomes through the application of engineering and administrative controls. Further specific and more detailed risk assessments will be conducted during the project design and construction phases to ensure the level of risk identified in this HRA is maintained throughout the life of the project.

References

Australian National Committee on Large Dams (ANCOLD) (2003) *Guidelines on dam safety management*.

Department of Planning and Environment (DP&E) (2015) (accessed 16/02/2016). *Major Hazards Planning*. New South Wales Government. http://www.planning.nsw.gov.au/Policy-and-Legislation/Hazards/Industrial-Hazards.

Department of Planning and Infrastructure (DP&I) (2011a) *Hazardous Industry Planning Advisory Paper No 4: Risk Criteria for Land Use Safety Planning*. New South Wales Government.

Department of Planning and Infrastructure (DP&I) (2011b) *Hazardous and Offensive Development Application Guidelines: Applying SEPP 33*. New South Wales Government.

Department of Primary Industries (DPI) (2001) *Guideline for coal dust explosion prevention and suppression.* New South Wales Government.

EMM Consulting (EMM) (2017) *Hume Coal Project Bushfire Assessment*. Report prepared for Hume Coal Pty Limited.

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

Roads and Traffic Authority (RTA) (2002) *NSW Road Design Guideline*. New South Wales Government.

R.W. Corkery & Co Pty Limited (2010) *Environmental assessment for the New Berrima Clay/Shale Quarry*. Report prepared for Austral Bricks Pty Limited.

R.W. Corkery & Co Pty Limited (2013) *Sutton Forest Quarry: documentation supporting an application for Director-General's requirements*. Report prepared for Sutton Forest Quarries Pty Limited.

SLR Consulting Australia Pty Limited (SLR) (2015) *Preliminary Risk Screening*. Report prepared for Boral Cement Limited.

Standards Australia (2009) *Australian/New Zealand Standard International Organisation for Standardisation 31000:2009 Risk Management – Principles and Guidelines.*

Work Cover NSW (2008) *Health and Safety notes: Hierarchy of Hazard Controls*. New South Wales Government.

Work Cover NSW (2011) *How to manage work health and safety risks – code of practice*. NSW Government and Safe Work Australia.

SYDNEY
Ground floor, Suite 01, 20 Chandos Street
St Leonards, New South Wales, 2065
T 02 9493 9500 F 02 9493 9599

NEWCASTLE
Level 1, Suite 6, 146 Hunter Street
Newcastle, New South Wales, 2300
T 02 4907 4800 F 02 4907 4899

BRISBANE
Level 4, Suite 01, 87 Wickham Terrace
Spring Hill, Queensland, 4000
T 07 3839 1800 F 07 3839 1866