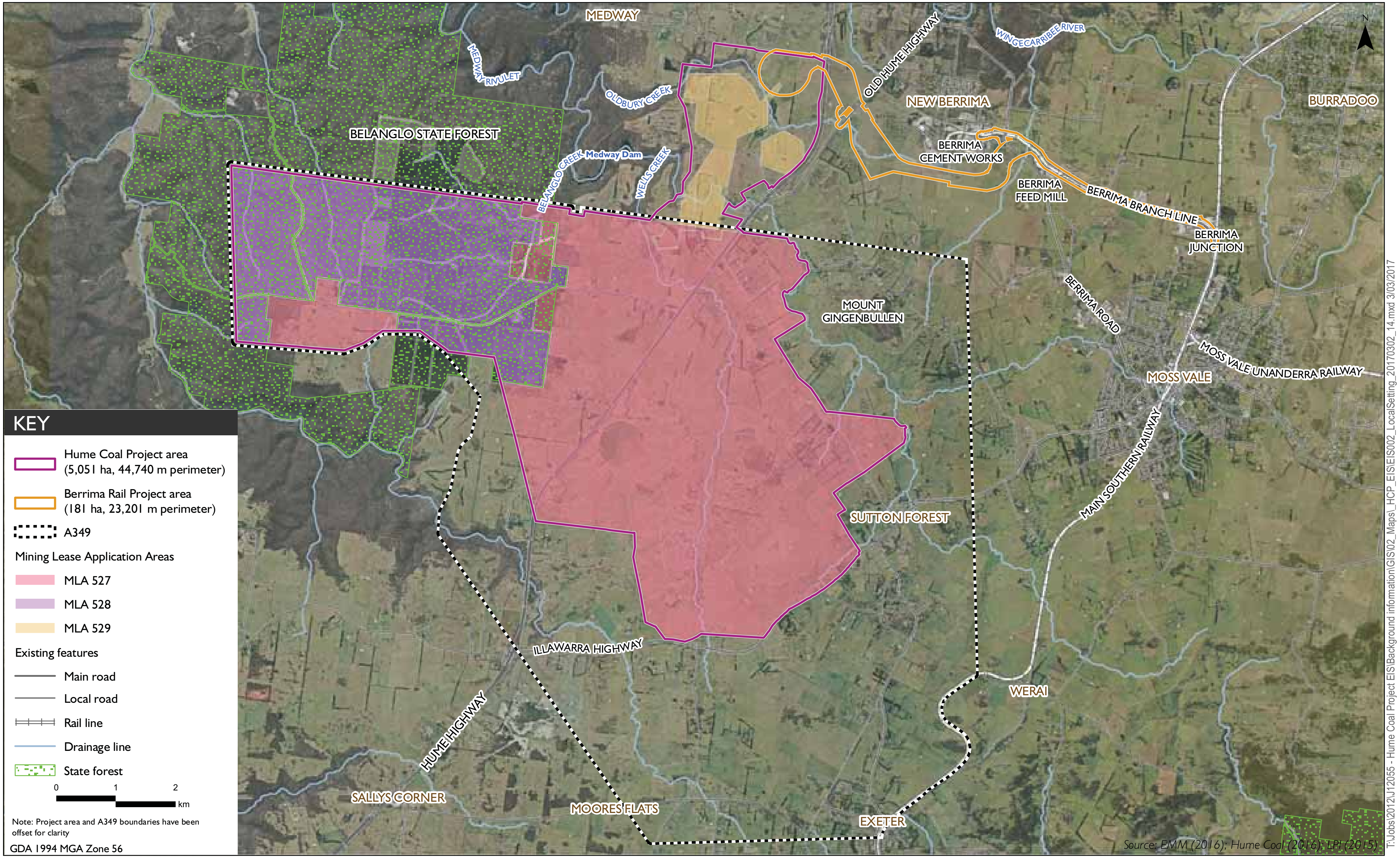



**Local context**

Hume Coal Project
Environmental Impact Statement
Figure 1.2

## 1.2 Project overview

A full project description is provided in Chapter 2. In summary the project involves:

- Ongoing resource definition activities, along with geotechnical and engineering testing and other fieldwork to facilitate detailed design.
- Establishment of temporary construction offices and 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. Coal extraction will commence during the second year of construction following excavation of the drifts, 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 temporary 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 or upgrade of minor internal roads.
- Relocation of some existing utilities.
- 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.

Product coal produced by the Hume Coal Project will be transported by rail via a new rail spur and loop, primarily to Port Kembla terminal for shipment to the international market, and possibly to domestic customers depending on market demand. Rail works, including construction and use of the new rail loop and rail line, form a separate development application (the Berrima Rail Project), as discussed further in Section 1.5.

The Berrima Rail Project is described in detail in the Environmental Impact Statement (EIS) accompanying that application, which is attached as Appendix D to this EIS.

## 1.3 Project objectives

The project seeks to meet three main objectives:

1. optimise the recovery of coal in the project area. The coal resource is a publicly owned asset held by the NSW Government and therefore optimising its recovery is in the public interest;

2. protect valuable environmental and social features of the locality from damage; and

3. the local community as the host of the project should benefit in tangible ways from its construction and operation.

## 1.4 Purpose of this document

The project is State significant development (SSD) pursuant to Schedule 1 of the *State Environmental Planning Policy (State and Regional Development) 2011* (State and Regional Development SEPP). Accordingly, approval is required under Part 4, Division 4.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) for the mine and associated facilities. This EIS has been prepared by EMM Consulting Pty Limited (EMM) on behalf of Hume Coal to support the SSD application for development consent under Section 78A (8A) of the EP&A Act for the project. It has been prepared to the form and content requirements set out in Clauses 6 and 7 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation). The schedule of lands to which this EIS applies is provided in Appendix A.

The primary objective of this EIS is to inform government authorities and other stakeholders about the project and the measures that will be implemented to mitigate, manage and/or monitor potential impacts, together with a description of the remaining social, economic and environmental impacts. It addresses the specific requirements provided in the Secretary's environmental assessment requirements (SEARs) issued by the NSW Department of Planning and Environment (DP&E) on 20 August 2015. The SEARs are provided in Appendix B along with a table identifying where each requirement has been addressed in the EIS. The EIS has also been prepared with input from a number of technical specialists. The EIS study team is provided in Appendix C.

This EIS also supports an application to the Commonwealth Department of the Environment and Energy (DoEE), as the project was declared a controlled action requiring assessment and approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Supplementary environmental assessment requirements were subsequently issued on 18 January 2016 with the DoEE's requirements. The project will be assessed under the bilateral agreement between the Commonwealth and NSW governments in accordance with Part 5 of the EPBC Act.

## 1.5 Other approvals required under the EP&A Act

Three separate approvals will be required under the EP&A Act for the Hume Coal mine to operate. Hume Coal is therefore seeking:

- development consent for the mine and associated facilities (the project the subject of this EIS) under Part 4, Division 4.1 of the EP&A Act;
- development consent for the construction and use of a new rail spur and loop (the Berrima Rail Project) under Part 4, Division 4.1 of the EP&A Act; and
- an activity approval for proposed electricity supply works under Part 5 of the EP&A Act.

Therefore, in addition to the application for the Hume Coal Project, separate applications will be made by Hume Coal under Part 4 of the EP&A Act for the rail works, which are broadly described in Section 2.9, and under Part 5 of the EP&A Act for the electricity supply works, which are broadly described in Section 2.12.

All three projects are inextricably linked, in that one will not be developed without the other two. Approval for the three projects is being sought separately and in parallel, and construction will occur concurrently.

In the initial stages of mine construction, while the upgrade is occurring to the existing powerline and the new powerline is being constructed, power will be supplied to the site via the existing 11 kV powerline and/or by diesel generators. The electricity supply works for which approval is being sought under Part 5 will be completed prior to commencement of the operational phase of the mine. Similary, the rail infrastructure will be constructed in conjunction with construction of the mine, so that the rail loop and spur is ready for use upon the commencement of mine operations.

Separate development consent is being sought for the Hume Coal Project and the Berrima Rail Project because the rail infrastructure will be used by others in addition to Hume Coal. The Berrima Branch Line, to which the Hume Coal rail line will be connected as part of the Berrima Rail Project, is owned by Boral Cement Ltd (Boral) and is currently used by Boral to transport material to and from the Berrima Cement Works. It is also used by Inghams Enterprises Pty Limited (Inghams) to carry goods to its feed mill east of the cement works, and by Omya (Australia) Pty Ltd (Omya) to haul material to their Moss Vale plant at the Berrima Junction. The rail project has therefore been separated from the Hume Coal Project so that the Hume Coal mine development consent, if granted, will not apply to the rail line.

## 1.6 The applicant

Hume Coal is a wholly-owned subsidiary of POSCO Australia (POSA), the Australian subsidiary of POSCO. POSCO is a leading multi-national steel manufacturer and one of the largest buyers of Australian coal and iron ore, purchasing an average of US$6.2 billion per annum in the period 2012 to 2014. Hume Coal was formed in 2010, as a joint venture company between POSA and Cockatoo Coal Limited (ASX: COK). POSA subsequently acquired Cockatoo Coal's stake and now owns 100% of the project.

POSCO, through POSA, has already invested around $1.9 billion in coal and iron ore projects in NSW, Queensland and Western Australia. POSCO is set to make a substantial investment in the Hume Coal Project if approved, making it an important part of the company's plans to increase its Australian investment portfolio.

Hume Coal's headquarters and community shop front are in Moss Vale and Berrima respectively. Hume Coal is an active member of the local community and supports and participates in various groups including the Moss Vale Chamber of Commerce and the Southern Highlands Chamber of Commerce and Industry. The project will last over two decades and the company is committed to making a significant and lasting contribution to the region's prosperity. Hume Coal is therefore actively promoting and supporting local businesses, industries and education facilities. In May 2015, Hume Coal launched the Hume Coal Charitable Foundation, providing two rounds of funding per year to local organisations. The foundation invested approximately $200,000 per annum in the local community with a focus on educational, indigenous and not-for-profit childcare organisations within Wingecarribee LGA.

Hume Coal also owns around 1,765 ha of land within and in the vicinity of the project area, making it one of the largest landholders in the area. The company has leased the properties to a pastoral company that is now running a productive agricultural business on these properties and is currently investing in weed control and other initiatives to improve the land's agricultural productivity. In keeping with the current land use, it is the current intention that most of this land will continue to be farmed during and following mining. Further information on Hume Coal's land management is provided in the Agricultural Impact Statement, attached as Appendix G.

## 1.7 Need for the Hume Coal Project

The project will produce both metallurgical and thermal coal, extracting around 50 Mt over the life of the mine. The product split will be about 55% metallurgical coal and 45% thermal coal.

Metallurgical coal is one of the two primary ingredients used in the steel-making process, with the other being iron ore. Steel is an essential engineering and construction material used in most industry sectors: energy, construction, transportation and vehicles, infrastructure, packaging and machinery. It is a basic component of many items used every day by the community including cars, reinforced concrete, buildings and household appliances. Thermal coal is used to generate electricity which is the main source of energy for heating, cooling, lighting, mobility, communications and industry.

The global demand for steel has grown substantially and is forecast to increase even further in the future. The World Steel Association estimates that demand will grow by 50 per cent above current levels by 2050 (World Steel Association 2015). Global per capita steel use increased from 150 kg in 2001 to 217 kg in 2014. This occurred despite development of stronger steel alloys which reduced requirements for individual structures.

Both metallurgical and thermal coal enable the provision of goods and services that are an integral part of all our daily lives. The project will help to provide these important materials in a socially and environmentally responsible manner.

The project will also deliver socio-economic benefits to the local community. A substantial number of long-term jobs (approximately 300 full time equivalent (FTE) positions) will be created, most of which will be filled by locals, adding an additional $44 million in disposal income to the Wingecarribee LGA. Greater local expenditure on goods and services will provide economic stimulus to the area. Investments in community facilities will also occur from funding provided by Hume Coal through a Voluntary Planning Agreement (VPA) or through a similar mechanism.

# 2 The proposal

## 2.1 Overview

Hume Coal is seeking State significant development consent under Division 4.1 of Part 4 of the EP&A Act to develop and operate an underground coal mine and associated mine infrastructure in the project area shown in Figure 1.2 and on the land listed in Appendix A. Up to 3.5 Mtpa of ROM coal will be extracted from the Wongawilli Seam within the project life of 23 years via a first workings mining system using continuous miners.

Product coal will be transported by rail to Port Kembla for shipment to export markets and/or by rail to domestic customers. As discussed in Chapter 1, rail works and rail use are covered by a separate development application for the Berrima Rail Project.

The project has been designed to maximise extraction of the coal resource within identified environmental constraints as efficiently and economically as possible, while minimising adverse impacts to the environment and community, and delivering socio-economic benefits to the local community.

The indicative project layout, including surface infrastructure locations and the underground mine, is shown in Figure 2.1. The surface infrastructure area is shown in further detail in Figures 2.2 and 2.3. The major project components are summarised in Table 2.1.

**Table 2.1 Project overview**

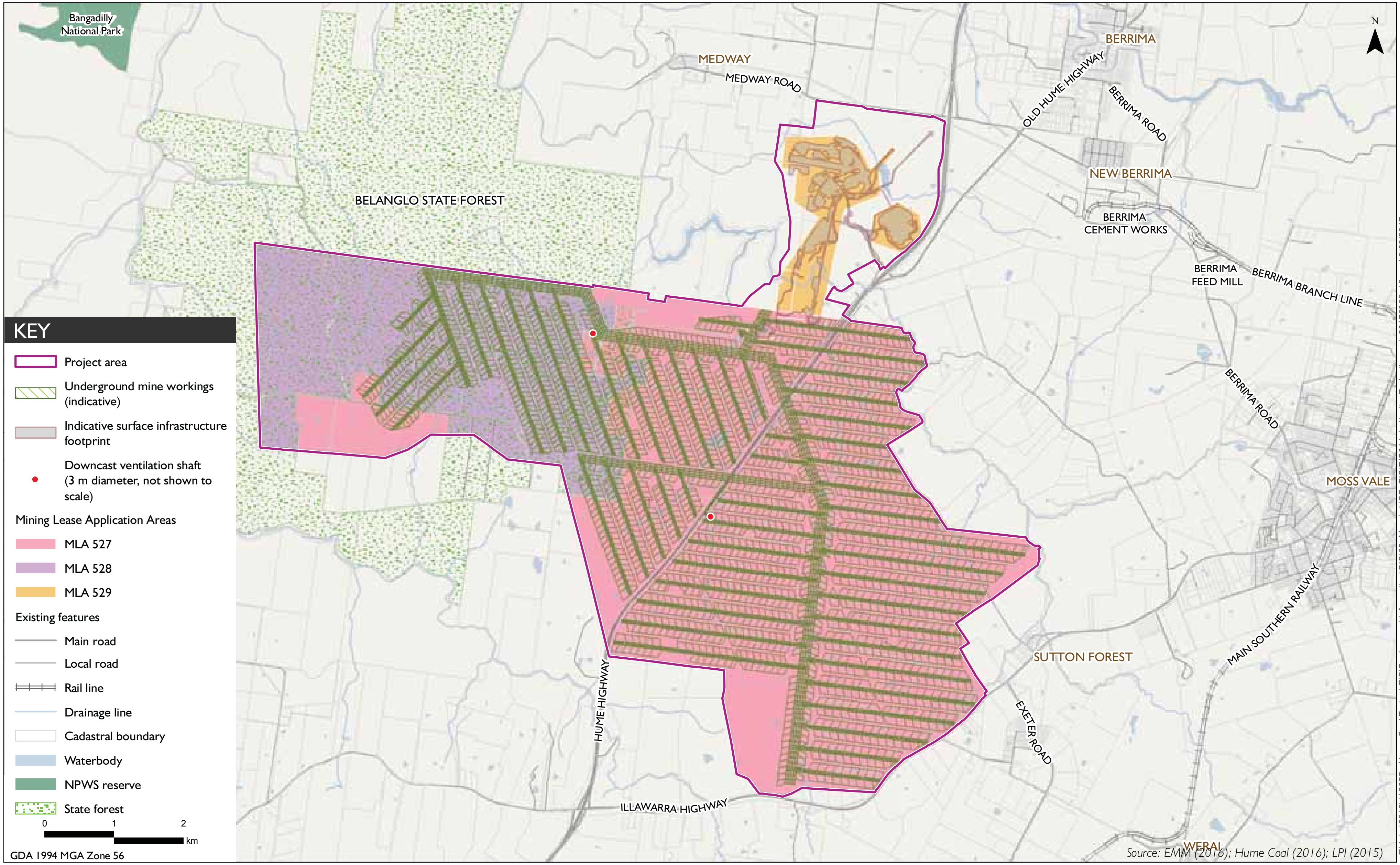
| Aspect | Description |
|---|---|
| Project area | The project area is illustrated in Figure 1.2, totalling 5,051 ha. Of this, approximately 3,472 ha is above the underground mine layout (refer to Figure 2.1), representing 69% of the total project area. The remainder comprises the surface infrastructure area, or buffer areas owned by Hume Coal or its subsidiaries, other freehold land or the Belanglo State Forest. |
| Surface disturbance | Approximately 117 ha or 2% of the project area will be occupied by the mine surface infrastructure area and associated facilities. Above the underground mine, the only material surface disturbance will be associated with be drilling, ventilation infrastructure and access tracks. |
| Project duration | A project life of 23 years, comprising:<br>• construction: around two years, including pre-construction activities;<br>• mine operating life: approximately 19 years; and<br>• rehabilitation: around two years from the end of mining, after which environmental monitoring will continue in accordance with relevant approval conditions. |
| Resource | Estimated 50 Mt of recoverable ROM coal within the Wongawilli Seam, at depths of between approximately 70 m and 180 m. |
| Annual mine production rate | Up to 3.5 Mtpa ROM coal. |
| Product coal | Up to 3.0 Mtpa will be produced, with a mix of metallurgical and thermal coal. |
| Product coal transport | Product coal will be transported by rail to Port Kembla for shipping to export markets and/or by rail to domestic customers. In any year, up to 3.5 Mtpa of product coal will be transported to market, potentially comprising CPP throughput, stockpile movements, and an allowance for yield variations. The volume of coal railed in a typical year will generally be lower than this. |
| Mining method | Underground first workings only, consisting of alternating web pillars and drives, using continuous miners. |

## Table 2.1 Project overview

| Aspect | Description |
|---|---|
| Construction and operating hours | Construction: Works generally during standard construction hours of:<br>• Monday to Friday 7 am to 6 pm<br>• Saturday 8 am to 1 pm<br>• no work on Sundays or public holidays<br>with the exception of:<br>• drift and shaft construction – 24 hours / 7 days<br>• work inside enclosed buildings/structures – 24 hours / 7 days<br>• accommodation village – 24 hours / 7 days<br>Operation: 24 hours per day, 7 days a week. |
| Workforce | Construction: estimated peak workforce of approximately 414 full-time equivalent employees and contractors.<br>Operation: approximately 300 full-time equivalent employees and contractors at peak production. |
| Surface infrastructure area | Construction and operation of a surface infrastructure area, generally as illustrated in Figures 2.2 and 2.3. The surface infrastructure area will include administration buildings, workshop and car parking area, as well as the CPP and associated facilities, and water management infrastructure. |
| Site access | The surface infrastructure area will be accessed from Mereworth Road. To improve safety along Mereworth Road, the traffic priority at the north bound Hume Highway/Mereworth Road off ramp will be changed to give priority to Mereworth Road consistent with traffic rules for a standard 'T' intersection, and Mereworth Road will be sealed and widened to two lanes from the Hume Highway off ramp to the mine. Existing property access gates will be used during construction.<br>There will be no new access points onto the Hume Highway for construction or operations.<br>Existing internal tracks will be upgraded where appropriate, and new internal roads and tracks will be established where required for access to surface infrastructure and mine portals. |
| Surface to seam access and ventilation | There will be one personnel and materials drift and one conveyor drift from the surface to the coal seam.<br>One upcast ventilation shaft and fans will be installed initially, with up to two additional downcast shafts over the life of the mine, depending on ventilation requirements as the mine progresses.<br>Gas drainage will not be required due to the low gas content of the coal seam. |
| Water supply | Operational water demands will be met by groundwater and surface water runoff captured and treated on-site. Potable water will be sourced from a pre-existing bore and treated for use. Potable water may be trucked to site initially if required. A water balance model has been developed to verify that adequate water supply is available over the life of mine. |
| Water and wastewater management | Water and wastewater management and treatment systems will include water storages, sumps, pumps, pipelines, drains, sediment controls, mine dewatering, a sewage treatment facility and a water treatment plant.<br>Water handled on-site, including water from underground workings, will be re-used on-site where possible.<br>Excess water (predominately groundwater that flows into the mine) will be pumped into sealed underground workings. |
| Communications and electricity supply | Installation of communications and electricity reticulation infrastructure, including high voltage distribution and switching equipment (33 kV and 11 kV) and low-voltage infrastructure. Hume Coal will seek for the primary power supply to be drawn from a combination of a new 33 kV powerline and an upgrade to an existing Endeavour Energy powerline outside the project area. Separate approval under Part 5 of the EP&A Act will be sought to build and upgrade this 33kV supply from the Endeavour Energy powerline to the mine. |

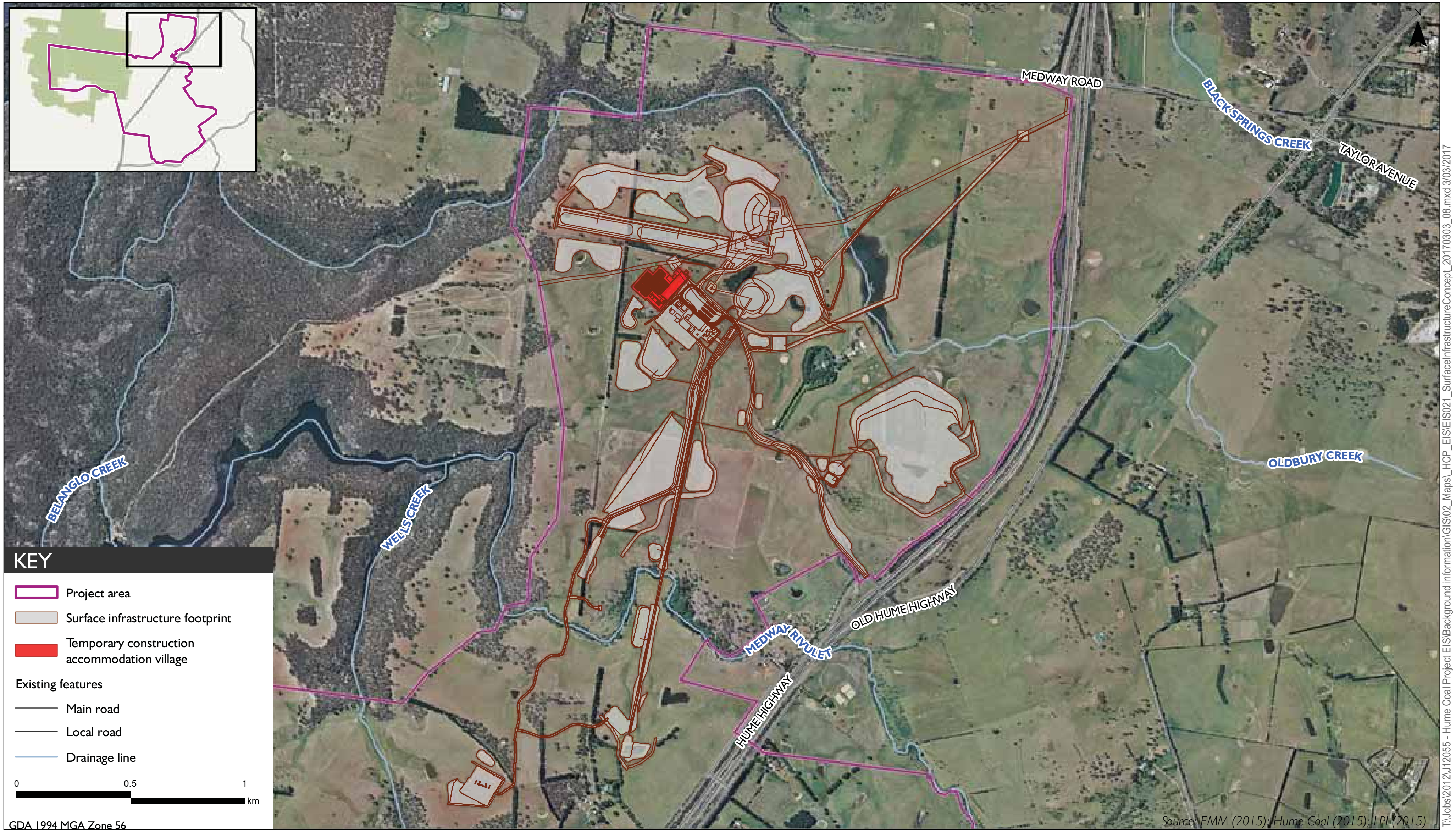
## Table 2.1 Project overview

| Aspect | Description |
|---|---|
| Infrastructure relocations | Internal access roads will be realigned and existing utilities relocated where required, including:<br>• realignment of some internal farm roads;<br>• relocation of some 11kV and low-voltage power lines;<br>• relocation of minor telephone cables; and<br>• relocation of water pipelines in the surface disturbance footprint, including a Wingecarribee Shire Council (WSC) pipeline.<br>Two parallel service corridors, each approximately 20 m wide, will be established into which the existing 11 kV powerline and the WSC pipeline will be relocated, and the 33kV powerline will be constructed. The proposed route is shown in Figure 2.3. |
| Coal reject management | Coarse and fine rejects from the CPP will be processed and then pumped underground to voids in the mine.<br>Initially, while underground void space is being created, coal rejects will be stored in one or more temporary surface emplacements which, when full, will be top dressed and re-vegetated.<br>Once mining is completed, rejects in surface emplacements will be removed, reprocessed and placed underground in the remaining voids. The surface emplacement area(s) will then be rehabilitated to integrate with the natural landform.<br>There will also be an emergency reject stockpile near the CPP to allow coal processing to continue if there is an interruption to underground emplacement, such as during maintenance of the pumping plant. |
| Pre-production drilling and other geological investigations | Coal resources will be more accurately defined in A349 by drilling both within and outside the proposed mine layout, and geotechnical and engineering investigations will be ongoing. |
| Temporary construction facilities | Temporary construction facilities in the mine infrastructure area will include:<br>• offices;<br>• stores;<br>• laydown areas; and<br>• an accommodation village for non-local construction employees (where specialist skills cannot be sourced locally). |
| Rehabilitation | After construction, temporary facilities such as the accommodation village will be dismantled and the site rehabilitated.<br>Minor disturbed areas such as drill pads will be progressively rehabilitated throughout the mine life.<br>At the end of mining, all surface infrastructure will be removed and disturbed areas rehabilitated to integrate with natural landforms. Mine accesses will be filled and sealed generally in accordance with applicable guidelines or standards (currently MDG 6000). |




**Indicative project layout**

Hume Coal Project
Environmental Impact Statement
Figure 2.1




Indicative surface infrastructure footprint

Hume Coal Project
Environmental Impact Statement

Figure 2.2

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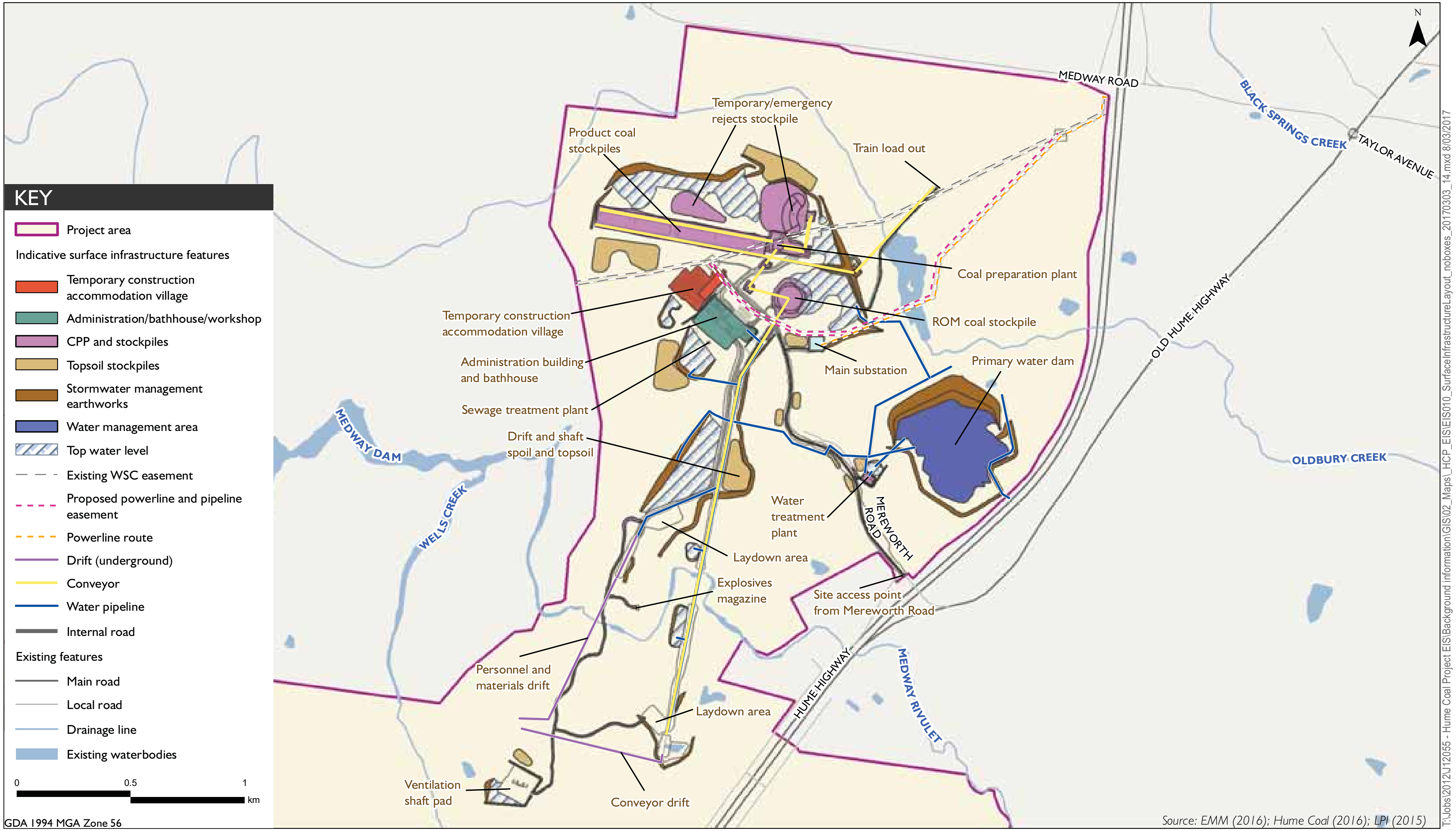



**Indicative surface infrastructure layout**

Hume Coal Project
Environmental Impact Statement

Figure 2.3

## 2.2 Project planning

The following three principles have informed the development of the mine plan:

1. the coal resource is a publicly owned asset and therefore optimising resource recovery is in the public interest;
2. valuable environmental and social features of the locality should be protected from damage; and
3. the local community should benefit in tangible ways from the project's construction and operation.

Detailed geological, engineering, environmental, financial and other technical investigations have shaped the project to arrive at the design described in this chapter. Numerous options have been examined, including different mining methods, mine layouts and surface infrastructure locations. These have been optimised against technical, financial and environmental criteria. At any stage, if an alternative option gave a significantly improved outcome, the project was redesigned. The main alternatives are discussed further in Chapter 6.

Hume Coal's exploration program began in 2011, including airborne surveys and 139 additional exploration boreholes to better define the geology and coal resource. Baseline environmental investigations also commenced in 2011, including groundwater, surface water, air quality, noise, meteorological monitoring, ecology, heritage and soil surveys. This extensive baseline dataset has given a comprehensive understanding of the existing environment.

Two consultative groups were set up, principally made up of community members. The Water Advisory Group (WAG) helped guide the project's water studies and the Social Reference Group (SRG) discussed local social and economic development matters. The role of these groups is discussed in Chapter 4.

Environmental constraints and sensitivities were identified early in the planning process and have been a fundamental consideration in designing the project. Project alternatives are discussed in Chapter 6. Throughout the baseline studies, community and other interest groups contributed valuable local knowledge that assisted in project planning (refer to Chapter 4).

This process determined the most appropriate method to efficiently and economically extract the coal resource, while minimising environmental impacts and delivering socio-economic benefits to the local community. The resulting project addresses the constraints, is practical and cost-efficient, and maximises participation by local businesses.

## 2.3 Leading practice innovations

Early in the planning process Hume Coal decided to incorporate leading mine practices. These included environmental and social management measures that exceeded the normal practices used in Australian coal mines and went beyond minimum regulatory standards. Project innovations are discussed in the following sections.

### 2.3.1 Mine design and process

To eliminate and/or minimise impacts on surface features and water resources, the mine will use a non-caving mining method based on proven geotechnical design principles, leaving coal pillars in place. These will provide long-term support to the overlying rock strata. Using only first workings, there will be negligible surface subsidence, so overlying aquifers and surface features will be protected. The mine will install bulkheads to seal each panel immediately after extraction and backfilling. This means that groundwater in each panel can begin to recover once a bulkhead is installed. These bulkheads will result in a shorter recovery time for groundwater levels than in conventional underground mines.

Similar mining systems have been used at various locations around the world, including the United States of America and Australia. The innovative aspects of the project involve the manner in which proven techniques and equipment are combined to form a new mining system, as described below.

- Proven pillar design techniques from highwall mining (the ARMPS-HWM system developed by the National Institute for Occupational Safety and Health (NIOSH) in the USA) have been adapted and conservative factors included in its application to the project (such as the maximum distance between barrier pillars of 60 m). This is discussed in detail in subsidence assessment (refer to Appendix L).

- Proven mining plant and equipment from highwall mining and traditional underground coal mining will be used, such as remotely operated continuous miners (used in highwall mines all over the world), and flexible conveyors, which are currently used in Australia at Clarence Colliery and Ulan West and in other locations around the world.

- A bulkhead design concept has been included in the project using methods outlined in multiple design standards such as the publications: *The design and construction of water impounding plugs in working mines* by the UK Health and Safety Executive (HSE 2015); and *Guidelines for permitting, construction, and monitoring of retention bulkheads in underground coal mines* by NIOSH (Harteis et al. 2008).

- Proven plant and equipment designs for the underground reject emplacement, such as positive displacement piston pumps (used routinely in high-rise construction projects for concrete pumping), wear resistant pipe (used routinely in slurry pumping applications), and commercially available crushers and screens. The use of mine backfill has been used for years in underground metalliferous mines, and its application to underground coal mining has been carried out elsewhere in the world including in Germany and China.

- Proven, off the shelf designs for covered wagon hoppers which are commercially available at a number of manufacturers globally. Currently, most grain wagons operating in NSW have similar covered hoppers and have done so for decades. In NSW, coal wagons have been converted to grain wagons with the addition of pneumatic top doors, and vice versa.

The adaptation for use in the project of the techniques and equipment discussed above requires a typical level of engineering design for a modern underground mining project. Every mining project requires its own 'bespoke' tailoring of otherwise proven engineering solutions to meet its specific circumstances.

### 2.3.2 Underground reject emplacement

All coal rejects will be returned underground to partially backfill mined-out voids, rather than leaving them in large above-ground emplacements or trucking them off-site to remote emplacements. Whilst mine backfill is a mature technology in underground metalliferous mines, this technology has so far only been adopted at one other Australian underground coal mine as a trial and is considered to be leading international practice. Whilst more complex and expensive than surface emplacement, it was selected to give the following environmental and social benefits:

- eliminates permanent tailings ponds or cells on the surface;

- significantly reduces the potential for visual, dust and noise impacts compared to conventional surface emplacements;

- reduces surface disturbance by avoiding the need for large reject stockpiles;

- additional ground support and pillar confinement is available in backfilled areas; and

- directly responds to the preferences of regulatory officials to minimise above-ground reject stockpiles.

The plant and equipment required to pump the material underground is all proven and currently available off-the shelf, including items such as positive displacement piston pumps, crushers and screens. As described above in Section 2.3.1, mine backfill has been practiced routinely for a number of decades in underground metalliferous mining (non coal).

### 2.3.3 Groundwater management

Groundwater that flows into active mine workings will be collected and recirculated back into the groundwater system. Environmental benefits will include reducing net groundwater consumption and associated drawdown impacts on other users. Groundwater management is described in detail in Section 2.10.

The progression of mining, the progressive emplacement of rejects and the reinjection of groundwater is conceptually illustrated in Figure 2.4.

### 2.3.4 Covering rail wagons

Rail wagons to transport product coal will be covered, thereby reducing the potential for dust emissions during transport. Hume Coal will be the first coal mining company in Australia to do this.

### 2.3.5 Advanced high performance locomotives

Hume Coal will use the latest generation rail locomotives and wagons. They use less fuel and generate fewer emissions than older locomotives commonly used in Australia, which will improve air quality and greenhouse gas emissions. The locomotives will have isolated engine and operator cab mountings to reduce vibration and noise generation. Electronic braking equipment will also reduce noise and have operational benefits.

## 2.4 Construction phase

### 2.4.1 Overview

The construction phase of the project will include:

- early works, including vegetation clearing where required, topsoil/subsoil stripping and stockpiling, establishing borrow pits and bulk earthworks;
- construction of the temporary construction offices and accommodation village;
- improving site access at the Mereworth Road intersection and the north bound Hume Highway off-ramp;
- installation of site services including power, water, communication services and compressed air. This includes relocation of existing site services as required;
- installation of appropriate bunding, drainage and erosion and sediment controls;
- establishment of storage and laydown areas, equipment assembly areas, car parking and fuel facilities;
- construction of the administration buildings, bathhouse, washdown and workshop facilities, fuel and lubrication storage, warehouses and an explosives magazine;
- commissioning of surface and groundwater management infrastructure and treatment facilities, including storages, pipelines and pumps;
- construction and commissioning of the CPP and associated conveyors, stockpiles and stacker/reclaimer equipment;
- construction of two surface to coal seam drifts - one personnel and materials drift access, and one conveyor drift access, from the surface to the coal seam;
- construction of the train load-out facility;

- establishment of ancillary facilities including fences, access roads, and helipad;
- installation of the main ventilation shaft and associated surface equipment; and
- commissioning of addition environmental monitoring equipment as identified in this EIS.

Temporary construction facilities will generally be co-located with the mine's surface infrastructure, so that they can be augmented at minimal disruption and cost. Where possible, construction infrastructure and facilities will continue to be used during operations, with the exception of the accommodation village, which will be dismantled and removed when no longer required. Areas to be directly disturbed during construction are indicatively shown in Figure 2.2.

Further detail on the construction phase is provided in the sub-sections below.

### 2.4.2 Construction schedule

Construction will take approximately two years. During this time works will be undertaken during standard construction hours (refer to Table 2.1), except for drift and shaft construction, work inside enclosed buildings/structures and construction of the temporary accommodation village. These works will need to occur 24 hours per day and seven days per week.

The construction phase will have two main stages:

- site establishment; and
- construction of surface infrastructure, underground drifts, main ventilation shaft and associated infrastructure.

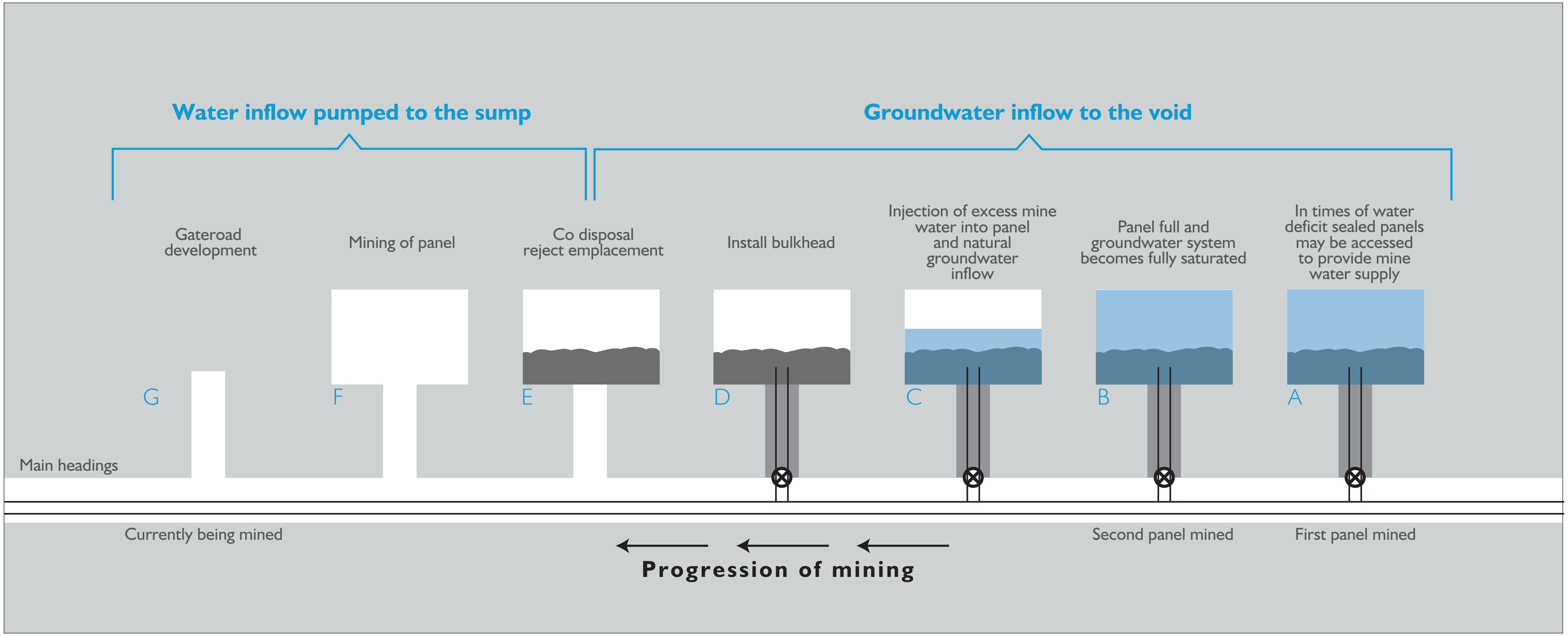
Whilst it is expected that site based construction activities will take around two years, many factors influence the exact time it will take to complete the various construction activities associated with the project, such as supplier lead-times, weather, project scheduling, securing minor approvals that are required post-development consent and actual site conditions encountered once construction commences. The construction timeframe assumed also does not include front-end engineering design and procurement. The construction phase may therefore take longer than the two years estimated, within the 23 year project life for which approval is sought. In terms of predicted impacts from construction activities, conservative assumptions were made so that an extended construction timeframe would not change the predicted maximum associated impacts. For example, the noise construction assessment conservatively assumed all works will occur simultaneously. Although such a scenario is highly unlikely, it represents the worst case construction noise level scenario, regardless of the overall construction timeframe. Similarly, the peak predicted air quality impacts associated with construction activities are based on the movement and handling of the maximum amount of bulk material in a one year period. If the movement of this material were to take longer than estimated, the associated peak emissions would also be less than predicted.

Operations will phase in progressively in the later stages of construction. Therefore, there will be some overlap between construction and operations.

The two stages of construction are discussed further below.

### 2.4.3 Site establishment and construction footprint

Initial works will include vegetation and topsoil removal, constructing site access and internal roads, building a temporary accommodation village and installing site services. These early works are described in the sub-sections below, with additional detail on site services, and in particular the required electricity supply works, provided in Section 2.12. The early works will extend for approximately eight months.




Panel A was mined first, then panel B and so on.
Panel G is in the first stages of mining.

Conceptual illustration of panel progression, reject emplacement and groundwater inflow

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Figure 2.4

The direct disturbance footprint of the project is shown in Figure 2.2. In addition to this footprint, a construction buffer will be provided around the direct disturbance areas. This 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 where required. Ground disturbance will generally be minor in this zone 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 in this construction buffer zone will be marked as avoidance zones so that activities in this area do not have an environmental impact.

#### i Vegetation removal, topsoil stripping and stockpiling

Before any earthworks are commenced areas to be cleared will be marked so that no damage occurs to vegetation outside the limits. Erosion and sediment controls will then be formed in accordance with *Managing Urban Stormwater: Soils and Construction, Volume 1, 4th Edition, and Volume 2E Mines and Quarries* (the Blue Book) (Landcom 2004), as described in more detail in Chapter 8 (soil and land resources).

Once vegetation is cleared, topsoil will be stripped following the recommendations of the soil and land resource assessment in Appendix F and Chapter 8. Topsoil will be stored in temporary stockpiles at the indicative locations shown in Figure 2.3.

#### ii Site access

Primary access to the mine will be from Mereworth Road. To improve safety, Mereworth Road will be sealed and widened to two lanes from the Hume Highway north-bound off ramp into the project area, and the Hume Highway/Mereworth Road off ramp will be changed to give priority to Mereworth Road. The present arrangement gives motorists turning right onto Mereworth Road from the north-bound off-ramp the right-of-way. Changing the priority to Mereworth Road will remove the current confusion associated with drivers expecting a traditional 'T' intersection when approaching Mereworth Road from the off-ramp. The existing intersection approach view from the Hume Highway is shown in Photograph 2.1.

Security will be provided at the mine entrance, including a boom gate with swipe card access for employees.

Some existing farm tracks will be upgraded to provide suitable internal access to surface infrastructure sites, as well as sections of new track in certain locations. During initial construction, the existing concrete causeway across Medway Rivulet will be upgraded so construction plant can reach the drift portal during wet weather. Internal all weather roads will also be constructed to access the ventilation shaft and drift portal construction areas. Further internal roads will be established where required to reject handling and storage facilities, the water treatment plant and alongside conveyors, as well as environmental monitoring points and ventilation infrastructure. Approximate locations of the internal access tracks are shown in Figure 2.3, and in further detail in Figure 2.5.

Other access points may be used during construction and intermittently during operations, for instance for maintenance. These will be predominantly existing farm access points. No new access points will be created from the Hume Highway.

Design of access roads and intersections is discussed in Chapter 15 (traffic and transport) and Appendix M.

**Photograph 2.1 Existing intersection approach view from the Hume Highway off ramp**

### iii Accommodation village

A temporary accommodation village will be established before the main construction begins. Portable buildings will be placed in position by cranes and tied in to services such as electricity, water and sewerage. The village will accommodate approximately 400 workers, and will house construction workers for the Hume Coal Project and the Berrima Rail Project. The village has been sized on the assumption that approximately 90% of the construction workforce for both the Hume Coal Project and the Berrima Rail Project will reside on site during construction. All non-local construction workers will be required to reside at the village while they are rostered on. The remaining 10% will comprise local workers.


**Internal road and carpark layout**

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Figure 2.5

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The village will be within the surface infrastructure area in the northern portion of the site as shown in Figure 2.3. It will contain facilities such as a dining hall, gym, library and games room.

To build the village, topsoil will be stripped where necessary, hardstand constructed, services connected, and walkways and car parks constructed. A sewage treatment plant (STP) will be installed, which will also service the main office buildings during operations.

A car park will be constructed for the village, which will have around 200 spaces. A car park will be constructed at the surface infrastructure area for operations employees, with the capacity to accommodate around 176 cars. This car park will be available early in the construction phase so that it can be used where overflow from the accommodation village car park occurs.

The village will be managed by an experienced operator, who will be contractually bound to implement Hume Coal's local procurement policy when reliability, quality and financial competitiveness can be satisfied. This will include engaging local businesses to supply goods and services to the village, typically consisting of laundry, cleaning and catering.

The village will mean that construction workers do not place additional pressure on local housing and short-term accommodation. In addition, the village will reduce short-term pressures on rental prices. Availability of accommodation during construction will help Hume Coal to attract skilled construction workers and minimise scheduling risks caused by skills shortages.

The construction village will be dismantled and its footprint rehabilitated once the mine is built and it moves into the operational phase.

### iv Utility and infrastructure relocations

Some existing utilities and infrastructure will be relocated and minor roads realigned as part of the project. In particular, part of the existing WSC easement containing power and water infrastructure associated with Medway Dam will be relocated as follows:

- relocation of an 11 kV overhead power line that supplies power to Medway Dam, which currently crosses the surface infrastructure area. The power line will be diverted around the train load out facility, product coal conveyor and the ROM coal stockpile, to pass between the ROM coal stockpile and the main mine car park and offices (refer to Figure 2.3); and

- relocation of part of the WSC water pipeline that connects Medway Dam and Berrima, which currently also crosses the surface infrastructure area. It will be relocated to the same easement as the 11 kV power line, as shown in Figure 2.3.

Detailed service locations, including 'dial before you dig' searches will be conducted before earthworks begin so other existing electricity lines, communications cables and/or gas pipelines are identified and relocated as necessary. Temporary internal road diversions may also be necessary during construction, where infrastructure crosses internal roads. Where this is the case, a temporary road diversion will be constructed next to the existing road and the original alignment reinstated when a culvert or crossing is completed.

### 2.4.4 Surface infrastructure, drift and shaft construction

Vegetation will be cleared from the direct disturbance footprint, and topsoil and subsoil removed and stockpiled. At the CPP, a hardstand area (approximately 150 m x 100 m) will be prepared to construct buildings. Some structures, such as conveyor gantries, will be pre-assembled off-site and transported to the mine. Most buildings will be portable demountable structures that can be transported to the site. The CPP will be a steel and concrete framed building with external cladding. Cranes will be used to lift large components into place during construction. Where possible, modular construction will be used to minimise on site work and reduce construction timeframes.

At the same time, work will be undertaken to establish surface stockpile areas and coal handling equipment, construct ROM and product coal conveyors, the train load out facility, surface water management earthworks, compressed air and water reticulation systems, high voltage electrical reticulation and communications and instrumentation.

Two drift portals will be constructed in the southern section of the surface infrastructure area once the site is established. One will be for personnel and materials and the other for a conveyor, which will also act as a secondary access to and from the underground workings (refer to Figure 2.3). After the portals have been excavated, concrete arches will be installed and fill materials placed over the arches to complete the portals. Tunnelling of the drifts will then commence, with the personnel drift to be constructed at a grade of around 1:9 and the conveyor drift at around 1:6.5. The main upcast ventilation shaft and fans and underground conveyor will be installed in parallel, allowing the ventilation circuit to be established in the pit bottom area once the initial underground roadways are mined.

Excavated rock from the drifts will be used as fill across the surface infrastructure area where possible, including environmental bunds. Approximately 90,000 bank cubic metres (bcm) of excavated material from the drift portals will be left over from the surface infrastructure area. Of this, around 60,000 bcm will be used to build the primary water dam embankment and noise and visual bunds. The remaining 30,000 bcm will be placed in a stockpile in the surface infrastructure area to be used to rehabilitate the mine at closure.

### 2.4.5 Construction equipment

Equipment required during surface construction activities will vary throughout the construction phase. Types of equipment that will be required include scrapers, dozers, backhoes, graders, excavators, mobile cranes, loaders, wacker packers, vibrating rollers and hand tools.

## 2.5 Operational phase

### 2.5.1 Mining

The project will produce up to 3.5 Mtpa of ROM coal or 3 Mtpa of product coal (a mix of metallurgical and thermal coal).

The mine will operate in the Wongawilli Seam using a low impact first workings mining system. Underground main roadways or ‘mains’ will be developed, followed by mining panels at an angle off the mains, together forming the trunk and limbs of the mine. Continuous miners will be used for mining at typical widths in standard drivages of between 5.2 m to 5.5 m. Over-width drivages (typically up to 6 m) may be developed from time-to-time for specific purposes (for example, niches for equipment), and will be geotechnically assessed on a case-by-case basis.

Following development of the gate roads, a narrow head continuous miner and continuous haulage system will be used to develop a series of parallel drives (also referred to as plunges) off the outside edges of the gate roads. The plunges will each be 4 m wide and angled at 70 degrees to the gate roads. Pillars will vary in size depending on the depth of cover.

The basic mine layout is illustrated in Figure 2.6.

The system will give long-term stability to the overlying strata, as discussed in detail in the pillar stability assessment (refer to Chapter 14 (subsidence) and Appendix L). The mine layout includes slender pillars, with plunges driven off the outside roadways and a 50 m wide barrier pillar left between individual panels. The barrier pillars will also provide hydraulic separation between individual panels, thus reducing groundwater make into mine workings. Varying the widths of the pillars in response to different depths of cover will maintain the stability of the overlying strata.

This method of coal extraction will meet the following objectives:

1. Provide stable open voids for coal reject emplacement.

2. Allow a high productivity, non-caving production system.

3. Cause negligible surface and subsurface subsidence.

As described in Chapter 6 (project evolution and alternatives), project development has been an iterative process of assessing design options, balanced against the efficiency of resource recovery and the environmental impacts and constraints associated with each option. The design presented in this EIS addresses environmental constraints through the following measures:

- Each panel will be separated from adjacent panels by solid coal pillars, as shown in Figure 2.6. Voids will be partially backfilled with coal reject and sealed with water-retaining bulkheads. This will allow groundwater levels to begin to recover immediately.

- Mining by first workings means that there will be negligible subsidence and no discernible subsidence impacts.

- Whilst negligible subsidence will occur, to avoid any perception that primary dwellings or the Hume Highway could be affected by long-term ground movements, no panels will be beneath these features, with only underground roadways required to access other parts of the mine.

- Coal reject will be returned to underground voids, removing the need for permanent above-ground waste emplacements.

- All surface infrastructure areas have been located to avoid ecological resources and heritage items where possible, as discussed in Chapters 10 and 21 respectively.

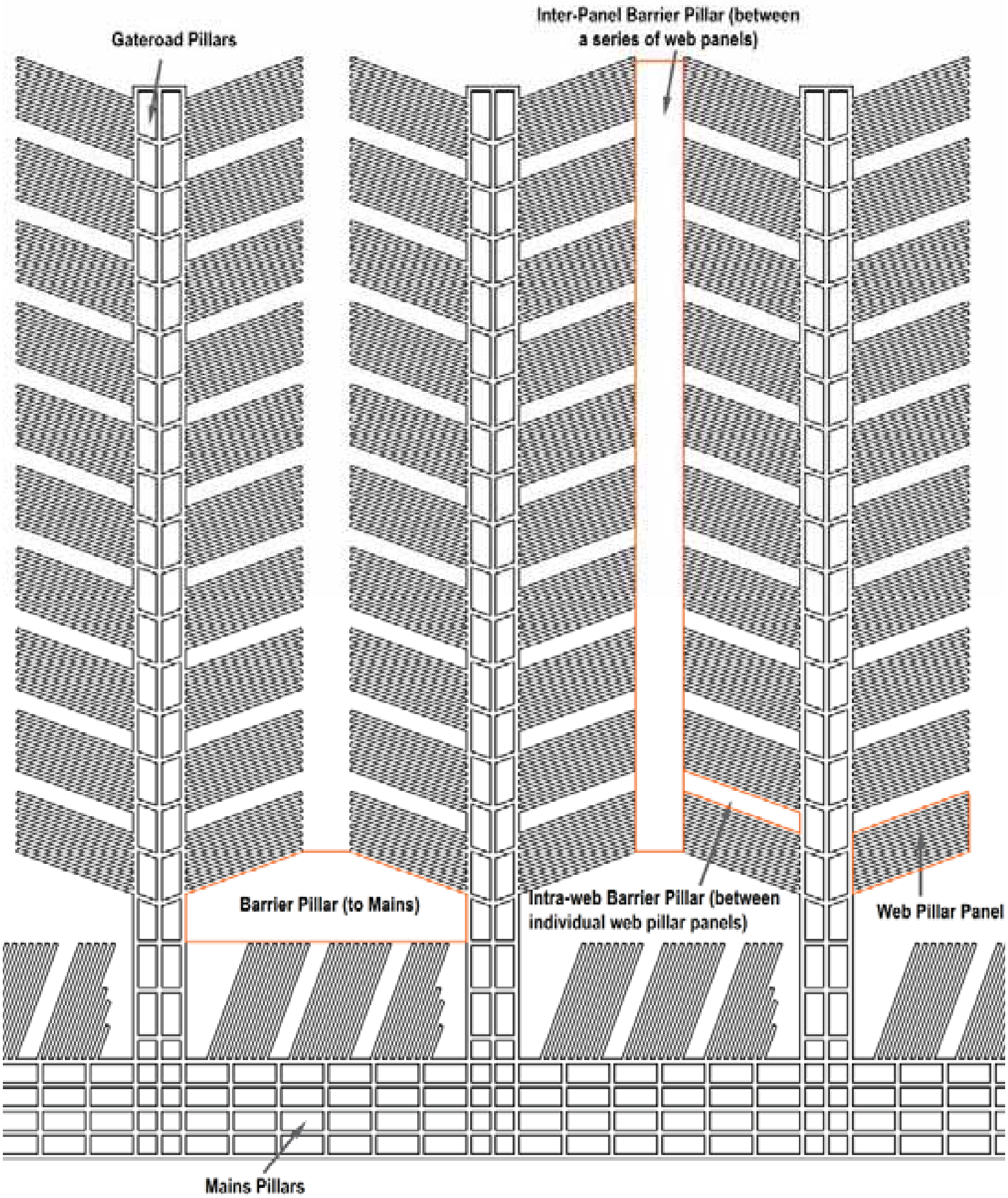


**Figure 2.6 Indicative mine layout showing different coal pillar types**

### 2.5.2 Mining fleet

Another feature of the project is the adoption of automated remote mining techniques. Remote mining is routinely practiced in high wall mining, as well as in some underground scenarios.

An inertial navigation system will direct continuous miners underground. Inertial navigation is a self-contained navigation technique in which measurements provided by accelerometers and gyroscopes track the position and orientation of a machine relative to a known starting point, orientation and velocity. Similar systems have been used in the USA and Australia, and are now standard in high wall mining. Standard off-the-shelf underground equipment can be used for the project with minimal requirements for alterations. This is reflected in the capital investment value, which incorporates estimates of equipment based on preliminary quotes obtained by Hume Coal.

ROM coal will be transported via a conveyor system.

### 2.5.3 Gas drainage

Testing of coal core samples confirmed that the gas content of the Wongawilli Seam is extremely low at 0.25 to 0.5 cubic metres ($m^3$) of gas per tonne, of which 96 to 100% is carbon dioxide. This is similar to the neighbouring Berrima Colliery. At these low gas contents, gas is unlikely to be given off from the coal other than under vacuum conditions. Therefore, gas drainage wells will not be required. Any gas liberated by mining will be controlled by dilution through ventilation.

### 2.5.4 Ventilation

A ventilation system will be installed, including:

- approximately five mains headings for ventilation and access to each mining domain (including nominally two intake travel roads, one intake conveyor road and two returns, noting that more or fewer headings may be required in certain parts of the mine);
- two trafficable intake air drifts (the personnel and materials and the conveyor drifts for the mine);
- a main upcast ventilation shaft near the bottom of the drifts, with associated surface fans; and
- up to two additional downcast shafts may be needed later in the mine life at the conceptual locations shown in Figure 2.1, depending on ventilation requirements at the time.

## 2.6 Mining schedule

The proposed sequence and approximate timing of the mine are illustrated in Figure 2.7. Mining will start in the northern section of the site near the surface infrastructure area. Panels will be mined sequentially, progressing initially in a westerly direction. Main headings running north to south will commence in around Year 7 and panels will be mined sequentially as shown in Figure 2.7.

## 2.7 Surface infrastructure

Surface infrastructure to service the mine will be constructed in the northern portion of the site on land owned by Hume Coal and its subsidiaries. A conceptual layout is shown in Figure 2.3. It will occupy about 117 ha and will include the CPP, main mine office buildings and workshops, water management structures, coal and emergency reject stockpiles, conveyor network and the main ventilation shaft.

The CPP, stockpiles and coal handling infrastructure will include:

- ROM coal stockpile, with a capacity of approximately 60,000 t;
- coal sizing and screening plant;
- CPP with a nominal capacity of 450 tonnes per hour (tph);
- conveyors, transfer points, tertiary sizing station and enclosed screening station;
- coal washery reject crushing, screening and pumping plant;
- coal washery reject stockpiles and associated plant and equipment, including emergency and temporary reject storage facilities;

- product stockpiles with a capacity of approximately 300,000 t;
- product coal reclaim system;
- product coal bin and train loading system;
- water management infrastructure;
- dust suppression and firefighting systems;
- services including compressed air, power and water;
- offices, car parking, ablutions facilities, storage for spare parts; and
- other minor buildings, plant and equipment associated with, or ancillary to, the coal handling and processing operation.

The main mine administration and infrastructure area will include:

- administration offices, bathhouse and carpark;
- control room;
- workshop facilities;
- warehouse/store and laydown area;
- fuel and lubrication storage and refuelling facilities;
- washdown facilities;
- security fencing;
- internal access roads;
- sewage treatment plant;
- water supply, storage, treatment and management infrastructure;
- electricity supply and communications infrastructure;
- air compressors and back-up generators;
- dust suppression and firefighting systems;
- emergency response facilities;
- explosives magazine;
- topsoil stockpiles;
- helipad;
- other minor plant, equipment and facilities required to service the mine; and
- environmental management and monitoring equipment.