HUMECOAL
PROJECT

VOLUME 8

Hume Coal Project

Environmental Impact Statement

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Prepared for Hume Coal Pty Limited
March 2017

EMM

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Hume Coal Project

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Prepared for Hume Coal Pty Limited | 7 March 2017

Hume Coal Project

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Hume Coal Project

Final

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Executive Summary

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 main project access is located via Mereworth Road, which is on the western side of the Hume Highway. The project involves developing and operating an underground coal mine and associated infrastructure over an estimated 23 year timeframe. Product coal will be transported by rail, primarily to Port Kembla terminal for the international market, and possibly other locations for the domestic market. Construction stage workforce accommodation is included for up to 400 persons.

The existing journey to work travel patterns in the Wingecarribee LGA show a high level of sub-regional self-containment. At the 2011 Census, 83.7% of all people working within the Wingecarribee LGA were residents and only 16.3% were travelling from outside the LGA. The travel patterns of the project's future workforce will include a similar percentage (about 15%) travelling by car from outside the LGA. Their daily travel distances will be limited to around 45 minutes commuting time each way. This policy will be enforced by Hume Coal to minimise the potential workforce traffic safety risk from longer distance commuting.

The project generated daily traffic movements have been calculated and assessed for three stages of the project (early stage construction, peal construction and project operations). The project would generate between 296 and 378 daily vehicle movements using the surrounding roads during each of these stages. No significant adverse traffic impacts have been identified for the future traffic movements generated by the project for either the road network traffic capacity, intersection traffic operations; the road network condition; road safety and the efficiency of operation of the road network as summarised in Table ES.1.

Table ES.1 Summary of the project traffic impacts assessment

Type of potential impact	Impacts to the local road network	Impacts to the state road network	Summary of Impact
Capacity	Minimal impacts are predicted to the local road network (Council controlled roads) for either mid block road capacity or the peak hour traffic capacity of intersections.	Minimal impacts are predicted to the state road network (Hume Highway and Illawarra Highway) for either mid block road capacity or the peak hour traffic capacity of intersections.	Low Impact
Condition	Minimal impacts are anticipated from the project truck traffic using roads which are maintained by the local Council.	Where access is proposed to the state road network during project construction, the access will be of short duration, of low traffic generation intensity and will be managed by standard RMS worksite traffic control plans prepared in accordance with RMS traffic control guidelines for worksites with access to major roads.	Low Impact
Safety	The current traffic safety record (accident history) for the local road network is good and safety will not be adversely affected by the additional project traffic.	The current traffic safety record (accident history) for the state road network is relatively good and safety will not be adversely affected by the additional project traffic.	Low impact
Efficiency	The project will not generate any significant road traffic increases which will adversely affect the efficiency of the local road network (Council controlled roads).	The project will not generate any significant road traffic increases which will adversely affect the efficiency of the local road network (Council controlled roads).	Low impact

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1 Introduction

1.1 Overview

Hume Coal Pty Limited (Hume Coal) proposes to develop and operate an underground coal mine and associated mine infrastructure (the 'Hume Coal Project') (the project) in the Southern Coalfield of New South Wales (NSW). Hume Coal holds exploration Authorisation 349 (A349) to the west of Moss Vale, in the Wingecarribee local government area (LGA). The underground mine will be developed within A349 and associated surface infrastructure facilities will be developed within and north of A349. The project area and its regional and local setting are shown in Figures 1.1 and 1.2.

The project has been developed following several years of technical investigations to define the mineable resource and identify and address potential environmental, social and economic constraints. Low impact mining methods will be used which will have negligible subsidence impacts and thereby protect the overlying aquifer and surface features, and therefore allow existing land uses to continue at the surface. Post-mining, all mine surface infrastructure will be decommissioned and areas rehabilitated to a state where they can support land uses similar to the current land uses.

Approval for the project is being sought under Part 4, Division 4.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). An environmental impact statement (EIS) is a requirement of the approval processes. This traffic impact assessment report forms part of the EIS. It documents the assessment methods, results and the mitigation and management measures proposed to address residual traffic impacts which cannot be avoided.

1.2 Project description

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 (refer to Figure 1.3 and Figure 1.5). 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 closure.

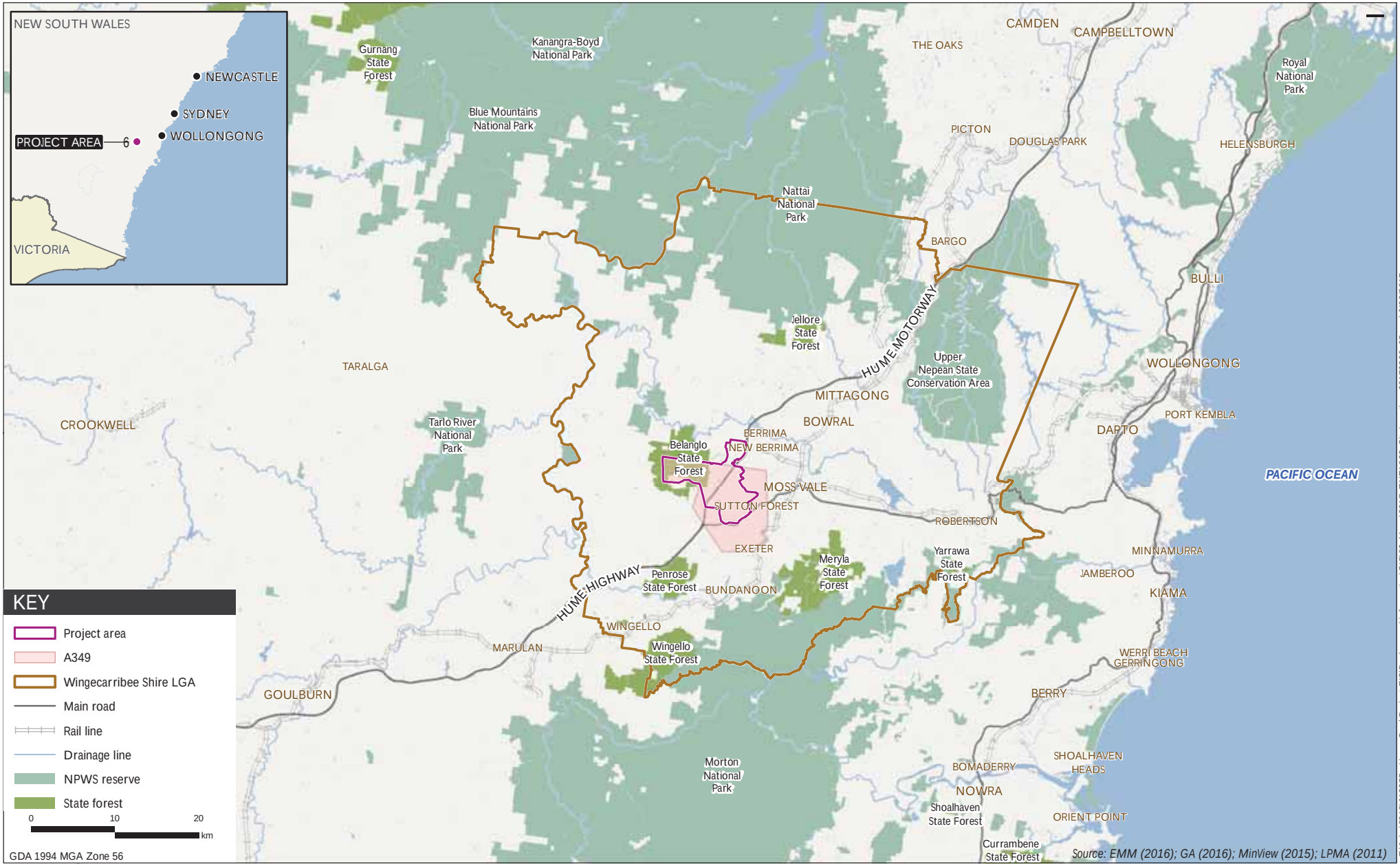
1.4 Project transport assessment details

Project related road traffic will be generated during the construction and operations stages by workers commuting, materials and equipment deliveries and maintenance/service provider traffic. The main surface access and surface infrastructure areas will be on the western side of the Hume Highway, approximately 1.5 km away from the Hume Highway and adjacent to the north-western corner of the mine lease area, as shown in Figure 1.4.

The existing journey to work travel patterns in the Wingecarribee LGA show a high level of sub-regional self-containment. At the 2011 Census, 83.7% of all people working within the Wingecarribee LGA were residents and only 16.3% were travelling from outside the LGA.

The future mine workforce residential catchment is shown on Figure 1.5. It will include some parts of the adjoining outer Sydney LGAs such as Wollondilly, but will generally exclude other Sydney LGAs further to the north. Similarly in the Wollongong/Nowra direction, some areas of the Kiama and (Upper) Shoalhaven LGAs will be included, but the main Wollongong and Shellharbour urban areas are excluded.

The travel patterns of the project's future workforce will include a similar percentage (about 15%) to what now occurs for the non-local workforce travelling by car from outside the LGA. Their daily travel distances will be limited to around 45 minutes commuting time each way. This policy will be enforced by Hume Coal to minimise the potential for fatigue-related traffic accidents.

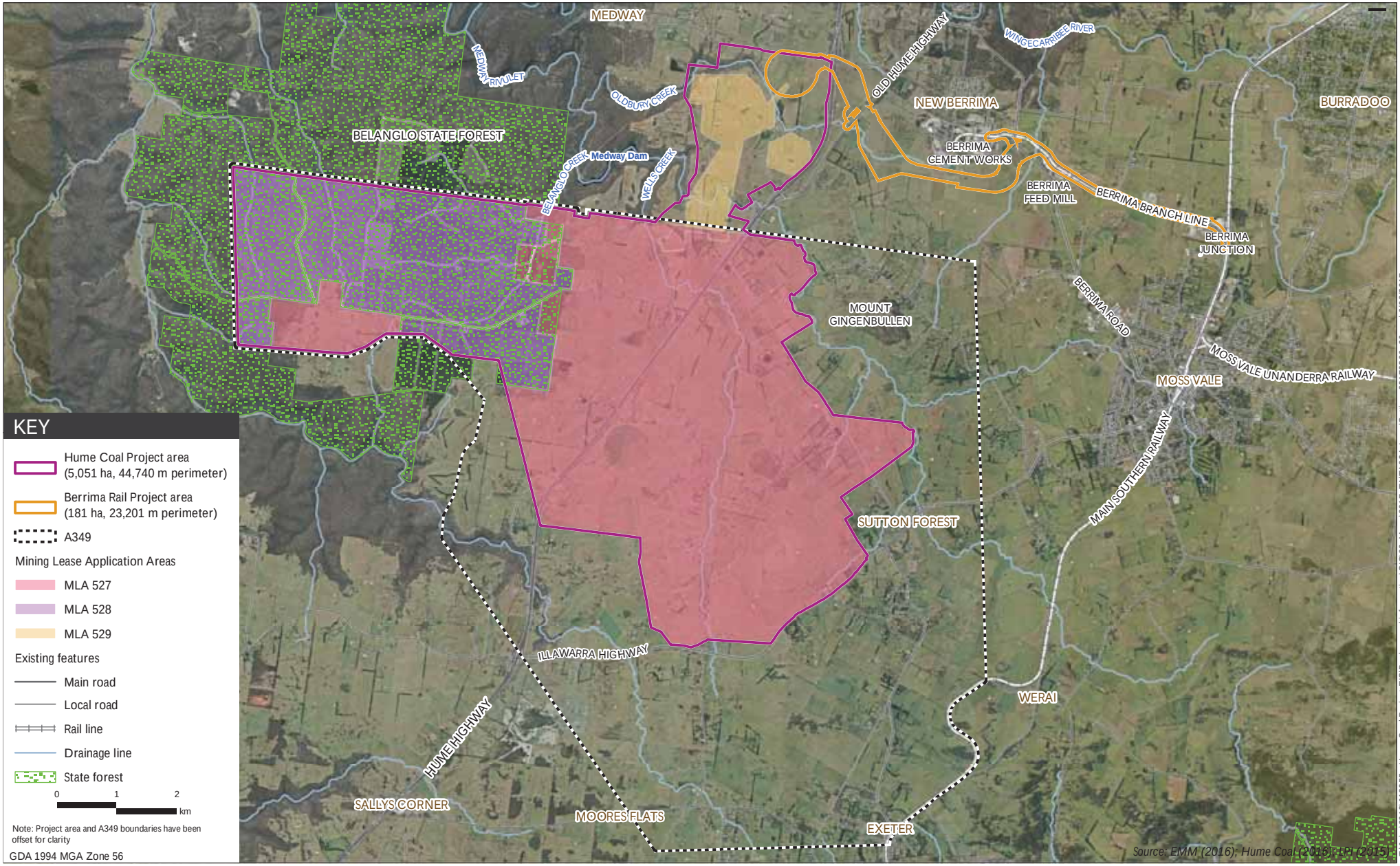


Regional context

Hume Coal Project

Traffic Impact Assessment

Figure 1.1

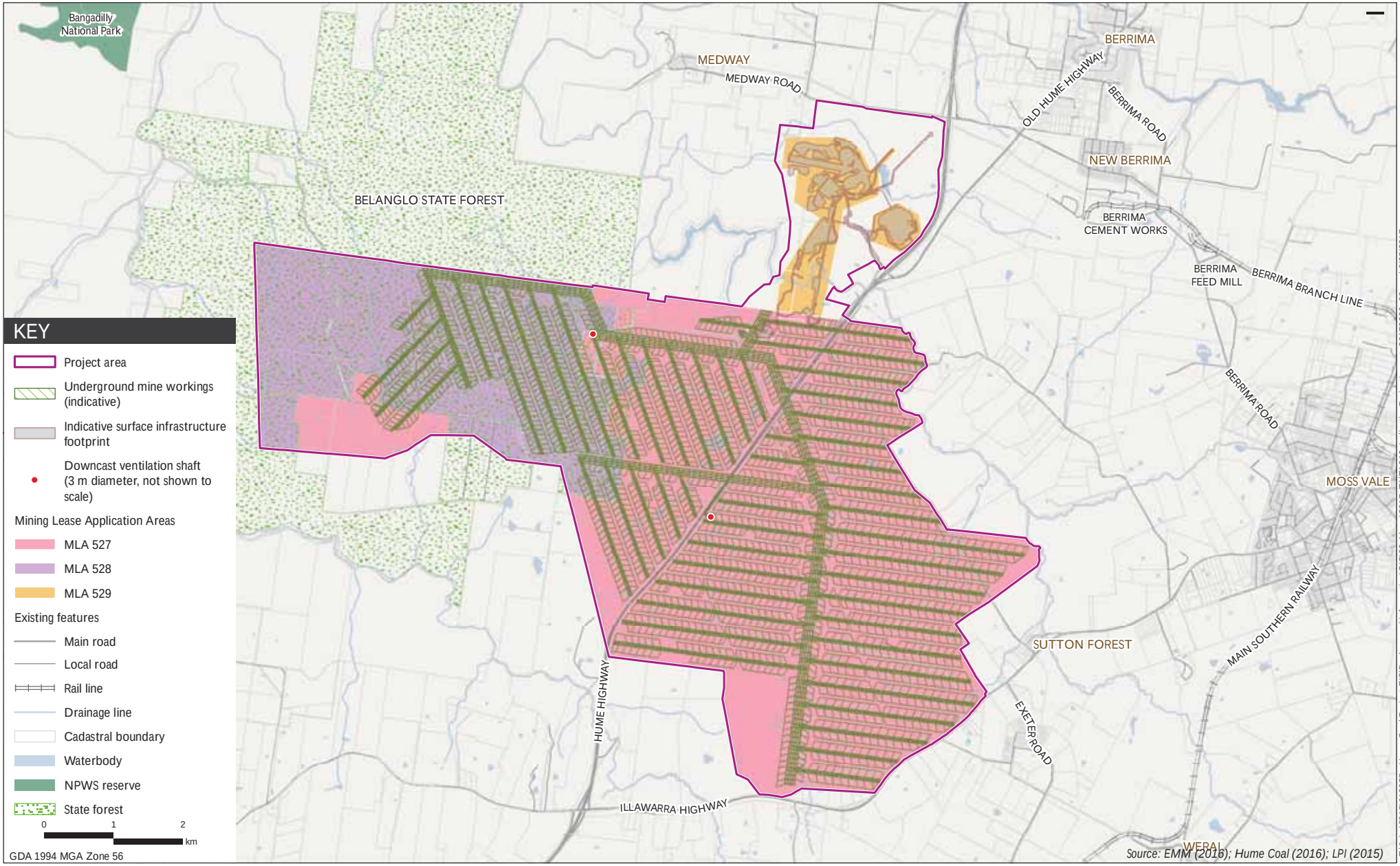


Local context

Hume Coal Project

Traffic Impact Assessment

Figure 1.2

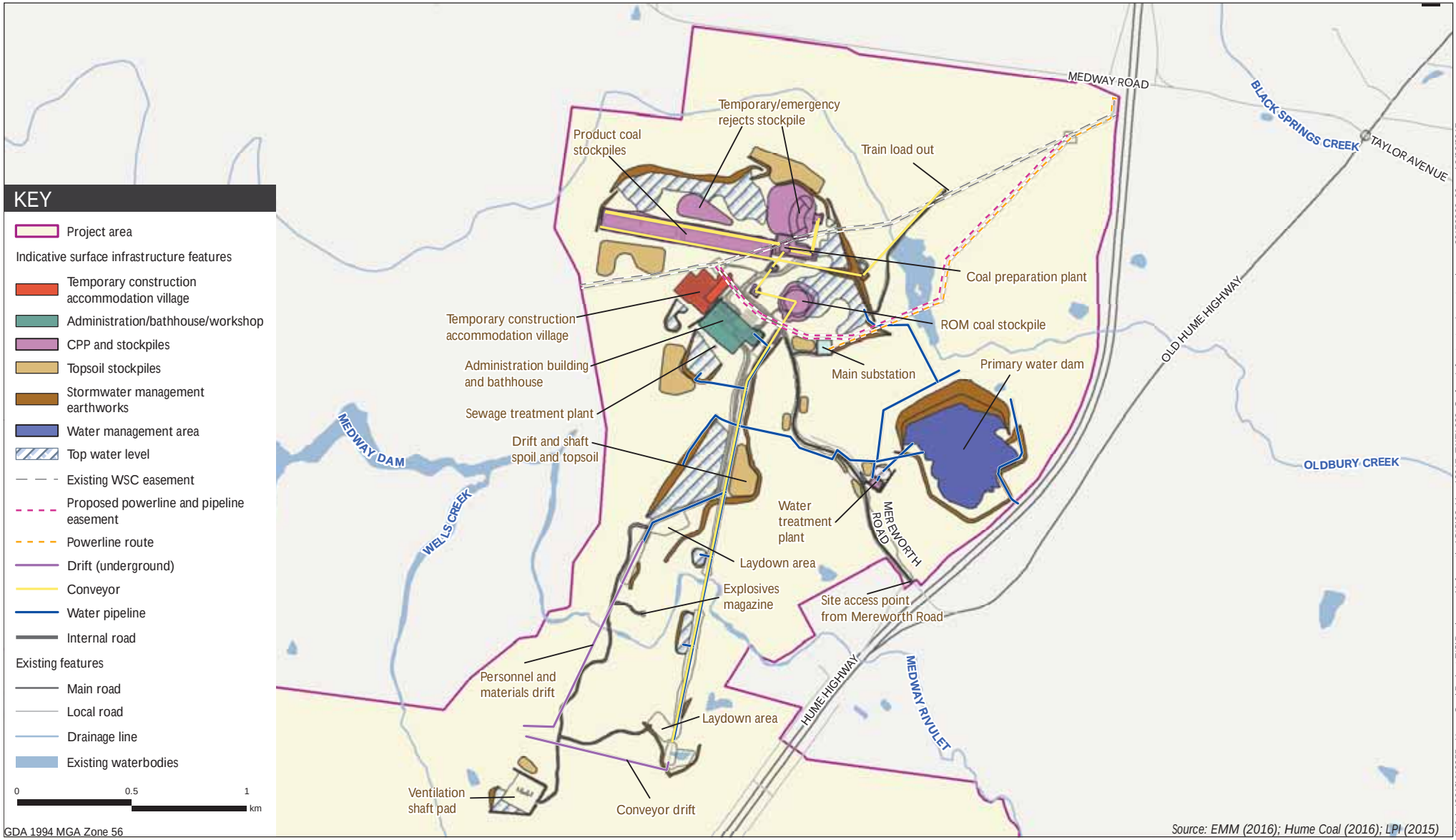


Indicative project layout

Hume Coal Project

Traffic Impact Assessment

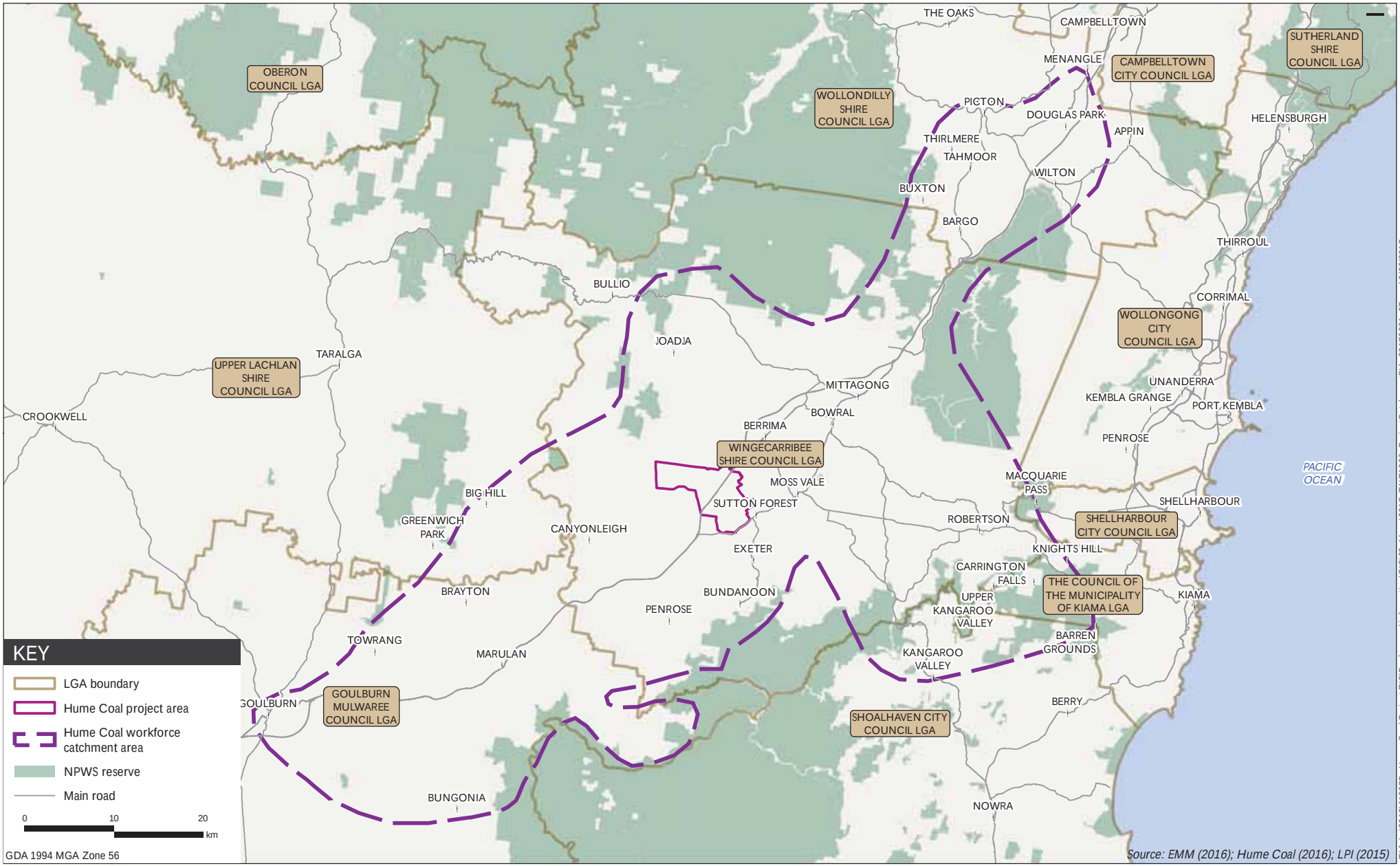
Figure 1.3



Indicative surface infrastructure layout

Hume Coal Project
Traffic Impact Assessment

Figure 1.4



Workforce catchment area

Hume Coal Project

Traffic Impact Assessment

Figure 1.5

1.5 Assessment requirements

This assessment has been prepared in accordance with the relevant governmental assessment requirements, guidelines and policies, and in consultation with the relevant government agencies. Guidelines and policies considered are as follows:

The SEARs for the project were issued by the NSW Department of Planning and Environment (DP&E) on 20 August 2015. They contained the requirements listed in Table 1.1 for assessment of the project's road transport impacts. Transport for NSW and RMS also added a number of requests, which are given in Table 1.1.

Table 1.1 Road transport SEARs and other agency requests

Requirement	Where assessed
DP&E	
An assessment of likely impacts on the capacity, condition, safety and efficiency of the local and state road networks, having regard for TfNSW and RMS requirements.	In Chapters 4 and 5, including a summary table of the assessed impacts in Chapter 7
Other agency requests	
TfNSW requests dated 8 August 2015	
A traffic impact study prepared in accordance with the methodology set out in Section 2 of the RTA Guide to Traffic Generating Developments including the following details:	In all chapters of this report and in the summary transport assessment in Chapter 15 of the EIS
• Accurate daily and peak traffic forecasts generated during construction and operation including details of transport route, types of vehicles likely to be used and expected ramp up periods. Forecasts are to include anticipated service vehicle movements, including service vehicle type and arrival and departure times.	In Chapter 3
• Details of the proposed staging of the project construction and operations.	In Chapter 1 and Chapter 3
• Details of the proposed access to the site from the road network during construction and operation of the project, including hours of operation, days of construction and operation for each stage of the project, intersection location, design and sight distances.	In Chapter 3. No new intersections are proposed for the project access which would require consideration of sight distances and other intersection design requirements.
• Detailed assessment of the impact of the proposed project on the capacity, safety and efficiency of the road networks during construction and operation. The assessment should consider the cumulative impacts of the project on current road users and should also include the contribution of mining inputs, having regard to the transportation of dangerous goods (explosives, fuel and chemicals) to be utilised during the construction and operational phases of the project. A risk assessment should be undertaken to identify management measures that will be implemented to ensure that dangerous goods are safely transported.	In Chapters 4, 5 and 6 (hazardous materials). Project hazard and risk assessment in Chapter 18 and Appendix Q of the EIS.

Table 1.1 Road transport SEARs and other agency requests

Requirement	Where assessed
• Any over size or over mass vehicles and loads expected for the construction, operation or decommissioning of the project should be identified, including the shortest and least trafficked route having been given priority for the movement of construction materials and machinery to minimise the risk and impact to other motorists.	In Chapter 6
• A description of the measures that would be implemented to maintain and/or improve the capacity, safety and efficiency of the road network for the construction and over the life of the project.	In Chapter 6
• Detailed plans of the proposed layout of the internal access roads and on-site parking in accordance with relevant Australian standards.	In Chapter 1 of this report and in Chapter 2 of the EIS under 'Project Description'.
RMS requests	
The effect on traffic volumes and roadway configurations associated with entry to and exit from the mine during construction and operation from vehicles associated with the mine. RMS will not accept any direct access to the Hume Highway. If significant road works are proposed to accommodate any changes to the traffic regime, then the EA will need to be expanded to address these proposals.	In Chapter 4 and 5.
The movement of overweight and oversize vehicles on the Hume Highway associated with the mine.	In Chapter 6
The visual amenity impact of the mine works with regard to driver behaviour.	Visual impacts have been assessed and mitigation measures provided in Chapter 16 and Appendix O of the EIS. Extensive tree planting is proposed to screen visually sensitive areas of the project from the surrounding roads.
The impact of dust pollution on the travelling public.	Air quality impacts have been assessed and mitigation measures provided in Chapter 12 and Appendix L of the EIS. The air quality impact assessment has determined there will be minimal dust related impacts from the project for areas in the vicinity of the Hume Highway and further east. It is noted the project is an underground mine which will have far lower dust generation potential than an open cut mine.
The impact of dust pollution or the deposition of fines on the functioning of reflective signs, pavement markers and pavement line marking.	As above.
The impacts of noise and vibration of the mine and rail line operations, including undermining or destabilisation of the Hume Highway through coal extraction operations or otherwise; and vibration impacts on the Hume Highway through mine construction and mine operation.	This requirement is addressed in Section 3.6 and Section 5.8 in The Noise and Vibration Impact Assessment (Appendix K of the EIS). It is highly unlikely that vibration levels will cause structural vibration impacts on the Hume Highway.
The impacts on the groundwater flows, including: changes in the water table configuration through such things as new dam construction, re-routing of water ways, groundwater behaviour changes, and changes to the catchment areas that feed to or away from the Hume Highway. Any change in the water table has the potential to affect the structural integrity of the Hume Highway.	This requirement is addressed in Chapter 11 of the Water Assessment (Appendix F of the EIS). The project impact will be less than 10 m drawdown in the Hume Highway area, which is considered small. Additionally, the Subsidence Impact Assessment (Appendix M of the EIS) concludes that subsidence impacts to surface features will be negligible or imperceptible.

2 Existing road network and traffic conditions

2.1 Key transport routes

The transport investigations undertaken during early project planning identified a number of vehicular access constraints and options. It was determined that nearly all project traffic would use access routes that do not require right turn access at any intersections on the Hume Highway south of the Mereworth Road (Old Hume Highway) interchange.

The Hume Highway has three grade separated interchanges that provide major road access into and around the project area. These are shown on Figure 2.1. The two northern interchanges at Mereworth Road (Old Hume Highway) and Medway Road are both outside the mine lease area boundary. The southern interchange, at the Illawarra Highway and Canyonleigh Road, is on the south-western boundary of the mine lease area.

Between the Mereworth Road (Old Hume Highway) and Illawarra Highway interchanges, the Hume Highway is dual carriageway with a wide central median, but is not classified as a motorway. It has a number of intersections with private property driveways and local roads, including Belanglo Road and Golden Vale Road.

The project's construction and operations traffic will generally use either the Medway or Mereworth Road interchanges (which are about 3 km apart) to provide the northbound and southbound access onto the Hume Highway respectively. The road will be upgraded to link with a new link road that will be built to access the mine infrastructure area from Mereworth Road.

The existing Hume Highway ramp access interchanges will provide appropriate access for all regionally based mine traffic approaching or departing from the area. Other locally based project traffic (which will be travelling to and from nearby locations such as Moss Vale, Mittagong and Berrima) will generally use other routes, such as the Old Hume Highway, which connects via Taylor Avenue and Berrima Road to Moss Vale and the Illawarra Highway.

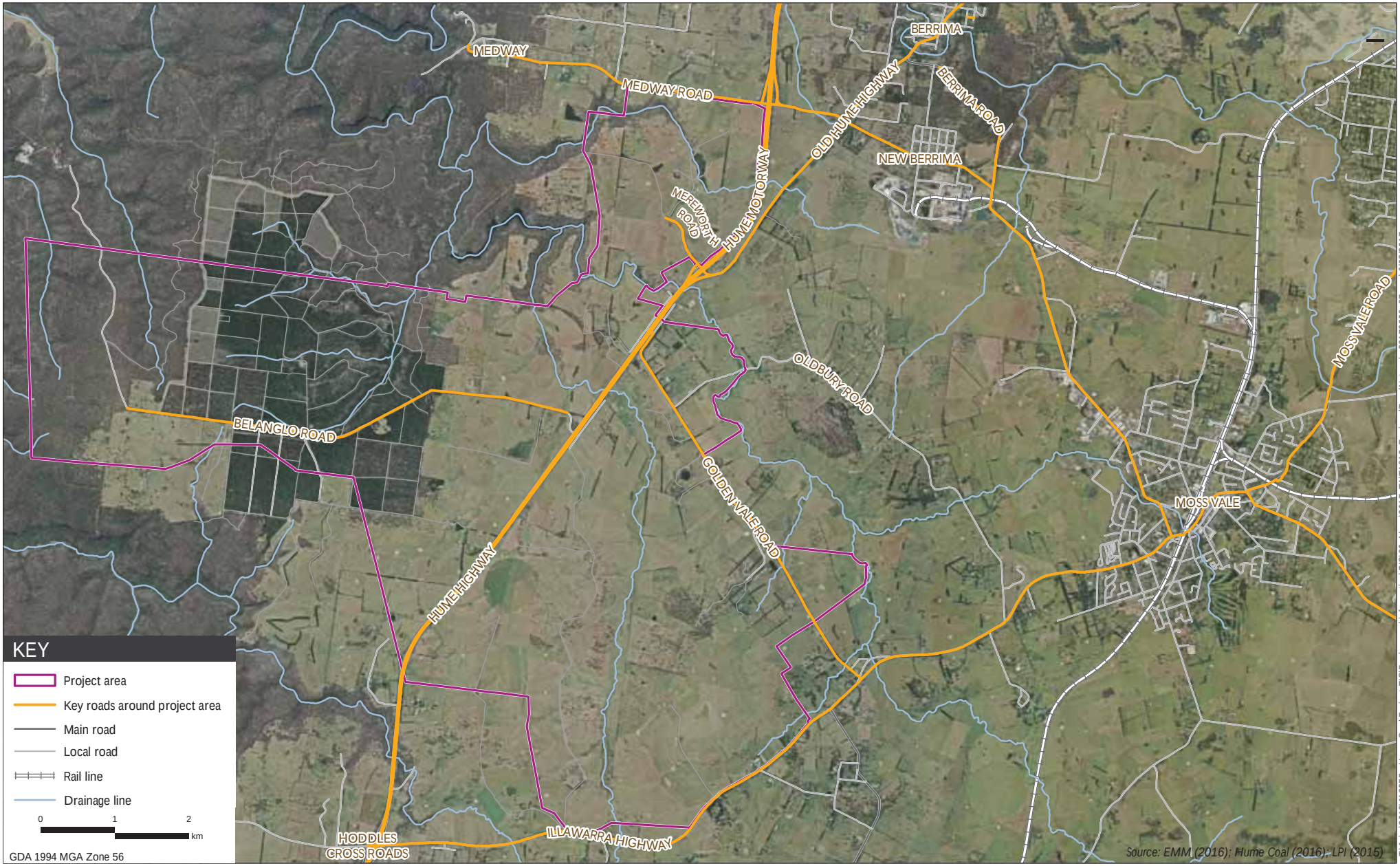
The Old Hume Highway between Mereworth Road and Medway Road/Taylor Avenue has substantial heavy vehicle traffic from the major industries located between Moss Vale and Berrima (including the Berrima Cement Works).

2.2 Road network

The main vehicular access routes and intersections the project traffic will use are shown on Figures 2.2, 2.3 and 2.4.

Most of the project's traffic will use the upgraded link road from Mereworth Road, which will be built on the western side of the Hume Highway. Some project construction stage traffic may also use Medway Road for access to and from the north.

Access off the Hume Highway at the Carlisle Downs property will be required during construction and operation of a ventilation shaft. This will not require significant road works and will be subject to traffic control plans prepared in accordance with the RMS procedure for traffic control at work sites.



Regional road network

Hume Coal Project

Traffic Impact Assessment

Figure 2.1

Local road network and intersections - Project area south

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Traffic Impact Assessment

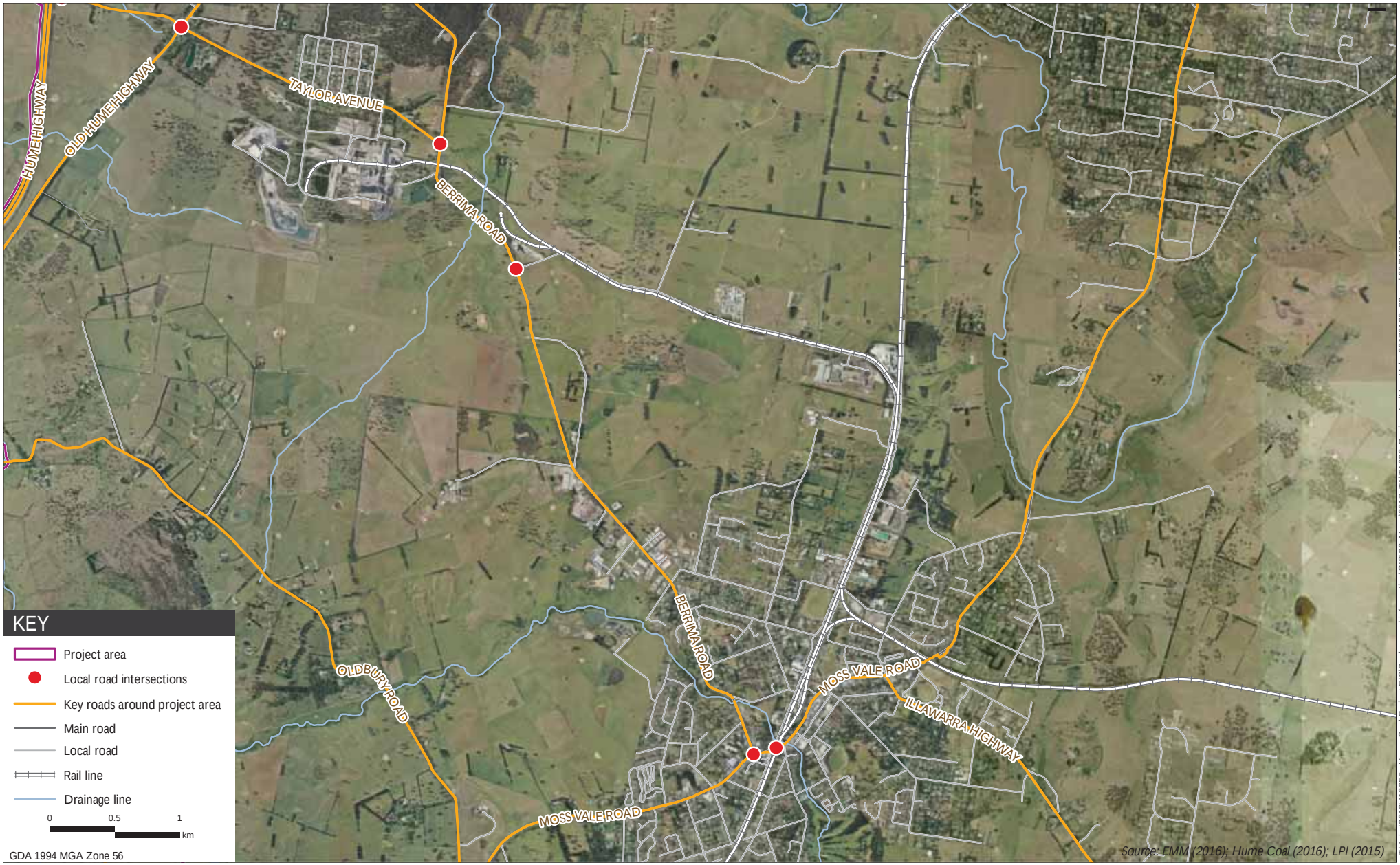
Figure 2.2

Local road network and intersections - Project area north

Hume Coal Project

Traffic Impact Assessment

Figure 2.3



Local road network and intersections - Berrima to Moss Vale

Hume Coal Project

Traffic Impact Assessment

Figure 2.4

The three main areas of the mine where traffic movements will occur during both construction and operations will be at:

- the main surface access construction compound and surface infrastructure area, which will mostly be accessed via the upgraded road from Mereworth Road, as well as some vehicular access from the south via a secondary access road on the western side of the Hume Highway, near Golden Vale Road;
- the rail spur line loading and CHPP area where access will mostly be from Mereworth Road and also potentially from the north, directly from Medway Road on the western side of the Hume Highway; and
- access to ventilation shafts and other services located on the eastern side of the Hume Highway (Carlisle Downs property).

The major roads most likely to be used by project's traffic are:

- the Hume Highway (SH 2);
- the Illawarra Highway (SH 25), which passes through Moss Vale and Sutton Forest continuing to access the Illawarra and South Coast via Robertson and other routes towards Kangaroo Valley, Kiama and Nowra;
- the Old Hume Highway, which passes through Berrima and Mittagong and intersects with the Hume Highway about 5 km south of Berrima, 3 km west of Mittagong and 6 km north of Mittagong; and
- the Berrima Road–Taylor Avenue–Medway Road route, which connects from the Illawarra Highway at Moss Vale to the Old Hume Highway and the Hume Highway about 2 km south of Berrima.

2.3 Width and condition of existing roads

The road network evaluated in this assessment comprises the two state highways (the Hume Highway and the Illawarra Highway), the Old Hume Highway and the Berrima Road–Taylor Avenue–Medway Road route. These roads are all likely to be used by the mine-related traffic during both the project's construction and operations stages.

The standards to which these roads have been constructed are based on historic standards which generally meet or exceed the current functional requirements of the routes, in particular for the Old Hume Highway route.

The physical condition of the affected roads in the project area has been determined by field inspections and detailed dilapidation surveys will be undertaken before construction starts on the project.

2.3.1 Hume Highway

The Hume Highway (SH 2) provides a continuous high standard connection between Sydney and Melbourne, (873 km). It is suitable for use by most vehicle types up to and including the largest B-double trucks, but excluding other larger road train-type vehicles. In the Berrima locality the road has a continuous four-lane dual carriageway cross-section. It has been built to motorway standard (with no surface access intersections) to the north of the Old Hume Highway (Mereworth Road) interchange, where the dual carriageway road was originally built as the Hume Highway bypass of Berrima.

Additional slow vehicle lanes are provided on some steeper sections of the highway between Berrima and Mittagong, providing six lanes of traffic capacity at these locations. The road surface along all sections of the highway is maintained to a high standard to provide safe and comfortable travel conditions for all types of vehicles.

2.3.2 Illawarra Highway

The Illawarra Highway (SH 25) provides the main arterial road connection between the Illawarra and Southern Highlands. It has generally been designed and constructed as a high standard, two-lane rural highway with generous traffic lane and sealed shoulder widths, but has only limited overtaking opportunities in the Moss Vale and Sutton Forest areas. The road is suitable for most types of larger trucks but only permits B-double vehicles to travel as far as Robertson.

Trucks larger than semi-trailers are not allowed to use the Macquarie Pass section east of Robertson, which connects to Wollongong and the coastal Illawarra region. Within urban areas, where the road passes through the townships of Sutton Forest, Moss Vale and Robertson, it uses a range of urban type road cross-sections and lower speed limits generally apply, including 40 km/hr 'school zone' limits. The road surface is generally maintained in good condition with few visible surface defects. There is one railway level crossing just west of Robertson.

Through Moss Vale, the Illawarra Highway is known as Argyle Street, and has urban intersections with major local roads, including Berrima Road, which is known as Waite Street in Moss Vale.

2.3.3 Old Hume Highway

The Old Hume Highway, north of Mereworth Road, provides local access and distribution through the Berrima area as well as a non-motorway connection between Berrima and Mittagong, which has substantial local traffic usage. To the south of Mereworth Road, the Old Hume Highway ceases to exist but some sections have effectively been incorporated into the four-lane dual carriageway alignment of the Hume Highway. Other isolated sections remain as service roads providing local access to properties, such as near the Golden Vale Road intersection. There is a former railway level crossing on the Old Hume Highway, south of Medway Road, where the former private railway branch line operated between Berrima and the Medway Village. The line has been closed for many years, but much of the track remains.

2.3.4 Taylor Avenue, Berrima Road and Medway Road

These roads provide an east-west major road connection between the Hume Highway, the Old Hume Highway and Moss Vale. The route provides vehicular access to a number of major industrial sites which are located between Moss Vale and Berrima and also to residential areas in New Berrima and in the south and west of Moss Vale.

The speed limit is generally 80 km/hr but is reduced to 50 km/hr near residential areas. There is one railway level crossing east of the Berrima Cement Works, which is used by a relatively small number of trains each day travelling to and from the cement works.

2.3.5 Mereworth Road

Mereworth Road, west of the Hume Highway is the main local road that mine-related traffic will use for future access. The existing daily traffic volumes using the roads are generally low as the road is mainly only used for access to the Mereworth property.

2.3.6 Other local roads

Medway Road (west of the Hume Highway), Golden Vale Road, Oldbury Road and Belanglo Road are other local roads that mine-related traffic could use for some future access. The existing daily traffic volumes using these roads are generally low, as the farming properties in the area are relatively large and the rural residential population is low. Future usage of these roads by project traffic is expected to be minimal.

2.4 Traffic volumes and heavy vehicle usage

Existing daily traffic volumes on the major roads in the project area were determined from historic RTA and RMS tube traffic counts from the years 2005 and 2012. The counts are summarised in Table 2.1.

Table 2.1 Existing major road daily traffic volumes

Road name	Average daily traffic (2005 vehicles)	Average daily traffic (2012 vehicles)*	% per annum growth in vehicles
Hume Highway (Menangle)	33,112		
Hume Highway (Pheasants Nest)	29,660	34,000	+2.1%
Hume Highway (Mittagong Bypass)	16,969	19,700	+2.3%
Hume Highway (Penrose)	20,029	21,300	+0.9%
Hume Highway (Marulan Bypass)	20,113		
Hume Highway (South of Federal Highway)	6,434		
Illawarra Highway (Sutton Forest)	3,204		
Illawarra Highway (east of Robertson)	2,940	3,400	+2.2%

*Note: * Daily Traffic Volumes are from RTA (2005) and RMS (2012) where survey data is available.*

On the Hume Highway over the past ten years, the prevailing annual traffic growth rate has been about 2%. On the other routes in the local Berrima and Moss Vale areas, annual traffic growth rates have been lower, typically around 1%.

Existing peak hour traffic volumes on major and local roads in the Berrima and Moss Vale localities were determined from intersection counts made during June 2015 and February 2016. The intersection traffic count survey results are given in Appendix A and summarised in Table 2.2 and Table 2.3. Key features are as follows:

- the morning 'peak hour' period is generally 8.00–9.00 am, but at some of the intersections it occurs between 7.45 am and 8.45 am;
- the afternoon 'peak hour' is generally between 3.30–4.30 pm, but varies between 3.00 pm and 4.00 pm and 4.00 pm and 5.00 pm at the range of intersections considered;
- on major roads, the proportion of heavy vehicle traffic is highest on the Hume Highway, where it is typically between 17% and 18%;
- on the local roads, Douglas Road has the highest proportion of heavy vehicles at 29%; and
- on other routes, the proportions of heavy vehicle traffic vary widely, between 1% and 14%.

Table 2.2 Summary of surveyed peak hour traffic volumes on roads near the project area

Road name	am peak hourly volume	am peak hourly volume	am peak hourly combined	pm peak hourly volume	pm peak hourly volume	pm peak hourly combined	Per cent heavy vehicles*
	North- or east-bound	South- or west-bound	Both directions	North- or east-bound	South- or west-bound	Both directions	
Hume Highway south of Golden Vale Road	451	585	1,036	664	525	1,191	18
Hume Highway south of Mereworth Road	490	581	1,071	687	524	1,211	18
Hume Highway north of Medway Road	501	664	1,165	750	551	1,301	17
Golden Vale Road east of Hume Highway	29	45	74	47	27	74	3
Mereworth Road west of Hume Highway	2	0	2	2	0	2	0
Old Hume Highway south of Medway Road	67	32	99	38	48	86	8
Old Hume Highway north of Medway Road	107	44	151	51	79	130	5
Medway Road west of Old Hume Highway	112	73	185	72	121	193	14
Medway Road west of Hume Highway	24	7	31	19	20	39	4
Taylor Avenue east of Old Hume Highway	126	115	241	98	129	227	14
Taylor Avenue west of Berrima Road	131	70	201	112	139	251	9

*Note: *Per cent heavy vehicles is the average percentage recorded from both the morning and afternoon peak hour traffic surveys.*

Table 2.3 Summary of surveyed peak hour traffic volumes on Berrima Road to Moss Vale route

Road name	am peak hourly volume	am peak hourly volume	am peak hourly combined	pm peak hourly volume	pm peak hourly volume	pm peak hourly combined	Per cent heavy vehicles*
	North- or east-bound	South- or west-bound	Both directions	North- or east-bound	South- or west-bound	Both directions	
Berrima Road south of Taylor Avenue	181	130	311	223	180	403	6
Berrima Road north of Douglas Road	195	139	334	250	190	440	10
Berrima Road south of Douglas Road	127	170	297	200	177	377	7
Douglas Road east of Berrima Road	33	20	53	21	58	79	29
Waite Street north of Argyle Street	343	267	610	327	330	657	4
Lackey Road north of Argyle Street	213	215	428	264	225	489	3
Argyle Street west of Waite Street	606	260	866	507	408	915	3
Argyle Street east of Waite Street	785	515	1,300	749	647	1,396	3
Argyle Street east of Lackey Road	895	694	1,589	815	905	1,720	3

*Note: *Per cent heavy vehicles is the average percentage recorded from both the morning and afternoon peak hour traffic surveys.*

2.5 Levels of service

2.5.1 Standards

The daily and peak hourly traffic volume standards for major rural roads are set by the RTA Guide to Traffic Generating Developments (RTA 2002). The RTA defines six levels of service for rural roads (A, B, C, D, E and F), as described below:

- **Level of Service A**
  - The top level is a free-flow condition in which individual drivers are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high and the general level of comfort and convenience provided to traffic is excellent.
- **Level of Service B**
  - This level is termed stable flow in which drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream, although the general level of comfort and convenience for traffic is a little less than that of Level of Service A.

- **Level of Service C**

  - This level is also in the stable flow zone, but most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience for traffic declines noticeably at this level.

- **Level of Service D**

  - This level is close to the limit of stable flow, approaching unstable flow. All drivers are severely restricted in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is poor and small increases in traffic flow will generally cause operational problems.

- **Level of Service E**

  - This level occurs when traffic volumes are at or close to capacity and there is virtually no freedom to select desired speeds or to manoeuvre within the traffic stream. Flow is unstable and minor disturbances within the traffic stream will cause a traffic-jam.

- **Level of Service F**

  - This level is termed forced flow where the amount of traffic approaching the point under consideration exceeds that which can pass it. Flow breakdown occurs and queuing and delays result.

In most cases, there is little practical difference between the traffic operating conditions for levels of service A and B on two-lane major roads and motorways. The maximum hourly traffic volume standards are defined in the RTA guide (RTA 2002) for two-lane rural roads for levels of service B to E.

More detailed calculations for the levels of service on two-lane rural roads and motorways can be made by reference to the Austroads Guide to Traffic Engineering Practice–Part 2 Roadway Capacity (Austroads 1988). For the Hume Highway which is a four lane dual carriageway major road and the other major roads, which have generally been built to a two-lane rural highway standard, the hourly traffic volume ranges for levels of service are defined by the following route characteristics described below:

Hume Highway (four-lane divided road or motorway):

- typical lane width is 3.5 metres (m);
- typical sealed shoulder width is 3 m;
- typical terrain is rolling (with additional climbing lanes on steeper sections);
- typical peak hourly directional distribution of traffic (north/south) is 55%/45%;
- about 17.5% of traffic is heavy vehicles; and
- weekday peak hour traffic is around 6.5% of average daily traffic.

Old Hume Highway, Medway Road, Taylor Avenue and Berrima Road (two-lane rural highways):

- typical lane width is 3.5 m;
- typical shoulder width is 2 m (0.5 m sealed);
- typical terrain is rolling, with no overtaking for 40% of route length;
- about 10% of traffic is heavy vehicles; and
- weekday peak hour traffic is around 9% of average daily traffic.

The defined hourly and daily traffic volumes ranges for levels of service for roads with these design traffic characteristics have been calculated using the prescribed RTA method and are as given below.

On the Hume Highway (for hourly volumes in the peak direction of traffic flow*) the daily volumes are:

- Level of Service A, up to 900* vehicles per hour = up to 25,200 vehicles per day;
- Level of Service B, range 900 to 1,400* vehicles per hour (25,200–39,200 vehicles per day);
- Level of Service C, range 1,400-1,800* vehicles per hour (39,200–50,400 vehicles per day);
- Level of Service D, range 1,800-2,200* vehicles per hour (50,400–61,500 vehicles per day);
- Level of Service E, range 2,200-2,800* vehicles per hour (61,500–78,300 vehicles per day); and
- Level of Service F, over 2,800* vehicles per hour (78,300 vehicles per day).

On other major rural roads, such as the Old Hume Highway, Medway Road, Taylor Avenue and Berrima Road (for the combined hourly traffic volumes in both directions), the daily traffic volumes and levels of service are:

- Levels of Service A or B, up to 360 vehicles per hour = 4,000 vehicles per day;
- Level of Service C, range 360–650 vehicles per hour (4,000–7,220 vehicles per day);
- Level of Service D, range 650–970 vehicles per hour (7,220–10,780 vehicles per day);
- Level of Service E, range 970–1,720 vehicles per hour (10,780–19,110 vehicles per day); and
- Level of Service F, over 1,720 vehicles per hour (19,110 vehicles per day).

On two-lane urban roads, such as the Illawarra Highway route (Argyle Street) through the centre of Moss Vale, the levels of service for the hourly volumes in the peak direction of traffic flow* and the corresponding daily volumes as defined by the RTA guide (RTA 2002) are effectively:

- Level of Service A, up to 200* vehicles per hour = up to 4,000 vehicles per day;
- Level of Service B, range 200 to 380* vehicles per hour (4,000–7,700 vehicles per day);
- Level of Service C, range 380–600* vehicles per hour (7,700–12,100 vehicles per day);

- Level of Service D, range 600–900* vehicles per hour (12,100–18,200 vehicles per day);
- Level of Service E, range 900–1,400* vehicles per hour (18,200–28,300 vehicles per day); and
- Level of Service F, over 1,400* vehicles per hour (28,300 vehicles per day).

2.5.2 Current levels of service

On the Hume Highway near the project area, the surveyed peak hourly directional volumes (Table 2.2) are up to 750 vehicles per hour. These hourly volumes are within the range for Level of Service A for a dual carriageway road, where all traffic is free flowing and drivers have a high degree of freedom to travel at their desired speed, subject to the applicable maximum speed limit for the route.

On the other rural roads listed in Table 2.2, which are either two-lane local roads or rural highways, the peak hourly two-way traffic volumes are all lower than 360 vehicles per hour, which corresponds to the two highest levels of service (A or B) and unconstrained traffic flow for these routes.

On the rural and urban roads listed in Table 2.3, which include Berrima Road and Argyle Street and their major connecting roads, the combined peak hourly two-way traffic volumes for Berrima Road are up to 440 vehicles per hour at certain locations. This corresponds to Level of Service C, where the traffic flow is 'stable' but most drivers are restricted in their freedom to select their desired travel speed.

On Argyle Street within Moss Vale, the surveyed peak hourly directional traffic volumes are up to 905 vehicles per hour. These hourly volumes correspond to the transition stage between the levels of service D to E, where the traffic flow is highly constrained, all drivers are generally restricted in their ability to travel at their desired speed and the traffic flow is subject to frequent interruptions.

2.6 Intersections

2.6.1 Design standards

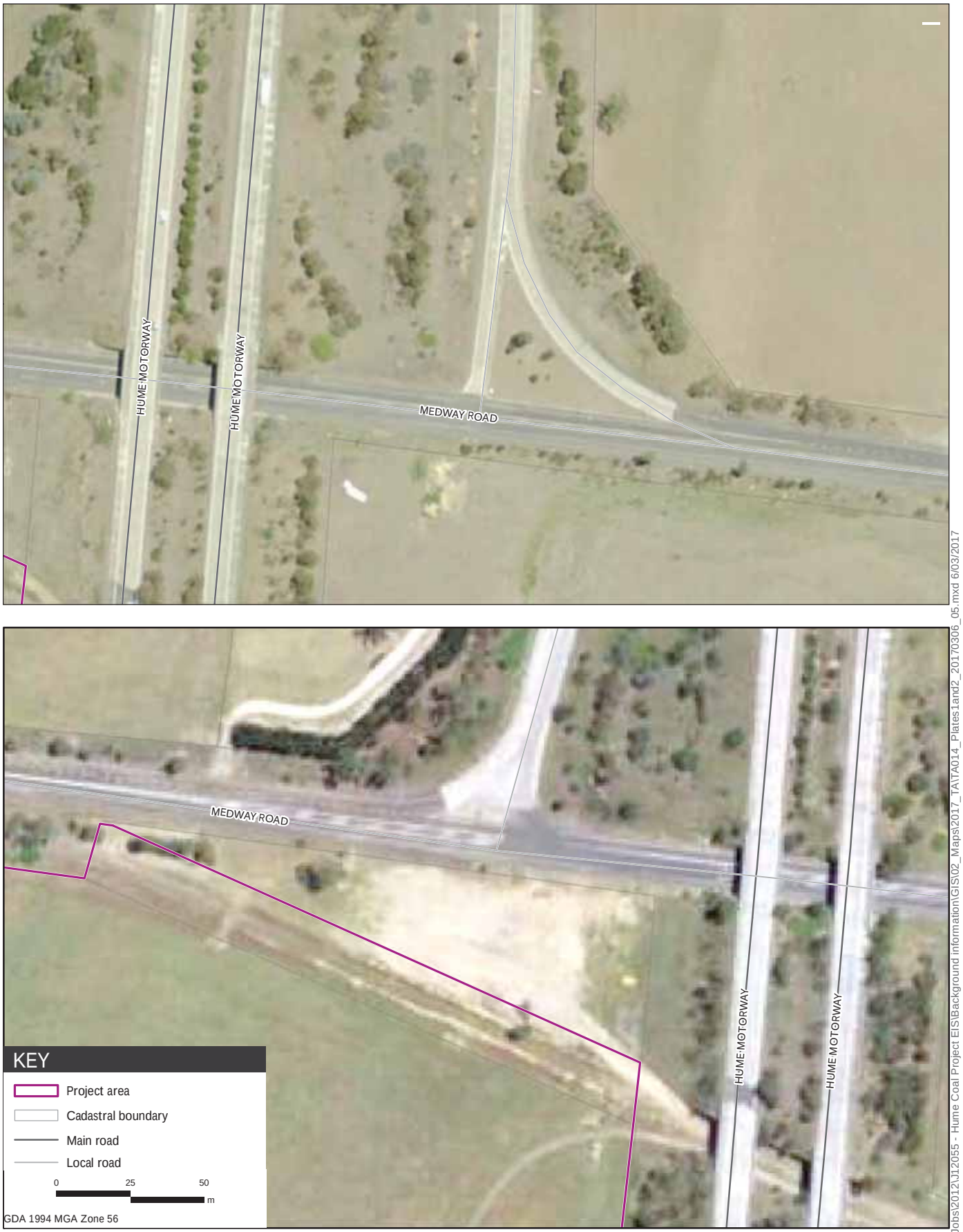
The nearest major road intersections that will be most used by project traffic are the two grade separated interchanges on the Hume Highway at Medway Road and at the Old Hume Highway (Mereworth Road).

The other nearby major road intersections that could also be affected are at Hume Highway/Golden Vale Road and Old Hume Highway/Medway Road, where there is a roundabout.

On the Berrima Road and Argyle Street routes, which connect towards and within Moss Vale, there are a number of other intersections that could also be affected, at Berrima Road/Taylor Avenue, Berrima Road/Douglas Road, Argyle Street/Waite Street and Argyle Street/Lackey Road.

The current design standard of these intersections is illustrated by Figures 2.5 to 2.9 and each intersection is described in Table 2.4. Some of these intersections have additional turning lanes. The requirements for turning and deceleration lanes at rural intersections are specified in Austroads (2010).

Where new intersections are proposed to include a left or right turning deceleration lane, the Austroads intersection design standard (Austroads 2010) is normally used to design the lane. The SIDRA intersection analysis program is also used to assess the intersection traffic delay and other operating performance, such as the maximum traffic queue length for any left or right turn deceleration/storage movement.



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Hume Highway and Medway Road ramp intersection
east side (top) and west side (bottom)

Hume Coal Project
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Figure 2.5

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Hume Highway and Mereworth Road ramp intersection
east side (top) and west side (bottom)

Hume Coal Project
Traffic Impact Assessment
Figure 2.6

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Hume Highway and Golden Vale Road access intersection (top) and
Old Hume and Highway Medway Road roundabout intersection (bottom)

Hume Coal Project
Traffic Impact Assessment
Figure 2.7

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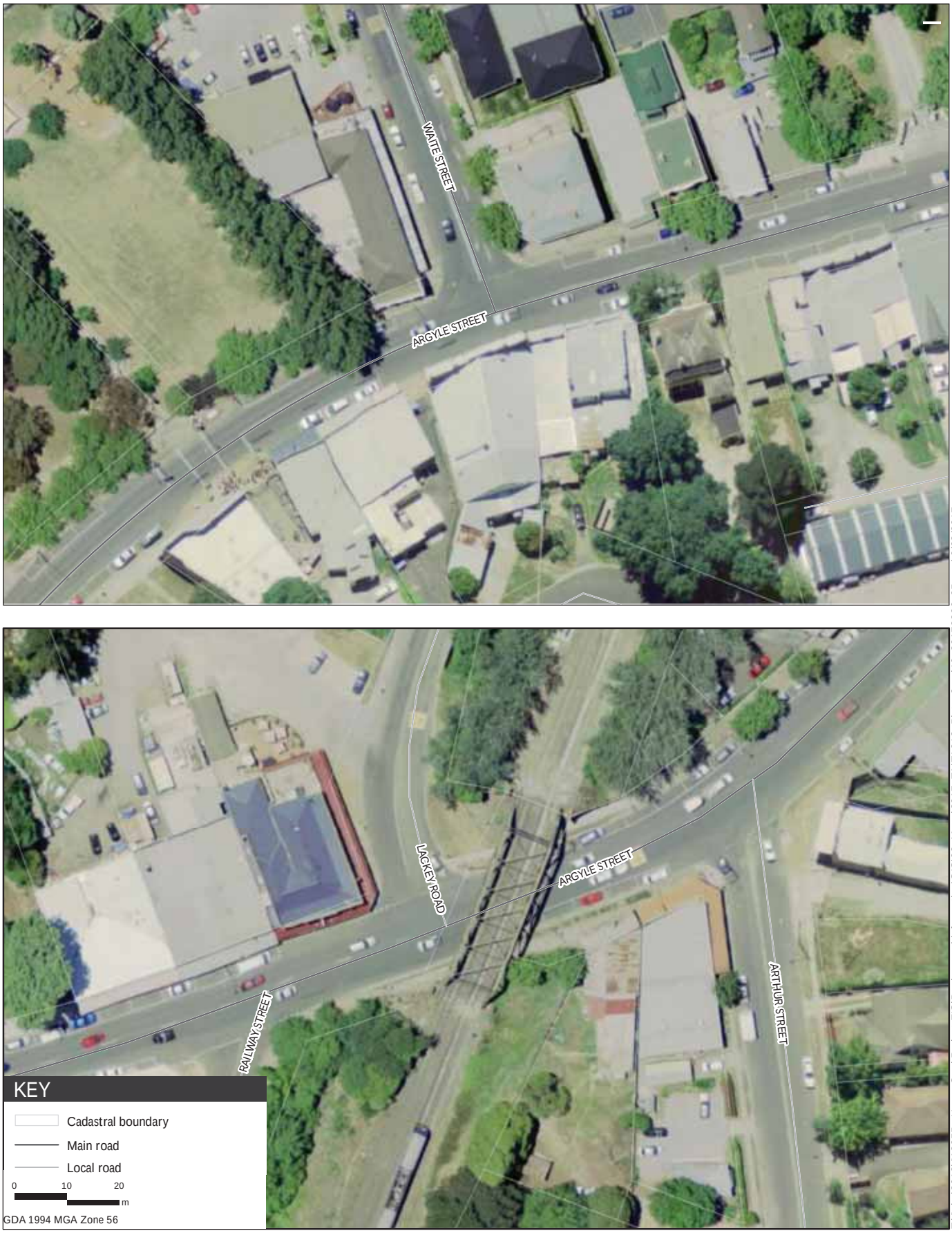
Berrima Road and Taylor Avenue Y intersection (top) and
Berrima Road and Douglas Road T intersection (bottom)

Hume Coal Project
Traffic Impact Assessment
Figure 2.8



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Argyle Street and Waite Street intersection in Moss Vale (top) and
Argyle Street and Lackey Road intersection in Moss Vale (bottom)

Hume Coal Project

Traffic Impact Assessment

Figure 2.9

Table 2.4 Design of existing Intersections

Major road	Minor road	Intersection type	Comment
Hume Highway	Medway Road (east side intersection)	Additional left turn merging lane for the Hume Highway exit traffic southbound	Will be used by some project traffic when travelling from the north from regional destinations
Hume Highway	Medway Road (west side intersection)	Additional left and right turning lanes for eastbound and westbound traffic on Medway Road	Will be used by some project traffic when travelling to the north to regional destinations
Hume Highway	Mereworth Road (east side intersection)	There are bypass lanes for the major traffic movements at the intersection and additional short turning lanes for the right turning traffic movements	Will be used by the majority of project traffic travelling to or from most regional and local destinations
Hume Highway	Mereworth Road (west side intersection)	No additional turning lanes. A change to the intersection priority is required as the existing intersection priority is confusing for most traffic	Will be used by virtually all the project traffic when travelling to or from regional or local destinations
Hume Highway	Golden Vale Road and private access road	This is a four-way intersection that has a wide median and deceleration lanes for left and right turning traffic from the Hume Highway	Will be used by some project traffic when travelling to or from the south to regional destinations or local destinations in the Sutton Forest area
Old Hume Highway	Medway Road and Taylor Avenue (roundabout intersection)	No additional turning lanes	Will be used by the majority of project traffic travelling to or from the north or east to and from both regional and local destinations
Berrima Road	Taylor Avenue	No additional turning lanes	Will be used by some project traffic travelling to or from the east from either regional or local destinations
Berrima Road	Douglas Road	Additional left and right turning lanes for south-east and north-westbound traffic on Berrima Road	Will be used by some project traffic travelling to or from the east from either regional or local destinations
Argyle Street	Waite Street	Additional left and right turning lanes for the north-east and south-westbound traffic on Argyle Street and a two-lane exit for the traffic using Waite Street	Will be used by some project traffic travelling to or from the east from regional destinations
Argyle Street	Lackey Road	Additional left and right turning lanes for the north-east and south-westbound traffic on Argyle Street and a two-lane exit for the traffic using Lackey Road	Will be used by some project traffic travelling to or from the east from regional destinations

2.6.2 Operating conditions

The existing intersection traffic operations for the project area intersections were assessed using SIDRA 5.1 intersection capacity analysis. The results are given in Appendix B and are interpreted according to the parameters that define different levels of service in Table 2.5.

The SIDRA analysis results, for the base year (2015) traffic, without any of the additional project traffic, are provided in Table 2.6 and 2.7.

Table 2.5 RTA/RMS Intersection level of service standards

Level of service	Average delay* (seconds per vehicle)	Traffic signals, roundabout	Priority intersection ('stop' and 'give way')
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity At signals, incidents would cause excessive delays Roundabouts require other control mode	At capacity; requires other control mode
F	Greater than 71	Unsatisfactory with excessive queuing	Unsatisfactory with excessive queuing; requires other control mode

Source: *RTA (2002).*

Note: ** The average vehicle delay is calculated by the SIDRA intersection program for a roundabout or a priority controlled intersection as the vehicle movement with the highest average delay (usually the right turn movement from the minor road) regardless of how many or how few vehicles are actually using that movement at the intersection. The calculated delay for turning traffic movements also includes the geometric delay where the vehicle slows down and then accelerates after travelling through the intersection, as well as the average time spent queuing at the intersection.*

Table 2.6 Existing SIDRA intersection operations for intersections near the project area

Intersection	Peak hour	Traffic demand flow (vehicles)*	Average vehicle delay (seconds)	Level of Service	Degree of saturation	Maximum queue length (m)
Hume Highway Medway Road (east side intersection)	Morning peak hour (7.45–8.45 am typically)	198	11.6	A	0.060	0
	Afternoon peak hour (3.15–4.15 pm typically)	204	11.9	A	0.065	0
Hume Highway Medway Road (west side intersection)	Morning peak hour (7.45–8.45 am typically)	100	12.5	A	0.066	2
	Afternoon peak hour (3.30–4.30 pm typically)	146	11.5	A	0.089	2
Hume Highway Mereworth Road (east side intersection)	Morning peak hour (8.00–9.00 am typically)	76	14.6	B	0.033	0
	Afternoon peak hour (3.00–4.00 pm typically)	78	11.3	A	0.022	0
Hume Highway Mereworth Road (west side intersection)**	Morning peak hour (8.00–9.00 am typically)	62	11.8	A	0.068	2
	Afternoon peak hour (4.00–5.00 pm typically)	46	12.4	A	0.054	2

Table 2.6 Existing SIDRA intersection operations for intersections near the project area

Intersection	Peak hour	Traffic demand flow (vehicles)*	Average vehicle delay (seconds)	Level of Service	Degree of saturation	Maximum queue length (m)
Hume Highway southbound Golden Vale Road and private access road east side intersection	Morning peak hour (8.00–9.00 am typically)	693	18.8	B	0.170	3
	Afternoon peak hour (3.30–4.30 pm typically)	635	17.6	B	0.162	2
Hume Highway northbound Golden Vale Road and private access road west side intersection	Morning peak hour (8.00–9.00 am typically)	523	17.7	B	0.146	3
	Afternoon peak hour (3.30–4.30 pm typically)	735	21.0	B	0.191	3
Old Hume Highway Medway Road and Taylor Avenue	Morning peak hour (8.00–9.00 am typically)	358	17.1	B	0.097	4
	Afternoon peak hour (3.30–4.30 pm typically)	335	17.2	B	0.095	4

Notes: **The SIDRA intersection analysis program automatically adds 5% to all surveyed traffic volumes as a contingency measure.*

*** The capacity analysis for this intersection assumes the intersection traffic priority will be changed to Mereworth Road as the existing intersection traffic priority is confusing for most traffic.*

Table 2.7 Existing SIDRA intersection operations for Berrima Road and Moss Vale intersections

Intersection	Peak hour	Traffic demand flow (vehicles)*	Average vehicle delay (seconds)	Level of Service	Degree of saturation	Maximum queue length (m)
Berrima Road and Taylor Avenue	Morning peak hour (8.00–9.00 am typically)	329	10.8	A	0.203	7
	Afternoon peak hour (3.15–4.15 pm typically)	427	11.9	A	0.198	6
Berrima Road and Douglas Road	Morning peak hour (8.00–9.00 am typically)	360	17.0	B	0.096	3
	Afternoon peak hour (3.15 to 4.15 pm typically)	472	15.1	B	0.134	4
Argyle Street and Waite Street	Morning peak hour (8.00–9.00 am typically)	1,461	51.1	D	0.451	19
	Afternoon peak hour (3.15–4.15 pm typically)	1,562	38.8	C	0.478	27
Argyle Street and Lackey Road	Morning peak hour (8.00–9.00 am typically)	1,729	70.6	F	0.451	39
	Afternoon peak hour (3.15–4.15 pm typically)	1,864	102.5	F	0.541	55

Notes: **The SIDRA intersection analysis program automatically adds 5% to all surveyed traffic volumes as a contingency measure.*

2.7 Intersection levels of service

In Table 2.6 all of the intersections within or close to the project area are operating at very low degrees of saturation (less than 0.2). This corresponds to below 20% of the maximum traffic capacity of the intersection and generally provides a high intersection level of service (either A or B).

In Table 2.7, the intersections along the Berrima Road and Argyle Street routes towards and through Moss Vale become progressively more congested towards the centre of Moss Vale. The two intersections assessed in Moss Vale (at Argyle Street/Waite Street and Argyle Street/Lackey Road) are now operating with significantly congested traffic conditions during both the morning and afternoon traffic peak hours.

2.7.1 Summary of project area intersections

In Table 2.6, the two Hume Highway and Medway Road intersections have low peak hourly traffic volumes of 100–200 vehicles and are both operating at Level of Service A under all of the traffic scenarios considered. There are low degrees of saturation, 6–9% of capacity during the peak hours, and the maximum intersection traffic queues are 2 m or less typically.

The two Hume Highway and Mereworth Road intersections have very low peak hourly traffic volumes of 50–80 vehicles and are also generally operating at Level of Service A, except at the east side intersection during the morning peak hour, which has Level of Service B. There are generally very low peak hour degrees of saturation, 2–7% of capacity, with maximum intersection traffic queues 2 m or less.

The two Hume Highway and Golden Vale Road (northbound and southbound carriageway) local access intersections carry significant through traffic volumes on the Hume Highway (500–700 vehicles per hour in the peak direction) and are generally operating at Level of Service B. These two intersections have low peak hourly degrees of saturation, 15–19% of the maximum capacity for the road and maximum traffic queues of between 2–3 m.

At the Old Hume Highway, Medway Road and Taylor Avenue intersection, which has a large roundabout about 30 m in diameter, there are moderately busy peak hourly traffic volumes of 340–360 vehicles and the intersection is operating at Level of Service B under all of the traffic scenarios considered. The intersection is operating at around 10% of its maximum capacity during both the morning and afternoon peak traffic hours and the maximum traffic queues are about 4 m long.

2.7.2 Summary of Berrima Road and Moss Vale intersections

In Table 2.7, at the Berrima Road and Taylor Avenue intersection (which has an angled approach for Taylor Avenue similar to a Y-intersection), there are moderately busy peak hourly traffic volumes of 330–430 vehicles. The intersection is operating at Level of Service A under all of the traffic scenarios considered. It is operating at about 20% of its maximum capacity during the peak hours, with maximum traffic queues about 6–7 m long.

At the Berrima Road and Douglas Road intersection, there are peak hourly traffic volumes of 360–470 vehicles. The intersection is operating at Level of Service B under all of the traffic scenarios considered and at between 10% and 13% maximum capacity during the peak hours. The maximum intersection traffic queues are about 3–4 m long.

At the Argyle Street and Waite Street intersection (which is within the Moss Vale urban area), there are high peak hourly traffic volumes of 1,460–1,560 vehicles. The intersection is operating at levels of service either C or D for the peak hourly traffic volumes. It is operating at between 45% and 48% of its maximum traffic capacity during these peak hours, with maximum traffic queues between 19 m and 27 m long.

At the Argyle Street and Lackey Road intersection (which is also within the Moss Vale urban area), there are even higher peak hourly intersection traffic volumes of 1,730–1,860 vehicles, with the intersection operating at Level of Service F during both the current peak hours. The intersection is operating at between 45% to 54% maximum capacity during the peak hours, with maximum traffic queues between 39 m and 55 m long.

2.8 Traffic safety

The existing traffic safety conditions in and around the project area have been quantified by reviewing the accident records for Wingecarribee LGA and Berrima. The most recent available five-year accident history (for 2009 to 2013 inclusive) is illustrated in Figures 2.10 and 2.11 and summarised in Table 2.8.

Table 2.8 Recent five-year accident history for all roads in the Wingecarribee LGA

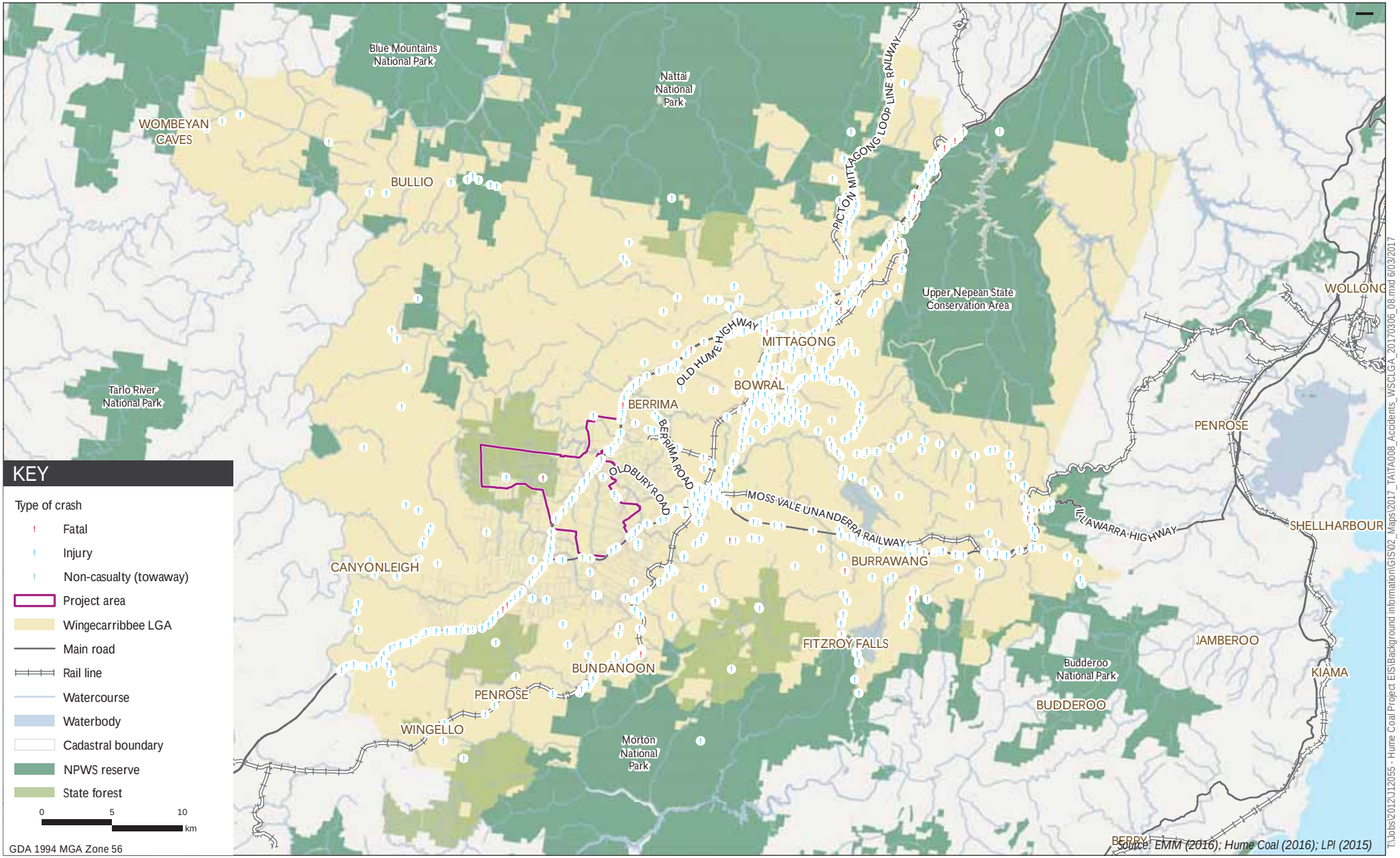
Road	2009	2010	2011	2012	2013	Average for all years
Hume Highway	50	75	80	79	72	71
Illawarra Highway	28	22	31	34	49	33
Other Roads	240	213	216	206	184	212
All Accidents	318	310	327	319	305	316

The data in Table 2.8 shows that the most accidents, about 33% of all those recorded, occurred on the two major roads in the LGA – the Hume Highway and the Illawarra Highway. Over the five years the total number of accidents in the LGA each year has not generally increased, but the number and proportion of the accidents that have occurred on the two state highways has steadily increased (from around 25% of all accidents in 2009 to almost 40% of all accidents in 2013).

The proportion and the total number of the accidents in the LGA that have occurred on the other roads (apart from the Hume Highway and Illawarra Highway) have both decreased significantly from about 240 accidents per year in 2009 to 184 accidents per year in 2013, which is a reduction of 23%. A further summary of the accident records by accident severity on each group of roads is provided in Table 2.9.

Table 2.9 Recent five-year accident history for accident severity in the Wingecarribee LGA

Road	Total accidents	Non-injury (%)	Personal injury (%)	Fatal (%)	Total persons Injured	Total fatalities
Hume Highway	356	225 (63%)	125 (35%)	6 (1.7%)	193	7
Illawarra Highway	164	79 (48%)	82 (50%)	3 (1.8%)	115	3
Other roads	1,059	573 (54%)	474 (45%)	12 (1.1%)	588	12
All accidents	1,579	877 (56%)	681 (43%)	21 (1.3%)	896	22



Five year (2009-2013) locality accident history map for Wingecarribee LGA

Hume Coal Project

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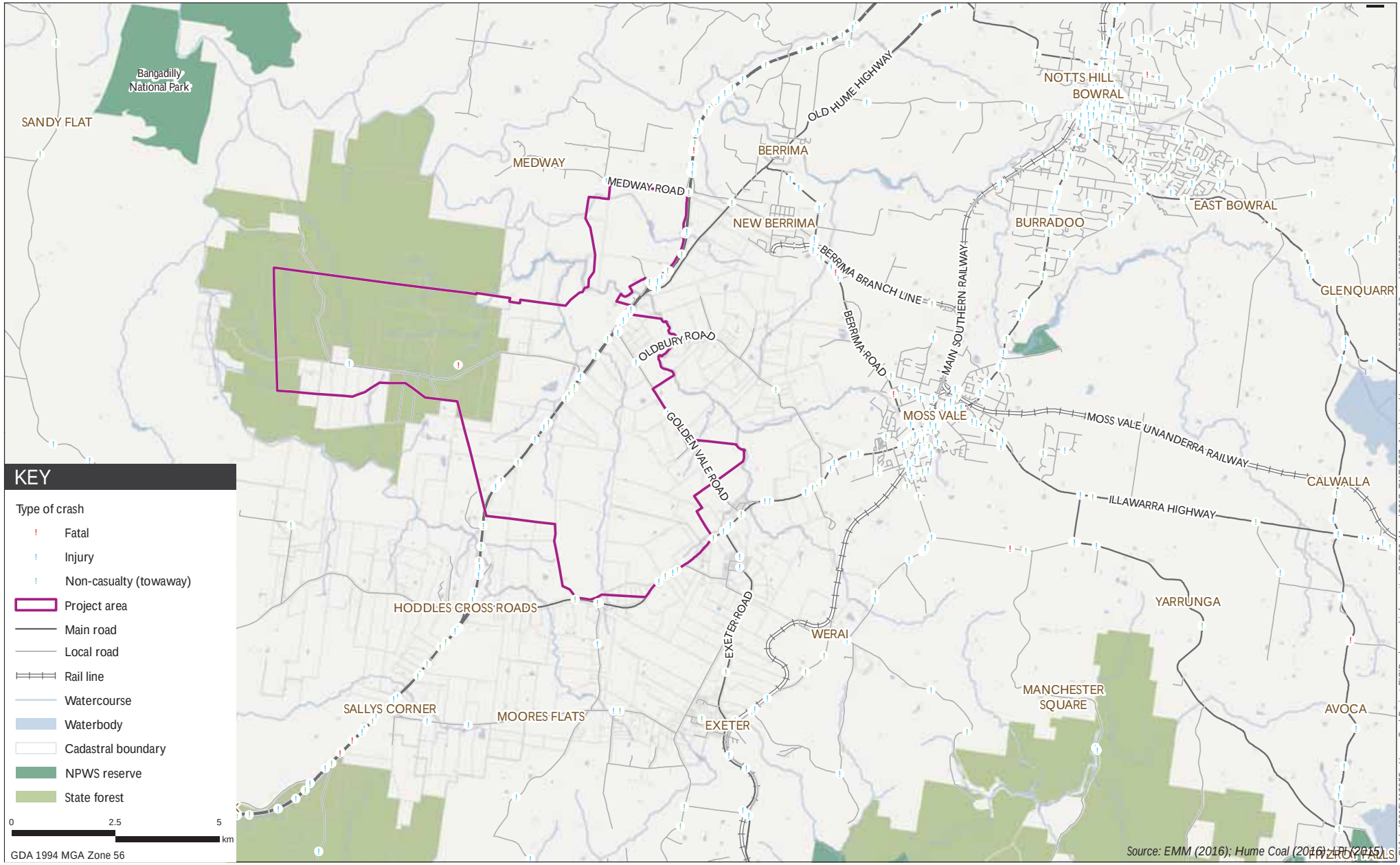
Figure 2.10



Five year (2009-2013) locality Accident History Map for the Berrima and Moss Vale areas

Hume Coal Project

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Figure 2.11

On the two state highways, the proportion of fatal accidents is between 1.7% and 1.8%, while it is 1.1% for the other roads, giving an overall average LGA fatal accident proportion of 1.3%. This proportion is higher than the NSW state average, which was 0.8% in 2013, but is lower than in most rural areas of NSW where proportions of around 2% fatal accidents are normal.

2.9 Public transport, pedestrian and cyclist access

School buses are the main form of public transport in and around the project area. Most school buses within the study area travel to and from Mittagong, Moss Vale, Bowral and Berrima.

Commuter and CountryLink train services operate from Sydney to and from the railway stations at Mittagong, Bowral, Burradoo, Moss Vale and Exeter. Public bus services also operate within and between most of these townships but they do not extend into the main project surface access areas on the western side of the Hume Highway.

3 Details of the proposed development

3.1 Project access including accommodation village

During both the project construction and later operations stages, the main project access will be via Mereworth Road, west of the Hume Highway, where the existing road will be extended and reconstructed to an appropriate standard to service the project traffic.

Mereworth Road will also provide access to the accommodation village for the project construction stage workforce, which will accommodate up to 400 workers and be commissioned before the main stages of project construction. The construction stage will extend over about 28 months. This is currently planned to occur between November 2019 and February 2022.

Before the project accommodation village is operating, prior to March 2020, the early stage construction workforce for the project will be up to 173 persons. The project accommodation village will also accommodate additional construction personnel (up to 38 persons) working on the Berrima Rail Project. The peak project construction workforce for the project will be 414 persons. The combined peak total construction workforce for both workforces which is assessed in this report will be about 440 people in December 2020. This peak construction activity level will occur during the period when the accommodation village is operating and about 90% of the combined project construction workforce will be resident there.

The build-up of the combined project construction workforce numbers over the full 28-month construction period and the subsequent tailing off in the later months of construction, is shown in Figure 3.1.

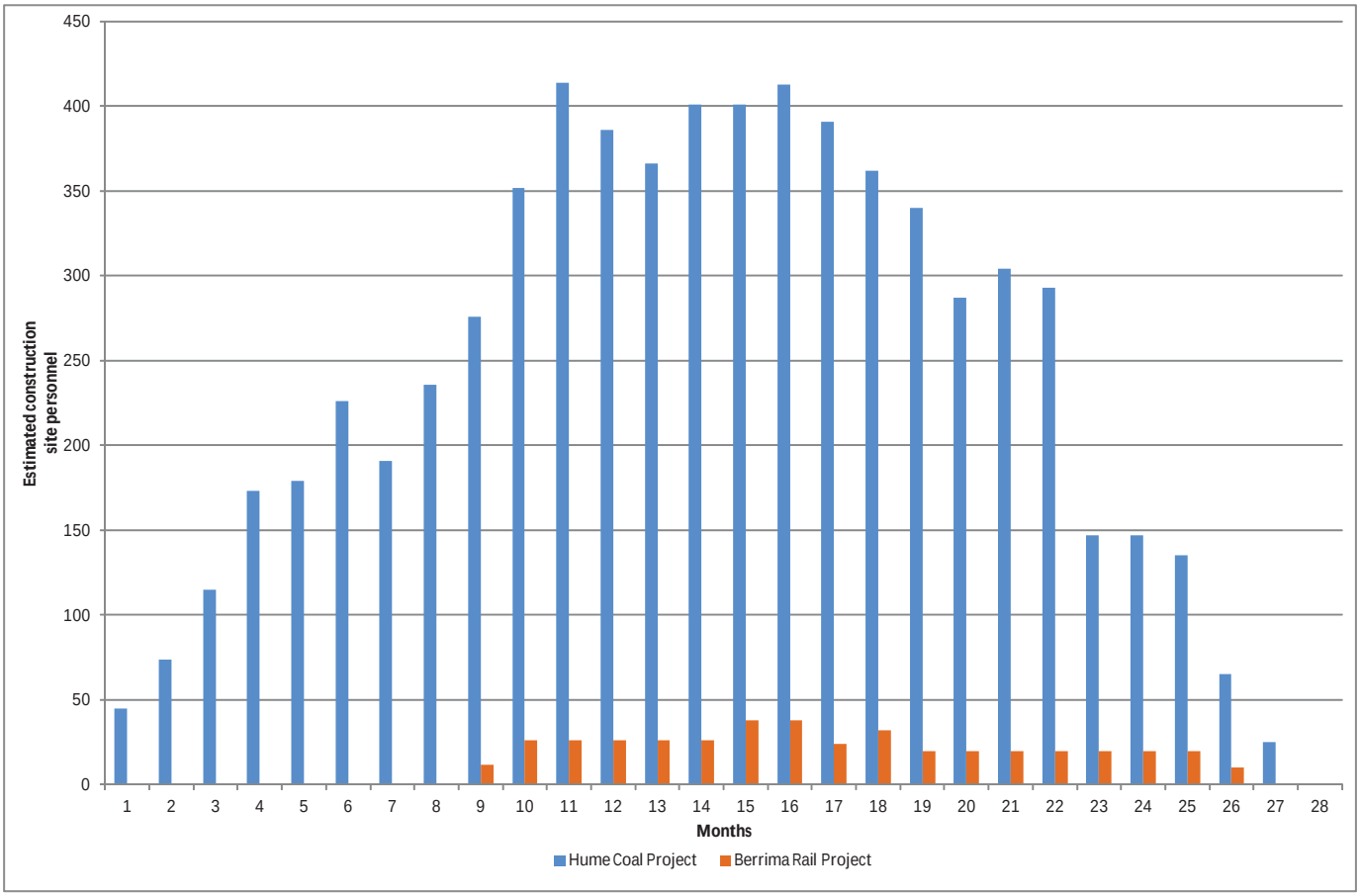
The subsequent project operations will have a 19-year operating life, and a maximum project operations workforce of about 300 full time equivalent employees.

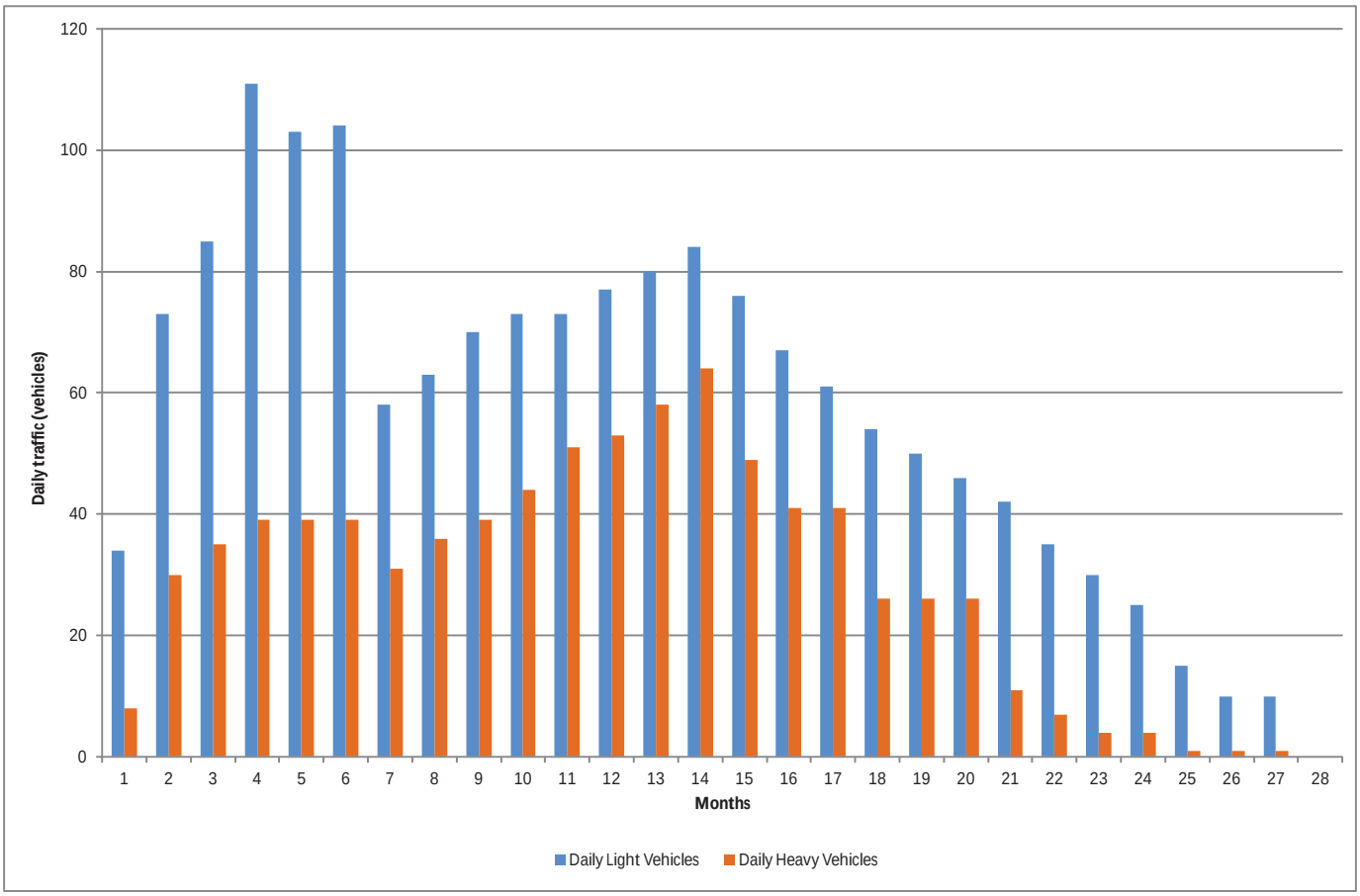
3.2 Project workforce and hours of operation

A summary breakdown of the project workforce numbers who are travelling to and from the project area each day (excluding the accommodation village residents) is provided in Table 3.1, including the hours of operation of each shift, during the project early construction, peak construction and operations stage.

The maximum numbers of employees and employee vehicles travelling each day assumes car parking is provided at project accommodation village and surface infrastructure area for all the locally based workforce and site visitors who will be travelling by car.

Approximately 200 car parking spaces will be provided for the project accommodation village during the construction period and 176 car parking spaces will be provided at the main surface infrastructure area car parking area during project operations.





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Monthly summary of construction workforce numbers (top), and monthly summary of construction traffic generation (bottom)

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Figure 3.1

Table 3.1 Project workforce and hours of operation for light vehicle traffic

Project stage	Number of employees travelling each day	Number of light vehicles	Arrival time	Departure time
Early Stage Construction (without accommodation village)				
Day shift workforce	140	66	6–7 am	4–7 pm
Office admin staff	10	10	8–9 am	5–6 pm
Drift Construction day shift	12	12	5–6 am	6–7 pm
Drift Construction night shift	11	11	5–6 pm	6–7 am
Light vehicle supply deliveries		11	6 am–3 pm	7 am–4 pm
Head office visitors		1	8–9 am	4–5 pm
Total for early stage construction	**173**	**111**		
Peak Stage Construction (with accommodation village)				
Day shift workforce not based at the village	20	15	6–7 am	4–7 pm
Office admin staff	20	20	8–9 am	5–6 pm
Light vehicle supply deliveries		48	6 am–3 pm	7 am–4 pm
Head office visitors		1	8–9 am	4–5 pm
Total for peak stage construction	**40**	**84**		
Project operations (no accommodation village)				
Day shift workforce	53	42	6–7 am	4–5 pm
Afternoon shift workforce	52	42	2–3 pm	0–1 am
Night shift workforce	52	42	10–11 pm	8–9 am
CHPP Crew day shift	7	7	6–7 am	7–8 pm
CHPP Crew night shift	7	7	6–7 pm	7–8 am
Daytime Operations management	22	22	5–8 am	4–7 pm
Daytime CHPP management	5	5	6–7 am	4–7 pm
Daytime deliveries		5	8 am–5 pm	9 am–6 pm
Daytime visitors		2	9 am–2 pm	12 noon–5 pm
Consultants and contractors		2	8 am–1 pm	10 am–4 pm
Supplier visitors		2	10 am–3 pm	11 am–4 pm
Head office visitors		1	9–10 am	4–5 pm
Total during project operations	**198**	**179**		

3.3 Construction stage traffic generation

3.3.1 Worksite light vehicle and car traffic

From the summaries in Table 3.1, the maximum daily light vehicle traffic movements on weekdays that would be generated by the project construction workforce, accommodation village and light vehicle site visitor or delivery traffic movements would be:

- 111 daily external vehicle visits (222 daily vehicle movements) during the early stage construction work in February 2020, before the workforce accommodation village is operating; and

- 84 daily vehicle visits (168 daily vehicle movements) during the peak stage of construction work in December 2020, when about 90% of the project workforce would be resident at the accommodation village.

The proposed build-up and later decline of the project construction traffic (daily vehicle visits) by both light vehicle and heavy vehicles over the full 28-month construction period is also shown in Figure 3.1.

The main project workforce, construction materials and equipment delivery traffic movements, during all the project construction and operations stages, will all generally be travelling to and from the main project infrastructure area at the western end of Mereworth Road, which is shown in Figure 1.2. Where the project construction requires workforce and delivery access to other areas, this access will be managed according to RMS traffic control at worksite procedures.

Excluding the workforce traffic movements based around the accommodation village, the geographical distribution of the project workforce traffic movements on weekdays during the peak stage of the project construction would be about 86% locally based within the Wingecarribee LGA,. However, there would be a lower proportion (50%) of locally-based traffic movements during the early stages of construction before the accommodation village is operating, as a significant proportion (50% generally) of the early stage project construction workforce would not be locally based.

The project workforce (light vehicle) traffic proportions are summarised in Table 3.2 for the range of predicted origins and destinations within and external to the Wingecarribee LGA. The car traffic movements for the arriving and departing residents from the accommodation village would normally occur on a Sunday and would not contribute to the assessed weekday traffic movements.

Table 3.2 Project workforce traffic distribution for light vehicles

Destination	Early stage construction light vehicles	Peak stage construction light vehicles
Moss Vale	15%	25%
Mittagong	15%	25%
Bowral	11%	20%
New Berrima	2%	4%
Berrima	1%	2%
Sutton Forest	1%	2%
Exeter	1%	2%
Rural areas of Wingecarribee LGA	4%	6%
Outside LGA (Wollondilly)	21%	6%
Outside LGA (Goulburn Mulwaree)	21%	6%
Outside LGA (Kiama)	4%	1%
Outside LGA (Shoalhaven)	4%	1%
Total	**100%**	**100%**

3.3.2 Heavy vehicles

During the project construction phase heavy vehicle traffic movements will be generated by deliveries of construction materials (including gravel road base material), construction equipment and waste removal.

The estimated numbers of daily heavy vehicle deliveries and truck movements for the respective early stage and peak stage construction periods are summarised in Table 3.3.

Table 3.3 Project construction stage daily heavy vehicle traffic

Type of heavy vehicle movement	Daily number of deliveries	Approximate time period
Early Stage Construction (without accommodation village)		
Deliveries of materials	24	6 am– 6 pm
Deliveries of equipment and machinery	12	5 am–3 pm
Waste removal	3	5 am–2 pm
Total heavy vehicles	**39**	
Peak Stage Construction (with accommodation village)		
Deliveries of materials	40	6 am–6 pm
Deliveries of equipment and machinery	18	5 am–3 pm
Waste removal	6	5 am–2 pm
Total heavy vehicles	**64**	

Notes: Compiled by EMM from information provided by Palaris.

From the summaries in Table 3.3, the maximum daily heavy vehicle traffic movements on weekdays that would be generated by the project construction materials and other deliveries would be:

- 39 daily heavy vehicle visits (78 daily heavy vehicle movements) during the early stage construction work, before the workforce accommodation village is operating; and
- 64 daily vehicle visits (132 daily heavy vehicle movements) during the peak stage of construction work.

About 80% of the daily heavy vehicle delivery movements would normally occur during the morning and early afternoon (between 8 am–2 pm) on weekdays and the remaining 20% would occur at other times of the day, including some evening and night-time deliveries, such as for oversize vehicle movements that may not be allowed to travel during daylight hours.

The geographical distribution of the project heavy vehicle traffic movements would be about 20–40% contained within the Wingecarribee LGA, with the following proportions travelling via identified routes as shown in Table 3.4.

Table 3.4 Project construction heavy vehicle traffic routes

Direction and route	Proportion using route
From Sydney and the surrounding region via the Hume Highway to/from the north	40%
From Goulburn, Marulan and other areas via the Hume Highway to/from the south	20%
From the local Moss Vale area, via Berrima Road and Douglas Road	20%
From the east of Moss Vale via Berrima Road, the Illawarra Highway and other routes	20%
Total	**100%**

Notes: Compiled by EMM from information provided by Palaris.

3.4 Operations stage traffic generation

3.4.1 Light vehicle and car traffic

From the project workforce and car traffic summary in Table 3.1, the maximum daily light vehicle traffic movements that would be generated on weekdays with a maximum project operations workforce of up to 300 people would be:

- 179 daily external vehicle visits (358 daily vehicle movements).

The total project operations workforce would include 64 people working on weekend shifts, who would not travel to/or from work on normal weekdays.

The project operations workforce and other car travel movements on a normal weekday would be distributed over a wide range of daytime travel periods, including early morning, mid-afternoon and evening shift change times, which would not normally coincide with the peak hourly traffic periods for the roads surrounding the project area and through Moss Vale. These are generally between 8 am and 9 am in the morning and 4 pm and 5 pm in the afternoon at most of the major road intersections in the Moss Vale and Berrima areas.

The geographical distribution of the project workforce traffic movements on weekdays would be about 86% and contained within the Wingecarribee LGA. These proportions would be the same as were summarised in Table 3.2 for the project peak construction stage, for the same range of typical destinations within and external to the Wingecarribee LGA.

3.4.2 Heavy vehicles

The maximum daily heavy vehicle traffic movements on weekdays that project operations would generate after the completion of all construction work would be:

- 5 daily heavy vehicle visits (10 daily heavy vehicle movements) for store and bulk goods deliveries;
- 4 daily heavy vehicle visits (8 daily heavy vehicle movements) for maintenance deliveries of equipment and materials; and
- 1 daily heavy vehicle visit (2 daily heavy vehicle movements) for waste removal.

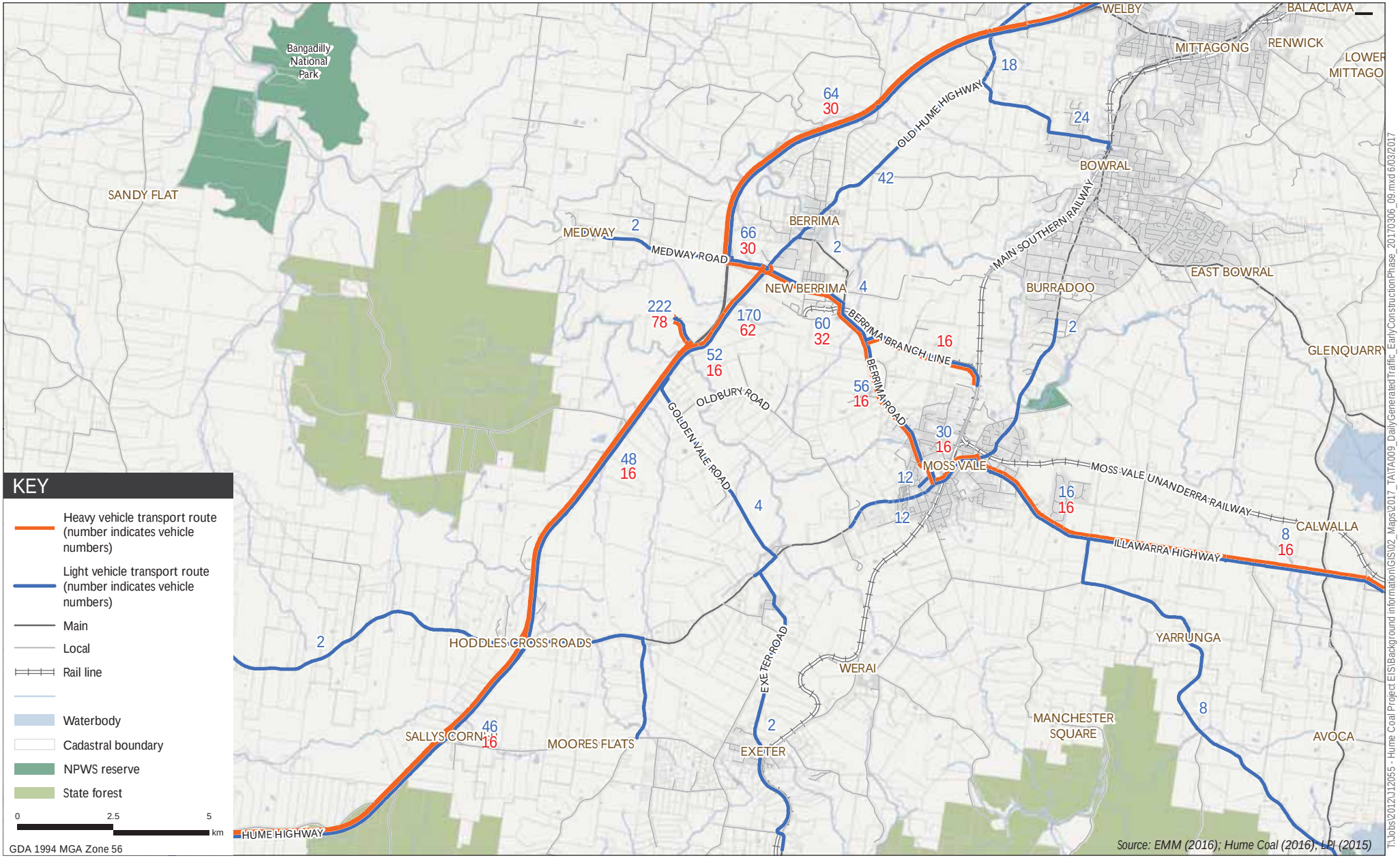
The heavy vehicle delivery movements at project operations stage would mostly occur (80%) during the morning and early afternoon (between 8 am and 2 pm) on weekdays and the remaining 20% would occur at other times of the day, including some evening and night-time deliveries. The geographical distribution of the project's heavy vehicle traffic movements would be similar to the distribution during the project construction stages, with the same proportions using the identified routes as shown in Table 3.4.

3.5 Car parking supply

Proposed car parking areas will be designed to meet the project requirements, which will generally surpass the requirements of the local council for the number of car parking spaces required for an industrial facility. A car park will be constructed for the village, which will have 200 spaces. A car park will be constructed at the surface infrastructure area for operations employees, with the capacity to accommodate 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. These are shown on the site plan in Figure 1.2.

3.6 Distribution of generated traffic

Graphical plots of the geographic distribution of the project-generated car and heavy vehicle traffic movements for the early construction, peak construction and operations stages are provided in Figures 3.2, 3.3 and 3.4.



Daily traffic movements - early project construction

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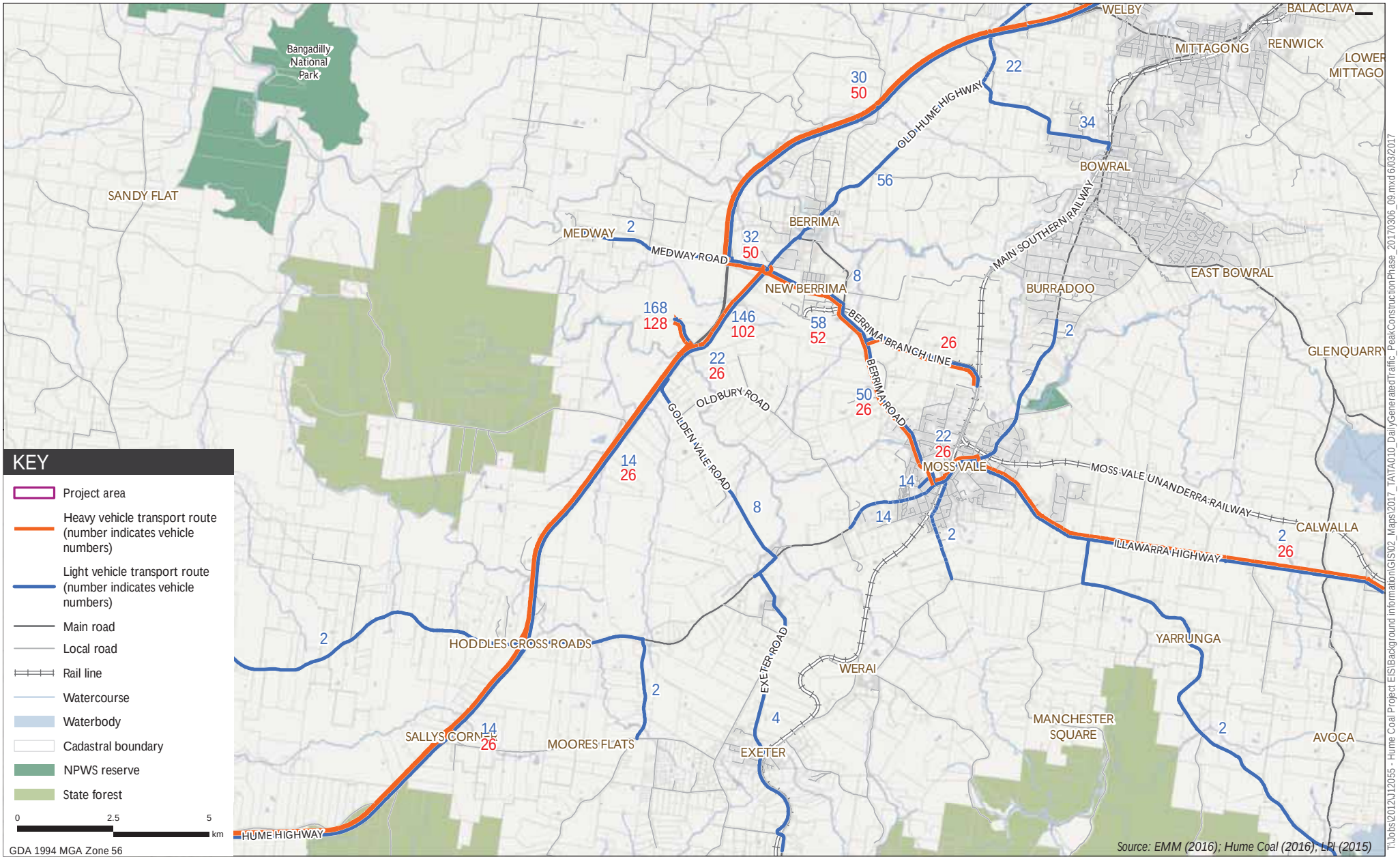
Figure 3.2

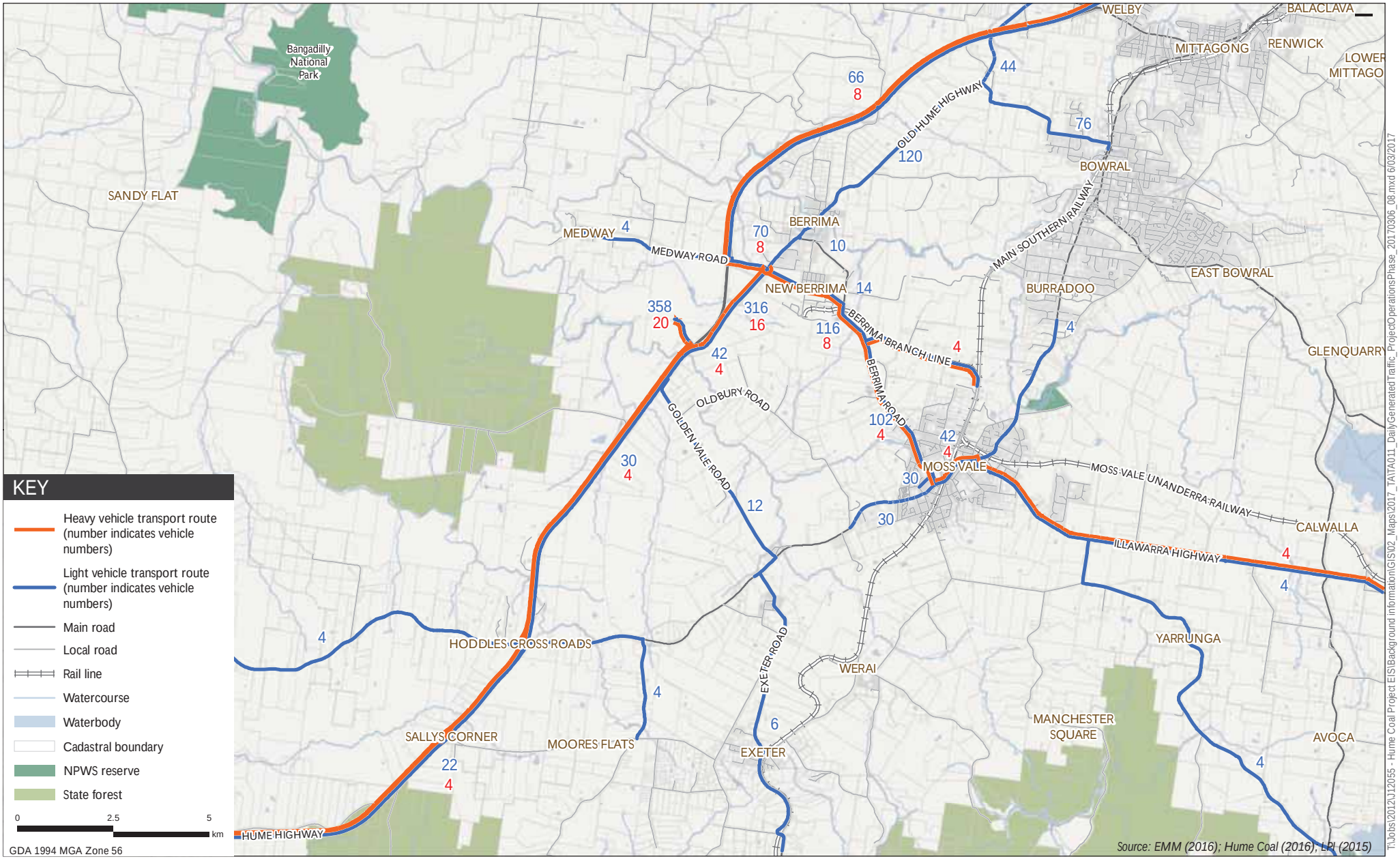


Daily traffic movements - peak project construction

Hume Coal Project

Traffic Impact Assessment

Figure 3.3



Daily traffic movements - project operation

Hume Coal Project

Traffic Impact Assessment

Figure 3.4

4 Construction impact of the proposed development

Traffic impacts on the road network and at intersections have been determined with reference to the levels of service and intersection design standards for rural roads, as defined by the Guide to Traffic Generating Developments (RTA 2002) and the Guide to Road Design (Austroads 2010).

The assessment was nominally for the base year 2020 when the existing road network traffic volumes will have increased by around 10% (on the Hume Highway) and 5% on other routes, compared to the surveyed (year 2015) base road network traffic volumes, based on annual traffic growth of 2% for the Hume Highway and 1% for other routes.

The calculated future base year (2020) road network traffic volumes are listed in Table 4.1.

Table 4.1 Summary of calculated year 2020 base road network traffic volumes

Road	2015 morning peak hourly traffic	2015 afternoon peak hourly traffic	2015 daily traffic volume	2020 daily traffic volume
Hume Highway at Penrose			22,600*	24,900
Hume Highway south of Golden Vale Road	1,036	1,191	18,300	20,100
Hume Highway south of Mereworth Road	1,071	1,211	18,700	20,600
Hume Highway north of Medway Road	1,165	1,301	20,200	22,200
Hume Highway at Mittagong Bypass			20,900*	23,000
Old Hume Highway south of Medway Road	99	86	1,100	1,150
Old Hume Highway north of Medway Road	151	130	1,600	1,700
Medway Road west of Old Hume Highway	185	193	2,100	2,200
Medway Road west of Hume Highway	31	39	400	420
Golden Vale Road east of Hume Highway	74	74	800	840
Mereworth Road west of Hume Highway	2	2	20	22
Taylor Avenue east of Old Hume Highway	241	227	2,600	2,750
Taylor Avenue west of Berrima Road	201	251	2,500	2,650
Berrima Road south of Taylor Avenue	311	403	4,000	4,200
Berrima Road north of Douglas Road	334	440	4,300	4,500
Berrima Road south of Douglas Road	297	377	3,700	3,900
Douglas Road east of Berrima Road	53	79	700	740
Waite Street north of Argyle Street	610	657	7,000	7,350
Illawarra Highway at Sutton Forest			3,900*	4,100
Argyle Street west of Waite Street	866	915	9,900	10,400
Argyle Street east of Waite Street	1,300	1,396	15,000	15,800
Argyle Street east of Lackey Road	1,589	1,720	18,400	19,300
Illawarra Highway east of Robertson			3,600*	3,800

*Notes: * Year 2015 Volumes were extrapolated from the Year 2012 Daily Traffic Volumes as surveyed by RMS (Table 2.1).*

4.1 Road network

Tables 4.2 and 4.3 show the predicted impact of the daily construction traffic movements generated by the project and distributed onto the surrounding road network (as shown in Figures 3.3 and 3.4) in proportional terms for the project early stage and peak stage construction traffic movements.

Table 4.2 Summary of predicted year 2020 traffic increases for early stage construction

Road	2020 daily traffic volume	2020 daily project traffic	Proportional project traffic increase (%)
Hume Highway at Penrose	24,900	62	0.2
Hume Highway south of Golden Vale Road	20,100	64	0.3
Hume Highway south of Mereworth Road	20,600	68	0.3
Hume Highway north of Medway Road	22,200	94	0.4
Hume Highway at Mittagong Bypass	23,000	76	0.3
Old Hume Highway south of Medway Road	1,150	232	20.2
Old Hume Highway north of Medway Road	1,700	44	2.6
Medway Road west of Old Hume Highway	2,200	96	4.2
Medway Road west of Hume Highway	420	2	0.4
Golden Vale Road east of Hume Highway	840	4	0.5
Mereworth Road west of Hume Highway	22	300	1,364*
Taylor Avenue east of Old Hume Highway	2,750	92	3.3
Taylor Avenue west of Berrima Road	2,650	88	3.3
Berrima Road south of Taylor Avenue	4,200	88	2.1
Berrima Road north of Douglas Road	4,500	88	2.0
Berrima Road south of Douglas Road	3,900	72	1.8
Douglas Road east of Berrima Road	740	16	2.1
Waite Street north of Argyle Street	7,350	60	0.8
Illawarra Highway at Sutton Forest	4,100	4	0.1
Argyle Street west of Waite Street	10,400	14	0.1
Argyle Street east of Waite Street	15,800	46	0.3
Argyle Street east of Lackey Road	19,300	46	0.2
Illawarra Highway east of Robertson	3,800	24	0.6

*Note: * Only two rural properties have access via Mereworth Road currently so the proportional project traffic increase is very high for this route.*

Table 4.3 Summary of predicted year 2020 traffic increases for peak project construction

Road	2020 daily traffic volume	2020 daily project traffic	Proportional project traffic increase (%)
Hume Highway at Penrose	24,900	36	0.1
Hume Highway south of Golden Vale Road	20,100	40	0.2
Hume Highway south of Mereworth Road	20,600	48	0.2
Hume Highway north of Medway Road	22,200	80	0.4
Hume Highway at Mittagong Bypass	23,000	60	0.3
Old Hume Highway south of Medway Road	1,150	248	21.6
Old Hume Highway north of Medway Road	1,700	56	3.3
Medway Road west of Old Hume Highway	2,200	82	3.7
Medway Road west of Hume Highway	420	2	0.5
Golden Vale Road east of Hume Highway	840	8	1.0
Mereworth Road west of Hume Highway	22	296	1,345*
Taylor Avenue east of Old Hume Highway	2,750	110	4.0
Taylor Avenue west of Berrima Road	2,650	102	3.8
Berrima Road south of Taylor Avenue	4,200	102	2.4
Berrima Road north of Douglas Road	4,500	102	2.3
Berrima Road south of Douglas Road	3,900	76	1.9
Douglas Road east of Berrima Road	740	26	3.5
Waite Street north of Argyle Street	7,350	62	0.8
Illawarra Highway at Sutton Forest	4,100	4	0.1
Argyle Street west of Waite Street	10,400	16	0.2
Argyle Street east of Waite Street	15,800	46	0.3
Argyle Street east of Lackey Road	19,300	46	0.2
Illawarra Highway east of Robertson	3,800	28	0.7

Note: ** Only two rural properties have access via Mereworth Road currently so the proportional project traffic increase is very high for this route.*

In Tables 4.2 and 4.3, with the exception of Mereworth Road, which will effectively be reconstructed as the main future project access road, the highest proportional increases in project construction traffic (about 20–22%) will occur on the section of the Old Hume Highway route, between the project access (Mereworth Road) and Medway Road.

Due to its former use as the main Hume Highway, this section of the Old Hume Highway was previously built to a relatively high standard for prevailing traffic usage. Consequently the existing road carriageway can comfortably accommodate the future daily traffic increase related to project construction (230–250 extra daily vehicle movements) during either early stage or peak stage construction, with minimal change to the existing traffic flow conditions and level of service.

This section of the Old Hume Highway also has a relatively high proportion of existing heavy vehicle traffic, due to heavy vehicle movements from the Berrima Cement works and other local industries, such that the additional daily heavy vehicle traffic related to the project during the construction stage would be relatively minor compared to the existing heavy vehicle traffic usage.

On the other routes listed in Tables 4.2 and 4.3, the proportional daily traffic increases generated by the project will be 4% or less, which would not generally be noticeable on any specific route.

On the main street sections of the Illawarra Highway (Argyle Street) route through the Moss Vale town centre, the existing traffic volumes are already sufficiently heavy (up to 18,400 daily vehicle movements in 2015, increasing to about 19,800 daily vehicle movements in 2020) such that daily traffic increases from the project construction would be about 0.2–0.3%. This would produce only minimal disruption to the existing traffic flow conditions or the town centre traffic amenity along Argyle Street.

Nevertheless, the high existing daily traffic usage for the Argyle Route is a concern to the Wingecarribee Shire Council, which has been developing (with RMS) a preliminary traffic bypass proposal, with an additional railway line crossing at the northern edge of Moss Vale.

4.2 Intersections

The hourly traffic volumes that the project would generate during early stage and peak stage construction activity have been determined from the daily traffic volumes and are summarised in Tables 4.4 and 4.5.

During the early stage project construction, the peak period for the construction workforce traffic arrivals will be generally 6.00–7.00 am on weekday mornings. This is well before the morning peak traffic period for the surrounding roads, which is generally between 8.00 am and 9.00 am. During the peak stage of the project construction, the morning peak construction volumes will coincide more closely with the surrounding roads; but the project construction peak hourly volumes will be lower by then as the workforce accommodation village will be in use.

On weekday afternoons, the volumes of the project construction traffic that will coincide with the current afternoon peak traffic period for the surrounding roads, which is generally between 4.00 pm and 5.00 pm, will be more variable, although generally significantly lower than the morning construction traffic peak volumes.

Table 4.4 Hourly traffic generation summary for the project early construction stage

Hourly interval commencing	Light vehicles arriving	Heavy vehicles arriving	Light vehicles departing	Heavy vehicles departing	Total hourly traffic movements
0 am					
1 am					
2 am					
3 am					
4 am					
5 am	12	2			14
6 am	67	4	11	2	84
7 am	2	5	1	4	12
8 am	**13**	**5**	**1**	**5**	**24**
9 am	2	5	2	5	14
10 am	1	3	2	5	11
11 am	1	3	2	3	9
12 midday		3	1	3	7
1 pm	1	4		3	8
2 pm	1	2	1	4	8
3 pm		1	1	2	4
4 pm		**1**	**34**	**1**	**36**
5 pm	11	1	32	1	45

Table 4.4 Hourly traffic generation summary for the project early construction stage

Hourly interval commencing	Light vehicles arriving	Heavy vehicles arriving	Light vehicles departing	Heavy vehicles departing	Total hourly traffic movements
6 pm			23	1	24
7 pm					
8 pm					
9 pm					
10 pm					
11 pm					
Total	111	39	111	39	300

Table 4.5 Hourly traffic generation summary for the project peak construction

Hourly interval commencing	Light vehicles arriving	Heavy vehicles arriving	Light vehicles departing	Heavy vehicles departing	Total hourly traffic movements
0 am					
1 am					
2 am					
3 am					
4 am					
5 am		2			2
6 am	18	8		2	28
7 am	6	10	3	8	27
8 am	**27**	**8**	**6**	**10**	**51**
9 am	6	9	6	8	29
10 am	6	7	6	9	28
11 am	6	7	6	7	26
12 midday		4	6	7	17
1 pm	6	4		4	14
2 pm	6	2	6	4	18
3 pm	3	2	6	2	13
4 pm		**1**	**9**	**2**	**12**
5 pm			25	1	26
6 pm			5		5
7 pm					
8 pm					
9 pm					
10 pm					
11 pm					
Total	84	64	84	64	296

At the two Medway Road and Hume Highway interchange intersections, the respective volumes of the project construction traffic for 2015 and projected future base year 2020 traffic volumes are compared in Table 4.6 using SIDRA intersection results in Appendix B to Appendix D.

Table 4.6 Comparison of SIDRA intersection operations for Medway Road interchange

Intersection and year of operation	Peak hour	Traffic demand flow (vehicles)*	Average vehicle delay (seconds)	Level of service	Degree of saturation	Maximum queue length (m)
Year 2015 baseline traffic (east side intersection)	Morning peak hour (7.45 to 8.45 am typically)	198	11.6	A	0.060	0
	Afternoon peak hour (3.15 to 4.15 pm typically)	204	11.9	A	0.065	0
Year 2015 baseline traffic (west side intersection)	Morning peak hour (7.45 to 8.45 am typically)	100	12.5	A	0.066	2
	Afternoon peak hour (3.30 to 4.30 pm typically)	146	11.5	A	0.089	2
Year 2020 baseline traffic (east side intersection)	Morning peak hour (7.45 to 8.45 am typically)	208	11.7	A	0.063	0
	Afternoon peak hour (3.15 to 4.15 pm typically)	214	12.0	A	0.068	0
Year 2020 baseline traffic (west side intersection)	Morning peak hour (7.45 to 8.45 am typically)	105	12.5	A	0.070	2
	Afternoon peak hour (3.30 to 4.30 pm typically)	154	11.5	A	0.093	2
Project early construction (east side intersection)	Morning peak hour (7.45 to 8.45 am typically)	218	11.7	A	0.068	0
	Afternoon peak hour (3.15 to 4.15 pm typically)	227	12.1	A	0.074	0
Project early construction (west side intersection)	Morning peak hour (7.45 to 8.45 am typically)	108	12.6	A	0.074	2
	Afternoon peak hour (3.30 to 4.30 pm typically)	166	11.5	A	0.103	3
Project peak construction (east side intersection)	Morning peak hour (7.45 to 8.45 am typically)	222	11.8	A	0.069	0
	Afternoon peak hour (3.15 to 4.15 pm typically)	218	12.0	A	0.070	0
Project peak construction (west side intersection)	Morning peak hour (7.45 to 8.45 am typically)	111	12.8	A	0.078	2
	Afternoon peak hour (3.30 to 4.30 pm typically)	157	11.6	A	0.097	3

Notes: **The SIDRA intersection analysis program automatically adds 5% to all surveyed traffic volumes as a contingency measure.*

From the results in Table 4.6, the future intersection traffic impacts from either project construction stage will be minimal in comparison to either 2015 or 2020 baseline traffic conditions, with the intersection level of service remaining at A for all traffic scenarios considered.

In the baseline traffic assessment results for 2020, the maximum intersection traffic delay and degree of saturation for any morning or afternoon peak hour traffic movement will be 12.5 seconds and 0.093 respectively. These results would increase to 12.8 seconds and 0.097 respectively for either of the two project construction traffic scenarios analysed.

At the two Mereworth Road and Hume Highway interchange intersections, the respective volumes of the project construction traffic with the current year 2015 and projected future base year 2020 traffic volumes are compared in Table 4.7 using the SIDRA intersection results from Appendix B to Appendix D.

The SIDRA intersection analysis assumes the current intersection priority is reconfigured, as has been discussed with representatives of RMS and Wingecarribee Shire Council, to realign the future traffic priority to Mereworth Road in recognition of the increased future traffic volumes using that route. The changed traffic priority will have minimal future impact on the Hume Highway off-ramp traffic, as it already has to slow to a virtual stop to make either a sharp right or a sharp left turn at the intersection.

Table 4.7 Comparison of SIDRA intersection operations for Mereworth Road interchange

Intersection and year of operation	Peak hour	Traffic demand flow (vehicles)*	Average vehicle delay (seconds)	Level of service	Degree of saturation	Maximum queue length (m)
Year 2015 baseline traffic (east side intersection)	Morning peak hour (8.00 to 9.00 am typically)	76	14.6	B	0.033	0
	Afternoon peak hour (3.00 to 4.00 pm typically)	78	11.3	A	0.022	0
Year 2015 baseline traffic (west side intersection)	Morning peak hour (8.00 to 9.00 am typically)	62	11.8	A	0.068	2
	Afternoon peak hour (4.00 to 5.00 pm typically)	46	12.4	A	0.054	2
Year 2020 baseline traffic (east side intersection)	Morning peak hour (8.00 to 9.00 am typically)	80	14.7	B	0.035	0
	Afternoon peak hour (3.00 to 4.00 pm typically)	82	11.4	A	0.023	0
Year 2020 baseline traffic (west side intersection)	Morning peak hour (8.00 to 9.00 am typically)	64	11.8	A	0.071	2
	Afternoon peak hour (4.00 to 5.00 pm typically)	48	12.4	A	0.056	2
Project early construction (east side intersection)	Morning peak hour (8.00 to 9.00 am typically)	101	16.2	B	0.039	0
	Afternoon peak hour (3.00 to 4.00 pm typically)	120	14.0	A	0.037	0
Project early construction (west side intersection)	Morning peak hour (8.00 to 9.00 am typically)	89	12.2	A	0.074	2
	Afternoon peak hour (4.00 to 5.00 pm typically)	86	12.8	A	0.060	2
Project peak construction (east side intersection)	Morning peak hour (8.00 to 9.00 am typically)	128	16.1	B	0.046	0
	Afternoon peak hour (3.00 to 4.00 pm typically)	95	14.0	A	0.028	0
Project peak construction (west side intersection)	Morning peak hour (8.00 to 9.00 am typically)	118	13.2	A	0.078	2
	Afternoon peak hour (4.00 to 5.00 pm typically)	61	12.5	A	0.058	2

*Notes: *The SIDRA intersection analysis program automatically adds 5% to all surveyed traffic volumes as a contingency measure.*

From the results in Table 4.7, the future intersection traffic impacts from either project construction stage will be minimal compared to baseline traffic conditions in either 2015 or 2020, with the intersection level of service remaining at either A or B for all traffic scenarios considered.

In the baseline traffic assessment results for 2020, the maximum intersection traffic delay and degree of saturation for any morning or afternoon peak hour traffic movement will be 14.7 seconds and 0.071 respectively. These results would increase to 16.1 seconds and 0.078 respectively for the two project construction traffic access scenarios considered.

At the two Golden Vale Road and Hume Highway interchange intersections, the respective volumes of the project construction traffic with the current year 2015 and projected future base year 2020 traffic volumes are compared in Table 4.8 using the SIDRA intersection results from Appendix B to Appendix D.

Table 4.8 Comparison of SIDRA intersection operations for Golden Vale Road intersections

Intersection and year of operation	Peak hour	Traffic demand flow (vehicles)*	Average vehicle delay (seconds)	Level of service	Degree of saturation	Maximum queue length (m)
Year 2015 baseline traffic (east side intersection)	Morning peak hour (8.00 to 9.00 am typically)	693	18.8	B	0.170	3
	Afternoon peak hour (3.30 to 4.30 pm typically)	635	17.6	B	0.162	2
Year 2015 baseline traffic (west side intersection)	Morning peak hour (8.00 to 9.00 am typically)	523	17.7	B	0.146	3
	Afternoon peak hour (3.30 to 4.30 pm typically)	735	21.0	B	0.191	3
Year 2020 baseline traffic (east side intersection)	Morning peak hour (8.00 to 9.00 am typically)	757	20.3	B	0.188	4
	Afternoon peak hour (3.30 to 4.30 pm typically)	694	19.1	B	0.178	2
Year 2020 baseline traffic (west side intersection)	Morning peak hour (8.00 to 9.00 am typically)	573	19.3	B	0.161	4
	Afternoon peak hour (3.30 to 4.30 pm typically)	806	23.4	B	0.210	4
Project early construction (east side intersection)	Morning peak hour (8.00 to 9.00 am typically)	758	20.4	B	0.188	4
	Afternoon peak hour (3.30 to 4.30 pm typically)	703	19.3	B	0.181	2
Project early construction (west side intersection)	Morning peak hour (8.00 to 9.00 am typically)	577	19.4	B	0.162	4
	Afternoon peak hour (3.30 to 4.30 pm typically)	806	23.4	B	0.210	4
Project peak construction (east side intersection)	Morning peak hour (8.00 to 9.00 am typically)	760	20.5	B	0.189	4
	Afternoon peak hour (3.30 to 4.30 pm typically)	695	19.1	B	0.179	2
Project peak construction (west side intersection)	Morning peak hour (8.00 to 9.00 am typically)	578	19.5	B	0.163	4
	Afternoon peak hour (3.30 to 4.30 pm typically)	806	23.4	B	0.210	4

*Notes: *The SIDRA intersection analysis program automatically adds 5% to all surveyed traffic volumes as a contingency measure.*

From the results in Table 4.8, the future intersection traffic changes during either project construction stage will be minimal compared to either 2015 or 2020 baseline traffic conditions, with the intersection levels of service remaining at B for all traffic scenarios considered.

In the baseline traffic assessment results for 2020, the maximum intersection traffic delay and degree of saturation for any morning or afternoon peak hour traffic movement will be 20.3 seconds (morning) and 23.4 seconds (afternoon) respectively and 0.188 (morning) and 0.210 (afternoon) respectively.

The future project construction (afternoon) maximum intersection delay and degree of saturation would not change from the future 2020 baseline traffic conditions.

The future project construction (morning) maximum intersection delay and degree of saturation would increase very marginally to 20.5 seconds and 0.189 respectively for the largest impact of the two project construction traffic scenarios analysed.

At the Old Hume Highway, Medway Road and Taylor Avenue roundabout intersections, the respective volumes of the project construction traffic with the current year 2015 and projected future base year 2020 traffic volumes are compared in Table 4.9 using SIDRA intersection results in Appendix B to Appendix D.

Table 4.9 Comparison of SIDRA intersection operations for Old Hume Highway roundabout

Intersection and year of operation	Peak hour	Traffic demand flow (vehicles)*	Average vehicle delay (seconds)	Level of service	Degree of saturation	Maximum queue length (m)
Year 2015 baseline traffic	Morning peak hour (8.00 to 9.00 am typically)	358	17.1	B	0.097	4
	Afternoon peak hour (3.30 to 4.30 pm typically)	335	17.2	B	0.095	4
Year 2020 baseline traffic	Morning peak hour (8.00 to 9.00 am typically)	375	17.0	B	0.102	4
	Afternoon peak hour (3.30 to 4.30 pm typically)	351	17.3	B	0.101	4
Project early construction	Morning peak hour (8.00 to 9.00 am typically)	395	17.5	B	0.109	4
	Afternoon peak hour (3.30 to 4.30 pm typically)	379	16.7	B	0.101	4
Project peak construction	Morning peak hour (8.00 to 9.00 am typically)	420	17.7	B	0.097	5
	Afternoon peak hour (3.30 to 4.30 pm typically)	362	17.2	B	0.101	4

*Notes: *The SIDRA intersection analysis program automatically adds 5% to all surveyed traffic volumes as a contingency measure.*

In the baseline traffic assessment results for 2020, the maximum intersection traffic delay and degree of saturation for any morning or afternoon peak hour traffic movement will be 17.0 seconds (morning) and 17.3 seconds (afternoon) respectively and 0.102 (morning) and 0.101 (afternoon) respectively.

The future project construction (afternoon) maximum intersection delay and degree of saturation would not generally increase from the future baseline year 2020 traffic conditions.

The future project construction (morning) maximum intersection delay and degree of saturation would increase very marginally to 17.7 seconds and 0.109 respectively for the largest impact of the two project construction traffic scenarios analysed.

At the two Berrima Road intersections, with Taylor Avenue and Douglas Road, the respective volumes of the project construction traffic with the current year 2015 and projected future base year 2020 traffic volumes are compared in Table 4.10 using the SIDRA intersection results from Appendix B to Appendix D.

Table 4.10 Comparison of SIDRA intersection operations for two Berrima Road intersections

Intersection and year of operation	Peak hour	Traffic demand flow (vehicles)*	Average vehicle delay (seconds)	Level of service	Degree of saturation	Maximum queue length (m)
Year 2015 baseline traffic (Taylor Avenue intersection)	Morning peak hour (8.00 to 9.00 am typically)	329	10.8	A	0.203	7
	Afternoon peak hour (3.15 to 4.15 pm typically)	427	11.9	A	0.198	6
Year 2015 baseline traffic (Douglas Road intersection)	Morning peak hour (8.00 to 9.00 am typically)	360	17.0	B	0.096	3
	Afternoon peak hour (3.15 to 4.15 pm typically)	472	15.1	B	0.134	4
Year 2020 baseline traffic (Taylor Avenue intersection)	Morning peak hour (8.00 to 9.00 am typically)	347	10.9	A	0.218	7
	Afternoon peak hour (3.15 to 4.15 pm typically)	448	12.2	A	0.214	7
Year 2020 baseline traffic (Douglas Road intersection)	Morning peak hour (8.00 to 9.00 am typically)	379	17.1	B	0.101	3
	Afternoon peak hour (3.15 to 4.15 pm typically)	493	15.4	B	0.142	4
Project early construction (Taylor Avenue intersection)	Morning peak hour (8.00 to 9.00 am typically)	355	11.1	A	0.226	8
	Afternoon peak hour (3.15 to 4.15 pm typically)	455	12.1	A	0.223	7
Project early construction (Douglas Road intersection)	Morning peak hour (8.00 to 9.00 am typically)	386	18.0	B	0.102	3
	Afternoon peak hour (3.15 to 4.15 pm typically)	499	15.5	B	0.143	4
Project peak construction (Taylor Avenue intersection)	Morning peak hour (8.00 to 9.00 am typically)	365	11.3	A	0.236	8
	Afternoon peak hour (3.15 to 4.15 pm typically)	453	12.2	A	0.222	7
Project peak construction (Douglas Road intersection)	Morning peak hour (8.00 to 9.00 am typically)	397	19.0	B	0.104	3
	Afternoon peak hour (3.15 to 4.15 pm typically)	497	15.4	B	0.143	4

*Notes: *The SIDRA intersection analysis program automatically adds 5% to all surveyed traffic volumes as a contingency measure.*

At the Berrima Road and Taylor Avenue intersection, the 2020 baseline traffic assessment results show the maximum intersection traffic delay and degree of saturation for any morning or afternoon peak hour traffic movement will be 10.9 seconds (morning) and 12.2 seconds (afternoon) respectively and 0.218 (morning) and 0.214 (afternoon) respectively.

The future project construction (afternoon) maximum intersection delays would not generally increase from the future baseline traffic conditions in 2020.

The future project construction (morning) maximum intersection delay and degree of saturation would increase very marginally to 11.3 seconds and 0.236 respectively for the largest impact of the two project construction traffic scenarios analysed.

At the Berrima Road and Douglas Road intersection the baseline traffic assessment results for 2020 show the maximum intersection traffic delay and degree of saturation for any morning or afternoon peak hour traffic movement will be 17.1 seconds (morning) and 15.4 seconds (afternoon) respectively and 0.101 (morning) and 0.142 (afternoon) respectively.

The future project construction (afternoon) maximum intersection delay and degree of saturation would not generally increase from the future baseline year 2020 traffic conditions.

The future project construction (morning) maximum intersection delay and degree of saturation would increase marginally to 19.0 seconds and 0.104 respectively for the largest impact of the two project construction traffic scenarios analysed.

At the two Argyle Street intersections in Moss Vale, with Waite Street and Lackey Road, the respective volumes of the project construction traffic with the current year 2015 and projected future base year 2020 traffic volumes are compared in Table 4.11 using the SIDRA intersection results from Appendix B to Appendix D.

Table 4.11 Comparison of SIDRA intersection operations for two Argyle Street intersections

Intersection and year of operation	Peak hour	Traffic demand flow (vehicles)*	Average vehicle delay (seconds)	Level of service	Degree of saturation	Maximum queue length (m)
Year 2015 baseline traffic (Waite Street intersection)	Morning peak hour (8.00 to 9.00 am typically)	1,461	51.1	D	0.451	19
	Afternoon peak hour (3.15 to 4.15 pm typically)	1,562	38.8	C	0.478	27
Year 2015 baseline traffic (Lackey Road intersection)	Morning peak hour (8.00 to 9.00 am typically)	1,729	70.6	F	0.451	39
	Afternoon peak hour (3.15 to 4.15 pm typically)	1,864	102.5	F	0.541	55
Year 2020 baseline traffic (Waite Street intersection)	Morning peak hour (8.00 to 9.00 am typically)	1,535	59.0	E	0.495	21
	Afternoon peak hour (3.15 to 4.15 pm typically)	1,639	44.6	D	0.519	30
Year 2020 baseline traffic (Lackey Road intersection)	Morning peak hour (8.00 to 9.00 am typically)	1,816	82.5	F	0.499	43
	Afternoon peak hour (3.15 to 4.15 pm typically)	1,957	129.3	F	0.580	59

Table 4.11 Comparison of SIDRA intersection operations for two Argyle Street intersections

Intersection and year of operation	Peak hour	Traffic demand flow (vehicles)*	Average vehicle delay (seconds)	Level of service	Degree of saturation	Maximum queue length (m)
Project early construction (Waite Street intersection)	Morning peak hour (8.00 to 9.00 am typically)	1,539	59.4	E	0.500	21
	Afternoon peak hour (3.15 to 4.15 pm typically)	1,643	45.5	D	0.522	30
Project early construction (Lackey Road intersection)	Morning peak hour (8.00 to 9.00 am typically)	1,819	83.1	F	0.500	43
	Afternoon peak hour (3.15 to 4.15 pm typically)	1,959	130.1	F	0.581	59
Project peak construction (Waite Street intersection)	Morning peak hour (8.00 to 9.00 am typically)	1,545	57.8	E	0.502	21
	Afternoon peak hour (3.15 to 4.15 pm typically)	1,642	45.1	D	0.522	30
Project peak construction (Lackey Road intersection)	Morning peak hour (8.00 to 9.00 am typically)	1,823	83.8	F	0.502	43
	Afternoon peak hour (3.15 to 4.15 pm typically)	1,959	130.1	F	0.581	59

*Notes: *The SIDRA intersection analysis program automatically adds 5% to all surveyed traffic volumes as a contingency measure.*

At the Argyle Street and Waite Street intersection, the baseline traffic assessment results for 2020 show the maximum intersection traffic delay and degree of saturation for any morning or afternoon peak hour traffic movement will be 59.0 seconds (morning) and 44.6 seconds (afternoon) respectively and 0.495 (morning) and 0.519 (afternoon) respectively. These intersection traffic conditions correspond to Level of Service E (morning) and Level of Service D (afternoon) for the respective peak hour traffic conditions.

The future project construction (afternoon) maximum intersection delays would not generally result in any significant change to the future baseline traffic conditions for 2020 at the intersection, with no change to the future intersection peak hour levels of service.

The future project construction (morning) maximum intersection delay and degree of saturation would increase very marginally to 59.4 seconds and 0.502 respectively for the largest impact of the two project construction traffic scenarios analysed.

The future project construction (afternoon) maximum intersection delay and degree of saturation would increase very marginally to 45.5 seconds and 0.522 respectively for the largest impact of the two project construction traffic scenarios analysed.

At the Argyle Street and Lackey Road intersection, the baseline traffic assessment results for 2020 show the maximum intersection traffic delay and degree of saturation for any morning or afternoon peak hour traffic movement will be 82.5 seconds (morning) and 129.3 seconds (afternoon) respectively and 0.499 (morning) and 0.580 (afternoon) respectively. These intersection traffic conditions correspond to Level of Service F for both the morning and afternoon peak hour traffic conditions.

The future project construction (afternoon) maximum intersection delays would not generally result in any significant change to the baseline traffic conditions for 2020 at the intersection, with no change to the future intersection peak hour levels of service.

The future project construction (morning) maximum intersection delay and degree of saturation would increase very marginally to 83.8 seconds and 0.502 respectively for the largest impact of the two project construction traffic scenarios analysed.

The future project construction (afternoon) maximum intersection delay and degree of saturation would increase very marginally to 130.1 seconds and 0.581 respectively for the largest impact of the two project construction traffic scenarios analysed.

Although this assessment shows the future peak hourly intersection traffic conditions at the two Argyle Street intersections will be congested (in particular at the Lackey Road intersection), there will be no significant worsening of the intersection traffic operations with the future project construction traffic.

4.3 Traffic safety

The detailed accident review for the LGA and the Moss Vale local area (see Section 2.8 of this assessment) has shown a generally good and improving road safety record for most roads in the LGA, particularly the local road network managed by the Wingecarribee Shire Council, which excludes the two major state highways, the Hume Highway and the Illawarra Highway.

The proposed project (construction stage) daily traffic movements would not have any adverse road safety implications for the LGA road network, in particularly as the project will mainly use a locally-based workforce, with generally 85% of employed persons resident within the Wingecarribee LGA, largely in Moss Vale, Mittagong and Bowral, except for during the early construction stage.

The use of a primarily locally based workforce, or workforce resident at the project accommodation village, during the majority of the project construction period, will minimise the longer distance workforce commuter traffic movements, which could otherwise contribute to an increased road safety risk for the workforce associated with the project.

4.4 Road condition

The potential traffic impact to the road pavement condition, on the access routes which are proposed to be used by project generated truck traffic during the construction phase, will depend on the existing route condition and the combination of the existing and the proposed project daily truck movements.

On the Hume Highway and Illawarra Highway routes, which carry large volumes of interstate and long distance truck traffic currently, the additional project generated daily truck traffic movements are expected to have minimal impacts to the road pavement condition. On the other major road routes in the Moss Vale and Berrima areas which are under the care and control of the local Council, such as Old Hume Highway and Berrima Road, these roads are also used by substantial volumes of heavy truck traffic from local heavy industries, such that significant additional road pavement condition impacts from the project truck traffic are also unlikely to occur.

4.5 Access by public transport and other travel modes

The immediate locality of the mine project area on the western side of the Hume Highway, which is accessed via Mereworth Road, is generally remote from the existing locality (local and regional) bus- and rail-based public transport services.

Consequently the project construction workforce or people visiting the project area are unlikely to use public transport services in the future, and such access or the need to provide services have not been specifically analysed in this traffic impacts assessment.

During the peak stages of project construction, when most of the project workforce will be resident on weekdays at the project accommodation village and will generally transfer their shifts at weekends, a proportion of the shift transfer movements could use charter coach to travel. For example, on weekends, if there were large numbers of the future construction workforce who did not live in either Wingecarribee LGA or the Sydney metropolitan area, those workers could travel to and from Sydney Airport by coach.

5 Operations impact of the proposed development

Traffic impacts on the road network and at intersections have been determined with reference to the levels of service and intersection design standards for rural roads, as defined by the Guide to Traffic Generating Developments (RTA 2002) and the Guide to Road Design (Austroads 2010).

The assessment is nominally for the base year 2020 when the existing road network traffic volumes will have increased by about 10% on the Hume Highway and 5% on other routes, compared to the surveyed (year 2015) base road network traffic volumes.

5.1 Road network

The predicted impact of the daily operations traffic movements generated by the project (shown in Figure 3.6) is shown in proportional terms in Table 5.1 based on the year 2020 baseline road network traffic volumes.

Table 5.1 Summary of predicted year 2020 traffic increases for project operations

Road	2020 daily traffic volume	2020 daily project traffic	Proportional project traffic increase (%)
Hume Highway at Penrose	24,900	26	0.1
Hume Highway south of Golden Vale Road	20,100	34	0.2
Hume Highway south of Mereworth Road	20,600	46	0.2
Hume Highway north of Medway Road	22,200	74	0.3
Hume Highway at Mittagong Bypass	23,000	30	0.1
Old Hume Highway south of Medway Road	1,150	332	28.9
Old Hume Highway north of Medway Road	1,700	130	7.6
Medway Road west of Old Hume Highway	2,200	78	3.5
Medway Road west of Hume Highway	420	4	1.0
Golden Vale Road east of Hume Highway	840	12	1.4
Mereworth Road west of Hume Highway	22	378	1,718*
Taylor Avenue east of Old Hume Highway	2,750	124	4.5
Taylor Avenue west of Berrima Road	2,650	110	4.2
Berrima Road south of Taylor Avenue	4,200	110	2.6
Berrima Road north of Douglas Road	4,500	110	2.4
Berrima Road south of Douglas Road	3,900	106	2.7
Douglas Road east of Berrima Road	740	4	0.5
Waite Street north of Argyle Street	7,350	76	1.0
Illawarra Highway at Sutton Forest	4,100	6	0.1
Argyle Street west of Waite Street	10,400	30	0.3
Argyle Street east of Waite Street	15,800	46	0.3
Argyle Street east of Lackey Road	19,300	46	0.2
Illawarra Highway east of Robertson	3,800	8	0.2

*Note: * Only two rural properties have access via Mereworth Road currently so the proportional project traffic increase is very high for this route.*

In Table 5.1, with the exception of Mereworth Road, which will effectively be rebuilt as the main future project access road, the highest proportion of increases in project operations traffic (28.9% and 7.6%) will occur on the section of the Old Hume Highway route to the north and the south of the Medway Road and Taylor Avenue (roundabout) intersection.

These sections of the Old Hume Highway were previously built to a relatively high design standard due to their former use as the main Hume Highway route. The existing road carriageway can comfortably accommodate the future project operations-related daily traffic increase (130–330 extra daily vehicle movements) with minimal change to the existing traffic flow conditions and level of service. This includes the potential environmental amenity impacts where the Old Hume Highway route passes through Berrima.

On the other routes listed in Table 5.1, the proportional daily traffic increases generated by the project will be generally 4% or less, which would not normally be noticeable on these routes.

On the main Illawarra Highway route (Argyle Street) through the town centre of Moss Vale, the existing traffic volumes are already generally heavy, up to 18,400 daily vehicle movements in 2015 and predicted to increase to approximately 19,800 daily vehicle movements by 2020.

Similarly to during project construction the proportional project operations daily traffic increases of 0.2% to 0.3% on this route would produce only minimal traffic impacts to existing traffic flow conditions or the town centre traffic amenity along Argyle Street.

The high existing daily traffic usage for the Argyle Route is a concern to the Wingecarribee Shire Council who have been developing (in conjunction with RMS) a preliminary traffic bypass proposal, with an additional railway line crossing, at the northern edge of Moss Vale township.

5.2 Intersections

The hourly traffic volumes for the operations workforce and other site operations traffic are summarised in Table 5.2. It shows the morning peak period for the operations workforce shift traffic, which comprises mainly workforce arrivals, will be between 6.00 am and 7.00 am on weekday mornings. This is well before the morning peak traffic period for the surrounding roads, as summarised in Table 2.2. Normally, however, there will be some traffic from night-shift departures from the mine between 8.00 am and 9.00 am.

During the main afternoon peak period for the operations workforce shift traffic, traffic departures will mainly be from 4.00–5.00 pm on weekdays. They will generally coincide with the afternoon peak traffic periods at most intersections on the surrounding road network that, as summarised in Table 2.2, are generally between 3.30 pm and 4.30 pm.

Table 5.2 Hourly traffic generation summary for project operations

Hourly interval commencing	Light vehicles arriving	Heavy vehicles arriving	Light vehicles departing	Heavy vehicles departing	Total hourly traffic movements
0 am			42		42
1 am					
2 am		1			1
3 am					
4 am				1	1
5 am	7				7
6 am	62	1			63
7 am	7		7	1	15
8 am	**2**	**2**	**42**		**46**
9 am	2		1	1	4
10 am	2	1	1	1	5
11 am			2	1	3
12 midday	2	1	1		4
1 pm	1		1	1	3
2 pm	44	2			46
3 pm			3	1	4
4 pm	**1**	**1**	**53**	**1**	**56**
5 pm			10	1	11
6 pm	7		9		16
7 pm			7		7
8 pm		1			1
9 pm					0
10 pm	42			1	43
11 pm					0
Total	179	10	179	10	378

At the two Medway Road and Hume Highway interchange intersections, the respective volumes of the project operations traffic for 2015 and the projected future base year 2020 are compared in Table 5.3 using the SIDRA intersection results from Appendices B, C and E.

Table 5.3 Comparison of SIDRA intersection operations for Medway Road interchange

Intersection and year of operation	Peak hour	Traffic demand flow (vehicles)*	Average vehicle delay (seconds)	Level of service	Degree of saturation	Maximum queue length (m)
Year 2015 baseline traffic (east side intersection)	Morning peak hour (7.45 to 8.45 am typically)	198	11.6	A	0.060	0
	Afternoon peak hour (3.15 to 4.15 pm typically)	204	11.9	A	0.065	0
Year 2015 baseline traffic (west side intersection)	Morning peak hour (7.45 to 8.45 am typically)	100	12.5	A	0.066	2
	Afternoon peak hour (3.30 to 4.30 pm typically)	146	11.5	A	0.089	2

Table 5.3 Comparison of SIDRA intersection operations for Medway Road interchange

Intersection and year of operation	Peak hour	Traffic demand flow (vehicles)*	Average vehicle delay (seconds)	Level of service	Degree of saturation	Maximum queue length (m)
Year 2020 baseline traffic (east side intersection)	Morning peak hour (7.45 to 8.45 am typically)	208	11.7	A	0.063	0
	Afternoon peak hour (3.15 to 4.15 pm typically)	214	12.0	A	0.068	0
Year 2020 baseline traffic (west side intersection)	Morning peak hour (7.45 to 8.45 am typically)	105	12.5	A	0.070	2
	Afternoon peak hour (3.30 to 4.30 pm typically)	154	11.5	A	0.093	2
Project operations traffic (east side intersection)	Morning peak hour (7.45 to 8.45 am typically)	218	11.7	A	0.064	0
	Afternoon peak hour (3.15 to 4.15 pm typically)	226	12.1	A	0.074	0
Project operations traffic (west side intersection)	Morning peak hour (7.45 to 8.45 am typically)	114	12.4	A	0.077	2
	Afternoon peak hour (3.30 to 4.30 pm typically)	165	11.5	A	0.103	3

*Notes: *The SIDRA intersection analysis program automatically adds 5% to all surveyed traffic volumes as a contingency measure.*

From the results in Table 5.3, the future intersection traffic impacts from project operations will be minimal, in comparison to either the 2015 or 2020 baseline traffic conditions, with the future intersection levels of service remaining at A for all traffic scenarios considered.

In the 2020 baseline traffic assessment results, the maximum intersection traffic delay and maximum degree of saturation for any morning or afternoon peak hour traffic movement will be 12.5 seconds and 0.093 respectively. The maximum intersection delays will not increase with the project operations traffic, although the maximum intersection degree of saturation would increase marginally to 0.103.

At the two Mereworth Road and Hume Highway interchange intersections, the respective volumes of the project operations traffic are compared with the 2015 and projected future base year 2020 traffic volumes in Table 5.4, using the SIDRA intersection results from Appendices B, C and E.

Similarly to during project construction, the SIDRA intersection analysis assumes the current intersection priority is reconfigured to realign the future traffic priority to Mereworth Road, in recognition of the increased future traffic volumes using that route. The changed traffic priority will have minimal future impact on the Hume Highway off-ramp traffic, as it already has to slow to a virtual stop to make either a sharp right or a sharp left turn at the intersection.

Table 5.4 Comparison of SIDRA intersection operations for Mereworth Road interchange

Intersection and year of operation	Peak hour	Traffic demand flow (vehicles)*	Average vehicle delay (seconds)	Level of service	Degree of saturation	Maximum queue length (m)
Year 2015 baseline traffic (east side intersection)	Morning peak hour (8.00 to 9.00 am typically)	76	14.6	B	0.033	0
	Afternoon peak hour (3.00 to 4.00 pm typically)	78	11.3	A	0.022	0
Year 2015 baseline traffic (west side intersection)	Morning peak hour (8.00 to 9.00 am typically)	62	11.8	A	0.068	2
	Afternoon peak hour (4.00 to 5.00 pm typically)	46	12.4	A	0.054	2
Year 2020 baseline traffic (east side intersection)	Morning peak hour (8.00 to 9.00 am typically)	80	14.7	B	0.035	0
	Afternoon peak hour (3.00 to 4.00 pm typically)	82	11.4	A	0.023	0
Year 2020 baseline traffic (west side intersection)	Morning peak hour (8.00 to 9.00 am typically)	64	11.8	A	0.071	2
	Afternoon peak hour (4.00 to 5.00 pm typically)	48	12.4	A	0.056	2
Project operations traffic (east side intersection)	Morning peak hour (8.00 to 9.00 am typically)	128	13.4	A	0.056	0
	Afternoon peak hour (3.00 to 4.00 pm typically)	141	13.0	A	0.037	0
Project operations traffic (west side intersection)	Morning peak hour (8.00 to 9.00 am typically)	113	12.3	A	0.076	2
	Afternoon peak hour (4.00 to 5.00 pm typically)	107	13.1	A	0.062	2

Notes: **The SIDRA intersection analysis program automatically adds 5% to all surveyed traffic volumes as a contingency measure.*

From the results in Table 5.4, the future intersection traffic impacts from project operations traffic will be minimal in comparison to either 2015 or 2020 baseline traffic conditions, with the future intersection levels of service remaining at either A or B for all traffic scenarios considered.

In the 2020 baseline traffic assessment results, the maximum intersection traffic delay and degree of saturation for any morning or afternoon peak hour traffic movement will be 14.7 seconds and 0.071 respectively.

The maximum intersection traffic delays would not increase with the project operations traffic, and the maximum degree of saturation would increase marginally to 0.078 as a result of the project operations traffic.

In Table 5.5, the respective volumes of the project operations traffic in 2015 and projected future base year 2020 traffic volumes are compared at the two Golden Vale Road and Hume Highway interchange intersections, using the SIDRA intersection results from Appendices B, C and E.

Table 5.5 Comparison of SIDRA intersection operations for Golden Vale Road intersections

Intersection and year of operation	Peak hour	Traffic demand flow (vehicles)*	Average vehicle delay (seconds)	Level of service	Degree of saturation	Maximum queue length (m)
Year 2015 baseline traffic (east side intersection)	Morning peak hour (8.00 to 9.00 am typically)	693	18.8	B	0.170	3
	Afternoon peak hour (3.30 to 4.30 pm typically)	635	17.6	B	0.162	2
Year 2015 baseline traffic (west side intersection)	Morning peak hour (8.00 to 9.00 am typically)	523	17.7	B	0.146	3
	Afternoon peak hour (3.30 to 4.30 pm typically)	735	21.0	B	0.191	3
Year 2020 baseline traffic (east side intersection)	Morning peak hour (8.00 to 9.00 am typically)	757	20.3	B	0.188	4
	Afternoon peak hour (3.30 to 4.30 pm typically)	694	19.1	B	0.178	2
Year 2020 baseline traffic (west side intersection)	Morning peak hour (8.00 to 9.00 am typically)	573	19.3	B	0.161	4
	Afternoon peak hour (3.30 to 4.30 pm typically)	806	23.4	B	0.210	4
Project operations traffic (east side intersection)	Morning peak hour (8.00 to 9.00 am typically)	762	20.4	B	0.188	4
	Afternoon peak hour (3.30 to 4.30 pm typically)	700	19.2	B	0.179	2
Project operations traffic (west side intersection)	Morning peak hour (8.00 to 9.00 am typically)	573	19.3	B	0.161	4
	Afternoon peak hour (3.30 to 4.30 pm typically)	806	23.4	B	0.210	4

*Notes: *The SIDRA intersection analysis program automatically adds 5% to all surveyed traffic volumes as a contingency measure.*

From the results in Table 5.5, the future intersection traffic changes during project operations will be minimal in comparison to either 2015 or 2020 baseline traffic conditions, with the future intersection levels of service remaining at B for all traffic scenarios considered.

In the 2020 baseline traffic assessment results, the maximum intersection traffic delay and degree of saturation for any morning or afternoon peak hour traffic movement will be 20.3 seconds (morning) and 23.4 seconds (afternoon) respectively and 0.188 (morning) and 0.210 (afternoon) respectively.

The future project operations (morning) maximum intersection delay would increase very marginally to 20.4 seconds although the maximum degree of saturation would not change from the future 2020 baseline traffic conditions.

The future project operations (afternoon) maximum intersection delay and degree of saturation would not change from the future 2020 baseline traffic conditions.

At the Old Hume Highway, Medway Road and Taylor Avenue roundabout intersections, the respective volumes of the project operations traffic are compared with 2015 and projected future base year 2020 traffic volumes in Table 5.6 using the SIDRA intersection results in Appendices B, C and E.

Table 5.6 Comparison of SIDRA intersection operations for Old Hume Highway roundabout

Intersection and year of operation	Peak hour	Traffic demand flow (vehicles)*	Average vehicle delay (seconds)	Level of service	Degree of saturation	Maximum queue length (m)
Year 2015 baseline traffic	Morning peak hour (8.00 to 9.00 am typically)	358	17.1	B	0.097	4
	Afternoon peak hour (3.30 to 4.30 pm typically)	335	17.2	B	0.095	4
Year 2020 baseline traffic	Morning peak hour (8.00 to 9.00 am typically)	375	17.0	B	0.102	4
	Afternoon peak hour (3.30 to 4.30 pm typically)	351	17.3	B	0.101	4
Project operations traffic	Morning peak hour (8.00 to 9.00 am typically)	418	17.5	B	0.107	4
	Afternoon peak hour (3.30 to 4.30 pm typically)	403	16.8	B	0.101	4

*Notes: *The SIDRA intersection analysis program automatically adds 5% to all surveyed traffic volumes as a contingency measure.*

From the results in Table 5.6, the future intersection traffic impacts from project operations traffic will be minimal in comparison to either 2015 or 2020 baseline traffic conditions, with the intersection level of service remaining at B for all the traffic scenarios considered.

In the 2020 baseline traffic assessment results, the maximum intersection traffic delay and degree of saturation for any morning or afternoon peak hour traffic movement will be 17.0 seconds (morning) and 17.3 seconds (afternoon) respectively and 0.102 (morning) and 0.101 (afternoon) respectively.

The future project operations (afternoon) maximum intersection traffic delay and degree of saturation would not generally increase from the future baseline year 2020 traffic.

The future project operations (morning) maximum intersection traffic delay and degree of saturation would increase marginally to 17.5 seconds and 0.107 respectively, which would represent a relatively minor impact for the morning peak hour project operations traffic.

At the two Berrima Road intersections, with Taylor Avenue and Douglas Road, the respective volumes of the project operations traffic in 2015 and projected future base year 2020 traffic volumes are compared in Table 5.7 using the SIDRA intersection results from Appendices B, C and E.

Table 5.7 Comparison of SIDRA intersection operations for two Berrima Road intersections

Intersection and year of operation	Peak hour	Traffic demand flow (vehicles)*	Average vehicle delay (seconds)	Level of service	Degree of saturation	Maximum queue length (m)
Year 2015 baseline traffic (Taylor Avenue intersection)	Morning peak hour (8.00 to 9.00 am typically)	329	10.8	A	0.203	7
	Afternoon peak hour (3.15 to 4.15 pm typically)	427	11.9	A	0.198	6
Year 2015 baseline traffic (Douglas Road intersection)	Morning peak hour (8.00 to 9.00 am typically)	360	17.0	B	0.096	3
	Afternoon peak hour (3.15 to 4.15 pm typically)	472	15.1	B	0.134	4
Year 2020 baseline traffic (Taylor Avenue intersection)	Morning peak hour (8.00 to 9.00 am typically)	347	10.9	A	0.218	7
	Afternoon peak hour (3.15 to 4.15 pm typically)	448	12.2	A	0.214	7
Year 2020 baseline traffic (Douglas Road intersection)	Morning peak hour (8.00 to 9.00 am typically)	379	17.1	B	0.101	3
	Afternoon peak hour (3.15 to 4.15 pm typically)	493	15.4	B	0.142	4
Project operations traffic (Taylor Avenue intersection)	Morning peak hour (8.00 to 9.00 am typically)	362	10.9	A	0.235	8
	Afternoon peak hour (3.15 to 4.15 pm typically)	465	12.1	A	0.239	8
Project operations traffic (Douglas Road intersection)	Morning peak hour (8.00 to 9.00 am typically)	394	17.5	B	0.107	3
	Afternoon peak hour (3.15 to 4.15 pm typically)	509	15.7	B	0.146	4

*Notes: *The SIDRA intersection analysis program automatically adds 5% to all surveyed traffic volumes as a contingency measure.*

From the results in Table 5.7, the future intersection traffic impacts from project operations traffic will be minimal in comparison to either the 2015 or 2020 baseline traffic conditions, with the intersection levels of service remaining at either A or B for all the traffic scenarios considered.

At the Berrima Road and Taylor Avenue intersection, the 2020 baseline traffic assessment results show the maximum intersection traffic delay and degree of saturation for any morning or afternoon peak hour traffic movement will be 10.9 seconds (morning) and 12.2 seconds (afternoon) respectively and 0.218 (morning) and 0.214 (afternoon) respectively.

The future project operations (morning) maximum intersection delay would not increase, although the maximum degree of saturation would increase to 0.235 with the project operations traffic. The future project operations (afternoon) maximum intersection delay would also not increase, although the maximum degree of saturation would increase to 0.239 with the project operations traffic.

At the Berrima Road and Douglas Road intersection the 2020 baseline traffic assessment results show the maximum intersection traffic delay and degree of saturation for any morning or afternoon peak hour traffic movement will be 17.1 seconds (morning) and 15.4 seconds (afternoon) respectively and 0.101 (morning) and 0.142 (afternoon) respectively.

The future project operations (morning) maximum intersection delay would increase marginally to 17.5 seconds and the degree of saturation would increase to 0.107 with the project operations traffic. The future project operations (afternoon) maximum intersection delay would increase marginally to 15.7 seconds and the degree of saturation would increase to 0.146 with the project operations traffic.

At the two Argyle Street intersections in Moss Vale, with Waite Street and Lackey Road, the respective volumes of the project operations traffic are compared with the 2015 and projected future 2020 baseline traffic volumes in Table 5.8 using the SIDRA intersection results from Appendices B, C and E.

Table 5.8 Comparison of SIDRA intersection operations for two Argyle Street intersections

Intersection and year of operation	Peak hour	Traffic demand flow (vehicles)*	Average vehicle delay (seconds)	Level of service	Degree of saturation	Maximum queue length (m)
Year 2015 baseline traffic (Waite Street intersection)	Morning peak hour (8.00 to 9.00 am typically)	1,461	51.1	D	0.451	19
	Afternoon peak hour (3.15 to 4.15 pm typically)	1,562	38.8	C	0.478	27
Year 2015 baseline traffic (Lackey Road intersection)	Morning peak hour (8.00 to 9.00 am typically)	1,729	70.6	F	0.451	39
	Afternoon peak hour (3.15 to 4.15 pm typically)	1,864	102.5	F	0.541	55
Year 2020 baseline traffic (Waite Street intersection)	Morning peak hour (8.00 to 9.00 am typically)	1,535	59.0	E	0.495	21
	Afternoon peak hour (3.15 to 4.15 pm typically)	1,639	44.6	D	0.519	30
Year 2020 baseline traffic (Lackey Road intersection)	Morning peak hour (8.00 to 9.00 am typically)	1,816	82.5	F	0.499	43
	Afternoon peak hour (3.15 to 4.15 pm typically)	1,957	129.3	F	0.580	59
Project operations traffic (Waite Street intersection)	Morning peak hour (8.00 to 9.00 am typically)	1,546	53.3	D	0.503	21
	Afternoon peak hour (3.15 to 4.15 pm typically)	1,651	46.9	D	0.528	30
Project operations traffic (Lackey Road intersection)	Morning peak hour (8.00 to 9.00 am typically)	1,823	83.8	F	0.503	43
	Afternoon peak hour (3.15 to 4.15 pm typically)	1,963	131.8	F	0.582	59

*Notes: *The SIDRA intersection analysis program automatically adds 5% to all surveyed traffic volumes as a contingency measure.*

At the Argyle Street and Waite Street intersection, the 2020 baseline traffic assessment results show the maximum intersection traffic delay and degree of saturation for any morning or afternoon peak hour traffic movement will be 59.0 seconds (morning) and 44.6 seconds (afternoon) respectively, and 0.495 (morning) and 0.519 (afternoon) respectively. These intersection traffic conditions correspond to Level of Service E (morning) and Level of Service D (afternoon) for the respective peak hour traffic conditions.

The future project operations (morning) peak hour intersection traffic delays would not increase and the intersection degree of saturation would increase only marginally to 0.503 with the project operations traffic.

The future project operations (afternoon) peak hour intersection traffic delays would increase to 46.9 seconds, the intersection degree of saturation would increase marginally to 0.528 with the project operations traffic, with no change to the future intersection peak hour level of service.

At the Argyle Street and Lackey Road intersection, the year 2020 baseline traffic assessment results show the maximum intersection traffic delay and degree of saturation for any morning or afternoon peak hour traffic movement will be 82.5 seconds (morning) and 129.3 seconds (afternoon) respectively, and 0.499 (morning) and 0.580 (afternoon) respectively. These intersection traffic conditions correspond to Level of Service F for both the morning and afternoon peak hour traffic conditions.

The future project operations (morning) intersection traffic delay would increase very marginally to 83.8 seconds and the degree of saturation to 0.503 with the project operations traffic.

The future project operations (afternoon) intersection traffic delay would increase very marginally to 131.8 seconds and the degree of saturation to 0.582 with the project operations traffic.

Although this assessment shows that the future peak hourly intersection traffic conditions at the two Argyle Street intersections will be congested (in particular at the Lackey Road intersection), there will be no significant worsening of the future intersection traffic operations with the project operations traffic.

5.3 Traffic safety

The detailed accident review for the Wingecarribee LGA and the Moss Vale local area road networks, in Section 2.8 of this assessment, has shown a generally good and improving road safety record for most of the roads in the LGA, in particular for the local road network managed by Wingecarribee Shire Council, which excludes the two major state highways, the Hume Highway and the Illawarra Highway.

The proposed project (operations) daily traffic movements would not have any adverse safety implications for the LGA road network, in particular as the project will mainly use a locally-based workforce, with approximately 85% of employed persons resident within the Wingecarribee LGA, largely in Moss Vale, Mittagong and Bowral.

The use of a primarily locally based workforce throughout the project operations period will minimise the potential road safety risk associated with longer distance workforce commuter travel movements occurring on a daily basis with the project.

5.4 Road pavement condition

The potential traffic impact to the road pavement condition, on the access routes which are proposed to be used by project generated truck traffic during operations, will depend on the existing route condition and the combination of the existing and the proposed project daily truck movements.

On the Hume Highway and Illawarra Highway routes, which carry large volumes of interstate and long distance truck traffic currently, the additional project generated daily truck traffic movements would be expected to have minimal impacts to the road pavement condition. On the other major road routes in the Moss Vale and Berrima areas which are under the care and control of the local Council, such as Old Hume Highway and Berrima Road, these roads are also used by substantial volumes of heavy truck traffic from local heavy industries, such that significant additional road pavement condition impacts from the project truck traffic are also unlikely to occur.

5.5 Access by public transport and other travel modes

The immediate locality of the mine project area on the western side of the Hume Highway, which is accessed via Mereworth Road, is generally remote from the existing locality (local and regional) bus- and rail-based public transport services.

Consequently the project operations workforce or people visiting the project area are unlikely to use public transport services in the future, and such access has not been specifically analysed for the project operations workforce or other site visitors in this traffic impacts assessment.

6 Mitigation measures

6.1 Construction stage traffic management

No specific external road widening measures were identified for the project construction stage as being required for the primary project construction stage access. What is effectively a private road will, however, require some project-related widening and reconstruction for it to serve as the project's main future construction and operation stage access route.

The existing road cross-section of Mereworth Road, west of the Hume Highway interchange, will be widened and upgraded, with marked road centre and edge lines and gravel road shoulders. It will be to an appropriate standard for the anticipated peak hour and daily traffic volumes the project will generate, including heavy vehicle movements.

The related measures to manage project construction stage traffic will mainly be to construct the accommodation village, which will accommodate up to 90% of the project construction workforce during the major part of the project construction period (from February/March 2020 onwards).

The accommodation village will minimise the externally generated project traffic movements (for both car and truck traffic) such that there will effectively be no significant project construction stage traffic impacts within the local area roads surrounding the project, or on major locality traffic routes such as the Berrima Road between Old Hume Highway and Argyle Street at Moss Vale.

Where temporary construction stage access is required for any project worksite that is not within the Mereworth Road locality, an additional locality project construction stage traffic management plan (and traffic control plan) will be prepared to confirm the local access safety and traffic management requirements for the work. Project traffic control plans would be prepared and implemented in accordance with RMS traffic control at worksite requirements.

6.2 Operations stage traffic management

No additional road widening or traffic management measures will be required for the project operations stage access compared with the primary project construction stage access.

The workforce accommodation village will be decommissioned and removed from the site when the project construction is completed. The project will then operate with a more locally based workforce, whereby about 85% of the future project management and operations staff and workers would residents of the Wingecarribee LGA, such that longer distance project workforce commuter traffic movements would be effectively avoided.

6.3 Intersection improvements

One intersection will require upgrading to safely accommodate the project related traffic during construction and operation; the intersection of the Hume Highway north bound off-ramp with Mereworth Road.

Mereworth Road currently has very low traffic volumes west of the Hume Highway and the primary traffic movement is from the Hume Highway off ramp, turning right onto Mereworth Road. This suits the current intersection priority which has Give Way signs on the two Mereworth Road approaches. However, the additional Hume Coal project traffic volumes mean that a design change to this intersection will be required. Potential design changes considered were:

- Retaining the existing T intersection design but changing the intersection priority to the eastern and western approaches via Mereworth Road, which is the normal intersection priority for a T-intersection, and would be generally more familiar to most road users in the future.

- Constructing a new roundabout at the intersection with an outside diameter of 32 metres. This is the effective minimum future circulating area which would be required for a B Double truck to undertake all possible traffic movements at the intersection.

SIDRA analysis of these two options was conducted. In relation to traffic delays, the analysis found that changing the priority to east-west at the T-intersection would reduce the average traffic delays by approximately 40% in comparison to the existing intersection priority, while the roundabout option would increase the average traffic delays by approximately 10%. The east-west priority intersection would provide a Level of Service A under the am and pm peak hour traffic scenarios considered, while the roundabout would provide a Level of Service B under the same six traffic scenarios. In addition only minimal changes to the existing intersection roadway (line marking primarily) will be required to change the existing intersection priority.

Retention of the existing T-intersection with a change in intersection priority was therefore shown to be best solution. The changed traffic priority will have minimal future impact on the Hume Highway off-ramp traffic, as it already has to slow to a virtual stop to make either a sharp right or a sharp left turn at the intersection. The reconfiguration of the Mereworth Road/Hume Highway interchange has been discussed with representatives of RMS and Wingecarribee Shire Council, as outlined in Chapter 5.

Hume Coal will fund the necessary works associated with the required intersection upgrade.

6.4 Special vehicle movements

At times during both project construction and operations, oversize vehicle movements and dangerous goods transport will be required to transport specific construction and maintenance components for the project.

6.4.1 Oversize vehicles

Suppliers of equipment for the project will be chosen following a detailed engineering design and procurement process, which will occur after the development application is determined so that investment decisions can be made with certainty. Given this, the exact dimensions and quantities of construction materials, machinery and equipment, or where these items will be sourced from has not been confirmed. However, it is anticipated that oversize vehicles transporting items to the project area could be up to 8 m wide and 30 m long.

The permitted routes and time restrictions for oversize vehicles, which may include either night-time or daytime deliveries, will be determined in consultation with RMS and documented in the CEMP and OEMP before construction commences. RMS will decide on the oversize vehicle routes and travel times for the project on a case by case basis in accordance with its policy for oversize vehicle movements within urban areas and key transport routes, such as Picton Road, which connects from the Hume Highway near Wilton to the Wollongong urban area near Mount Keira.

6.4.2 Hazardous materials

Contractors for transportation of hazardous goods will be required to comply with the following guidelines:

- *Australian Code for the Transport of Dangerous Goods by Road and Rail Edition 7.4* (National Transport Commission 2016);
- *Australian Standard 1940:2004 The Storage and Handling of Flammable and Combustible Liquids*;
- *Australian Standard/New Zealand Standard 1596:2008 The Storage and Handling of LP Gas*;
- *Australian Standard 2187:1998 Explosives – Storage, Transport and Use: Storage*;
- *Workplace Relations Minister's Council 2009 Australian code for the transport of explosives by road and rail third edition 2008;* and
- *Code of practice for transport of radioactive material* (Australian Radiation Protection and Nuclear Safety Agency 2008).

Appendix P of the EIS considered if transportation of hazardous goods would qualify the project as a hazardous development under State Environmental Planning Policy 33 (Hazardous and Offensive Development) (SEPP 33). This involved comparison of the quantities and frequency of transportation of dangerous goods to the thresholds in Table 2 of *Applying SEPP 33* (DoP 2011). This comparison determined that transportation of hazardous goods to and from the project will not qualify it as a potentially hazardous development under SEPP 33.

Generally, the risk assessment in Appendix P of the EIS determined that transportation of dangerous goods would represent a medium risk, provided this is in accordance with the above guidelines. This is because the consequences of a crash or other incident involving these goods, regardless of the likelihood of an incident, could lead to major injury.

7 Conclusions

7.1 Method

This report addresses the road transport-related SEARs for the project construction and operations stages, including considering the *RTA Guide to Traffic Generating Developments* (RTA 2002). An accompanying Rail Infrastructure Transport Assessment assesses the project's rail infrastructure transport impacts, including the potential impacts to traffic safety and traffic delays at railway level crossings.

7.2 Findings

The project traffic impacts assessment for the project construction and operations stage traffic movements has investigated the existing (2015) and future baseline (2020) traffic volumes at a large number of locations and intersections on the road network in the locality of the project area and on the Berrima Road route between Berrima and Moss Vale.

A summary of the study findings and recommendations in terms of the capacity, condition, safety and efficiency of the local and state road networks is listed in Table 7.1

Table 7.1 Summary of the project traffic impacts assessment

Type of potential impact	Impacts to the local road network	Impacts to the state road network	Summary of Impact
Capacity	Minimal impacts are predicted to the local road network (Council controlled roads) for either mid block road capacity or the peak hour traffic capacity of intersections	Minimal impacts are predicted to the state road network (Hume Highway and Illawarra Highway) for either mid block road capacity or the peak hour traffic capacity of intersections	Low Impact
Condition	Minimal impacts are anticipated from the project truck traffic using roads which are maintained by the local Council.	Where access is proposed to the state road network during project construction, the access will be of short duration, of low traffic generation intensity and will be managed by standard RMS worksite traffic control plans prepared in accordance with RMS traffic control guidelines for worksites with access to major roads	Low Impact
Safety	The current traffic safety record (accident history) for the local road network is good and safety will not be significantly impacted by the additional project traffic	The current traffic safety record (accident history) for the state road network is relatively good and safety will not be significantly impacted by the additional project traffic	Low impact
Efficiency	The project will not generate any significant road traffic increases which will adversely affect the efficiency of the local road network (Council controlled roads)	The project will not generate any significant road traffic increases which will adversely affect the efficiency of the local road network (Council controlled roads)	Low impact

No significant adverse traffic impacts have been identified for the future traffic movements generated by the project for either the road network traffic capacity, intersection traffic operations; the road network condition; road safety and the efficiency of operation of the road network.