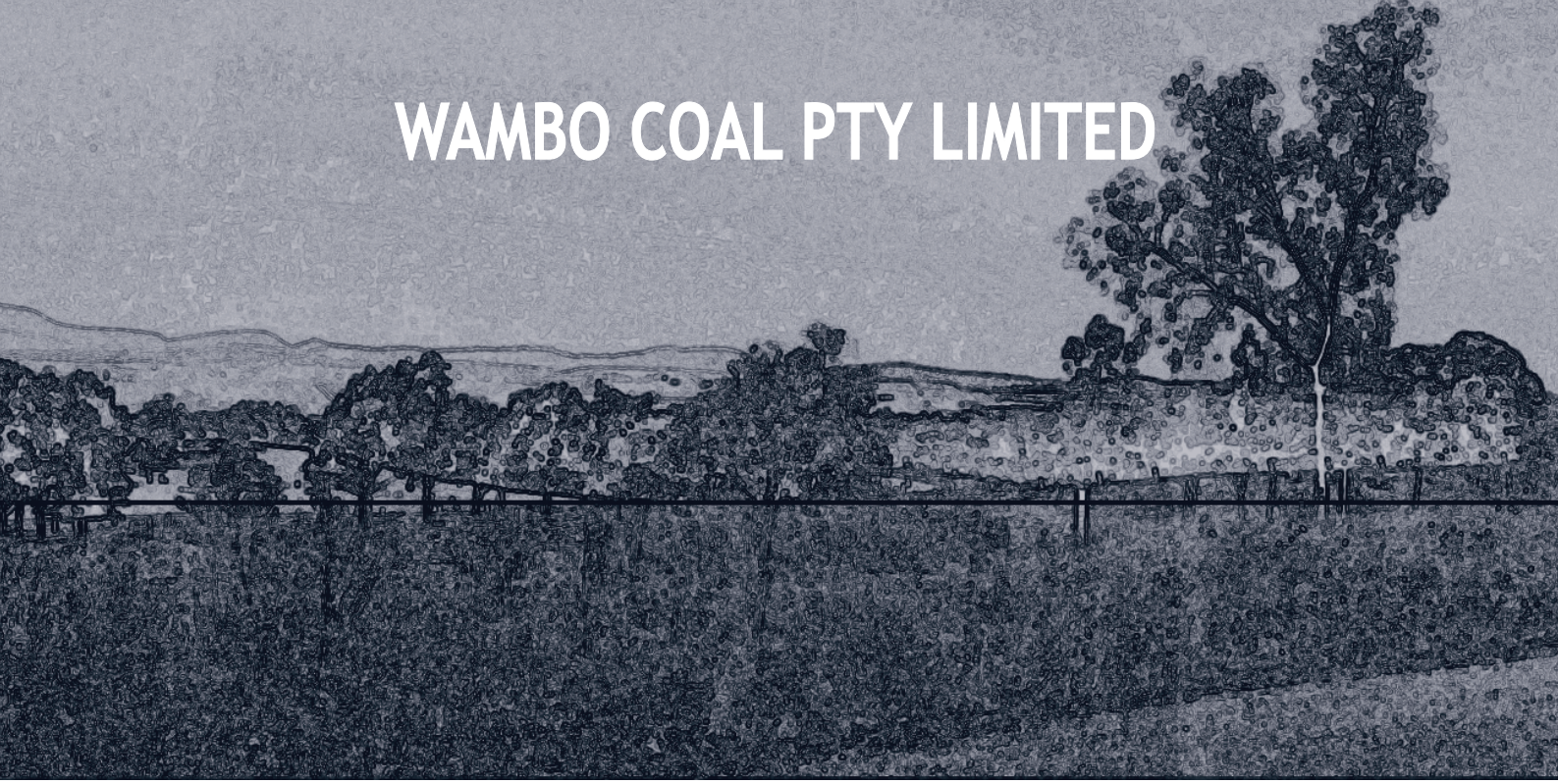


WAMBO COAL PTY LIMITED

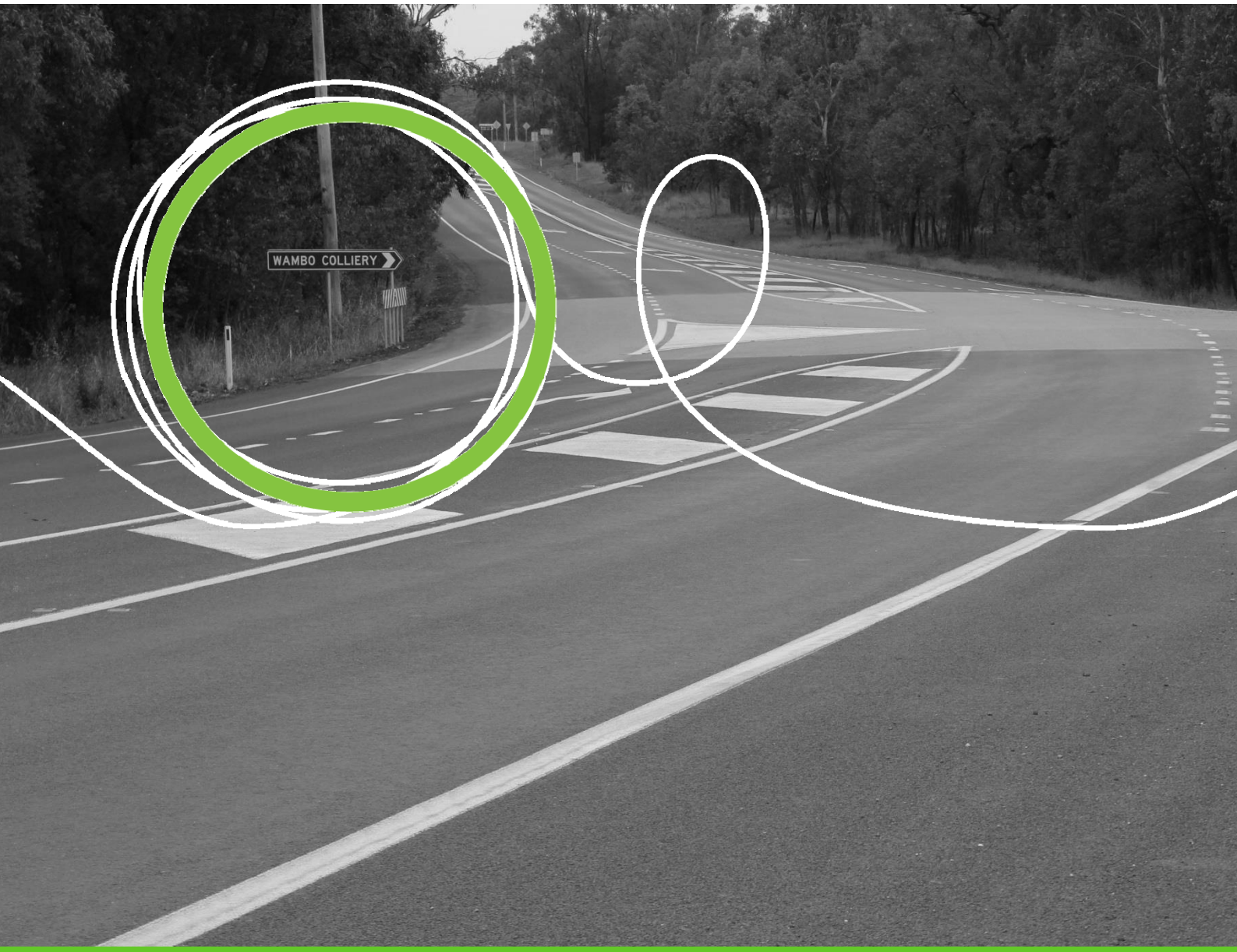
SOUTH WAMBO UNDERGROUND MINE MODIFICATION

ENVIRONMENTAL ASSESSMENT

APPENDIX J

Road Transport Assessment

Peabody ENERGY



South Wambo Underground Mine Modification

Wambo Coal Mine

Road Transport Assessment

Client // Wambo Coal Pty Limited
Office // NSW
Reference // 16S9009000
Date // 10/03/16

South Wambo Underground Mine Modification

Wambo Coal Mine

Road Transport Assessment

Issue: A 10/03/16

Client: Wambo Coal Pty Limited
Reference: 16S9009000
GTA Consultants Office: NSW

Quality Record

Issue	Date	Description	Prepared By	Checked By	Approved By	Signed
A	10/03/16	Final	Penny Dalton	Penny Dalton	Ken Hollyoak	

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Melbourne | Sydney | Brisbane
Canberra | Adelaide | Perth
Gold Coast | Townsville

Table of Contents

Appendices

Figures

Tables

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1. Introduction

This report has been prepared on behalf of Wambo Coal Pty Limited (WCPL), a subsidiary of Peabody Energy Australia Pty Limited, to present the findings of an assessment of the road transport implications of the proposed South Wambo Underground Mine Modification (the Modification) at the Wambo Coal Mine.

WCPL is seeking approval for a modification to Development Consent (DA 305-7-2003) for the Wambo Coal Mine under Section 75W of the New South Wales (NSW) *Environmental Planning & Assessment Act, 1979*. The Modification involves a realignment and extension/relocation of the approved South Wambo (Arrowfield Seam) Underground Mine longwall panels and mining of the Woodlands Hill Seam rather than the Bowfield Seam.

This study has been undertaken with reference to the road transport components of the Secretary's Environmental Assessment Requirements (SEARs). The SEARs refer to guidelines which may be relevant to the assessment, including the Roads and Maritime Services (RMS, formerly Roads and Traffic Authority [RTA]) *Guide to Traffic Generating Developments* (RTA, 2002). With regard to traffic and transport, the SEARs state:

- ***Transport*** *– including an assessment of the likely transport impacts of the development on the capacity, condition, safety and efficiency of the local and State road and rail network.*

An assessment of the potential impacts of the Modification on the rail network is provided in the Environmental Assessment.

2. Wambo Coal Mine

2.1 Existing Operations

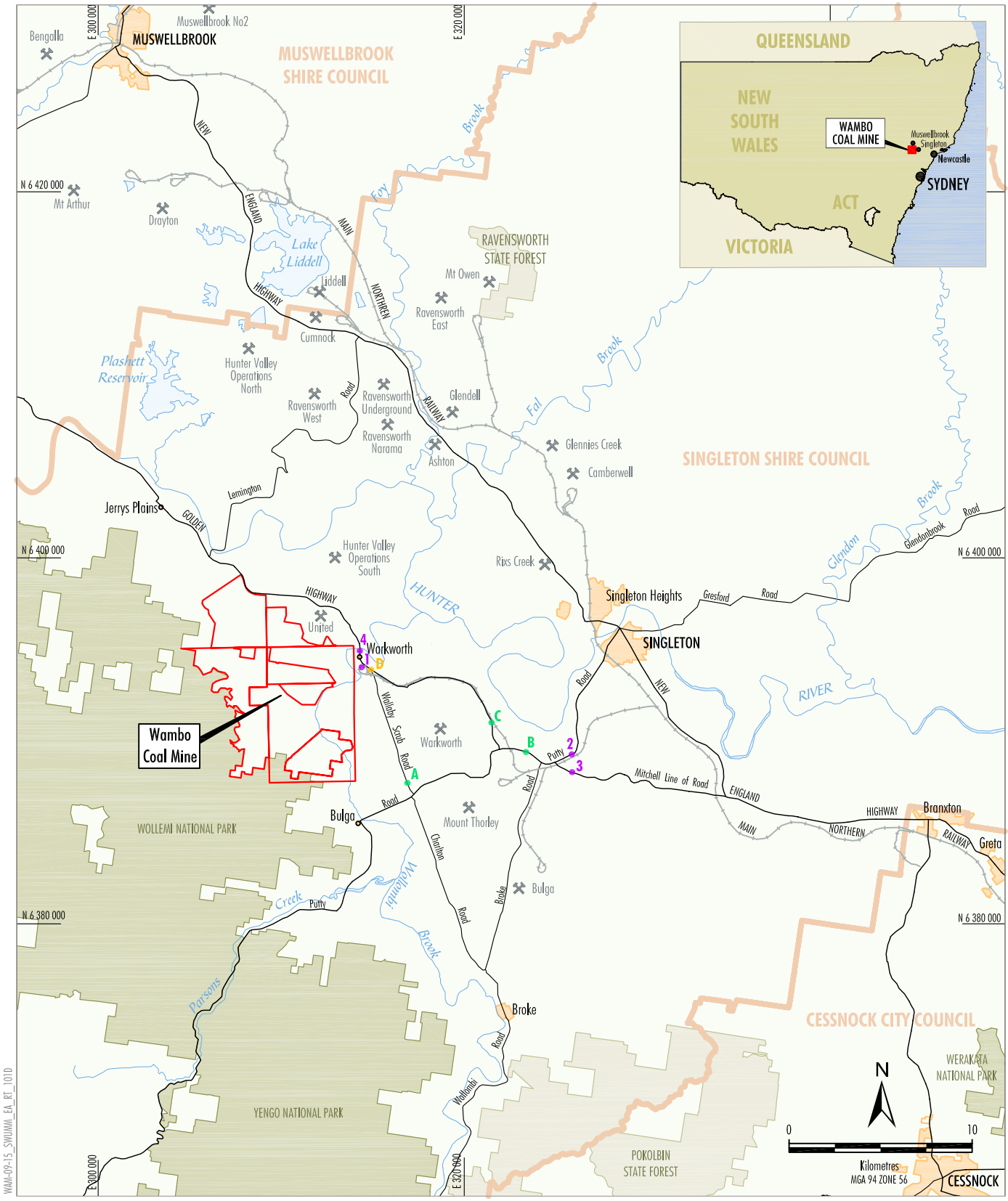
The Wambo Coal Mine is an open cut and underground coal mining operation located approximately 15 kilometres (km) west of Singleton, near the village of Warkworth, NSW (Figure 2-1). The Wambo Coal Mine is owned and operated by WCPL.

The Wambo Coal Mine is approved to extract up to 14.7 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal, over a mine life of approximately 21 years until 1 March 2025. Approximately 213 million tonnes (Mt) of ROM coal is expected to be extracted during the approved mine life, including an estimated 98 Mt open cut ROM coal reserve and 115 Mt underground ROM coal reserve. Open cut mining is approved to March 2017 at a rate of up to 8 Mtpa of ROM coal from the Whybrow, Redbank Creek, Wambo and Whynot Seams. Underground mining is approved at a rate of up to 7.5 Mtpa of ROM coal from the Whybrow, Wambo, Arrowfield and Bowfield Seams.

ROM coal is hauled to the Wambo Coal Mine Coal Handling and Preparation Plant (CHPP) for processing and product coal is loaded onto trains at the Wambo Coal Terminal for transport off-site. Vehicular access is provided via an access road to Jerrys Plains Road near the north and eastern boundaries of Consolidated Coal Lease (CCL) 743. The intersection of Jerrys Plains Road and the Wambo Coal Mine access road is a "seagull" intersection with a channelised right turn deceleration lane (CHR) for vehicles entering the Wambo Coal Mine, and a channelised acceleration lane for vehicles turning right when exiting the Wambo Coal Mine. An auxiliary left turn deceleration lane (AUL) is provided in Jerrys Plains Road for vehicles entering the Wambo Coal Mine. Give way signage and linemarking is provided for traffic exiting the Wambo Coal Mine. Inbound and outbound vehicles are separated by a raised concrete island near the intersection.

An informal vehicular access for the Wambo Coal Mine is located off Jerrys Plains Road, approximately 1.1 km to the north-east of the Wambo Coal Mine access road. The secondary access road is used intermittently by environmental personnel for one-off access requirements.

The Wambo Coal Mine workforce consists of approximately 670 employees and contractors, of which approximately 90 percent are present on site each day. Shift times currently vary for workers in different operational areas, with the current shift start and end times summarised in Table 2.1.



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LEGEND

- Mining and Coal Lease Boundary
- Local Government Boundary
- Mining Operation
- A EMM (2014) Traffic Survey Locations
- 1 Modification Traffic Survey Locations
- D Modification Traffic Forecast Location

Source: Geoscience Australia (2009); EMM (2014); GTA Consultants (2016)

Peabody ENERGY

WAMBO COAL MINE

Regional Location and Traffic Survey Locations

Figure 2-1

Table 2.1: Wambo Coal Mine Shift Times

Crew	Shift Start Time	Shift End Time	Days
Open Cut Day	6.00am	4.30pm	Daily
Open Cut Night	4.30pm	3.00am	Daily
CHPP Day	7.00am	7.10pm	Daily
CHPP Night	7.00pm	7.10am	Daily
CHPP Maintenance	7.00am	3.30pm	Weekdays
Underground Day	6.30am	3.30pm	Weekdays
Underground Afternoon	2.30pm	11.30pm	Weekdays
Underground Day	7.00am	7.00pm	Weekend
Underground Night	7.00pm	7.00am	Weekend
Administration	7.00am	5.00pm	Weekdays

WCPL has provided the following information on the residential distribution of its existing workforce, taken from an analysis of the employees' residential postcodes:

- 26 percent Singleton;
- 26 percent Maitland;
- 18 percent Cessnock;
- 13 percent Newcastle/Lake Macquarie;
- 6 percent Muswellbrook; and
- 11 percent Other.

WCPL has advised that visitors and deliveries to the Wambo Coal Mine are drawn from Singleton (10 percent) and Newcastle/Sydney (90 percent). Typically, visitor and delivery trips occur during daylight hours, between 6.00am and 6.00pm.

2.2 The Modification

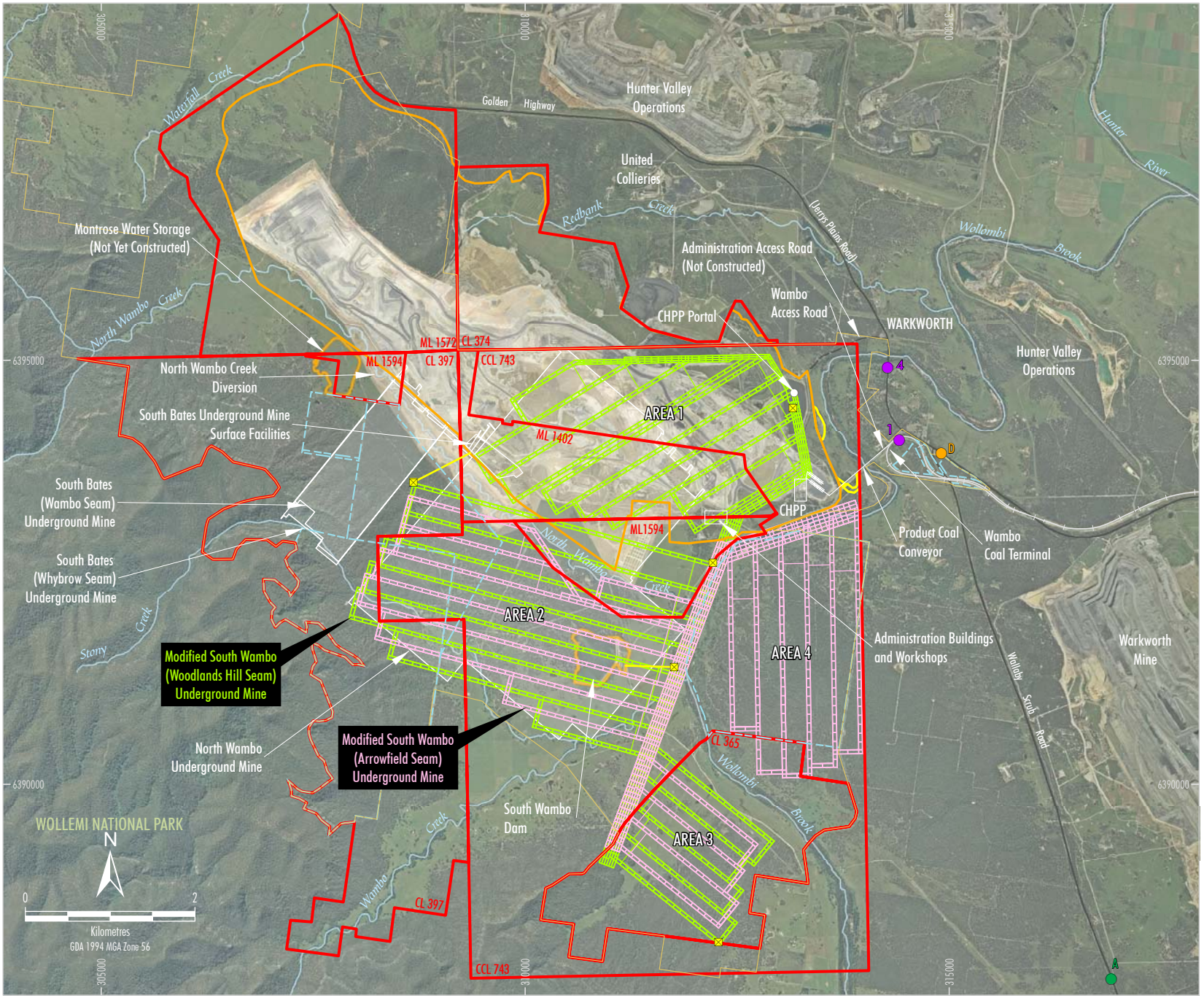
The Modification would involve a realignment and extension/relocation of the approved South Wambo (Arrowfield Seam) Underground Mine longwall panels and mining of the Woodlands Hill Seam rather than the Bowfield Seam. The rearrangement of the South Wambo Underground Mine would require a minor extension of the approved surface development area (Figure 2-2) and result in an extension of the approved mine life by 7 years to 2032.

The underground mine ROM coal production rate would increase from 7.5 to 9.75 Mtpa. The approved total ROM coal production rate of 14.7 Mtpa would remain unchanged.

The Modification would not involve changes to any aspects of the approved North Wambo Underground Mine or South Bates Underground Mine.

The Modification would also include an extension of approved open cut mining operations by 3 years to 2020. The Modification would not include any change to the approved total open cut ROM coal production limit.

The total Wambo Coal Mine workforce would fluctuate with the completion of open cut mining and any increase in production in the underground operations, however is not anticipated to exceed the existing Wambo Coal Mine workforce of approximately 670.



Peabody ENERGY

WAMBO COAL MINE

Modified Wambo Coal Mine General Arrangement and Traffic Survey Locations

Figure 2-2

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While the Modification would include upgrades to internal sections of the existing Wambo Coal Mine access road (Figure 2-1), including construction of a grade separated crossing, these upgrades are considered part of the internal Wambo Coal Mine road network and are therefore not considered in this assessment.

2.3 Road Transport Aspects and Future Scenarios

With regard to the road transport characteristics of the Wambo Coal Mine, the Modification would result in the continued generation of vehicle trips to and from the Wambo Coal Mine for an additional seven years from 2025 to 2032. As the Modification would not result in any change to the approved maximum mining rate or an increase in the level of employment, the traffic generated during the additional operating years would be expected to be similar to that currently generated.

The Modification would include some construction activities associated with initial development of the South Wambo Underground Mine. As the South Wambo Underground Mine construction phase already forms part of the approved Wambo Coal Mine, this construction phase has not specifically been considered in this assessment.

No changes to arrangements with regard to vehicular access between the external road network and the Wambo Coal Mine site are proposed with the Modification.

To assess the road transport implications of the Modification, operating conditions in 2032 (being the proposed final year of the operation of the modified Wambo Coal Mine) have been examined and compared with the operating conditions in that same year with cessation of mining activity in 2025 (as approved).

3. Existing Conditions

3.1 Road Network

The road network serving the Wambo Coal Mine is briefly described below. It is noted that some of the roads are known by several names. For consistency throughout this report, the names below, which are based on the NSW government's SIX Maps website, will be used to refer to the relevant sections of road as described here.

Jerrys Plains Road provides an east-west link between Denman Road near Denman, and Putty Road at Mount Thorley. Jerrys Plains Road forms part of the Golden Highway (Route B84), which extends from Dubbo in the west to New England Highway west of Belford. The Golden Highway is a designated B-Double route. Jerrys Plains Road is typically a two-way two-lane sealed road, with centre linemarking and a posted speed limit of 100 kilometres per hour (km/h), reducing to 80 km/h for approximately 1 km each side of the Wambo Coal Mine access road. Additional acceleration and deceleration lanes are provided at major intersections.

Putty Road is a rural road which provides a link from Singleton in the Hunter Region to Wilberforce in the northwest outskirts of Sydney. Between Jerrys Plains Road and Mitchell Line of Road, it forms part of the Golden Highway (Route B84). To the west of Loder Creek, this section of Putty Road has two westbound travel lanes and one eastbound travel lane. To the east of Loder Creek, this section of Putty Road has two eastbound travel lanes and one westbound travel lane. West of Jerrys Plains Road, Putty Road typically has a single travel lane in each direction. North of Mitchell Line of Road, Putty Road typically has a single travel lane in each direction. Putty Road crosses the Main Northern Railway at an overbridge at Singleton. It has a posted speed limit of 100 km/h, reducing to 60 km/h on the approach to Singleton.

Mitchell Line of Road extends between Putty Road south of Singleton and New England Highway east of the Main Northern Railway. Mitchell Line of Road forms part of the Golden Highway (Route B84), and typically has a single travel lane in each direction. It crosses the Main Northern Railway at an overbridge west of New England Highway.

New England Highway provides an inter-regional link from Hexham in the south to near Toowoomba in the north. In the Hunter Region, New England Highway provides a link from Hexham and the Hunter Expressway through Singleton and Muswellbrook. Between Mitchell Line of Road and Belford, New England Highway has a single travel lane eastbound and two travel lanes westbound. It widens to a divided road with two travel lanes in each direction between Belford and the Hunter Expressway. RMS is planning to upgrade New England Highway between Belford and Golden Highway (Mitchell Line of Road) to provide two travel lanes in each direction and a flyover for vehicles turning right from Golden Highway (RMS, 2015). As part of this upgrade project, a road corridor for future development of New England Highway would be established towards Singleton. At the time of writing, concept design and environmental assessment work is underway, which are expected to be displayed for community comment in late 2016.

Wambo Coal Mine access road extends south-west from Jerry Plains Road, forming a seagull T-intersection. Left and right turn deceleration lanes are provided in Jerrys Plains Road for vehicles entering the Wambo Coal Mine to slow to turn without impeding the flow of through traffic. Vehicles exiting Wambo Coal Mine by a right turn do so into a designated acceleration lane, and then merge with the eastbound through traffic on Jerrys Plains Road.

Wallaby Scrub Road is a local rural road which provides a link between Jerrys Plains Road and Putty Road, to the east of the Wambo Coal Mine. Together with Charlton Road, it provides an alternative route from Warkworth to Cessnock via Broke. The intersection of Jerrys Plans Road with Wallaby Scrub Road does not have any auxiliary lanes, and Wallaby Scrub Road approaches Jerrys Plains Road at an angle of approximately 60 degrees.

Wallaby Scrub Road is approved to be closed from 2017 as part of the approved Warkworth Continuation Project (Section 4.2.2).

3.2 Historic Traffic Volumes

RMS collects traffic volume data on roads throughout NSW, which is reported as the Annual Average Daily Traffic (AADT). AADT is the total volume of traffic recorded at the location over a calendar year divided by the number of days in that year. AADT volumes for roads in the region of the Wambo Coal Mine are summarised in Table 3.1.

Table 3.1: RMS Historic Traffic Volume AADT Data

	1992	1995	1998	2001	2004
Golden Highway					
05.841 Whittingham, West of New England Highway	2,286	3,337	3,333	3,724	3,637
Jerrys Plains Road					
05.485 at Hunter River Bridge	1,502	1,528	2,213	2,337	2,583
05.481 Mt Thorley North of Putty Road	4,508	7,997	6,256	7,059	5,572
Putty Road					
05.167 Milbrodale South of Broke Road	1,075	860	799	793	845
05.638 East of Broke Road	4,800	6,447	7,164	7,966	8,143

EMGA Mitchell McLennan (EMM) (2014) presents the results of traffic surveys undertaken between 4 and 10 March 2014 on roads which serve the Wambo Coal Mine. Peak hourly and daily traffic volumes from those traffic surveys are summarised in Table 3.2, noting that the traffic surveys occurred just prior to the opening of the Hunter Expressway, which occurred on 22 March 2014.

Table 3.2: Surveyed Traffic March 2014

Site[A]	Survey Location	Average Weekday			Average Day (vehicles/day)
		AM Peak Hour (vehicles/hour)	PM Peak Hour (vehicles/hour)	Daily (vehicles/day)	
A	Wallaby Scrub Road North of Putty Road	83	95	921	875
B	Putty Road East of Jerrys Plains Road	1,132	838	9,849	8,346
C	Jerrys Plains Road North of Putty Road	237	267	3,314	2,978

[A] Refer to Figure 2-1 for locations
Source: EMM (2014)

3.3 Traffic Survey Program

A program of traffic surveys was conducted during October 2015. The traffic surveys were conducted between Tuesday 6 October and Monday 12 October 2015 or between Saturday 21 November and Friday 27 November 2015 at the following locations (Figure 2-1):

- Wambo Coal Mine access road (November);
- Putty Road north of Mitchell Line of Road (October);

- Mitchell Line of Road east of Putty Road (October); and
- Jerrys Plains Road west of Wambo Coal Mine access road (November).

Automatic counters were used to obtain traffic volumes by direction and the classification of those vehicles based on the Austroads vehicle classification system.

3.4 Traffic Volumes 2015

Table 3.3 summarises the key findings of the tube count surveys, including the average weekday peak hourly traffic volume during the morning (midnight to midday) and evening (midday to midnight), and the daily traffic volume over an average weekday and over an average day. The full results of the survey are provided in Appendix A.

Table 3.3: Surveyed Traffic October and November 2015

Site[A]	Survey Location	Average Weekday			Average Day[C]
		AM Peak Hour[B]	PM Peak Hour[B]	Daily[C]	
1	Wambo Coal Mine Access Road South of Jerrys Plains Road	167	126	1,185	969
2	Putty Road North of Mitchell Line of Road	504	489	4,771	4,142
3	Mitchell Line of Road East of Putty Road	822	536	6,686	5,740
4	Jerrys Plains Road West of Wambo Coal Mine Access Road	239	254	3,114	2,991

[A] Refer to Figure 2-1 for locations
[B] vehicles per hour
[C] vehicles per day

It is noted that the busiest hour was not the same at the four surveyed sites. The busiest hours for traffic generated by the Wambo Coal Mine were 5.00am to 6.00am, and 3.00pm to 4.00pm.

The proportion of heavy vehicles recorded at each of the survey locations over the average weekday was as follows. Heavy vehicles include single unit trucks and buses, semitrailers and rigid trucks with trailers, B-Doubles and road trains (where permissible).

- Wambo Coal Mine access road 14.2 percent
- Putty Road north of Mitchell Line of Road 12.8 percent
- Mitchell Line of Road east of Putty Road 16.5 percent
- Jerrys Plains Road west of Wambo Coal Mine access road 19.6 percent

3.5 Road Safety

Road crash data was obtained from RMS for the most recent five year period available on the main access routes used by traffic travelling to and from the Wambo Coal Mine. The data covers the period from 1 January 2010 to 31 December 2014, and includes those crashes which conform to the national guidelines for reporting and classifying road vehicle crashes based on the following criteria:

- The crash was reported to the police.
- The crash occurred on a road open to the public.
- The crash involved at least one moving vehicle.
- The crash involved at least one person being killed or injured or at least one motor vehicle being towed away.

Crash data was obtained and reviewed for the following roads:

- Jerrys Plains Road between Jerrys Plains and Putty Road;
- Putty Road between Bulga and the railway bridge on the outskirts of Singleton;
- Wallaby Scrub Road; and
- Mitchell Line of Road between Putty Road and New England Highway.

Table 3.4 summarises the number and general types of crashes which occurred on the sections of road under consideration.

Table 3.4: General Crash Types on Wambo Coal Mine Access Routes (2010 to 2014)

Road	Pedestrian	Multiple Vehicles					Single Vehicle			Other
		Adjacent Approaches	Opposing Directions	Same Direction	U-turn/Parking	Overtaking	On Path	Off Path on Straight	Off Path on Curve	
Jerrys Plains Road Jerrys Plains to Putty Road	-	1	3[A]	8	1	3	5	10	7	-
Putty Road Bulga to Singleton	-	2	3	5	1	1	3	5	9	1
Wallaby Scrub Road Jerrys Plains Road to Putty Road	-	-	-	-	-	1	-	1	-	-
Mitchell Line of Road Putty Road to New England Highway	-	19[A]	3	2	-	-	2	4	7	-
Total Crashes by Type	**-**	**22**	**9**	**15**	**2**	**5**	**10**	**20**	**23**	**1**
Total People Injured	**-**	**18**	**15**	**5**	**-**	**5**	**4**	**13**	**14**	**-**
Total People Killed	**-**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

[A] Includes one fatal crash

Over the five years and routes reviewed, a total of 107 crashes occurred on the main access routes, resulting in four fatalities and 74 people being injured.

Table 3.4 demonstrates that over all the roads investigated, the most common types of crashes involved single vehicles leaving the carriageway, known as run-off-road (ROR) crashes, which made up 40.2 percent of the reported crashes in Table 3.4, and 36.5 percent of injured people. This is consistent with Austroads (2015), which found that in rural road environments in Australia, off-path crashes were the most likely. They were also associated with the greatest numbers of fatalities, however on the routes investigated here, the fatalities occurred only in multi-vehicle crashes. ARRB (2011) states that known causes of ROR crashes include:

- driver behaviours such as speed, inattention, avoidance manoeuvres, errant vehicles;
- driver impairment including fatigue, alcohol, drugs, mood state;
- road conditions such as horizontal alignment, shoulder deficiencies, slippery surface, poor delineation, damaged surfaces;
- vehicle failure; and
- environmental conditions such as rain, fog, snow, livestock or native fauna.

Crashes between vehicles travelling in adjacent directions at intersections are generally low in number, with the exception of Mitchell Line of Road, where they make up 51 percent of reported crashes, including one fatal crash, which occurred at the intersection with New England Highway.

The road safety history of the various roads has been reviewed with regard to each road's crash exposure, which considers the rate at which crashes occur in crashes per vehicle kilometres travelled (VKT). One VKT is equivalent to one vehicle travelling a distance of 1 km, or alternatively two vehicles travelling for a distance of half a kilometre (and so on).

Crash exposure increases as the length of a trip increases, and as traffic volumes increase. This is a general measure of the performance of the roads, and enables a comparison to be made between the relative safety of roads. RTA (2004) indicates that based on a review of data on 36 classified roads in NSW, undivided two lane rural roads have an average crash rate of 32.8 crashes per 100 million vehicle kilometres travelled (MVKT), of which 28.6 were non-intersection crashes, and 4.2 were intersection crashes. The overall crash rate was higher where sealed shoulders of less than 1.0 metre (m) width were provided, at 38.1 crashes per 100 MVKT, and lower where sealed shoulders greater than 1.0 m width were provided, at 28.5 crashes per 100 MVKT.

Table 3.5 presents the estimated average daily traffic (ADT) for each of the route sections described in Table 3.4, and the calculated crash rates for those routes. As there is a distinct change in the number of crashes and traffic volumes on Putty Road east and west of Jerrys Plains Road, this road has been considered in two sections in Table 3.5.

Table 3.5: Crash Rates on Wambo Coal Mine Access Routes 2010-2014

	Distance (km)	Estimated ADT 2010-2014	MVKT 2010-2014	Number of Crashes 2010-2014	Crashes per 100 MVKT
Jerrys Plains Road Jerrys Plains to Putty Road	26	3,000	142.4	38	26.7
Putty Road Bulga to Jerrys Plains Road	9.5	830	14.4	4	27.8
Putty Road Jerrys Plains Road to Singleton	10.6	5,400	104.5	30	28.7
Wallaby Scrub Road Jerrys Plains Road to Putty Road	7.5	875	12.0	2	16.7
Mitchell Line of Road Putty Road to New England Highway	10	5,750	104.9	37	35.3

ADT over 2010 to 2014 is based on seven day average volumes from 2015 survey results.

Comparison with the RTA (2004) average crash rate of 32.8 crashes per 100 MVKT indicates that the overall crash rate on these roads are below average, with the exception of Mitchell Line of Road which is slightly above average. A detailed review of the crashes on each route is provided in the following sections.

3.5.1 Jerrys Plains Road Crash History

As Wambo Coal Mine has its vehicular access from Jerrys Plains Road, all traffic travelling to and from the mine uses Jerrys Plains Road. The details of the crash history of Jerrys Plains Road between Jerrys Plains and Putty Road between 2010 and 2014 are summarised in Table 3.6.

Table 3.6: Jerrys Plains Road (Jerrys Plains to Putty Road) Crash Summary 2010-2014

		Multiple Vehicles					Single Vehicle			
	Pedestrian	Adjacent Approaches	Opposing Directions	Same Direction	U-turn/Parking	Overtaking	On Path	Off Path on Straight	Off Path on Curve	Other
Total Crashes	-	1	3	8	1	3	5	10	7	-
Road Surface Condition										
Dry Road	-	-	2	6	-	3	3	8	4	-
Wet Road	-	1	1	2	1	-	2	2	3	-
Natural Lighting										
Daylight	-	-	2	7	1	3	1	8	4	-
Darkness	-	1	1	-	-	-	2	2	3	-
Dawn	-	-	-	1	-	-	2	-	-	-
Dusk	-	-	-	-	-	-	-	-	-	-
Vehicle Type										
Motorcycle	-	-	-	-	-	1	1	1	1	-
Car, station wagon, 4WD, van	-	1	6	8	1	4	4	3	2	-
Light or Large Truck or Bus	-	1	-	7	1	1	-	6	3	-
Articulated Vehicle	-	-	-	1	-	-	-	-	1	-
Other	-	-	-	-	-	-	-	-	-	-
Severity of Crash										
Fatal	-	-	1	-	-	-	-	-	-	-
Injury	-	-	2	3	-	2	2	6	4	-
Non-injury	-	1	-	5	1	1	3	4	3	-
People Killed or Injured										
Killed	-	-	3	-	-	-	-	-	-	-
Injured	-	-	8	3	-	4	2	6	4	-
Factors[A]										
Speed	-	-	2	2	-	-	1	-	5	-
Fatigue	-	-	-	-	-	-	-	8	2	-
Alcohol	-	-	-	-	-	-	-	-	-	-
None	-	1	1	6	1	3	4	2	1	-

[A] Factors considered to have contributed to the crash. More than one factor can be nominated for a single crash.

One fatal crash occurred along this section of Jerrys Plains Road, 5.75 km west of Comleroi Road, or approximately 8 km west of the Wambo Coal Mine access road. The crash occurred on Sunday 16 February 2014 at 2.15pm on a wet road surface during rain, and occurred on a curve in the road. It involved a westbound 4WD travelling on the incorrect side of the road which collided with an eastbound ute. Three people were killed and one injured, and speed was nominated as a contributing factor to this crash. The attending ambulance also crashed on the wet road conditions on its way to respond to the first crash.

3.5.2 Putty Road Crash History

The details of the crash history of Putty Road between Bulga and Singleton between 2010 and 2014 are summarised in Table 3.7.

Table 3.7: Putty Road (Bulga to Singleton) Crash Summary 2010-2014

		Multiple Vehicles					Single Vehicle			
	Pedestrian	Adjacent Approaches	Opposing Directions	Same Direction	U-turn/Parking	Overtaking	On Path	Off Path on Straight	Off Path on Curve	Other
Total Crashes	-	2	3	5	1	1	3	5	9	1
Road Surface Condition										
Dry Road	-	2	2	3	1	1	2	2	8	1
Wet Road	-	-	1	2	-	-	1	3	1	-
Natural Lighting										
Daylight	-	2	3	4	1	1	1	1	5	1
Darkness	-	-	-	-	-	-	2	3	3	-
Dawn	-	-	-	-	-	-	-	1	1	-
Dusk	-	-	-	1	-	-	-	-	-	-
Vehicle Type										
Motorcycle	-	1	1	1	-	-	1	-	1	-
Car, station wagon, 4WD, van	-	2	4	9	1	1	-	5	5	1
Light or Large Truck or Bus	-	1	-	2	1	-	2	-	2	1
Articulated Vehicle	-	-	1	-	-	-	-	-	1	-
Other	-	-	-	-	-	-	-	-	-	-
Severity of Crash										
Fatal	-	-	-	-	-	-	-	-	-	-
Injury	-	1	2	1	-	1	1	3	4	-
Non-injury	-	1	1	4	1	-	2	2	5	1
People Killed or Injured										
Killed	-	-	-	-	-	-	-	-	-	-
Injured	-	1	4	1	-	1	1	3	4	-
Factors[A]										
Speed	-	-	1	2	-	1	-	1	5	-
Fatigue	-	-	-	-	-	-	-	1	2	-
Alcohol	-	-	-	-	-	-	-	-	-	-
None	-	2	2	3	1	-	3	3	3	1

[A] Factors considered to have contributed to the crash. More than one factor can be nominated for a single crash.

No fatal crashes occurred on this section of Putty Road over the period from 2010 to 2014.

3.5.3 Mitchell Line of Road Crash History

The details of the crash history of Mitchell Line of Road between Putty Road and New England Highway between 2010 and 2014 are summarised in Table 3.8.

Table 3.8: Mitchell Line of Road (Putty Road to New England Highway) Crash Summary 2010-2014

		Multiple Vehicles					Single Vehicle			
	Pedestrian	Adjacent Approaches	Opposing Directions	Same Direction	U-turn/Parking	Overtaking	On Path	Off Path on Straight	Off Path on Curve	Other
Total Crashes	-	19	3	2	-	-	2	4	7	-
Road Surface Condition										
Dry Road	-	18	2	2	-	-	2	4	5	-
Wet Road	-	1	1	-	-	-	-	-	2	-
Natural Lighting										
Daylight	-	13	1	2	-	-	-	3	5	-
Darkness	-	2	-	-	-	-	2	1	1	-
Dawn	-	2	2	-	-	-	-	-	1	-
Dusk	-	2	-	-	-	-	-	-	-	-
Vehicle Type										
Pedal or Motorcycle	-	1	-	-	-	-	1	-	1	-
Car, station wagon, 4WD, van	-	27	3	2	-	-	1	2	4	-
Light or Large Truck or Bus	-	1	2	2	-	-	-	1	2	-
Articulated Vehicle	-	1	2	-	-	-	-	1	-	-
Other	-	-	-	-	-	-	-	-	-	-
Severity of Crash										
Fatal	-	1	-	-	-	-	-	-	-	-
Injury	-	11	1	1	-	-	1	3	6	-
Non-injury	-	7	2	1	-	-	1	1	1	-
People Killed or Injured										
Killed	-	1	-	-	-	-	-	-	-	-
Injured	-	17	3	1	-	-	1	4	6	-
Factors[A]										
Speed	-	1	-	-	-	-	-	-	5	-
Fatigue	-	-	3	-	-	-	-	2	4	-
Alcohol	-	-	-	-	-	-	-	-	-	-
None	-	18	-	2	-	-	2	2	-	-

[A] Factors considered to have contributed to the crash. More than one factor can be nominated for a single crash.

One fatal crash occurred along this section of Mitchell Line of Road, at its intersection with New England Highway. The crash occurred on Thursday 13 February 2014 at 12.25pm on a dry road surface in fine weather. It involved an eastbound car in Mitchell Line of Road at low speed colliding with a northbound semitrailer on New England Highway and a southbound light truck on New England Highway. One person was killed and no specific contributing factors (speed, alcohol or fatigue) were identified.

A notable feature of the reported crashes on Mitchell Line of Road is that 19 of the 37 crashes occurred at the intersection with New England Highway, including the fatal crash in February 2014. Of those 19 crashes, 18 involved vehicles from adjacent approaches; 11 involved a vehicle turning right from Mitchell Line of Road, five involved an eastbound vehicle in Mitchell Line of Road travelling into the northbound travel lane of New England Highway, and two involved vehicles turning left from Mitchell Line of Road. One crash involved a single vehicle only, and occurred when an eastbound vehicle in Mitchell Line of Road which did not stop and ran off the end of the road into a fence at the T-intersection.

The planned upgrading of New England Highway by RMS (Section 3.1) would grade separate the right turn movement from Mitchell Line of Road to New England Highway, which is expected to significantly reduce the number of crashes at the intersection.

3.5.4 Wambo Coal Mine Access Road Intersection Crash History

The aforementioned RMS data indicates that there was one crash reported at or near the intersection of Jerrys Plains Road and the Wambo Coal Mine access road over the period 2010 to 2014. That crash occurred at 10.20am on Friday 2 December 2011 on a wet road surface and during rain. A light truck emerging from the access road at low speed (20 km/h) collided with a westbound car travelling along Jerrys Plains Road. The data does not indicate whether the truck driver was intending to turn left or right.

3.6 Wambo Coal Mine Traffic Generation

The surveys indicate that the volume of traffic generated by the Wambo Coal Mine varies by day of the week (Table 3.9). The surveys demonstrate that the weekday traffic generation is distinctly different from that of weekend days, and also that Mondays and Fridays are also somewhat lower than the other weekdays. This is likely due to the change from weekday to weekend shift arrangements, with fewer people on site on weekend days. On an average weekday, the volume of traffic generated by the Wambo Coal Mine was 1,185 vehicles per day.

Table 3.9: Wambo Coal Mine Traffic Generation per Day (vehicles per day)

	Light Vehicles	Heavy Vehicles	Total Vehicles
Monday	996	130	1,126
Tuesday	1,034	179	1,213
Wednesday	1,044	193	1,237
Thursday	1,095	198	1,293
Friday	916	139	1,055
Saturday	395	41	436
Sunday	386	36	422
Average Weekday (rounded)	1,017	168	1,185

During the morning and afternoon peak hours on the average weekday, the Wambo Coal Mine generated an average of 167 and 126 vehicles per hour respectively. The directional split of this traffic and its composition is summarised in Table 3.10.

Table 3.10: Wambo Coal Mine Average Weekday Peak Hourly Traffic (vehicles per hour)

Direction	5:00am to 6:00am			3:00pm to 4:00pm		
	Light	Heavy	Total	Light	Heavy	Total
Inbound	146	8	154	22	4	26
Outbound	12	1	13	92	8	100
Two Way	158	9	167	114	12	126

Table 3.10 demonstrates that the dominant directions of traffic during the peaks are inbound during the morning and outbound during the afternoon. During the peak hours, the proportion of heavy vehicles is lower than the proportion over the whole day, suggesting that heavy vehicles tend to travel to and from the Wambo Coal Mine outside of the peak hours.

3.6.1 Light Vehicle Traffic Generation

The surveys demonstrate that over the average weekday, the Wambo Coal Mine generates 1,017 light vehicle trips per day. Due to the location of the Wambo Coal Mine and local transport conditions, it is expected that these trips are primarily generated by the workforce driving to and from the site at the start and end of shifts. Car pooling by workers would reduce the total number of vehicles used. GTA's experience of similar projects is that car pooling typically results in an average car occupancy of 1.1 to 1.2 people per vehicle.

WCPL has advised that based on review of their visitor log, there is an average of 10 light vehicle visitor/delivery arrivals each day, which would generate 20 vehicle trips per day on the Wambo Coal Mine access road. These trips would typically occur during daylight hours, and for the purpose of this assessment, it is assumed that 10 percent of the daily light vehicle visitor trips would occur during each of the peak hours for Wambo Coal Mine traffic generation.

The balance of the light vehicle trips would be generated by the workforce travelling to and from the site at the start and end of shifts. WCPL has advised that approximately 90 percent of the total workforce is present each weekday, which is equivalent to 603 people. Excluding Mondays and Fridays, for which the change from weekend to weekday shift arrangements impacts the number of workers arriving and departing over the day, and allowing for visitor trips as above, the survey results suggest that the 603 workers travelling to and from the site in a day generate 1,038 light vehicle trips per day when arriving and departing. This is equivalent to approximately 1.16 people per vehicle, which is well within the expected range for similar mining projects.

3.6.2 Heavy Vehicle Traffic Generation

WCPL has advised that based on review of its visitor log, there is an average of 15 heavy vehicle visitor/delivery arrivals each day, which would generate 30 vehicle trips per day on the Wambo Coal Mine access road. These trips would typically occur during daylight hours, and for the purpose of this assessment, it is assumed that 10 percent of the daily heavy vehicle delivery trips would occur during each of the peak hours for Wambo Coal Mine traffic generation.

The survey results (Table 3.9) show that on the average weekday, there was 168 heavy vehicle trips per day. During the survey period, atypical activity was occurring, including construction of the South Bates Underground Mine surface infrastructure, and campaign rehabilitation activities which require significant heavy vehicle movements. These activities are expected to occur for the short term only, and should not be considered part of the typical day-to-day operational activity.

On an ongoing basis, the Wambo Coal Mine generates 30 heavy vehicle trips per day, which are associated with deliveries for regular operational activities. The survey results indicate that heavy vehicle trips are spread throughout the day, with 90 percent of the total heavy vehicle trips occurring between 5.00am and 6.00pm.

3.7 Wambo Coal Mine Traffic Distribution

The distribution of the traffic generated by the Wambo Coal Mine on the surrounding road network is dependent upon the origins and destinations of the trips, and the routes available.

3.7.1 Travel Routes

The primary routes used to travel from Wambo Coal Mine would be:

- Singleton: Jerrys Plains Road – Putty Road;
- Maitland: Jerrys Plains Road – Putty Road – Mitchell Line of Road – New England Highway;
- Cessnock: Jerrys Plains Road – Putty Road – Mitchell Line of Road – New England Highway – Wine Country Road;
- Newcastle/Lake Macquarie: Jerrys Plains Road – Putty Road – Mitchell Line of Road – New England Highway – Hunter Expressway;
- Muswellbrook: Jerrys Plains Road – Edderton Road – Denman Road; and
- Other: WCPL advised these employees are assumed to approach via Newcastle, and would thus use the same route as above for Newcastle/Lake Macquarie.

Departures would occur along the same routes in the reverse direction. It is noted that an alternative route to and from Cessnock exists along Wallaby Scrub Road, Charlton Road, Broke Road, Cessnock Road and Wine Country Road, however the route via New England Highway would be quicker. Therefore, it has been assumed that all traffic to and from Cessnock would use the quicker route.

3.7.2 Light Vehicle Traffic Distribution

The distribution of employee traffic on the surrounding road system has been estimated based on the information collated by WCPL regarding the residential distribution of its existing workforce, the likely routes used (Section 3.7.1) and WCPL's advice regarding the source of visitor/delivery trips (Section 2.1). On the basis of the above, the distribution of the light vehicle traffic to and from the Wambo Coal Mine is summarised in Table 3.11.

Table 3.11: Average Weekday Wambo Coal Mine Light Vehicle Traffic 2015

Site[A]	Survey Location	Employees			Visitors		
		AM Peak[B]	PM Peak[B]	Daily[C]	AM Peak[B]	PM Peak[B]	Daily[C]
1	Wambo Coal Mine Access Road South of Jerrys Plains Road	156	112	997	2	2	20
2	Putty Road North of Mitchell Line of Road	41	29	259	0	0	2
3	Mitchell Line of Road East of Putty Road	106	76	678	2	2	18
4	Jerrys Plains Road West of Wambo Coal Mine Access Road	9	7	60	0	0	0
A	Wallaby Scrub Road North of Putty Road	0	0	0	0	0	0
B	Putty Road East of Jerrys Plains Road	147	105	937	2	2	20
D	Jerrys Plains Road East of Wambo Coal Mine Access Road	147	105	937	2	2	20

[A] Refer to Figure 2-1 for locations
[B] vehicles per hour
[C] vehicles per day

3.7.3 Heavy Vehicle Traffic Distribution

The distribution of the typical average weekday heavy vehicle traffic on the surrounding road system has been estimated based on the information collated by WCPL regarding the sources of deliveries (Section 2.1), and the likely routes used (Section 3.7.1).

The heavy vehicle trips generated by the atypical construction and rehabilitation activity during the traffic surveys are not indicative of the typical operational activity at Wambo Coal Mine. The contribution of those trips on the surrounding road network would therefore be expected to cease once those activities are completed. For the purpose of this assessment, it is assumed that over the average weekday, the atypical heavy vehicle trips would be similar to the distribution of the operational visitor and delivery trips.

On this basis, the distribution of the typical operational average weekday heavy vehicle traffic to and from the Wambo Coal Mine is summarised in Table 3.12, together with the contribution of the atypical activity occurring during the surveys in 2015.

Table 3.12: Average Weekday Wambo Coal Mine Heavy Vehicle Traffic 2015

Site[A]	Survey Location	Operational Deliveries			Atypical Activity		
		AM Peak[B]	PM Peak[B]	Daily[C]	AM Peak[B]	PM Peak[B]	Daily[C]
1	Wambo Coal Mine Access Road South of Jerrys Plains Road	3	3	30	6	9	138
2	Putty Road North of Mitchell Line of Road	0	0	3	1	1	14
3	Mitchell Line of Road East of Putty Road	3	3	27	5	8	124
4	Jerrys Plains Road West of Wambo Coal Mine Access Road	0	0	0	0	0	0
A	Wallaby Scrub Road North of Putty Road	0	0	0	0	0	0
B	Putty Road East of Jerrys Plains Road	3	3	30	6	9	138
D	Jerrys Plains Road East of Wambo Coal Mine Access Road	3	3	30	6	9	138

[A] Refer to Figure 2-1 for locations
[B] vehicles per hour
[C] vehicles per day

3.8 Baseline Traffic Volumes in 2015

The traffic surveys on Putty Road between Jerrys Plains Road and Mitchell Line of Road, on Jerrys Plains Road west of Putty Road, and Wallaby Scrub Road (EMM, 2014) were conducted prior to the opening of the Hunter Expressway and therefore do not fully reflect the potential implications of that change to the road system. Estimates of current traffic volumes at those survey locations have been developed based on the 2015 traffic surveys.

The existing traffic volume conditions on Jerrys Plains Road east of the Wambo Coal Mine have been forecast based on the volumes west of the Wambo Coal Mine, taking into account the volume and distribution of traffic generated by the Wambo Coal Mine. The existing traffic volumes on Putty Road between Jerrys Plains Road and Mitchell Line of Road have been forecast by assuming 2.0 percent growth over the volumes surveyed in 2014. The traffic on Wallaby Scrub Road is unlikely to have been impacted significantly by the opening of the Hunter Expressway, and thus 2015 volumes have been estimated assuming a growth rate of 1.8 percent per annum. These growth rates are consistent with those identified by ARC Traffic + Transport and Transport and Urban Planning (TaUP) (2012) and EMM (2014).

The resulting baseline average weekday traffic volumes at key locations on the surrounding road network are summarised in Table 3.13. These include the traffic being generated by the atypical activity at the Wambo Coal Mine during the traffic surveys.

Table 3.13: Average Weekday Baseline Traffic Volumes 2015

Site[A]	Survey Location	AM Peak[B]	PM Peak[B]	Daily[C]
1	Wambo Coal Mine Access Road South of Jerrys Plains Road	167	126	1,185
2	Putty Road North of Mitchell Line of Road	504	489	4,771
3	Mitchell Line of Road East of Putty Road	822	536	6,686
4	Jerrys Plains Road West of Wambo Coal Mine Access Road	239	254	3,114
A	Wallaby Scrub Road North of Putty Road	83	95	921
B	Putty Road East of Jerrys Plains Road	1,155	856	10,046
D	Jerrys Plains Road East of Wambo Coal Mine Access Road	422	486	5,304

[A] Refer to Figure 2-1 for locations
[B] vehicles per hour
[C] vehicles per day

3.9 Baseline Road Network Operational Performance

The Austroads (2013) *Guide to Traffic Management Part 3: Traffic Studies and Analysis* provides guidelines for the capacity and performance of two lane, two way rural roads, which in turn, refers to the *Highway Capacity Manual* (HCM) (Transportation Research Board, 2010).

The capacity of a road is defined as the maximum hourly rate at which vehicles can reasonably be expected to traverse a point or uniform section of a lane or roadway during a given time period under the prevailing roadway, traffic and control conditions. The capacity of a single traffic lane will be affected by factors such as the pavement width and restricted lateral clearances, the presence of heavy vehicles and grades.

Level of Service (LOS) is defined as a qualitative measure describing the operational conditions within a traffic stream as perceived by drivers and/or passengers. A LOS definition generally describes these conditions in terms of factors such as speed and travel time, freedom to manoeuvre, traffic interruptions, comfort, convenience and safety. LOS A provides the best traffic conditions, with no restriction on desired travel speed or overtaking. LOS B to D describe progressively worse traffic conditions. LOS E occurs when traffic conditions are at or close to capacity, and there is virtually no freedom to select desired speeds or to manoeuvre in the traffic stream. The service flow rate for LOS E is taken as the capacity of a lane or roadway. In rural situations, LOS C is generally considered to be acceptable. At LOS C, most vehicles are travelling in platoons, and travel speeds are curtailed. At LOS D, platooning increases significantly, and the demand for passing is high, but the capacity to do so is low.

The LOS experienced by drivers on two way rural roads is dependent on the drivers' expectations regarding the road, and three classes of road are defined in the HCM. Class I roads are those on which motorists expect to travel at relatively high speeds. They most often serve long-distance trips or provide connecting links between facilities that serve long-distance trips. Class II roads are those on which motorists do not necessarily expect to travel at high speeds, and may function as access routes to Class I facilities, serve as scenic or recreational routes or pass through rugged terrain. Class III roads serve moderately developed areas, and may be portions of a Class I or Class II highway that pass through small towns or developed recreational areas, where local traffic mixes with through traffic, and the density of unsignalised roadside access points increases.

The primary determinant of a road's classification for operational analysis is the drivers' expectations, which may not necessarily agree with the functional classification. The surveyed two-lane two-way roads would typically be considered as Class II roads under the HCM descriptions, as drivers would expect some level of restriction to their freedom of movement along the routes as a result of characteristics of the route such as limits on the opportunities for overtaking (e.g. centre linemarking, sight distances, lack of overtaking lanes).

On Class II roads, LOS is defined only in terms of Percent Time Spent Following (PTSF). The PTSF is a measure of the level of opportunities to overtake, and is estimated from the demand traffic volumes, the directional distribution of that traffic, and the percentage of no-passing zones. The LOS criteria for Class II two-lane roads are as shown in Table 3.14.

Table 3.14: Level of Service Criteria for Class II Two Lane Roads

Level of Service	PTSF
A	40
B	> 40-55
C	> 55-70
D	> 70-85
E	85

As Putty Road between Mitchell Line of Road and Jerrys Plains Road (survey location B on Figure 2-1) has two westbound lanes for half its length, and two eastbound lanes for half its length, the HCM two lane road model cannot be applied. The model applies to roads with vehicle speeds of between 45 miles per hour (mi/h) (approximately 72 km/h) and above 65 mi/h (approximately 105 km/h), and thus does not apply to the Wambo Coal Mine access road (survey location 1 on Figure 2-1), which has a posted speed limit of 60 km/h. For the purpose of this assessment, Wallaby Scrub Road is assumed to carry 5 percent heavy vehicles.

The forecast peak hour volumes have been assessed on the two lane roads, and the PTSF and Levels of Service results are presented in Table 3.15.

Table 3.15: Midblock Levels of Service 2015

Site[A]	Location	Outbound from WCM				Inbound to WCM			
		AM Peak		PM Peak		AM Peak		PM Peak	
		PTSF	LOS	PTSF	LOS	PTSF	LOS	PTSF	LOS
2	Putty Road North of Mitchell Line of Road	18.8	A	64.9	C	67.1	C	31.9	A
3	Mitchell Line of Road East of Putty Road	25.0	A	70.8	D	78.1	D	29.9	A
4	Jerrys Plains Road West of Wambo Coal Mine Access Road	42.8	B	37.3	A	42.7	B	48.9	B
A	Wallaby Scrub Road North of Putty Road	6.0	A	31.2	A	31.2	A	9.6	A
D	Jerrys Plains Road East of Wambo Coal Mine Access Road	47.3	B	59.3	C	57.1	C	52.2	B

[A] Refer to Figure 2-1 for locations
WCM = Wambo Coal Mine

With regard to the Wambo Coal Mine access road and Putty Road between Mitchell Line of Road and Jerrys Plains Road, to which the HCM model does not apply, as a guide, the theoretical capacity of a two way two lane road under ideal conditions is 3,200 passenger cars per hour (Austroads, 2013), equivalent to 1,700 passenger cars per hour in each lane. The peak hourly volumes in any one direction on these roads in 2015 are 167 vehicles per hour on the Wambo Coal Mine access road and 911 vehicles per hour on Putty Road (both inbound during the morning peak). Allowing for the capacity of these roads to be reduced below the theoretical ideal conditions, and the proportion of heavy vehicles, the peak hourly flows on the road network would remain well below the theoretical capacity, and travel conditions are expected to be acceptable.

4. Changes to Traffic Conditions in 2032

4.1 Background Growth

Background growth in traffic volumes is expected to occur which is not directly related to any specific project in the region. ARC Traffic + Transport and TaUP (2012) reviewed historical traffic count data and found average growth of 1.6 percent per annum on Golden Highway East of Broke Road and 1.8 percent on Broke Road. EMM (2014) identified traffic growth rates of between 1.2 and 2.0 percent per annum on Golden Highway and Wallaby Scrub Road, and applied the higher of these rates to forecast future traffic volumes.

For the purpose of this assessment, a background growth rate of 1.8 percent per annum has been applied over the period to 2032 to all traffic which is not directly associated with the Wambo Coal Mine. This is considered a conservatively high estimate of traffic growth on these roads, as a significant proportion of the existing traffic during the peak hours is directly associated with mining activity, and is unlikely to increase in the absence of changes to activities at those mines.

4.2 Regional Projects

GTA has reviewed major projects located in the Upper Hunter region which have recently been approved or are currently lodged with the Department of Planning and Environment to identify any projects which may have a direct impact on future traffic flows on the roads of interest and during the period of interest. These are discussed below.

4.2.1 Bulga Coal Complex

The Bulga Coal Complex is located to the south of the Mount Thorley Operations, between Charlton Road and Broke Road. The Bulga Coal Optimisation Project was approved in December 2014, which permits mining activity until the end of 2035 and includes realignment of portions of Broke Road and Charlton Road.

ARC Traffic + Transport and TaUP (2012) examined the traffic implications of the Bulga Coal Optimisation Project, and found that no significant change was anticipated to the volume or distribution of operational traffic on the external road network. Construction activity would occur from Years 1 to 4, and thus is unlikely to occur in the period affected by the proposed Modification.

ARC Traffic + Transport and TaUP (2012) reviewed historical traffic count data to identify how growth in background traffic has occurred on subarterial roads. That review found average growth of 1.6 percent per annum on Golden Highway East of Broke Road and 1.8 percent on Broke Road.

No changes to the volume or distribution of traffic generated by the Bulga Coal Complex are expected during the future years of relevance to the Modification.

4.2.2 Mount Thorley Operations and Warkworth Mine

Mount Thorley Operations is an open cut coal mine located approximately 10.5 km south-west of Singleton, predominantly to the south of Putty Road, between Charlton Road and Broke Road. Warkworth Mine is an open cut coal mine located approximately 8 km south-west of Singleton, in the area bounded by Jerrys Plains Road, Wallaby Scrub Road and Putty Road.

The two mines are operated by Coal & Allied and their operation integrated, with shared use of infrastructure and resources.

The Warkworth Continuation Project involves expansion of the mine to facilitate further extraction of coal at a rate of up to 18 Mtpa over 21 years. The November 2015 approval includes a continuation of all aspects of the present operations, with the following changes that are related to traffic and transport:

- the closure of Wallaby Scrub Road (approved as part of Warkworth Extension);
- an option to develop an underpass beneath Putty Road for the third bridge crossing yet to be constructed, while maintaining the current approval for an overpass; and
- continued use of secondary access gates to the mine site and offsets for various activities.

Mount Thorley Operations also had an extension to its development consent period to 2035 approved in November 2015, with all key aspects of the operation to remain as it presently operates, maintaining the existing extraction rate of 10 Mtpa of ROM coal. Transfer of coal between Warkworth Mine and Mount Thorley Operations, and transportation of coal via the Mount Thorley Coal Loader to Port of Newcastle would continue.

EMM (2014) assessed the traffic and transport implications of the two proposals and found that the volume of traffic generated by the mines on the external road network would not change under the proposals. The current combined workforce is indicative of the future emplomentlevels throughout the proposed life of the mines, thus workforce traffic would remain unchanged. Heavy vehicle movements generated by the mines would also remain unchanged.

The approved closure of Wallaby Scrub Road would require vehicles currently using that route to detour to the alternative routes of either Jerrys Plains Road and Putty Road, or Broke Road, Putty Road and Jerrys Plains Road. EMM (2014) found that the closure of Wallaby Scrub Road would redistribute approximately 928 vehicles per day from 2017. It is noted that this assumes no reduction in traffic on Wallaby Scrub Road following opening of the Hunter Expressway, and is based on average daily flows over a seven day week. The impacts on average daily volumes on other roads in the region in 2017 as determined by EMM (2014) are summarised in Table 4.1.

Table 4.1: Average Daily Traffic Impact of Closure of Wallaby Scrub Road in 2017

Impacted Section of Road	Average Daily Volume (vehicles per day)
Wallaby Scrub Road surveyed 2014	**875**
Wallaby Scrub Road estimated 2017	**928**
Jerrys Plains Road between Putty Road and Wallaby Scrub Road	+863
Putty Road between Broke Road and Jerrys Plains Road	+609
Broke Road south of Putty Road	+609
Putty Road between Wallaby Scrub Road and Jerrys Plains Road	+254

Source EMM (2014)

Thus, in 2032, the impact of the Warkworth Continuation Project compared with existing traffic generated on the external road system would be limited to the impacts of the closure of Wallaby Scrub Road.

In 2014, Wallaby Scrub Road carried 921 vehicles per day on an average weekday (EMM, 2014) which is approximately 5.3 percent higher than the average daily volume reported in Table 4.1, which is based on the average volume over a 7-day week. Applying a background growth rate of 1.8 percent per annum from 2014 to 2032, if it were to remain open, Wallaby Scrub Road would carry some 1,219 vehicles per average weekday. The average weekday impacts of the closure of Wallaby Scrub Road in 2032 are summarised in Table 4.2.

Table 4.2: Average Weekday Traffic Impact of Closure of Wallaby Scrub Road in 2032

Road and Location	Average Weekday Volume (vehicles per day)
Wallaby Scrub Road surveyed 2014	**921**
Wallaby Scrub Road estimated 2032	**1,219**
Jerrys Plains Road between Putty Road and Wallaby Scrub Road	+1,134
Putty Road between Broke Road and Jerrys Plains Road	+800
Broke Road south of Putty Road	+800
Putty Road between Wallaby Scrub Road and Jerrys Plains Road	+334

4.2.3 Rix's Creek Extension Project

Rix's Creek Coal Mine is located approximately 5 km north-west of Singleton. An Environmental Impact Statement (EIS) (AECOM, 2015) for the Rix's Creek Extension Project has been prepared. The Rix's Creek Extension Project proposes continuation of the existing open cut mining using existing mine infrastructure, with a small extension of the existing Mining Lease boundary to the west. Approval is being sought for extraction of up to 4.5 Mtpa of ROM coal, which is an increase from the current approval to mine up to 1.5 Mtpa of ROM coal. The CHPP would also operate for seven days per week rather than the current four and a half days. Product coal would continue to be transported by rail, either via the Integra Mine rail loop or the Rix's Creek rail loop which has been approved but not yet constructed.

The EIS indicates that the proposal may temporarily increase heavy vehicle movements during initial site preparation works, while the increased ROM capacity may increase the workforce and hence the number of light vehicle trips to and from the mine. Between 2029 and 2032, Rix's Creek is expected to produce 1.5 Mtpa of ROM coal, which is equivalent to the current production rate from the existing operations.

It is therefore likely that the operational workforce at Rix's Creek in 2032 would be similar to the existing operational workforce. The traffic generated by the Rix's Creek Extension Project would therefore be expected to be similar to that which was occurring at the time of the traffic surveys (Section 3.4).

4.3 Wambo Coal Mine

Without the Modification, in 2032, the Wambo Coal Mine would have ceased operating. While it is likely that some traffic associated with remediation activities may still be generated to and from Wambo Coal Mine, those volumes would be relatively low and are likely to occur infrequently on a campaign basis. For the purpose of this assessment, it is assumed that in 2032, without the Modification, the Wambo Coal Mine would generate no traffic.

4.4 Future Traffic Volumes 2032

The forecast traffic volumes in 2032 on the surrounding road network without the Modification are summarised in Table 4.3. In summary, these forecasts include the effects of:

- the removal of all traffic generated by the Wambo Coal Mine following its closure in 2025 (Section 4.3);
- background growth of traffic not associated with the Wambo Coal Mine (Section 4.1); and
- regional developments (Section 4.2) including the planned closure of Wallaby Scrub Road (Section 4.2.2).

Table 4.3: Average Weekday Traffic Volumes 2032 – No Modification

Site[A]	Survey Location	AM Peak[B]		PM Peak[B]		Daily[C]
		Hour Starting	Vehicles	Hour Starting	Vehicles	
1	Wambo Coal Mine Access Road South of Jerrys Plains Road	-	0	-	0	0
2	Putty Road North of Mitchell Line of Road	6.00am	616	4.00pm	606	5,867
3	Mitchell Line of Road East of Putty Road	6.00am	953	3.00pm	584	7,626
4	Jerrys Plains Road West of Wambo Coal Mine Access Road	11.00am	310	3.00pm	322	3,988
A	Wallaby Scrub Road North of Putty Road	-	0	-	0	0
B	Putty Road East of Jerrys Plains Road	6:00am	1,417	3.00pm	1,044	12,454
D	Jerrys Plains Road East of Wambo Coal Mine Access Road	6.00am	388	3.00pm	479	5,457

[A] Refer to Figure 2-1 for locations
[B] vehicles per hour
[C] vehicles per day

4.5 Future Road Network Performance 2032

The operational performance of the road network has been reassessed using the HCM LOS model with the forecast peak hour traffic volumes in 2032. The results are summarised in Table 4.4.

Table 4.4: Midblock Levels of Service 2032 – No Modification

Site[A]	Location	Outbound from WCM				Inbound to WCM			
		AM Peak		PM Peak		AM Peak		PM Peak	
		PTSF	LOS	PTSF	LOS	PTSF	LOS	PTSF	LOS
2	Putty Road North of Mitchell Line of Road	22.1	A	68.1	C	69.5	C	36.6	A
3	Mitchell Line of Road East of Putty Road	28.5	A	71.0	D	81.3	D	32.2	A
4	Jerrys Plains Road West of Wambo Coal Mine Access Road	45.6	B	36.4	A	45.7	B	48.7	B
A	Wallaby Scrub Road North of Putty Road	-	-	-	-	-	-	-	-
D	Jerrys Plains Road East of Wambo Coal Mine Access Road	54.8	B	51.9	B	42.8	B	58.9	C

[A] Refer to Figure 2-1 for locations

The results demonstrate that the LOS would be expected to remain generally consistent with those experienced during the surveys in 2015. Traffic travelling in the peak direction associated with the Wambo Coal Mine (inbound during the morning peak and outbound during the evening peak) would experience a slight improvement from LOS C to B on Jerrys Plains Road east of the Wambo Coal Mine access road with the cessation of activity at the Wambo Coal Mine. Traffic travelling in the opposing direction during the evening peak hour would experience a slight reduction from LOS B to C.

With regard to Putty Road between Mitchell Line of Road and Jerrys Plains Road, to which the HCM model does not apply, the peak hourly volume in any one direction in 2032 is forecast to be 1,208 vehicles per hour (westbound during the morning peak). Allowing for the capacity of these roads to be reduced below the theoretical ideal conditions, and the proportion of heavy vehicles, the peak hourly flows on the road network would remain below the theoretical capacity of 1,700 passenger cars per hour per lane, and travel conditions are expected to be acceptable.

4.6 Future Road Safety 2032

With increased traffic volumes, crash exposure increases, and with no changes to the roads, an increase in the number of crashes can generally be expected to occur. The crash history of the road network found that the historic crash rates on the roads were below average, with the exception of Mitchell Line of Road, which displayed a slightly above average crash rate. The higher number of crashes on Mitchell Line of Road was largely attributable to a clustering of crashes at its intersection with New England Highway.

The longer term planned upgrading of New England Highway by RMS (Section 3.1) would include grade separation of the right turn movement from Mitchell Line of Road to New England Highway. As a significant number of the crashes which have occurred at the intersection have been related to vehicles turning right from Mitchell Line of Road, the planned upgrade would be expected to significantly reduce the number of crashes at the intersection.

It is noted that improvement works at the intersection of Mitchell Line of Road and New England Highway commenced in March 2014, which included road widening and line marking on New England Highway, installation of a concrete median in New England Highway to improve separation between the left turn and the through lane, construction of a concrete median in Mitchell Line of Road and relocation of the stop line to improve sight distance.

5. Impacts of the Modification in 2032

5.1 Modification Traffic Generation and Distribution

With the Modification, the typical weekday traffic generation of the Wambo Coal Mine is expected to remain the same as in 2015, and its distribution on the surrounding road network would also remain the same. The traffic generated by the atypical activity which was occurring during the 2015 surveys would not be expected to occur in 2032.

The volume and distribution of Modification traffic on the surrounding road network in 2032 is presented in Table 5.1, noting that the morning peak hour occurs from 5.00am to 6.00am, and the evening peak hour occurs from 3.00pm to 4.00pm. This includes traffic generated by employees, visitors and deliveries.

Table 5.1: Average Weekday Wambo Coal Mine Traffic 2032 – With Modification

Site[A]	Survey Location	Light Vehicles			Heavy Vehicles		
		AM Peak[B]	PM Peak[B]	Daily[C]	AM Peak[B]	PM Peak[B]	Daily[C]
1	Wambo Coal Mine Access Road South of Jerrys Plains Road	158	114	1,017	3	3	30
2	Putty Road North of Mitchell Line of Road	41	29	261	0	0	3
3	Mitchell Line of Road East of Putty Road	108	78	696	3	3	27
4	Jerrys Plains Road West of Wambo Coal Mine Access Road	9	7	60	0	0	0
A	Wallaby Scrub Road North of Putty Road	0	0	0	0	0	0
B	Putty Road East of Jerrys Plains Road	149	107	957	3	3	30
D	Jerrys Plains Road East of Wambo Coal Mine Access Road	149	107	957	3	3	30

[A] Refer to Figure 2-1 for locations
[B] vehicles per hour
[C] vehicles per day

5.2 Future Traffic Volumes with Modification

Table 5.2 summarises the forecast traffic volumes in 2032 with the Modification and the cumulative influences of other changes to the road network (Section 4). In summary, these forecasts include the effects of:

- exclusion of the atypical traffic generated by the Wambo Coal Mine during the surveys in 2015 (Table 3.12);
- continuance of typical operational traffic generated by the Wambo Coal Mine (Table 5.1);
- background growth of traffic not associated with the Wambo Coal Mine (Section 4.1); and
- regional developments (Section 4.2) including the planned closure of Wallaby Scrub Road (Section 4.2.2).

Table 5.2: Average Weekday Traffic Volumes 2032 – With Modification

Site[A]	Survey Location	AM Peak[B]		PM Peak[B]		Daily[C]
		Hour Starting	Vehicles	Hour Starting	Vehicles	
1	Wambo Coal Mine Access Road South of Jerrys Plains Road	5.00am	161	3.00pm	117	1,047
2	Putty Road North of Mitchell Line of Road	6.00am	647	4.00pm	630	6,132
3	Mitchell Line of Road East of Putty Road	6.00am	1,039	3.00pm	665	8,349
4	Jerrys Plains Road West of Wambo Coal Mine Access Road	11.00am	312	3.00pm	329	4,048
A	Wallaby Scrub Road North of Putty Road	-	0	-	0	0
B	Putty Road East of Jerrys Plains Road	6:00am	1,535	3.00pm	1,155	13,442
D	Jerrys Plains Road East of Wambo Coal Mine Access Road	6.00am	506	3.00pm	589	6,445

[A] Refer to Figure 2-1 for locations
[B] vehicles per hour
[C] vehicles per day

5.3 Road Network Performance with Modification

The operational performance of the road network has been reassessed using the HCM LOS model with the forecast peak hour traffic volumes in 2032 with the Modification traffic. The results are summarised in Table 5.3.

Table 5.3: Midblock Levels of Service 2032 – With Modification

Site[A]	Location	Outbound from WCM				Inbound to WCM			
		AM Peak		PM Peak		AM Peak		PM Peak	
		PTSF	LOS	PTSF	LOS	PTSF	LOS	PTSF	LOS
2	Putty Road North of Mitchell Line of Road	22.7	A	68.8	C	70.0	C	37.2	A
3	Mitchell Line of Road East of Putty Road	30.6	A	72.2	D	83.0	D	33.6	A
4	Jerrys Plains Road West of Wambo Coal Mine Access Road	45.8	B	39.3	A	45.7	B	51.1	B
A	Wallaby Scrub Road North of Putty Road	-	-	-	-	-	-	-	-
D	Jerrys Plains Road East of Wambo Coal Mine Access Road	54.6	B	62.6	C	59.2	C	58.5	C

[A] Refer to Figure 2-1 for locations

Table 5.4 presents a comparison between the LOS for the peak direction of traffic flow associated with the Wambo Coal Mine in 2015, in 2032 without the Modification, and in 2032 with the Modification.

Table 5.4: Midblock Levels of Service in Peak Direction to/from Wambo Coal Mine

Site[A]	Location	AM Peak Inbound			PM Peak Outbound		
		2015	2032 No Modification	2032 With Modification	2015	2032 No Modification	2032 With Modification
2	Putty Road North of Mitchell Line of Road	C	C	C	C	C	C
3	Mitchell Line of Road East of Putty Road	D	D	D	D	D	D
4	Jerrys Plains Road West of Wambo Coal Mine Access Road	B	B	B	A	A	A
A	Wallaby Scrub Road North of Putty Road	A	-	-	A	-	-
D	Jerrys Plains Road East of Wambo Coal Mine Access Road	C	B	C	C	B	C

[A] Refer to Figure 2-1 for locations

Table 5.4 demonstrates that in 2032 with the Modification, the midblock LOS in the peak flow directions associated with the Modification (inbound in the morning peak and outbound in the evening peak) would remain the same as those which occurred during the surveys in 2015.

With regard to the Wambo Coal Mine access road and Putty Road between Mitchell Line of Road and Jerrys Plains Road, to which the HCM model do not apply, the peak hourly volumes in any one direction on these roads in 2032 with the Modification are forecast to be 149 vehicles per hour on the Wambo Coal Mine access road and 1,106 vehicles per hour on Putty Road (both inbound during the morning peak). Allowing for the capacity of these roads to be reduced below the theoretical ideal conditions, and the proportion of heavy vehicles, the peak hourly flows on these roads would remain below the theoretical capacity of 1,700 passenger cars per hour per lane, and travel conditions are expected to be acceptable.

5.4 Road Safety Implications

As noted, there are safety concerns regarding the intersection of New England Highway with Mitchell Line of Road. The Modification would result in an additional 723 vehicles per weekday through the intersection between 2025 and 2032 compared with approved Wambo Coal Mine conditions. The Modification's contribution to traffic at the intersection would be small in the context of total traffic movements through the intersection, and would occur only for the additional 7 years.

The planned upgrading of New England Highway by RMS (Section 3.1) would grade separate the right turn movement from Mitchell Line of Road to New England Highway, which is expected to significantly reduce the number of crashes at the intersection.

No improvements to the road network are warranted by the Modification traffic.

6. Conclusion

This study has examined the likely road transport implications of the Modification to Development Consent (DA 305-7-2003) for the Wambo Coal Mine. It is concluded that no specific measures to mitigate the impacts of the development on the capacity, safety and efficiency of the local and State road network would be required as a result of the Modification.

Appendix A

Traffic Survey Results

Site 1 100m East of Golden Hwy On Coal Mine Access Rd [60] **Eastbound** **Lane 0**

Day	*Tue*	*Wed*	*Thu*	*Fri*	*Sat*	*Sun*	*Mon*	*W/Day*	*W/End*	*7 Day*
Time	6/10/2015	7/10/2015	8/10/2015	9/10/2015	10/10/2015	11/10/2015	12/10/2015	*Ave.*	*Ave.*	*Ave*
0:00	0	0	1	0	1	0	1	0	1	0
1:00	0	1	0	2	0	0	0	1	0	0
2:00	1	0	1	2	1	1	1	1	1	1
3:00	0	1	0	0	0	0	0	0	0	0
4:00	11	15	20	14	5	4	15	15	5	12
5:00	137	148	152	115	44	49	154	141	47	114
6:00	94	100	119	117	34	28	125	111	31	88
7:00	36	30	38	26	6	3	38	34	5	25
8:00	19	26	33	36	1	3	16	26	2	19
9:00	11	23	20	23	3	1	15	18	2	14
10:00	26	24	23	22	2	6	12	21	4	16
11:00	16	30	20	21	2	0	18	21	1	15
12:00	14	16	22	14	4	1	11	15	3	12
13:00	41	43	39	12	1	3	32	33	2	24
14:00	21	25	20	9	2	2	22	19	2	14
15:00	25	23	14	36	18	19	32	26	19	24
16:00	26	31	30	22	13	18	22	26	16	23
17:00	16	20	23	15	17	19	18	18	18	18
18:00	6	8	7	32	29	23	11	13	26	17
19:00	1	1	3	0	1	1	6	2	1	2
20:00	2	3	3	4	3	1	3	3	2	3
21:00	17	14	11	4	1	1	18	13	1	9
22:00	7	8	10	1	2	1	11	7	2	6
23:00	2	1	1	1	1	0	1	1	1	1
Total	**529**	**591**	**610**	**528**	**191**	**184**	**582**	**568**	**188**	**459**

Site 1 100m East of Golden Hwy On Coal Mine Access Rd [60] **Westbound** **Lane 0**

Day	*Tue*	*Wed*	*Thu*	*Fri*	*Sat*	*Sun*	*Mon*	*W/Day*	*W/End*	*7 Day*
Time	6/10/2015	7/10/2015	8/10/2015	9/10/2015	10/10/2015	11/10/2015	12/10/2015	*Ave.*	*Ave.*	*Ave*
0:00	0	7	2	2	0	0	2	3	0	2
1:00	0	1	0	1	1	0	1	1	1	1
2:00	27	18	24	29	17	2	15	23	10	19
3:00	3	11	6	2	13	14	10	6	14	8
4:00	3	2	1	5	1	2	2	3	2	2
5:00	13	11	11	9	10	8	9	11	9	10
6:00	9	11	20	19	7	9	20	16	8	14
7:00	27	31	34	30	34	30	42	33	32	33
8:00	21	16	22	27	1	3	9	19	2	14
9:00	9	17	18	34	1	3	15	19	2	14
10:00	16	19	24	29	5	2	12	20	4	15
11:00	26	28	18	29	3	2	24	25	3	19
12:00	14	28	32	23	5	2	18	23	4	17
13:00	21	30	24	40	2	3	33	30	3	22
14:00	33	31	28	42	1	3	27	32	2	24
15:00	94	112	130	44	1	2	109	98	2	70
16:00	77	83	89	66	33	35	79	79	34	66
17:00	60	54	45	39	11	14	62	52	13	41
18:00	27	28	32	19	11	7	22	26	9	21
19:00	6	6	3	25	28	27	8	10	28	15
20:00	1	4	4	7	13	3	7	5	8	6
21:00	4	3	4	2	4	1	7	4	3	4
22:00	1	1	2	4	2	2	5	3	2	2
23:00	27	35	33	2	1	0	27	25	1	18
Total	**519**	**587**	**606**	**529**	**205**	**174**	**565**	**561**	**190**	**455**

Site 2 North of golden Hwy on Putty rd [100] **Northbound** **Lane 0**

Day	*Tue*	*Wed*	*Thu*	*Fri*	*Sat*	*Sun*	*Mon*	*W/Day*	*W/End*	*7 Day*
Time	6/10/2015	7/10/2015	8/10/2015	9/10/2015	10/10/2015	11/10/2015	12/10/2015	*Ave.*	*Ave.*	*Ave*
0:00	0	16	20	14	15	9	3	11	12	11
1:00	0	5	9	13	9	4	6	7	7	7
2:00	3	4	6	7	4	7	8	6	6	6
3:00	15	15	20	12	17	13	21	17	15	16
4:00	10	12	14	11	7	3	12	12	5	10
5:00	30	42	54	41	24	16	46	43	20	36
6:00	74	87	98	75	56	50	65	80	53	72
7:00	151	160	167	187	114	95	144	162	105	145
8:00	175	163	199	179	81	45		179	63	140
9:00	157	179	162	174	92	68		168	80	139
10:00	150	149	153	142	134	75		149	105	134
11:00	164	190	174	196	119	76		181	98	153
12:00	159	163	152	186	93	74		165	84	138
13:00	101	156	160	199	71	64		154	68	125
14:00	199	218	196	268	87	76		220	82	174
15:00	309	352	334	308	73	69		326	71	241
16:00	366	382	371	279	77	69		350	73	257
17:00	216	259	256	183	79	68		229	74	177
18:00	161	163	154	130	98	76		152	87	130
19:00	115	129	125	144	115	114		128	115	124
20:00	33	30	37	31	27	18		33	23	29
21:00	18	19	20	24	13	13		20	13	18
22:00	17	15	22	15	14	16		17	15	17
23:00	17	16	15	20	14	9		17	12	15
Total	**2640**	**2924**	**2918**	**2838**	**1433**	**1127**	**305**	**2822**	**1280**	**2314**

Site 2 North of golden Hwy on Putty rd [100] **Southbound** **Lane 0**

Day	*Tue*	*Wed*	*Thu*	*Fri*	*Sat*	*Sun*	*Mon*	*W/Day*	*W/End*	*7 Day*
Time	6/10/2015	7/10/2015	8/10/2015	9/10/2015	10/10/2015	11/10/2015	12/10/2015	*Ave.*	*Ave.*	*Ave*
0:00	0	4	4	6	8	8	3	3	8	5
1:00	0	2	6	6	4	3	5	4	4	4
2:00	6	3	4	4	3	5	5	4	4	4
3:00	11	10	10	11	5	3	8	10	4	8
4:00	25	36	48	40	16	8	43	38	12	31
5:00	284	302	299	269	97	72	280	287	85	229
6:00	393	459	451	407	128	104	411	424	116	336
7:00	241	261	262	222	56	39	201	237	48	183
8:00	159	163	190	151	47	35		166	41	124
9:00	119	162	165	168	74	62		154	68	125
10:00	135	148	131	134	97	76		137	87	120
11:00	127	132	126	160	108	83		136	96	123
12:00	148	156	157	163	105	84		156	95	136
13:00	154	169	174	165	81	98		166	90	140
14:00	130	172	150	166	73	64		155	69	126
15:00	129	170	142	152	82	86		148	84	127
16:00	122	147	133	154	62	58		139	60	113
17:00	148	176	151	144	119	78		155	99	136
18:00	127	142	142	143	134	108		139	121	133
19:00	58	54	74	67	33	32		63	33	53
20:00	27	33	46	28	20	16		34	18	28
21:00	27	23	28	22	37	22		25	30	27
22:00	15	19	19	21	21	15		19	18	18
23:00	5	7	11	8	8	6		8	7	8
Total	**2590**	**2950**	**2923**	**2811**	**1418**	**1165**	**956**	**2805**	**1292**	**2335**

Site 3 1.5km East of Putty rd on Mitchell Line Rd [100] **Eastbound** **Lane 0**

Day	*Tue*	*Wed*	*Thu*	*Fri*	*Sat*	*Sun*	*Mon*	*W/Day*	*W/End*	*7 Day*
Time	6/10/2015	7/10/2015	8/10/2015	9/10/2015	10/10/2015	11/10/2015	12/10/2015	*Ave.*	*Ave.*	*Ave*
0:00	0	49	43	36	22	5	5	27	14	23
1:00	0	16	16	15	8	5	7	11	7	10
2:00	7	9	7	18	8	5	3	9	7	8
3:00	25	25	25	29	29	15	18	24	22	24
4:00	15	28	20	12	14	3	14	18	9	15
5:00	42	38	34	41	33	31	55	42	32	39
6:00	107	117	116	110	83	72	97	109	78	100
7:00	230	198	224	226	168	145	223	220	157	202
8:00	95	121	135	117	60	32	92	112	46	93
9:00	104	103	99	129	102	57	118	111	80	102
10:00	134	85	93	132	89	64	116	112	77	102
11:00	165	117	125	166	110	89	181	151	100	136
12:00	160	153	148	182	108	115	229	174	112	156
13:00	193	152	148	252	72	116	251	199	94	169
14:00	244	265	259	304	120	126	296	274	123	231
15:00	384	383	406	389	86	148	479	408	117	325
16:00	399	390	430	355	85	127	412	397	106	314
17:00	235	329	345	281	95	103	283	295	99	239
18:00	203	225	223	197	134	140	193	208	137	188
19:00	172	187	214	267	153	235	201	208	194	204
20:00	40	51	78	83	36	47	38	58	42	53
21:00	29	23	33	44	16	31	17	29	24	28
22:00	13	17	22	19	11	33	23	19	22	20
23:00	35	39	48	19	10	17	38	36	14	29
Total	**3031**	**3120**	**3291**	**3423**	**1652**	**1761**	**3389**	**3251**	**1707**	**2810**

Site 3 1.5km East of Putty rd on Mitchell Line Rd [100] **Westbound** **Lane 0**

Day	*Tue*	*Wed*	*Thu*	*Fri*	*Sat*	*Sun*	*Mon*	*W/Day*	*W/End*	*7 Day*
Time	6/10/2015	7/10/2015	8/10/2015	9/10/2015	10/10/2015	11/10/2015	12/10/2015	*Ave.*	*Ave.*	*Ave*
0:00	0	6	10	3	7	1	4	5	4	4
1:00	0	8	4	6	3	4	8	5	4	5
2:00	8	8	8	11	4	3	9	9	4	7
3:00	26	14	17	18	9	1	19	19	5	15
4:00	83	92	90	87	45	27	78	86	36	72
5:00	497	556	587	519	182	100	553	542	141	428
6:00	714	732	712	665	258	183	740	713	221	572
7:00	301	251	279	289	68	21	269	278	45	211
8:00	188	212	181	198	109	56	216	199	83	166
9:00	174	166	144	172	111	68	196	170	90	147
10:00	155	136	132	182	130	94	175	156	112	143
11:00	135	133	139	179	86	118	128	143	102	131
12:00	125	123	116	142	81	118	119	125	100	118
13:00	145	145	147	132	71	109	134	141	90	126
14:00	117	106	118	155	67	99	116	122	83	111
15:00	129	112	121	142	79	120	136	128	100	120
16:00	109	93	104	152	59	106	91	110	83	102
17:00	170	164	159	190	109	162	152	167	136	158
18:00	170	169	178	216	138	179	173	181	159	175
19:00	20	26	29	45	20	23	31	30	22	28
20:00	26	17	21	27	12	30	21	22	21	22
21:00	54	42	51	21	8	19	50	44	14	35
22:00	34	39	40	23	7	14	27	33	11	26
23:00	6	7	7	15	6	10	7	8	8	8
Total	**3386**	**3357**	**3394**	**3589**	**1669**	**1665**	**3452**	**3436**	**1667**	**2930**

Site 4 120m West of Wambo Coal Mine Access Rd [80] **Eastbound** **Lane 0**

Day	*Tue*	*Wed*	*Thu*	*Fri*	*Sat*	*Sun*	*Mon*	*W/Day*	*W/End*	*7 Day*
Time	6/10/2015	7/10/2015	8/10/2015	9/10/2015	10/10/2015	11/10/2015	12/10/2015	*Ave.*	*Ave.*	*Ave*
0:00	0	6	6	6	10	2	4	4	6	5
1:00	0	3	4	5	6	3	6	4	5	4
2:00	7	4	0	9	3	2	4	5	3	4
3:00	4	4	3	7	8	1	4	4	5	4
4:00	10	11	7	14	7	4	11	11	6	9
5:00	29	29	32	35	20	15	38	33	18	28
6:00	53	64	69	66	30	21	71	65	26	53
7:00	75	60	60	85	50	24	64	69	37	60
8:00	82	58	88	105	59	37	74	81	48	72
9:00	87	89	86	98	112	65	106	93	89	92
10:00	117	88	76	116	117	72	122	104	95	101
11:00	136	97	103	122	111	105	170	126	108	121
12:00	139	130	117	139	91	135	191	143	113	135
13:00	180	128	130	116	83	135	210	153	109	140
14:00	152	147	129	175	112	169	193	159	141	154
15:00	144	123	123	171	75	155	142	141	115	133
16:00	140	104	128	182	93	121	126	136	107	128
17:00	67	89	114	125	75	79	93	98	77	92
18:00	76	58	82	122	49	94	45	77	72	75
19:00	46	39	93	88	42	61	44	62	52	59
20:00	30	22	78	59	26	48	23	42	37	41
21:00	23	17	25	42	16	30	13	24	23	24
22:00	8	12	16	12	16	37	16	13	27	17
23:00	6	7	12	18	7	17	9	10	12	11
Total	**1611**	**1389**	**1581**	**1917**	**1218**	**1432**	**1779**	**1655**	**1325**	**1561**

Site 4 120m West of Wambo Coal Mine Access Rd [80] **Westbound** **Lane 0**

Day	*Tue*	*Wed*	*Thu*	*Fri*	*Sat*	*Sun*	*Mon*	*W/Day*	*W/End*	*7 Day*
Time	6/10/2015	7/10/2015	8/10/2015	9/10/2015	10/10/2015	11/10/2015	12/10/2015	*Ave.*	*Ave.*	*Ave*
0:00	0	3	5	5	10	1	1	3	6	4
1:00	0	4	5	4	3	3	4	3	3	3
2:00	5	3	4	5	3	1	5	4	2	4
3:00	14	13	14	3	7	2	9	11	5	9
4:00	36	24	21	27	10	7	38	29	9	23
5:00	61	62	57	47	30	9	64	58	20	47
6:00	130	117	90	101	65	29	105	109	47	91
7:00	127	116	110	134	68	29	109	119	49	99
8:00	112	112	103	107	111	58	115	110	85	103
9:00	125	147	122	130	106	84	139	133	95	122
10:00	140	111	115	146	123	91	140	130	107	124
11:00	127	104	108	160	120	116	122	124	118	122
12:00	106	106	108	136	101	133	105	112	117	114
13:00	121	90	85	123	91	141	101	104	116	107
14:00	90	90	94	153	73	120	111	108	97	104
15:00	115	90	113	127	82	109	91	107	96	104
16:00	101	93	74	120	56	93	107	99	75	92
17:00	82	76	103	112	62	90	75	90	76	86
18:00	66	56	67	110	43	57	57	71	50	65
19:00	37	34	53	66	36	42	26	43	39	42
20:00	15	22	33	31	10	26	24	25	18	23
21:00	18	11	22	27	17	16	14	18	17	18
22:00	9	7	11	10	12	8	10	9	10	10
23:00	7	7	8	13	8	5	8	9	7	8
Total	**1644**	**1498**	**1525**	**1897**	**1247**	**1270**	**1580**	**1629**	**1259**	**1523**

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