



Maules Creek Coal Mine

Employee Transport Modification Environmental Assessment

MAIN REPORT

APPENDICES

MAULES CREEK COAL MINE
EMPLOYEE TRANSPORT MODIFICATION
ENVIRONMENTAL ASSESSMENT



MAY 2016
Project No. WHC-15-30
Document No. 00740194.docx

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EXECUTIVE SUMMARY

Maules Creek Coal Pty Ltd (MCC) (a wholly owned subsidiary of Whitehaven) manages the Maules Creek Coal Mine (MCCM).

The original Environmental Assessment (EA) to support the Project Approval of the MCCM was compiled in a time when the mining industry was in a period of significant and sustained growth and there were several proposed projects in the region that were to be developed at the same time.

Accordingly, as part of the original EA, MCC devised transport assumptions which were reflective of this environment, including assuming that a high proportion of employees would travel to and from the area and live in temporary accommodation to work their roster (i.e. reside in nearby Workers Accommodation Facilities). Employee transport to and from site was assumed to occur predominantly via bus (90%).

Following review and determination by the Planning Assessment Committee, Project Approval was issued and a condition (Condition 63, Schedule 3 of the Project Approval [10_0138]) was included which reflects the initial traffic assumptions and contains specific requirements regarding the use of a shuttle bus system to transport construction and operational workers to and from the site. Of most relevance, this condition requires that construction and operational employees travel predominantly via bus consistent with the EA.

Construction of the mine is now complete and the operational phase is underway. These activities have occurred in a period characterised by a significant contraction of the mining industry, in contrast to the boom experienced during the project planning and approvals phase when the employee and transport assumptions were devised.

MCC has strongly advocated a local employment policy which has resulted in a predominantly residential-based workforce. Therefore, rather than a workforce using accommodation facilities, employees typically live in local towns with their families. Long-term residency in accommodation villages is discouraged.

Consistent with Condition 63, Schedule 3 of the Project Approval (10_0138); MCC has implemented a strategy to facilitate the use of buses by their employees.

From review of the patronage of these services, MCC has determined that some 65 to 84% of MCC's direct operations, maintenance and CHPP wages employees typically use this service when working a regular rostered shift pattern.

Whilst this is considered to be a good take-up of the service, Whitehaven considers it unlikely that 90% bus use is achievable because:

- A high percentage of employees live in local towns and rural areas with their families, leading to bus use being less convenient relative to employees living in accommodation facilities.
- The workforce includes many specialised contractors who attend site with their own tools and equipment, therefore requiring access by private or tool of trade vehicle rather than via the bus services.

Accordingly, this Modification seeks to modify the existing Condition 63, Schedule 3 of the Project Approval (10_0138) to better reflect the locally residing workforce and associated transport regime. In order to determine the impact that the Modification may have on the surrounding road network, the Modification is supported by an EA and technical Road Transport Assessment appendix by GTA Consultants.

The Road Transport Assessment provides an assessment of the impacts on the road network, comparing:

- with the Modification – the current employee transport regime; and
- without the Modification – assuming the current Condition 63 prevails.

GTA Consultants (2015) determined that the Modification would not materially affect the Levels of Service of local roads and intersections, with the difference in conditions as perceived by motorists being negligible.

GTA Consultants (2015) identified that there remains some spare capacity on local roads (even with the Modification). For example, traffic on Rangari Road would need to increase by some 160% or 65 vehicles (in both directions) above the Modification traffic volumes during the afternoon peak hour for the westbound Level of Service to change from A to B.

Accordingly, changes to the existing Condition 63, Schedule 3 are considered to be justified because:

- The need for the Modification is driven by the prevalence of a locally residing workforce.
- There are no material road transport implications (i.e. no material change in the level of service and perceived change by motorists).

1 INTRODUCTION

This document is an Environmental Assessment (EA) for a proposed modification to the Maules Creek Coal Mine (MCCM), an open cut coal mining operation which operates in accordance with Project Approval 10_0138.

The MCCM is located approximately 50 kilometres (km) north-northeast of Gunnedah in New South Wales (NSW) (Figures 1 and 2). The MCCM is a joint venture between Aston Coal 2 Pty Limited (a wholly owned subsidiary of Whitehaven Coal Limited [Whitehaven]) (75 percent [%]), ITOCHU Corporation (15%) and J-Power Corporation Pty Limited (10%). The MCCM is managed by Maules Creek Coal Pty Ltd (MCC), a wholly owned subsidiary of Whitehaven.

The Maules Creek Employee Transport Modification (the Modification) is sought under section 75W of the New South Wales (NSW) *Environmental Planning and Assessment Act, 1979* (EP&A Act).

1.1 OVERVIEW OF THE EXISTING/APPROVED MAULES CREEK COAL MINE

The MCCM was granted Project Approval under the EP&A Act by the Planning Assessment Commission (PAC) under delegation of the Minister for Planning and Infrastructure on 23 October 2012.

The MCCM was granted approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 11 February 2013 (Commonwealth Approval Decision 2010/5566).

Project Approval 10_0138 has been modified on two occasions since it was issued:

- July 2013 – for the construction and operation of a switching station, electricity transmission lines, and a minor repositioning of the Coal Handling Preparation Plant (CHPP) (Mod 1).
- March 2014 – to realign the raw water pipeline and relocate the raw water pump (Mod 2).

Project Approval 10_0138 allows for the production and processing of up to 13 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal until the end of December 2034.

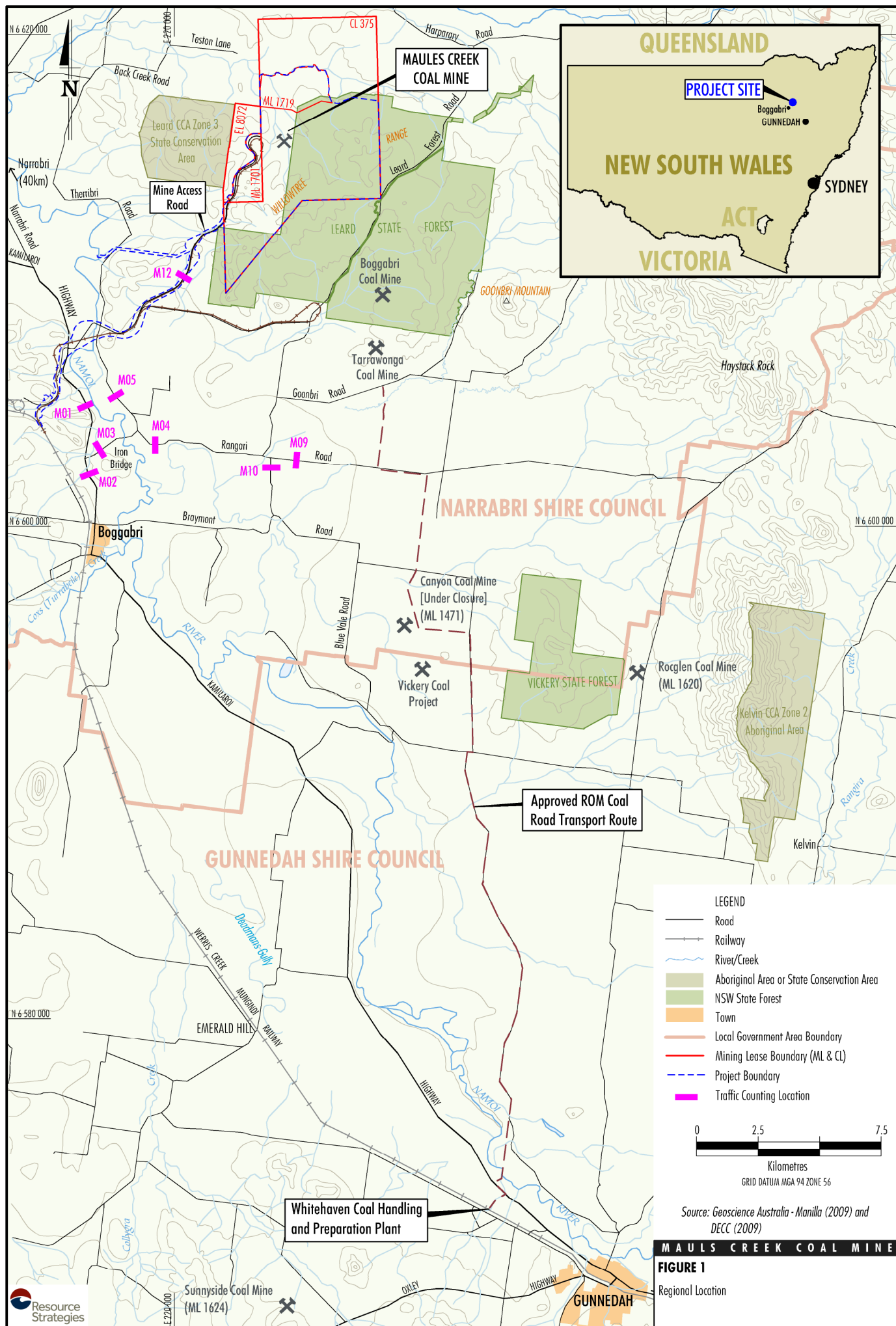
1.2 OVERVIEW OF THE MODIFICATION

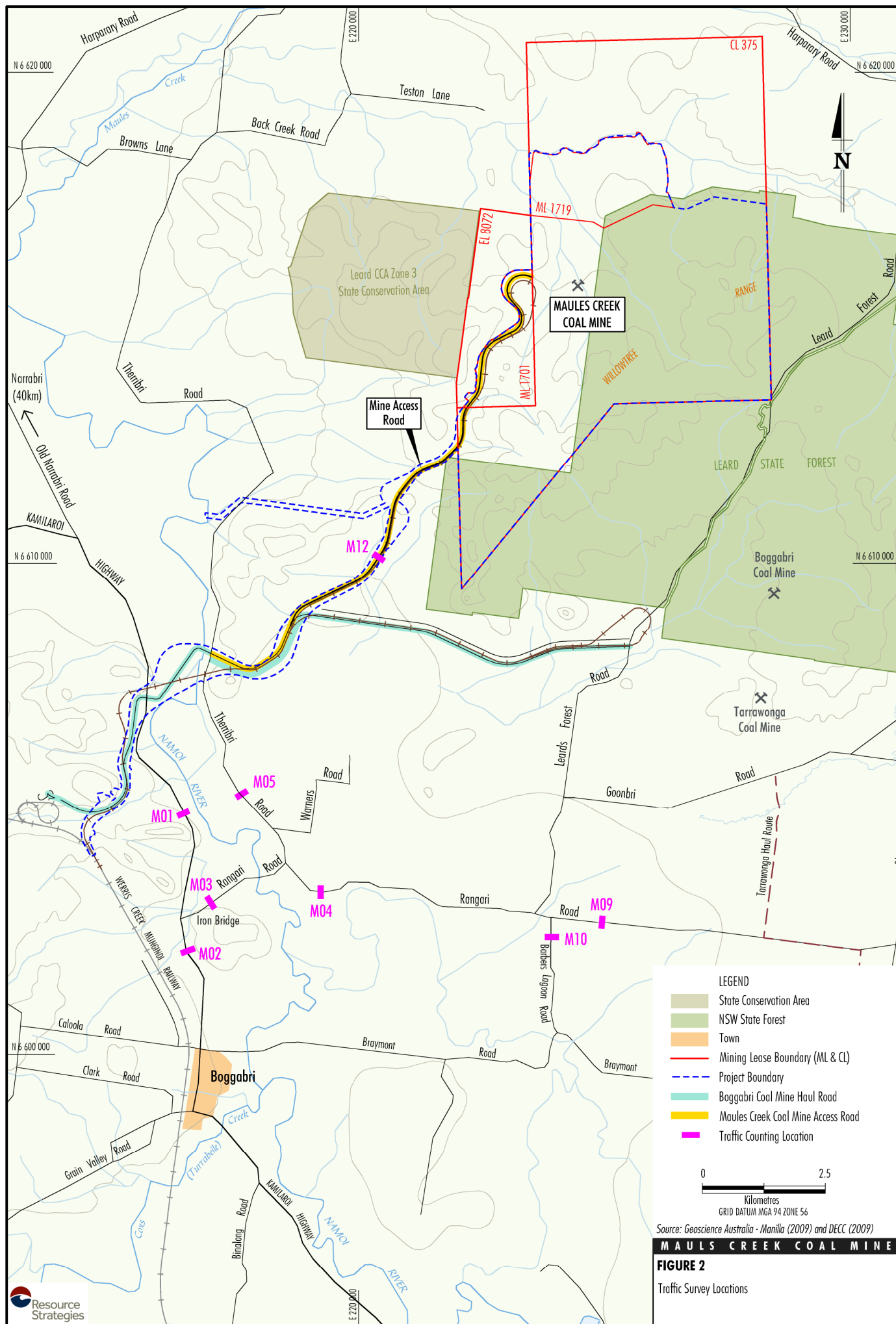
Condition 63, Schedule 3 of the Project Approval (10_0138) contains specific requirements regarding the use of a shuttle bus system to transport construction and operational workers to and from the site. In particular this condition, which is unique to the MCCM, states:

The Proponent shall ensure that construction and operational employees are predominantly transported to the site by shuttle bus, consistent with the assumptions used in the traffic study undertaken for the EA. Note: The EA assumed that 90% of construction employees and 90% of operational workers based on peak travel movements would be transported to site by shuttle bus from Boggabri township. However, the shuttle bus service could also operate from Gunnedah and Narrabri.

The MCCM is now moving into its operational phase, and the long-term Mine Access Road from Therribri Road has now been commissioned. Bus use was proposed in the original EA to reflect the likelihood that many of the MCCM employees would reside at temporary accommodation, such as the Boggabri Workers Accommodation Facility. At the time the mining industry was in a period of significant and sustained growth and there were several proposed projects that were to be developed at the same time. As a result, it was anticipated that a large proportion of Project employees would need to be sourced from outside the local government areas and would be travelling into the area temporarily to work their roster and reside at the Boggabri and Narrabri Workers Accommodation Facilities, therefore, would be amenable to bus transport. The proposed 90% use of buses was assumed in this context.

Since Project commencement, there has been a significant contraction of the mining industry which has lead to a higher proportion of employees being sourced from and residing in the local area (consistent with Whitehaven's local employment policy). Employees living and residing in the local area is a focus across the Whitehaven group and this has resulted in bus transport being much less practical for these employees (i.e. rather than the majority of employees being housed in the Boggabri and Narrabri Workers Accommodation Facilities, they mainly live in private houses and other accommodation in Gunnedah, Narrabri, Boggabri and local rural areas such as Manilla). Accordingly, long-term residencies in the accommodation facilities is not encouraged. In addition, the workforce includes many specialised contractors who attend site with their own tools and equipment, therefore requiring access by private vehicle rather than via the bus services.





Given these changes to a more locally residing workforce and despite some 16 daily bus services being available at the MCCM, use of the shuttle bus service has not been as practical as that anticipated by the original EA traffic assessment (Hyder Consulting, 2010).

MCC has reviewed the prevalence of bus use and has determined that some 65 to 84% of MCC's direct operations, maintenance and CHPP wages employees typically use this service when working a regular shift.

A Road Transport Assessment (Appendix A) has been conducted to determine the incremental change of road transport impacts associated with the assumed 90% bus usage and the actual use. This assessment has shown that despite the reduced reliance on bus transport, there are no identified issues with respect to road network performance or capacity. Consequently, this Modification proposes amendment of Condition 63, Schedule 3, to reflect the locally residing workforce and associated traffic management practicalities and practices currently in place.

The Modification would not include any other significant changes to the existing/approved MCCM.

1.3 CONSULTATION

MCC consults with relevant NSW Government agencies on a regular basis in relation to the current MCCM operations.

MCC wrote to the Department of Planning and Environment (DP&E) in May 2015 outlining the strategy that has been implemented in regard to traffic management and provision of buses to Project employees; and indicating that this Modification would be prepared.

A subsequent meeting occurred in January 2016 where MCC outlined the content of the Modification and DP&E provided some supplementary advice regarding the required EA content. The EA was updated to include issues raised, including consideration of the intersection of Rangari Road and the Kamilaroi Highway, road noise impacts and interaction with school buses.

MCC met with Roads and Maritime Services (RMS) in May 2016 regarding the modification. RMS did not raise any issues, and items discussed included the predicted maintenance of levels of service and internal MCC communication with staff regarding positive driver behaviour.

MCC also met with both Gunnedah and Narrabri Shire Councils in May 2016. Neither Council raised concerns however indicated that they would like to continue to be updated regarding the Modification.

MCC wrote to the Community Consultative Committee (CCC) in May 2016 regarding the Modification. MCC will provide CCC members with a copy of the EA once finalised.

It is anticipated that further consultation with these stakeholders would occur during exhibition of the EA.

1.4 STRUCTURE OF THIS DOCUMENT

This EA comprises a main text component and supporting studies. An overview of the main text sections is presented below:

Section 1	Provides an overview of the existing/approved MCCM, an overview and justification for the Modification and a summary of the consultation undertaken in relation to the Modification.
Section 2	Provides a description of the existing/approved MCCM and the Modification.
Section 3	Presents an overview of the Modification.
Section 4	Provides an assessment of the Modification on the existing road network.
Section 5	Presents the key conclusions of the Modification EA.
Section 6	References.

The Road Transport Assessment undertaken by GTA Consultants (2015) is provided in Appendix A.

2 EXISTING/APPROVED MAULES CREEK COAL MINE

A summary description of the existing/approved MCCM is provided below.

2.1 APPROVALS HISTORY

The MCCM was assessed in the *Maules Creek Coal Project Environmental Assessment* (Hansen Bailey, 2011) and Project Approval 10_0138 for the MCCM was granted under the EP&A Act by the PAC under delegation of the Minister for Planning and Infrastructure on 23 October 2012.

Additionally, the MCCM was granted approval under the EPBC Act on 11 February 2013 (Commonwealth Approval Decision 2010/5566).

As described in Section 1.1, Project Approval 10_0138 has been modified on two occasions since it was issued:

- July 2013 – for the construction and operation of a switching station, electricity transmission lines, and a minor repositioning of the CHPP (Mod 1).
- March 2014 – to realign the raw water pipeline and relocate the raw water pump (Mod 2).

A copy of the consolidated Project Approval 10_0138 is provided in Attachment 1.

2.2 MINING OPERATIONS

Project Approval 10_0138 allows for:

- the construction and operation of an open cut mining operation extracting up to 13 Mtpa of ROM coal;
- open cut mining fleet including excavator/shovels and fleet of haul trucks, dozers, graders and water carts;
- the construction and operation of a CHPP with a throughput capacity of 13 Mtpa ROM coal;
- an operational workforce of up to 470 employees;
- the construction and operation of a Tailings Drying Area;
- the construction and operation of a rail spur, rail loop, associated load out facility and connection to the Werris Creek Mungindi Railway;

- the construction and operation of a Mine Access Road to connect to Therribri Road;
- the construction and operation of administration, workshop and related facilities;
- the construction and operation of water management infrastructure including a water pipeline, pumping station and associated infrastructure for access to water from the Namoi River;
- the installation of supporting power and communications infrastructure;
- the construction and operation of a high voltage (132 kilovolt [kV]) transmission line and switching station;
- the minor extension of an existing low voltage (11 kV) transmission line to the Project Boundary; and
- the construction and operation of an explosive magazine and explosives storage areas.

2.3 TRAFFIC MANAGEMENT

Principal vehicular access to the MCCM is provided by the Mine Access Road (Figures 1 and 2), which was completed in the first half of 2015. Prior to its construction, access to the site was temporarily provided via Goonbri Road.

In accordance with Condition 63, Schedule 3 of the Project Approval, a shuttle bus system is used to transport workers to and from the MCCM. Employees who do not use the shuttle bus system are encouraged to car pool.

MCC has access to two Workers Accommodation Facilities for mine workers located in the Narrabri and Boggabri townships, however, there are very low occupancy rates at these facilities by MCCM employees due to the hire of locals and/or relocation of employees to the area. Accordingly, long-term residency of the accommodation facilities is not encouraged by Whitehaven, who implements a 'user pays' policy for its employees. A bus service is used to transport mine employees from Gunnedah, Narrabri and Boggabri to the MCCM. The buses access the MCCM via the Kamilaroi Highway, Rangari Road, Therribri Road and the Mine Access Road (Figures 1 and 2). The transport route is in accordance with the access routes described in the Traffic Management Plan (MCC, 2014).

It should be noted that Boggabri Coal Mine has gained approval for a separate intersection directly off the highway to access their site (Boggabri Coal Pty Limited, 2013).

This would be used as a permanent operational access and would reduce vehicle turning movements at the intersection of Kamilaroi Highway and Rangari Road. Maules Creek Coal has an optional agreement to use the new intersection to the Boggabri Coal Mine, once constructed and commissioned.

The findings of this study are planned to be reviewed in approximately 12 months from the completion of the Constructive Solutions report when the primary access arrangements for the mines is resolved.

2.4 KAMILAROI HIGHWAY/RANGARI ROAD INTERSECTION STUDY

Condition 60, Schedule 3 of the Maules Creek Coal Mine Project Approval refers to the need to upgrade the intersection of Kamilaroi Highway and Rangari Road.

Since the Project Approval was granted, Boggabri Coal Mine has gained approval for a separate intersection directly off the highway to access their site. This would be used as a permanent operational access and would reduce vehicle turning movements at the intersection of Kamilaroi Highway and Rangari Road. MCC has an optional agreement to use the new intersection to the Boggabri Coal Mine, once constructed and commissioned.

Because of these proposed changes, Whitehaven has commissioned a review of the operation and capacity of the intersection of Kamilaroi Highway and Rangari Road. This review was undertaken by Constructive Solutions in October 2015, and was provided to the DP&E in November 2015. This review found:

- *The capacity of the right turn movement [from Kamilaroi Highway to Rangari Road] exceeds the current demand for turning vehicles;*
- *The usage will reduce by approximately half once Boggabri Coal utilise the existing access arrangements directly from the Kamilaroi Highway;*
- *Maules Creek traffic may also transfer [to] the Kamilaroi Highway Access in the future; and*
- *Major future road works, e.g. replacement of the Iron Bridge and upgrade on Rangari Rd are being considered.*

In regard to the adequacy of the existing channelised right turn, Constructive Solutions (2015) concluded:

The existing CHR(s) is considered to provide adequate capacity for right turn movements for the existing and known developments that are likely to affect this intersection.

3 MODIFICATION OVERVIEW

A description of the Modification is provided below.

3.1 TRAFFIC

The initial employee bus use assumptions for the original EA were devised during a period of mining industry expansion and the MCCM mine development period was expected to be concurrent with other operations.

Since approval of the MCCM, employment conditions in the mining industry have deteriorated significantly and as a consequence more employees reside in the local area than was originally anticipated (as opposed to being accommodated in local mine Workers Accommodation Facility).

Consistent with the Traffic Management Plan, MCC provides buses free of charge to employees from Boggabri, Gunnedah and Narrabri to the MCCM and has also restricted the availability of parking on-site (to encourage use of the bus service).

Despite these efforts, because of the presence of a largely locally-residing workforce, with some of these residing in a rural setting and the need for specialist contractors to travel to site with their own tools and equipment, bus use has not been as practical for these MCCM employees as originally anticipated.

This Modification proposes amendment of Condition 63, Schedule 3, to reflect the traffic management practicalities and practices currently in place.

Specifically, the amendment of Condition 63, Schedule 3, sought is as follows:

The Proponent shall ensure that a shuttle bus service is available to facilitate the transportation of construction and operational employees to site. MCC will target that 70% (averaged over a week) of the operations, maintenance and CHPP wages employees would utilise the bussing service, are predominantly transported to the site by shuttle bus, consistent with the assumptions used in the traffic study undertaken for the EA. Note: The EA assumed that 90% of construction employees and 90% of operational workers based on peak travel movements would be transported to site by shuttle bus from Boggabri township. However, the shuttle bus service could also operate from Gunnedah and Narrabri.

A Road Transport Assessment (Appendix A) has been conducted to determine the incremental change of road transport impacts associated with the assumed 90% bus use and the actual use, with the results provided in Section 4.

3.2 OTHER MINE COMPONENTS

There would be **no change** to the following key components of the existing/approved MCCM due to the Modification:

- mine life and hours of operation;
- Project boundary;
- mining operations (i.e. underground longwall mining);
- mine fleet;
- maximum annual ROM coal production rate;
- ROM coal processing operations;
- coal reject management;
- product coal transport;
- heavy vehicle site deliveries;
- water demand and supply;
- workforce;
- rehabilitation strategy; and
- biodiversity offset.

4 ENVIRONMENTAL REVIEW

4.1 IDENTIFICATION OF KEY ISSUES

The key potential impact of the Modification is related to the extension of the incremental change of road transport impact associated with the assumed 90% bus use from the original EA (Hansen Bailey, 2011) and the actual use. A discussion of this potential impact is provided in this section of the EA.

The Modification would not change approved surface disturbance areas, therefore no impacts on flora and fauna or heritage would occur.

The Modification would not change the annual ROM coal production rate, total ROM coal mined, mine fleet or mine life; therefore there would be no material alteration to the existing/approved groundwater impacts or amenity impacts (noise/air quality) from the MCCM.

As no change to the approved MCCM workforce or mine life is proposed for the Modification, there would be no material alteration to the approved community infrastructure impacts.

4.2 ROAD TRANSPORT

4.2.1 Background

The following key roads are of relevance to the MCCM (Figures 1 and 2):

- Kamilaroi Highway – provides the principal access route between Gunnedah to Narrabri, passing through Boggabri.
- Rangari Road – provides an east-west link from Kamilaroi Highway to Manilla.
- Therribri Road – a local road which provides a south-north connection to the Mine Access Road and to rural properties further north.
- Barbers Lagoon Road – extends south from Rangari Road through Blue Vale Road as an alternative south link to Gunnedah.
- Tarrawonga Haul Route – a private haul road consisting of a two-lane two-way sealed road which extends northward from Manilla Road to Tarrawonga Coal Mine. It is the nominated heavy vehicle access route for the MCCM.
- Mine Access Road – extends between MCCM facilities area to Therribri Road.

The primary route from Gunnedah to the site is via Kamilaroi Highway, Rangari Road, Therribri Road and the Mine Access Road.

The nominated truck route is via the Mine Access Road, Therribri Road, Rangari Road, Tarrawonga Haul Road, and Blue Vale Road to access the Kamilaroi Highway to the west of Gunnedah.

In accordance with Condition 61, Schedule 3, the unsealed section of Rangari Road was sealed during 2014.

A total of seven complaints over the period 1 January 2014 to 31 December 2015 have been received in relation to road transport issues. The details of these complaints and MCC responses are provided in Table 1. It is noted that the majority of these complaints concerned construction-related traffic and that no complaints have been received since July 2014.

Shuttle Bus System

A shuttle bus system was proposed in the original EA (Hansen Bailey, 2011) (Section 2.3) and has been operating since commencement of construction.

MCC has conducted a review of the bus use using data collected for the Modification in June 2015. From review of the patronage of the bus services, MCC has determined that some 65 to 84% of MCC's direct operations, maintenance and CHPP wages employees typically use this service when working a regular shift.

Traffic Management Plan

The MCCM Traffic Management Plan (MCC, 2014) contains other traffic management commitments, which are listed below:

- MCC has installed signage on the surrounding road network to enforce the access routes and prohibited roads.
- Parking provisions on-site are capped which further encourages workers to travel by the chartered bus service or car pool.
- MCC will continue to consult with the local school bus operators for the purposes of managing interactions of MCCM traffic with school buses.

Car pooling was found to occur at a rate of 1.6 people per vehicle by GTA Consultants (2016).

Table 1
MCCM Road Transport Complaints

Date	Complaint Received	MCC Response
March 2014	Complaint received from resident regarding vehicles using flashing beacons whilst driving on Leard Forest Road.	Toolbox talks held with construction employees about the use of Leard Forest Road. It was noted that at the time of the complaint, Narrabri Shire Council were undertaking roadworks on that stretch of the public road and the conditions were also very dusty.
13/03/2014	Complaint received regarding speeding traffic along Boston Street, Boggabri on the way to and from the Workers Accommodation Facility.	Notification sent to staff and contractors toolbox talks conducted on obeying the speed limits on local road network.
13/03/2014	Complaint from resident regarding contractor minibuses observed utilising Therribri Road for route to Narrabri and the north (contrary to the Traffic Management Plan, which prohibits normal access by this route).	Toolbox talk held with contractors and follow up monitoring of road use by MCC staff to confirm that the practice had ceased. MCC Project Manager met with the resident subsequently to communicate the outcome.
21/05/2014	Complaint received regarding speeding traffic along Boston Street, Boggabri on the way to and from the Workers Accommodation Facility.	Reminder notification sent to staff and contractors toolbox talked on obeying the speed limits on local road network.
22/07/2014	Complaint received regarding the traffic control on the Rangari Road upgrade works remaining too long on red.	Investigation undertaken concerning the red/green timing cycle at the road works. The apparent lengthy time between green lights was considered necessary to allow traffic to pass safely through the works area. Findings communicated to the complainant by telephone message.
28/07/2014	Query regarding possible Project vehicles using Therribri Road, where access to Project traffic was prohibited.	Investigation undertaken regarding the vehicles specified by the complainant. Neither were found to be related to the Maules Creek Coal Mine. Email reply sent to the enquirer regarding the findings.
31/07/2014	A property owner called enquiring about the proposed closure of Leard Forest Road, as he used this road for access to his property.	The Environmental Manager telephoned the enquirer to explain the reasons for the proposed closure and the alternative routes that could be used during the closure period.

Source: Whitehaven Coal Limited (2015).

Review of Levels of Services

The traffic operating conditions associated with the existing road transport conditions (i.e. 90% bus use) were assessed by GTA Consultants (2016) (Appendix A). This assessment was undertaken to reflect the changes in road conditions, driver behaviour and cumulative impacts that have occurred since the original EA (Hyder Consulting, 2010). This assessment indicated that the surveyed locations (Figure 2) would be expected to continue to experience good levels of service with regard to roadway efficiency and delays during the busiest hours. Analysis of intersection results indicate that the surveyed intersections operate at good levels of service during the morning and evening peak hours, with spare capacity and only short delays to some vehicles (Appendix A). This is generally consistent with the findings of Hyder Consulting (2010).

4.2.2 Environmental Review

A Road Transport Assessment for the Modification was undertaken by GTA Consultants (2016) and is presented as Appendix A.

The Road Transport Assessment includes consideration of the potential cumulative impacts of the Boggabri Coal Mine and Tarrawonga Coal Mine.

The Road Transport Assessment reviews the actual usage of the shuttle bus services to consider the ongoing implications on the operation of the road network (Appendix A).

Existing Traffic Volumes and Distributions

Traffic volumes and distribution in the vicinity of the MCCM and on the key roads (Section 4.2.1) were determined by traffic surveys conducted in June 2015, including automatic tube counts, peak period turning movement surveys (Kamilaroi Highway and Rangari Road) and passenger counts on buses and private and contractor vehicles surveys with the results presented in Appendix A. Traffic survey locations are shown on Figure 2.

The average weekday traffic volumes at the surveyed locations demonstrated a reasonably distinct morning peak hour (generally 5.00 am to 7.00 am), and well defined evening peak (generally 5.00 pm to 6.00 pm). The exception to this was the location on Kamilaroi Highway north Rangari Road (M01), where the busiest hour in the morning occurred from 9.00 am to 10.00 am, and the busiest hour in the afternoon occurred between 2.00 pm and 3.00 pm (Appendix A).

Potential Impacts

GTA Consultants (2016) assessed impacts on the surrounding road systems of the maximum operational workforce of 470 employees, assuming the current workforce travel behaviour (i.e. bus use/car pooling).

The Road Transport Assessment (Appendix A) concluded that with the current and forecasted traffic generation, the surrounding road network and the key intersections would continue to operate at good levels of service, with spare capacity, short delays to some vehicles, and with drivers having freedom to select their desired travel speed.

The surveyed intersections would continue to operate at satisfactory levels of service, with sufficient capacity to accommodate the additional traffic with spare capacity and short delays to some vehicles (Appendix A).

GTA Consultants (Appendix A) concluded that no significant impacts on the performance, capacity, efficiency and safety of the road network are expected to arise as a result of the Modification.

Further, GTA Consultants (2016) identified that there remains some spare capacity on local roads (even with the Modification) relative to their Level of Service thresholds. For example, traffic on Rangari Road would need to increase by some 160% or 65 vehicles (in both directions) above the Modification traffic volumes during the afternoon peak hour for the westbound Level of Service to change from A to B.

Kamilaroi Highway/Rangari Road Intersection

GTA Consultants (2016) revised the performance of the Kamilaroi Highway and Rangari Road intersection and concluded that the intersection would continue to perform with a level of service of 'A' with the Modification. Notwithstanding, consistent with the findings of Constructive Solutions, (2015), MCC will further review the adequacy of this intersection in consideration of any changes to access for Boggabri Coal Mine of the MCCM.

Interactions with School Buses

GTA Consultants (2016) includes consideration of interactions of MCC traffic with school bus services.

Appendix A notes that whilst school buses use roads coincident with MCC employees (predominantly the Kamilaroi Highway), shift changes over times are typically timed to avoid the main operating times for the school buses.

Morning bus services generally operating later than the times at which the majority of MCC employees would be travelling on the road network. Afternoon school buses typically operate earlier than the times at which the majority of MCC workers would be travelling (Appendix A).

4.2.3 Mitigation Measure, Management and Monitoring

MCC would continue to mitigate employee road transport movements by specifically encouraging the use of buses and car pooling, including:

- provision of buses free of charge to MCCM employees;
- parking provisions on-site are capped which further encourages workers to travel by the bus service;
- regularly reviewing the prevalence of bus use and car pooling; and
- liaison with school bus service providers to reduce interactions between MCC-related traffic movements and school buses.

These measures would continue to be conducted in accordance with the Traffic Management Plan (MCC, 2014). The Traffic Management Plan would be reviewed and revised for the Modification.

4.3 ROAD NOISE

4.3.1 Background

An assessment of worst-case construction and operational road traffic noise impacts was conducted as part of the original EA. It was concluded that predicted worst case operational traffic noise levels would remain well below the 55 $L_{Aeq(1hr)}$ day criterion and within the 50 $L_{Aeq(1hr)}$ night criterion at all private receivers (MCC, 2014). Since the original EA was conducted, the Environment Protection Authority has introduced the Road Noise Policy (RNP) which includes criteria over entire assessment periods (i.e. 9 hours night time, 15 hours daytime) (Department of Environment, Climate Change and Water, 2011).

4.3.2 Environmental Review

Road noise associated with MCCM's use of Therribri Road was assessed by Global Acoustics (2016) in accordance with the RNP (Appendix B).

The focus of this assessment was a privately-owned receiver located approximately 37 m west of Therribri Road. The assessment found that:

- Road noise would marginally decrease due to the Modification due to the reduction in heavy vehicle movements.
- Daytime peak hour noise would comply with the relevant RNP criteria (55 dBA $L_{Aeq(1\text{ hour})}$).
- Night peak hour noise would exceed the relevant RNP criteria (55 dBA $L_{Aeq(1\text{ hour})}$) during the hours of 6:00 am to 7:00 am (i.e. a period where many rural residents are active).

Given that Global Acoustics (2016) found a decrease in road noise due to the Modification, no further assessment is considered warranted.

4.3.3 Mitigation Measure, Management and Monitoring

MCC would consult with the owners of the dwelling on Therribri Road and would address any concerns raised in accordance with the complaints handling and response protocol.

4.4 OTHER ENVIRONMENTAL IMPACTS

Because of the reduction in use of buses relative to the approved MCCM, the Modification would result in additional use of private light vehicles to access the site relative to the approved MCC. This has the potential to give rise to additional scope 3 (indirect) greenhouse gas emissions associated with the MCCM. However, these emissions would be small compared with other scope 3 emissions (e.g. use of the product coal) and did not warrant specific inclusion in the Maules Creek Coal Project Air Quality Assessment (Pacific Environment Limited, 2011). These emissions would be mitigated by ongoing encouragement of bus transportation and car pooling.

5 CONCLUSIONS

The EA conclusions are as follows:

- The original EA included employee transport assumptions that were derived in a period of significant mining industry expansion across Australia, thus it was expected that the majority of the mine employees would travel to the area to work their rosters and reside in local temporary workers accommodation.
- In consideration of the employment conditions that were anticipated, 90% of operational and construction employees were assumed to use shuttle buses to get to the MCCM. This assumption was included as a specific Project Approval condition (Condition 63, Schedule 3).
- Since the Project Approval was granted, the mining industry has experienced substantial contraction and the majority of the MCCM workforce resides permanently in the local area which is consistent with Whitehaven's policy which is to maximise local employment. Long-term residency in local Workers Accommodation Facilities is not encouraged.
- In addition, the workforce includes many specialist contractors who require private transport to bring their own tools and equipment to site.
- The consequence of these points is that bus transport of 90% of employees is not practical for a predominantly locally residing workforce.
- Boggabri Coal Pty Limited has approval for new intersections directly off the Kamilaroi Highway. MCC has an option with Boggabri Coal Pty Limited to use these intersections to access the MCCM, once constructed.
- MCC has conducted a review of the bus use using data collected for the Modification in June 2015. From review of the patronage of the bus services, MCC has determined that some 65 to 84% of MCC's direct operations, maintenance and CHPP wages employees typically use this service when working a regular shift.
- The incremental change in MCCM traffic on the road network has been assessed by GTA Consultants (2016). GTA Consultants concluded that the additional traffic resulting from the reduction of bus use would not have a detrimental effect on the serviceability of the local road network, with the difference in conditions as perceived by motorists being negligible.
- GTA Consultants (2016) identifies that there remains some spare capacity on local roads (even with the Modification) relative to their Level of Service thresholds. For example, traffic on Rangari Road would need to increase by some 160% or 65 vehicles (in both directions) above the Modification traffic volumes during the afternoon peak hour for the westbound Level of Service to change from A to B.
- Consequently, Condition 63, Schedule 3 is proposed to be revised to state:

The Proponent shall ensure that a shuttle bus service is available to facilitate the transportation of construction and operational employees to site. MCC will target that 70% (averaged over a week) of the operations, maintenance and CHPP wages employees would utilise the bussing service.
- The Modification does not include any other changes to the existing/approved MCCM.

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APPENDIX A
ROAD TRANSPORT ASSESSMENT



Maules Creek Coal Mine Employee Transport Modification Road Transport Assessment

Client // Whitehaven Coal Mining Limited
Office // NSW
Reference // 15S9039000
Date // 14/04/16

Maules Creek Coal Mine

Employee Transport Modification

Road Transport Assessment

Issue: A 14/04/16

Client: Whitehaven Coal Mining Limited
Reference: 15S9039000
GTA Consultants Office: NSW

Quality Record

Issue	Date	Description	Prepared By	Checked By	Approved By	Signed
A	16/12/15	Final	Penny Dalton	Ken Hollyoak	Ken Hollyoak	Ken Hollyoak
B	14/04/16	Final	Penny Dalton	Ken Hollyoak	Ken Hollyoak	

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1. Introduction

This report has been prepared on behalf of Whitehaven Coal Mining Limited (Whitehaven) to present the findings of a review of the transport implications of a proposed modification to the Maules Creek Project Approval (10_0138). Condition 63, Schedule 3 of the Project Approval contains specific conditions regarding the use of a shuttle bus system to transport construction and operational workers to and from the site:

The Proponent shall ensure that construction and operational employees are predominantly transported to the site by shuttle bus, consistent with the assumptions used in the traffic study undertaken for the EA. Note: The EA assumed that 90% of construction employees and 90% of operational workers based on peak travel movements would be transported to site by shuttle bus from Boggabri township. However, the shuttle bus service could also operate from Gunnedah and Narrabri.

The Maules Creek Project is now moving into its operational phase, and the long term mine access road from Therribri Road has been commissioned. Bus usage was proposed in the original Environment Assessment (EA) to reduce the number of private vehicles accessing the site at the start and end of shifts. This had the effect of reducing the Project-only and cumulative construction and operational road movements. This was proposed in an environment of an extensive resources industry expansion, where it was anticipated that a large proportion of Project employees would be travelling into the area temporarily to work their roster, therefore, be amenable to bus transport (i.e. by living at temporary accommodation such as the Civeo Boggabri camp). Since Project commencement, there has been a contraction of the resources industry which has led to a higher proportion of employees residing in the area, including in rural localities, resulting in bus transport being less convenient for these employees. Notwithstanding that some 16 bus services are available, because of this increased proportion of residential-based employees, use of the shuttle bus service has not been as practicable as that anticipated by the original EA traffic assessment (Hyder Consulting, 2010). The Modification proposes amendment of Condition 63, Schedule 3, to reflect the existing road management practices on-site.

This study therefore assesses the actual usage of the shuttle bus services together with light vehicle usage, to consider the ongoing implications of the transport characteristics on the operation of the road network. The remainder of this report is set out as follows:

- Section 2 describes the Maules Creek Coal Mine, the traffic implications as anticipated by the original EA traffic assessment report, and the current operating conditions.
- Section 3 presents the results of a traffic survey and data collection program conducted at the Maules Creek Coal Mine during June 2015. Existing characteristics of the movement of the existing operational workforce and construction workforce are determined from that data, including mode of travel and the distribution of vehicle trips through the day and on the road network.
- Section 4 presents forecasts of traffic conditions in the vicinity of the Maules Creek Coal Mine assuming that the mode of transport used by the operational workforce is consistent with that assumed in the original EA traffic assessment.
- Section 5 presents forecasts of traffic conditions in the vicinity of the Maules Creek Coal Mine assuming that the mode of transport used by the operational workforce is consistent with that which has been achieved at the mine to date.
- Section 6 presents a brief summary of the study and its conclusions.

2. Maules Creek Coal Mine

2.1 Maules Creek Coal Mine Project Approval

The Maules Creek Coal Project is located approximately 20 kilometres (km) north-east of the town of Boggabri. Aston Coal 2 Pty Ltd lodged a Project Application to the NSW Department of Planning and Infrastructure for Maules Creek in August 2010, which was approved with conditions in October 2012 (Project Approval 10_0138). Maules Creek includes the development of surface infrastructure and open cut mining activities until the end of December 2034, with run-of-mine (ROM) coal production of up to 13 million tonnes per annum (Mtpa).

Maules Creek includes construction and operation of a rail spur, rail loop, associated load out facility and connection to the Werris Creek-Mungindi railway line.

A Traffic Management Plan (TMP) has been prepared for the Project, which sets out strategies for minimising and managing traffic generated by the Project.

2.2 Original Environmental Assessment Traffic Assessment

Hyder Consulting (2010) prepared a traffic and transport impact assessment as part of the Maules Creek EA (the original EA traffic assessment). That assessment made a number of assumptions regarding the operational characteristics of the Project as they apply to travel characteristics, including:

- peak workforce of 470 full time workers in 2020, including contractors, maintenance activities, deliveries, coal processing, coal transport and mining operations;
- maximum daytime workforce of 140 people;
- maximum night time workforce of 110 people;
- light vehicle occupancy 1 person per vehicle;
- shuttle bus occupancy 20 people per bus;
- two shifts per day 7.00am to 7.00pm and 7.00pm to 7.00am;
- mining operations 24 hours per day, 7 days per week;
- 90 percent of employees travel by shuttle bus;
- shuttle buses arrive carrying start-of-shift workers from Boggabri, then depart carrying end-of-shift workers back to Boggabri (it should be noted however that the Project Approval [Condition 62, Schedule 3] states that the buses may also be provided from Gunnedah and Narrabri); and
- Theribri Road would be used as the main site access road once construction of the Mine Access Road was completed.

The traffic generation of the Maules Creek Coal Project for the 470 operational workers in 2020 was assessed as:

- 6 shuttle buses arrive between 6.00am and 7.00am, and depart between 7.00am and 8.00am;
- 6 shuttle buses arrive between 6.00pm and 7.00pm, and depart between 7.00pm and 8.00pm;
- 14 light vehicles arrive between 6.00am and 7.00am and depart between 7.00pm and 8.00pm; and

- 11 light vehicles arrive between 6.00pm and 7.00pm and depart between 7.00am and 8.00am.

The original EA traffic assessment assumed 6 buses for each day and night shift.

The shuttle buses would access the Project via Kamilaroi Highway, Rangari Road, Therribri Road and the Mine Access Road (Figure 2-1). Operational workers travelling in light vehicles would access the Project as follows:

- 60 percent from Boggabri and the south via Kamilaroi Highway and Rangari Road;
- 30 percent from Narrabri and the north via Kamilaroi Highway and Rangari Road; and
- 10 percent via Barbers Lagoon Road and Rangari Road.

Table 2.1 summarises the two way traffic generation on an average weekday for Maules Creek, from the assessment undertaken by Hyder Consulting (2010) for the peak operational phase in 2020. The assessment assumed operational traffic arrived in the hour prior to the start of shift, and departed in the hour following the end of shift, i.e. all traffic is generated within four hours of the day. Some minor changes have been made to the volumes reported in Hyder Consulting (2010) due to rounding.

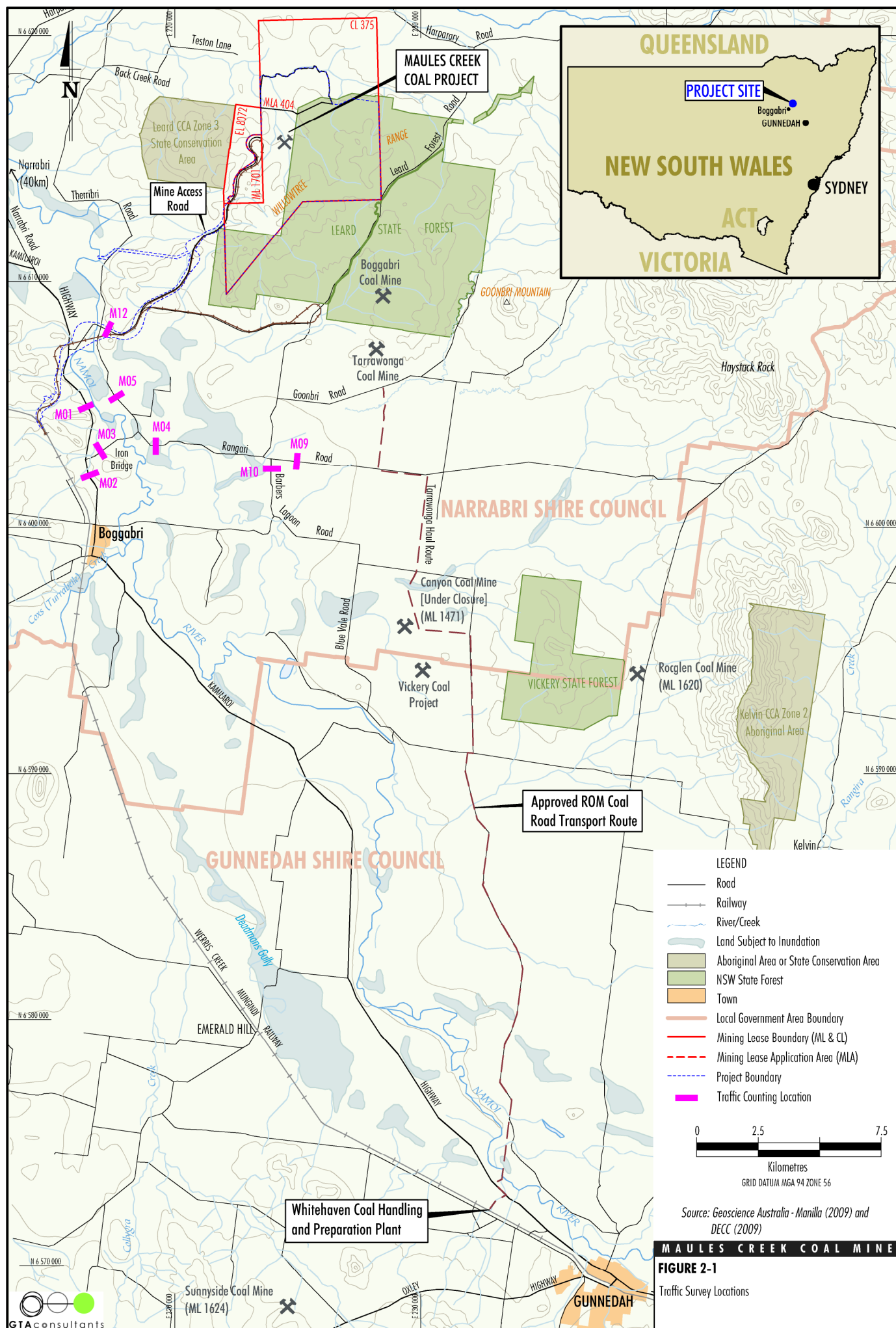
Table 2.1: Original EA Traffic Assessment Maules Creek Project Two Way Traffic Volumes in 2020

Site ^A	Road and Location	6.00am to 7.00am 7.00pm to 8.00pm (vehicles/hour)		7.00am to 8.00am 6.00pm to 7.00pm (vehicles/hour)		Daily (vehicles/day)	
		Light	Heavy	Light	Heavy	Light	Heavy
M01	Kamilaroi Highway north of Rangari Road	4	0	3	0	14	0
M02	Kamilaroi Highway south of Rangari Road	9	6	7	6	32	24
M03	Rangari Road east of Kamilaroi Highway	13	6	10	6	46	24
M04	Rangari Road east of Therribri Road	1	0	1	0	4	0
M05	Therribri Road north of Rangari Road	14	6	11	6	50	24
M09	Rangari Road east of Barbers Lagoon Road	0	0	0	0	0	0
M10	Barbers Lagoon Road south of Rangari Road	1	0	1	0	4	0
M12	Maules Creek Coal Mine Access Road, east of Therribri Road	14	6	11	6	50	24

^A Refer to Figure 2-1 for locations

Source: Hyder Consulting (2010) for workforce of 470 people, 6.00am-7.00am and 6.00pm-7.00pm traffic is inbound, 7.00am-8.00am and 7.00pm-8.00pm traffic is outbound

While Hyder (2010) indicates that the peak workforce of 470 people includes "contractors, maintenance activities, deliveries, coal processing, coal transport and mining operations," the assessment does not include specific allowance for these movements which would not necessarily occur at the shift changeover times.



2.3 Existing Operations

The Project has commenced its operational phase, including commissioning of the Mine Access Road from Therribri Road. Whitehaven currently employs 237 people (June 2015) and operates different shift times for various workers, as summarised in Table 2.2. In addition, contractors work varying hours at the site each day, typically during daylight hours. Some construction activity was also occurring at the site in June 2015, however this has since been completed.

Table 2.2: Maules Creek Coal Mine Operational Shift Times 2015

Position	Shift Start	Shift Finish	Workforce
Operators	7.00am 5.10pm	5.30pm 3.40am	135
Maintenance	7.00am 7.00pm	7.00pm 7.00am	39
CHPP	6.50am 6.50pm	7.10pm 7.10am	15
Staff (Monday to Friday only)	7.00am	5.00pm	48

Workers travel to and from the site by:

- Shuttle bus;
- Light vehicle as driver; and
- Light vehicle as passenger.

The shuttle buses operate to transport workers to and from Gunnedah, Narrabri and Boggabri. Information regarding the scheduled bus services has been provided and is summarised in Table 2.3.

Table 2.3: Scheduled Shuttle Bus Services

Location	Bus Capacity (seats)	Personnel	Depart	Return
Gunnedah	22	Operators	2.30am	4.30am
Narrabri	22	Operators	2.30am	4.30am
Narrabri	22	Operators	3.10am	4.10am
Gunnedah	12	Blast Crew	5.00am	5.30pm
Gunnedah	12	CHPP	5.30am	8.00am
Gunnedah	2 x 22	Operators	5.55am	8.10am
Narrabri	22	Operators	5.55am	8.10am
Gunnedah	12	Staff	6.00am	6.00pm
Gunnedah	12	Maintainers	6.00am	8.10am
Boggabri	12	Maintainers	6.15am	7.40am
Narrabri	22	Operators	6.20am	8.00am
Gunnedah	2 x 22	Operators	4.00pm	6.30pm
Narrabri	22	Operators	4.00pm	6.30pm
Narrabri	22	Operators	4.20pm	6.00pm
Gunnedah	12	Maintainers	6.00pm	8.00pm
Narrabri	12	Maintainers	6.15pm	7.40pm

3. Existing Traffic Conditions

3.1 Traffic Survey Program

To quantify the existing traffic conditions in the vicinity of Maules Creek Coal Mine, a program of surveys was undertaken during June 2015. The survey program included automatic tube counts at a number of locations which generally replicate those locations surveyed by Hyder Consulting (2010). The purpose of the survey programme was to assess the existing employee transport behaviour to provide data for the assessment of the impacts of the Modification on levels of service on key roads and intersections. Where relevant, the Hyder Consulting (2010) reference location name is given below (Figure 2-1). The surveys were conducted between Thursday 11 June 2015 and Wednesday 17 June 2015 (inclusive) (Appendix A).

1. Kamilaroi Highway north of Rangari Road (M01);
2. Kamilaroi Highway south of Rangari Road (M02);
3. Rangari Road east of Kamilaroi Highway (M03);
4. Rangari Road east of Therribri Road (M04);
5. Therribri Road north of Rangari Road (M05);
6. Rangari Road east of Barbers Lagoon Road (M09)
7. Barbers Lagoon Road south of Rangari Road (M10); and
8. Maules Creek Coal Mine Access Road east of Therribri Road (not included in Hyder (2010) surveys, referenced as M12 on Figure 2-1).

The vehicle turning movements at the intersection of Kamilaroi Highway and Rangari Road were surveyed during the afternoon of Wednesday 10 June 2015 and the morning of Thursday 11 June 2015. Turning movement volumes were recorded between 5.30am and 8.30am, and between 4.00pm and 7.00pm, and vehicles classified as light vehicles, heavy vehicles, or buses.

Additional data regarding the number of passengers on each bus was collected from all shuttle buses transporting Whitehaven employees to and from the site during the survey program period above. The number of people in each light vehicle was also recorded (including work vehicles used by specialist contractors because they contain tools/equipment required for on-site work), together with employer and shift information.

3.2 Kamilaroi Highway/Rangari Road Intersection Study

Condition 60, Schedule 3 of the Maules Creek Coal Mine Project Approval refers to the need to upgrade the intersection of Kamilaroi Highway and Rangari Road.

Since the Project Approval was granted, Boggabri Coal Mine has gained approval for a separate intersection directly off the highway to access their site. This would be used as a permanent operational access and would reduce vehicle turning movements at the intersection of Kamilaroi Highway and Rangari Road. Maules Creek Coal Mine has an optional agreement to use the new intersection to the Boggabri Coal Mine, once constructed and commissioned.

Because of these proposed changes, Whitehaven has commissioned a review of the operation and capacity of the intersection of Kamilaroi Highway and Rangari Road. This review was undertaken by Constructive Solutions in October 2015, and was provided to the Department of Planning and Environment in November 2015. This review found:

- The capacity of the right turn movement [from Kamilaroi Highway to Rangari Road] exceeds the current demand for turning vehicles;
- The usage will reduce by approximately half once Boggabri Coal utilise the existing access arrangements directly from the Kamilaroi Highway;
- Maules Creek traffic may also transfer [to] the Kamilaroi Highway Access in the future (further reducing use of the intersection); and
- Major future road works, e.g. replacement of the Iron Bridge and upgrade on Rangari Rd are being considered.

The findings of this study are planned to be reviewed in approximately 12 months from the completion of the Constructive Solutions report when the primary access arrangements for the mines is resolved, i.e. approximately by the end of 2016.

3.3 Surveyed Midblock Traffic Volumes

The results of the traffic surveys have been reviewed (Appendix A), and the key results are summarised in Table 3.1 for the average weekday conditions. The AM Peak volume is the highest number of vehicles in any hour between midnight and midday, and the PM Peak volume is the highest number of vehicles in any hour between midday and midnight.

Table 3.1: Surveyed Average Weekday Traffic Volumes June 2015

Site ^A	Road and Location	AM Peak		PM Peak		Daily
		Vehicles per Hour	Hour Start	Vehicles per Hour	Hour Start	Vehicles per Day
M01	Kamilaroi Highway north of Rangari Road	161	9.00am	174	2.00pm	2,200
M02	Kamilaroi Highway south of Rangari Road	186	6.00am	250	5.00pm	2,796
M03	Rangari Road east of Kamilaroi Highway	133	5.00am	132	5.00pm	957
M04	Rangari Road east of Therribri Road	100	5.00am	95	5.00pm	669
M05	Therribri Road north of Rangari Road	71	6.00am	48	5.00pm	446
M09	Rangari Road east of Barbers Lagoon Road	58	5.00am	61	5.00pm	385
M10	Barbers Lagoon Road south of Rangari Road	5	5.00am	8	5.00pm	67
M12	Maules Creek Coal Mine Access Road, east of Therribri Road	67	6.00am	46	5.00pm	395

^A Refer to Figure 2-1 for locations

Table 3.1 indicates that on the average weekday, the morning peak hour at most locations occurred between 5.00am and 7.00am, and the afternoon peak hour between 5.00pm and 6.00pm. The exception to these was Kamilaroi Highway north of Rangari Road, where the busiest hour in the morning occurred from 9.00am to 10.00am, and the busiest hour in the afternoon occurred between 2.00pm and 3.00pm.

At the time of the surveys, construction work was continuing at the Maules Creek Coal Mine and Boggabri Coal Mine, and roadworks were being undertaken on Therribri Road (now completed).

3.4 Intersection Turning Movements

The turning movements of vehicles were surveyed at the intersection of Kamilaroi Highway with Rangari Road over a morning and afternoon period in June 2015. The other key intersections serving the Maules Creek Coal Mine include Rangari Road and Therribri Road; Rangari Road and Barbers Lagoon Road; and Therribri Road and Maules Creek Coal Mine Access Road. Volumes at those intersections are below those at the surveyed intersection, thus it is expected that those intersections would have greater spare capacity than the surveyed intersection.

The busiest hour during the morning occurred between 5.30am and 6.30am, and the busiest hour during the evening occurred between 4.45pm and 5.45pm. Table 3.2 presents the peak hour volumes by direction from the surveys.

Table 3.2: Peak Hour Traffic Volumes by Direction 2015 (vehicles/hour)

	Northbound or Eastbound			Southbound or Westbound			Two Way		
	Light	Heavy	Bus	Light	Heavy	Bus	Light	Heavy	Bus
5.30am to 6.30am									
Kamilaroi Highway North of Rangari Road	35	19	0	37	7	1	72	26	1
Kamilaroi Highway South of Rangari Road	128	22	7	43	7	1	171	29	8
Rangari Road East of Kamilaroi Highway	125	3	8	38	0	1	163	3	9
4.45pm to 5.45pm									
Kamilaroi Highway North of Rangari Road	74	15	2	74	21	0	148	36	2
Kamilaroi Highway South of Rangari Road	91	18	0	138	25	5	229	23	5
Rangari Road East of Kamilaroi Highway	46	5	0	93	6	7	139	11	7

The survey results indicate that during the morning peak hour, the heaviest movement is the right turn from Kamilaroi Highway into Rangari Road. During the afternoon, the heaviest movements are the left turn from Rangari Road to Kamilaroi Highway and the southbound through movement along Kamilaroi Highway.

3.5 Maules Creek Coal Mine Traffic Generation

The number of vehicle trips generated by the Maules Creek Coal Mine over the surveyed week in June 2015 is summarised in Table 3.3. The surveys also provided data on the composition of traffic, which is included in the summarised results. Light vehicles include motorcycles, cars, vans, 4WDs, and utes (including those towing a trailer). Heavy vehicles include single unit trucks and buses with two to four axles and articulated vehicles such as semi-trailers, rigid trucks with trailers and B Doubles.

Table 3.3: Maules Creek Daily Traffic Generation June 2015

	Light Vehicles	Heavy Vehicles	Total Vehicles
Monday	252	114	366
Tuesday	353	102	455
Wednesday	326	62	388
Thursday	307	113	420
Friday	274	72	346
Saturday	105	37	142
Sunday	87	36	123
Weekday Average	302	93	395
Weekend Average	96	37	133
Daily Average	243	77	320

The June 2015 survey results (Appendix A) demonstrate that the number of vehicle trips generated by the Maules Creek Coal Mine is significantly different on weekdays compared with weekend days. On the average weekday, it generates 395 vehicle trips per day, while on the average weekend days, it generates 133 vehicle trips per day, i.e. approximately one third of the average weekday generation. These volumes include vehicles associated with construction activity which was underway at the time of the surveys, which is not typical of the expected traffic characteristics of the Maules Creek Coal Mine in the longer term.

The surveys show that the busiest hour of the day occurred between 6.00am and 7.00am, and the next busiest hour occurred between 5.00pm and 6.00pm (Table 3.4). These are the hours during which the Maules Creek Coal Mine would have its greatest impact on the surrounding road network. Approximately 17.2 percent and 11.6 percent of the total daily weekday traffic was generated during the morning and evening peak hours respectively.

Table 3.4: Average Weekday Traffic Generation of Maules Creek Coal Mine (vehicles/hour)

Hour Starting	Light Vehicles	Heavy Vehicles	Total Vehicles
12.00am	1	1	1
1.00am	1	0	1
2.00am	4	2	6
3.00am	4	5	8
4.00am	6	1	6
5.00am	29	2	31
6.00am	55	12	68
7.00am	21	8	29
8.00am	9	6	15
9.00am	11	7	18
10.00am	11	7	18
11.00am	10	5	15
12.00pm	17	7	23
1.00pm	13	6	19
2.00pm	11	5	15
3.00pm	14	3	17
4.00pm	19	6	26
5.00pm	40	6	46
6.00pm	15	1	16
7.00pm	9	0	9
8.00pm	2	0	2
9.00pm	2	1	3
10.00pm	1	0	1
11.00pm	1	1	3
Daily (vehicles/day)	302	93	395

3.6 Maules Creek Coal Mine Security Gate Surveys

Throughout the traffic survey period, additional data was collected at the Maules Creek Coal Mine gates by security staff. For each vehicle entering site, the type of vehicle, the number of people in the vehicle, and the employer was identified, as well as the origin of the trip. The time of departure of the vehicle was also recorded. Over the survey period, 1,294 vehicles were surveyed.

The operational workforce at Maules Creek Coal Mine is made up of a combination of Whitehaven employees and contractors. In consultation with Whitehaven, the security gate survey results for the operational workforce were extracted and analysed. Trips identified as being associated with construction activity (which included both buses and light vehicles), and operational visitors and deliveries were excluded.

Table 3.5 summarises the trips made by the current operational workforce at Maules Creek over the survey period. The results in Table 3.5 assume that all passengers on the Whitehaven shuttle buses are Whitehaven employees.

Table 3.5: Gate Survey Summary for Operational Workforce (10-18 June 2015)

Survey Day	Whitehaven Employees				Other Operational Employees	
	Shuttle Buses		Light Vehicles		Light Vehicles	
	Buses	Passengers ^B	Vehicles	Passengers ^C	Vehicles	Passengers ^C
Wednesday ^A	4	31	17	34	37	41
Thursday	16	80	75	122	58	75
Friday	18	77	64	104	61	79
Saturday	15	61	16	27	19	24
Sunday	15	58	19	31	10	13
Monday	19	77	61	94	62	73
Tuesday	20	98	75	115	46	55
Wednesday	19	85	57	87	49	72
Thursday	20	113	55	90	44	58
Total	146	680	439	704	386	490

^A part day only

^B Inbound trips only, excludes bus driver

^C Includes driver and passengers

The data indicates that over the week surveyed, of the total of 1,874 operational workers who travelled to and from the Maules Creek Coal Mine site (excluding shuttle bus drivers), 680 travelled by shuttle bus, and 1,194 travelled by light vehicle.

Over the survey period, the operational workforce arrivals were made up of 1,384 Whitehaven employees, and 490 other operational workers not directly employed by Whitehaven. Whitehaven employees thus make up 73.8 percent of the operational workforce. The remaining 26.2 percent are contractors. Whitehaven currently employs 237 people, thus there is estimated to be 84 contractors, with a total operational workforce of 321 people in 2015.

3.7 Whitehaven Shuttle Bus Routes

The gate survey collected data on the route used by each of the Whitehaven shuttle buses, the results of which are summarised in Table 3.6 for each general origin area of the route. Iron Bridge refers to the bridge over the Namoi River on Rangari Road east of Kamilaroi Highway, thus routes via Iron Bridge use Kamilaroi Highway – Rangari Road – Therribri Road.

Table 3.6: Whitehaven Shuttle Bus Routes Used (10-18 June 2015)

Origin and Route	Number of Buses	Percent of Buses
Boggabri via Iron Bridge	45	30.8
Gunnedah via Blue Vale Road	1	0.7
Gunnedah via Iron Bridge	76	52.1
Narrabri via Iron Bridge	24	16.4
Total	146	100.0

The majority of the Whitehaven shuttle buses thus approach and depart along Kamilaroi Highway south of Rangari Road to access either Boggabri or Gunnedah.

3.8 Operational Workforce Light Vehicle Routes

The gate survey also included data on the routes taken by those light vehicles driven by the operational workforce. The results of that component of the survey over the surveyed period are summarised in Table 3.7.

Table 3.7: Operational Workforce Light Vehicle Routes Used (10-18 June 2015)

Route	Number of Vehicles			Percent of Vehicles
	Whitehaven Employees	Other Operational Workers	Total Workforce	
Blue Vale Road/Braymont Road	18	39	57	6.9
Iron Bridge	392	336	728	88.7
- Kamilaroi Highway North	41	16	57	7.1
- Kamilaroi Highway South	343	316	659	81.6
- Kamilaroi Highway Not Specified	8	4	12	-
Rangari Road East	28	8	36	4.4
Unknown	1	3	4	-
Total	439	386	825	100.0

The results indicate that 88.7 percent of the operational workforce light vehicles use the Iron Bridge (Rangari Road west of Therribri Road) to access the site. The remaining 11.3 percent use Rangari Road east of Therribri Road, with 6.9 percent then using Braymont Road to the south and 4.4 percent continuing along Rangari Road to and from the east.

3.9 Whitehaven Shuttle Bus Time of Day Distribution

The gate survey also identified the time at which each vehicle arrived at and departed from the Maules Creek Coal Mine. Considering only the Whitehaven shuttle bus services, the spread of bus arrivals and departures have been determined throughout the average weekday. Due to the different characteristics of weekdays and weekend days, this distribution is for the weekdays only, being the busier days. The results are presented in Table 3.8.

Table 3.8: Whitehaven Shuttle Bus Weekday Arrivals and Departures (percent of daily)

Hour Starting	Inbound	Outbound	Hour Starting	Inbound	Outbound
12.00am	0.0	0.0	12.00pm	0.0	0.9
1.00am	0.0	0.0	1.00pm	0.9	2.8
2.00am	10.3	0.0	2.00pm	0.0	2.8
3.00am	5.2	15.7	3.00pm	0.0	0.9
4.00am	0.0	0.9	4.00pm	24.1	1.9
5.00am	3.4	0.0	5.00pm	0.0	29.6
6.00am	41.4	0.0	6.00pm	12.1	0.0
7.00am	0.9	29.6	7.00pm	0.0	13.0
8.00am	1.7	0.9	8.00pm	0.0	0.0
9.00am	0.0	0.0	9.00pm	0.0	0.0
10.00am	0.0	0.0	10.00pm	0.0	0.0
11.00am	0.0	0.9	11.00pm	0.0	0.0

Note: Whitehaven shuttle buses only

The busiest hour for shuttle bus arrivals occurs between 6.00am and 7.00am when 41.4 percent of daily arrivals occur, and the busiest hour for bus departures occurs between 7.00am and 8.00am, and also 5.00pm and 6.00pm, when 29.6 percent of daily departures occur.

3.10 Light Vehicle Time of Day Distribution

The gate survey identified the time at which each light vehicle arrived at and departed from the Maules Creek Coal Mine. Considering only the operational workforce light vehicle trips, the spread of vehicle arrivals and departures have been determined throughout the average weekday. Due to the different characteristics of weekdays and weekend days, this distribution is for the weekdays only, being the busier days. The results are presented in Table 3.9, noting that not all outbound departure times were recorded. The results are based on those vehicles for which a departure time was recorded.

Table 3.9: Weekday Light Vehicle Arrivals and Departures (percent of daily)

Hour Starting	Inbound	Outbound	Hour Starting	Inbound	Outbound
12.00am	0.1	0.6	12.00pm	4.2	7.9
1.00am	0.5	0.6	1.00pm	2.0	7.0
2.00am	3.0	0.6	2.00pm	1.7	5.2
3.00am	1.2	2.0	3.00pm	1.6	9.0
4.00am	3.6	0.6	4.00pm	3.3	10.9
5.00am	13.7	1.6	5.00pm	1.3	22.7
6.00am	31.2	1.5	6.00pm	4.1	5.2
7.00am	6.3	3.5	7.00pm	0.5	3.8
8.00am	4.3	2.5	8.00pm	0.3	0.4
9.00am	7.0	2.0	9.00pm	1.1	1.0
10.00am	5.0	4.7	10.00pm	0.3	0.4
11.00am	3.6	5.2	11.00pm	0.3	0.9

Note: Operational workforce traffic only

The busiest hour for arrivals of the light vehicles occurs between 6.00am and 7.00am, when 31.2 percent of daily arrivals and 1.5 percent of daily departures occur, and the busiest hour for departures of the operational workforce occurs between 5.00pm and 6.00pm when 22.7 percent of daily departures and 1.3 percent of daily arrivals occur.

3.11 Existing Operational Workforce Traffic

The surveys have established the following key characteristics of the existing traffic conditions relating to the operational workforce at the Maules Creek Coal Mine:

Operational Workforce

- 237 Whitehaven employees and 84 contractors.

Vehicle Occupancy

- average occupancy of laden shuttle buses is approximately 6 passengers per bus
- average occupancy of light vehicles (Whitehaven employees) is 1.60 people per vehicle
- average occupancy of light vehicles (operational contractors) is 1.27 people per vehicle
- 22 percent of inbound shuttle buses are unladen (i.e. enroute to pick-up departing employees).

Spatial Distribution

- 83 percent of shuttle buses travel to and from Kamilaroi Highway south of Rangari Road, and 16 percent travel to and from Kamilaroi Highway north of Rangari Road.
- 82 percent of light vehicles travel to and from Kamilaroi Highway south of Rangari Road, 7 percent travel to and from Kamilaroi Highway north of Rangari Road, 4 percent travel to and from Rangari Road east of Barbers Lagoon Road, and 7 percent travel to and from Barbers Lagoon Road/Blue Vale Road.

Temporal Distribution

- Between 6.00am and 7.00am, 41.1 percent of daily shuttle bus arrivals occur, 31.4 percent of the operational workforce arrive, and 1.5 percent of the operational workforce depart.
- Between 5.00pm and 6.00pm, 29.6 percent of daily shuttle bus departures occur, 1.3 percent of the operational workforce arrive and 22.8 percent of the operational workforce depart.

The existing operational workforce traffic generated by the Maules Creek Coal Mine can therefore be determined as shown in Table 3.10. Whitehaven has further reviewed the travel survey data to identify the travel patterns of their direct operations, maintenance and CHPP wages employees, being the subset of the overall workforce for whom the shuttle bus services are intended. That data is presented for information in Table 3.10, and relates to the average day travel by those workers only.

Table 3.10: Operational Workforce Existing Traffic Generation

	Light Vehicles	Shuttle Buses
Total Workforce (people)	321	
People by Mode	205	117
Average day direct operations, maintenance and CHPP wages employees	99	
Average weekday direct operations, maintenance and CHPP wages employees by Mode	24	76
Vehicle Occupancy (people per vehicle)	120 Whitehaven employees 84 contractors	6 (laden)
Number of Vehicles	1.60 Whitehaven employees 1.27 contractors	20 (laden) 5 (unladen)
Daily Inbound Vehicles	142	25
Daily Outbound Vehicles	142	25
AM Peak Inbound Vehicles per Hour	45	10
AM Peak Outbound Vehicles per Hour	3	0
PM Peak Inbound Vehicles per Hour	2	0
PM Peak Outbound Vehicles per Hour	33	7

The distribution of the operational workforce traffic on the surrounding road network is presented in Table 3.11.

Table 3.11: Operational Workforce Traffic Distribution 2015

Site ^A	Road and Location	Light Vehicles			Shuttle Buses		
		AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily
M01	Kamilaroi Highway north of Rangari Road	3	2	20	2	1	8
M02	Kamilaroi Highway south of Rangari Road	40	29	232	8	6	42
M03	Rangari Road east of Kamilaroi Highway	43	31	252	10	7	50
M04	Rangari Road east of Theribri Road	5	4	32	0	0	0
M05	Theribri Road north of Rangari Road	48	35	284	10	7	50
M09	Rangari Road east of Barbers Lagoon Road	3	2	12	0	0	0
M10	Barbers Lagoon Road south of Rangari Road	2	2	20	0	0	0
M12	Maules Creek Coal Mine Access Road, east of Theribri Road	48	35	284	10	7	50

^A Refer to Figure 2-1 for locations

AM Peak = 6.00am to 7.00am (vehicles/hour), PM Peak = 5.00pm to 6.00pm (vehicles/hour), Daily = vehicles/day

3.12 Existing Construction Traffic

The difference between the total traffic surveyed on the Maules Creek Coal Mine Access Road and that identified as being generated by the operational workforce is associated with ongoing construction activity on the site (Table 3.12).

Table 3.12: Construction Traffic Generation June 2015

	6.00am to 7.00am		5.00pm to 6.00pm		Daily	
	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
Light Vehicles						
Surveyed	50	5	3	36	151	151
Operational Workforce	45	3	2	33	142	142
Construction	5	2	1	3	9	9
Heavy Vehicles						
Surveyed	12	0	0	6	48	45
Operational Workforce	10	0	0	7	25	25
Construction	2	0	0	0	23	20

As noted in Table 3.12, the calculated number of outbound shuttle buses generated by the operational workforce during the evening peak hour (7 vehicles) exceeded the actual number of outbound heavy vehicles surveyed (6 vehicles) by one vehicle. The calculated distribution of outbound vehicles is based on the results of the gate survey records, in which not all vehicle departure times were recorded. This minor difference would have no material impact on the outcomes of this study, and the contribution of construction activity during the evening peak hour is negligible.

The gate surveys also provide information on the generation and distribution of traffic associated with construction workers at the Maules Creek Coal Mine. Construction workers were transported by both light vehicles and buses, which were operated by contract companies rather than Whitehaven (Table 3.13).

Table 3.13: Construction Workforce Travel Routes Used (10-18 June 2015)

Route	Light Vehicles		Buses	
	Vehicles	Percent	Vehicles	Percent
Blue Vale Road/Braymont Road	3	1.5%	-	-
Iron Bridge	194	97.0%	22	100%
- Kamilaroi Highway North	25	12.6%	11	50%
- Kamilaroi Highway South	167	84.4%	11	50%
- Kamilaroi Highway Not Specified	2	-	-	-
Rangari Road East	3	1.5%	-	-
Total	200	100%	22	100%

The distribution of construction traffic thus varies somewhat from that of the operational workforce, which is likely due to the temporary nature of the work which influences the residential locations of the workers. The resulting spread of the construction traffic on the surrounding road network is presented in Table 3.14, which applies the light vehicle distribution to light vehicles and the shuttle bus distribution to heavy vehicles.

Table 3.14: Existing Construction Traffic Distribution

Site ^A	Road and Location	Light Vehicles			Buses/Heavy Vehicles		
		AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily
M01	Kamilaroi Highway north of Rangari Road	1	0	2	1	0	21
M02	Kamilaroi Highway south of Rangari Road	7	4	16	1	0	22
M03	Rangari Road east of Kamilaroi Highway	7	4	18	2	0	43
M04	Rangari Road east of Therribri Road	0	0	0	0	0	0
M05	Therribri Road north of Rangari Road	7	4	18	2	0	43
M09	Rangari Road east of Barbers Lagoon Road	0	0	0	0	0	0
M10	Barbers Lagoon Road south of Rangari Road	0	0	0	0	0	0
M12	Maules Creek Coal Mine Access Road, east of Therribri Road	7	4	18	2	0	43

^A Refer to Figure 2-1 for locations

AM Peak = 6.00am to 7.00am (vehicles/hour), PM Peak = 5.00pm to 6.00pm (vehicles/hour), Daily = vehicles/day

3.13 School Buses

School buses operate on several of the roads which are used by vehicles travelling to and from the Maules Creek Mine, primarily along Kamilaroi Highway.

Hopes Bus Service runs the Willala Bus Service which starts and ends in Gunnedah and travels to Willala. The morning service operates between 6.10am and 9.00am, and the afternoon service operates between 2.55pm and 5.45pm.

Two school bus services are operated by GJ & SJ Haire Warragrah Bus Service. The Boggabri Primary School Service starts and ends in Boggabri and operates between 7.20am and 9.05am, and between 2.50pm and 4.45pm. The Boggabri to Gunnedah High School service operates from Boggabri starting at 7.40am and ending in Gunnedah at 8.35am. In the afternoon, it starts in Gunnedah at 3.15pm and ends at Boggabri at 4.15pm.

The Blue Vale School Bus Service operates a school bus service along Blue Vale Road.

The MW & JA Roy Bus Service operates the Wallah Road Bus Service, which starts at Narrabri and operates to Harparary Road, Maules Creek Road, Browns Lane, Old Gunnedah Road and then returns to Narrabri. It also operates the Davis Nursery to Narrabri School Bus Service, which starts at Narrabri, and operates along Leard Forest Road, Black Mountain Creek Road, Old Gunnedah Road and returns to Narrabri.

To manage the potential for interaction between school bus operations and mine-related traffic, the Maules Creek Coal Mine TMP indicates that management will continue to liaise with the local school bus operators to assist in:

- identifying bus routes and operating times, as well as pick up and drop off points for school children, to allow truck consignors to actively avoid those times where practical and to advise contractors (including shuttle bus drivers) on the safe driving practices required as part of the Maules Creek Coal Mine operations;

- include a review of school bus pick up and drop off times along the main access routes in close proximity to the mine when developing shift change over times at Maules Creek Coal Mine; and
- establishing mutual understanding and courtesies to minimise potential conflicts between the bus and mine operations.

Shift changes over times are typically timed to avoid the main operating times for the school buses. Morning bus services generally operating later than the times at which the majority of Maules Creek Coal Mine workers would be travelling on the road network. Afternoon school buses typically operate earlier than the times at which the majority of Maules Creek Coal Mine workers would be travelling.

Some of the school bus routes vary times, routes and services in response to the changing student population, which is acknowledged in the TMP, with management undertaking to consult with the bus services operators on a regular basis.

4. Traffic Conditions – Approved Shuttle Bus

This section describes the expected traffic conditions with the operational workforce travelling as set out in the Project Approval for the Maules Creek Coal Mine, i.e. with 90 percent of the operational workforce using shuttle buses to travel to and from the site.

4.1 Change in Shift Times

After the traffic surveys were completed in June 2015, a new 12-hour shift was introduced, which would continue into the future. The change in the shift arrangements is as set out in Table 4.1.

Table 4.1: Changes to Maules Creek Coal Mine Operational Shift Times Since Traffic Surveys

Position	June 2015			Current		
	Shift Start	Shift Finish	Workforce	Shift Start	Shift Finish	Workforce
Operators	7.00am 5.10pm	5.30pm 3.40am	135	7.00am 5.10pm	5.30pm 3.40am	90
Operators 12 hour Shift	-	-	-	7.00am 7.00pm	7.30pm 7.00am	45
Maintenance	7.00am 7.00pm	7.00pm 7.00am	39	7.00am 7.00pm	7.00pm 7.00am	39
CHPP	6.50am 6.50pm	7.10pm 7.10am	15	6.50am 6.50pm	7.10pm 7.10am	15
Staff (Monday to Friday only)	7.00am	5.00pm	48	7.00am	5.00pm	48

The change in shift times would impact the profile of the distribution of workers arriving prior to their shift and departing after their shift. Based on the times in Table 4.1, and assuming workers typically arrive during the half hour prior to the shift start and leave within half an hour of the end of their shift, the theoretical effect of the new shift on travel during the busiest hours can be observed to be as below. This assumes that the quoted workforce in Table 4.1 is evenly split between the two shifts, with rounding up of the resulting number of daytime shift workers and rounding down of the resulting night shift workers.

Table 4.2: Theoretical Workforce Travelling Times Based on Shift Change Times

	June 2015 Shifts Workforce			Current Shifts Workforce		
	Inbound	Outbound	Total	Inbound	Outbound	Total
Morning						
6.20am to 6.50am	8		8	8		8
6.30am to 7.00am	68+20+48		136	45+23+20+48		136
7.00am to 7.30am		19	19		22+19	41
7.10am to 7.40am		7	7		7	7
<i>Total Morning</i>	144	26	170	144	48	192
Early Evening						
4.40pm to 5.10pm	67		67	45		45
5.00pm to 5.30pm		48	48		48	48
5.30pm to 6.00pm		68	68		45	45
<i>Total Evening</i>	67	116	183	45	93	138

The comparison suggests that the change in shift times would have increased outbound travel by 22 workers during the busiest period in the morning, and decreased inbound travel by 22 workers

and outbound travel by 23 workers (total 45 workers) during the busiest period in the evening. This represents an increase of 6.9 percent of the total workforce of 321 employees and contractors travelling in the morning period, and a decrease of 7.1 percent of the total workforce travelling in the evening period.

As a robust review of future conditions, the assessment which follows assumes that the temporal distribution of the workforce would be as surveyed in 2015, with an additional 6.9 percent of the workforce travelling outbound during the busiest one hour in the morning, and no change in the proportion of the workforce travelling during the busiest one hour in the evening. In reality, the spread of arrivals and departures is more evenly distributed than would be suggested by the theoretical profile, thus this assumption is considered to overestimate the future conditions with regard to the number of workers travelling in the busiest hours.

4.2 Approved Operational Workforce Trip Generation

The Project Approval for the Maules Creek Coal Mine assumes that 90 percent of the operational workforce would travel by shuttle bus, and 10 percent by light vehicle. The traffic generated by the current and future operational workforce under the Project approval has been assessed on this basis, in order to determine what impact the Modification would have on the operation of the road network.

The operational workforce at the Maules Creek Coal Mine is forecast to be 470 full time workers in 2020. To best estimate future conditions as approved, it is assumed that the spatial and temporal distribution of movements to and from the site each day would remain the same as the observed operational conditions in 2015, with the adjustment described in Section 4.1 to account for the change in shift times.

The assessment which follows assumes that all of the workforce would be present each weekday, while in reality, a proportion would not be present due to rostering, illness or leave.

4.2.1 Light Vehicle Trip Generation

Table 4.3 presents the estimated light vehicle trips generated by the existing and future operational workforce assuming that 10 percent of the operational workforce travel by light vehicle in accordance with the consent condition.

Table 4.3: Operational Workforce Light Vehicle Travel at Approved Shuttle Bus Usage

Average Weekday	Year 2015	Year 2020
Operational Workforce (people)	321	470
10% by Light Vehicle (people)	33	47
Light Vehicles	23	33
Daily Inbound Vehicles	23	33
Daily Outbound Vehicles	23	33
AM Peak Inbound Vehicles	8	11
AM Peak Outbound Vehicles	1	3
PM Peak Inbound Vehicles	1	1
PM Peak Outbound Vehicles	6	8

4.2.2 Shuttle Bus Trip Generation

The number of shuttle buses would not necessarily change in direct proportion to the change in workforce or passengers, as each bus is not currently operating at capacity (Table 4.4). As

noted, excluding empty buses (with the driver only) the average number of passengers on each inbound bus over the period of the gate surveys was approximately six people per bus. The buses have a capacity of either 12 or 22 people, and it is considered that additional services would be provided once a bus reached around 80 percent of capacity. For the purpose of this assessment, it is conservatively assumed that buses would carry an average of 10 passengers. From the gate survey results, for every approximately four laden buses arriving at the site, there was one unladen bus arriving.

Table 4.4: Operational Workforce Shuttle Bus Travel at Approved Shuttle Bus Usage

Average Weekday	Year 2015	Year 2020
Workforce (people)	321	470
90% by Shuttle Bus (people)	289	423
10 People per Bus (vehicles)	29	43
Unladen Buses (vehicles)	9	13
Daily Inbound Vehicles	38	56
Daily Outbound Vehicles	38	56
AM Peak Inbound Vehicles	16	24
AM Peak Outbound Vehicles	0	4
PM Peak Inbound Vehicles	0	0
PM Peak Outbound Vehicles	12	17

4.3 Approved Operational Workforce Trip Distribution

4.3.1 Light Vehicle Trip Distribution

The distribution of shuttle buses on the surrounding road network is assumed to be similar to that surveyed in 2015 for the operational workforce (Table 3.7). The resulting vehicle trips on the road network are summarised in Table 4.5 for the 2015 and 2020 workforce levels, assuming that 10 percent of the operational workforce travel by shuttle bus.

Table 4.5: Operational Workforce Light Vehicle Distribution with Approved Shuttle Bus Usage

Site ^A	Road and Location	2015 Workforce			2020 Workforce		
		AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily
M01	Kamilaroi Highway north of Rangari Road	1	1	4	1	1	4
M02	Kamilaroi Highway south of Rangari Road	8	6	38	12	7	54
M03	Rangari Road east of Kamilaroi Highway	8	6	40	13	8	58
M04	Rangari Road east of Therribri Road	1	1	6	1	1	8
M05	Therribri Road north of Rangari Road	9	7	46	14	9	66
M09	Rangari Road east of Barbers Lagoon Road	0	0	2	0	0	4
M10	Barbers Lagoon Road south of Rangari Road	1	0	4	1	1	4
M12	Maules Creek Coal Mine Access Road, east of Therribri Road	9	7	46	14	9	66

^A Refer to Figure 2-1 for locations

AM Peak = 6.00am to 7.00am (vehicles/hour), PM Peak = 5.00pm to 6.00pm (vehicles/hour), Daily = vehicles/day

4.3.2 Operational Workforce Shuttle Bus Trip Distribution

The distribution of shuttle buses on the surrounding road network is assumed to be similar to that surveyed in 2015 for the operational workforce (Table 3.6). The resulting vehicle trips on the road network are summarised in Table 4.6 for the 2015 and 2020 workforce levels, assuming that 90 percent of the operational workforce travel by shuttle bus.

Table 4.6: Operational Workforce Shuttle Bus Distribution with Approved Shuttle Bus Usage

Site ^A	Road and Location	2015 Workforce			2020 Workforce		
		AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily
M01	Kamilaroi Highway north of Rangari Road	3	2	12	5	3	18
M02	Kamilaroi Highway south of Rangari Road	13	10	62	23	14	92
M03	Rangari Road east of Kamilaroi Highway	16	12	76	28	17	110
M04	Rangari Road east of Therribri Road	0	0	0	0	0	2
M05	Therribri Road north of Rangari Road	16	12	76	28	17	112
M09	Rangari Road east of Barbers Lagoon Road	0	0	0	0	0	0
M10	Barbers Lagoon Road south of Rangari Road	0	0	0	0	0	2
M12	Maules Creek Coal Mine Access Road, east of Therribri Road	16	12	76	28	17	112

^A Refer to Figure 2-1 for locations

AM Peak = 6.00am to 7.00am (vehicles/hour), PM Peak = 5.00pm to 6.00pm (vehicles/hour), Daily = vehicles/day

4.3.3 Total Operational Workforce Traffic

Table 4.7 presents the total vehicle trips generated by the operational workforce at the Maules Creek Coal Mine for the 2015 and 2020 workforce levels, assuming that 10 percent of the operational workforce travel by light vehicle and 90 percent travel by shuttle bus.

Table 4.7: Operational Workforce Total Vehicle Trips with Approved Shuttle Bus Usage

Site ^A	Road and Location	2015 Workforce			2020 Workforce		
		AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily
M01	Kamilaroi Highway north of Rangari Road	4	3	16	6	4	22
M02	Kamilaroi Highway south of Rangari Road	21	16	100	35	21	146
M03	Rangari Road east of Kamilaroi Highway	24	18	116	41	25	168
M04	Rangari Road east of Therribri Road	1	1	6	1	1	10
M05	Therribri Road north of Rangari Road	25	19	122	42	26	178
M09	Rangari Road east of Barbers Lagoon Road	0	0	2	0	0	4
M10	Barbers Lagoon Road south of Rangari Road	1	0	4	1	1	6
M12	Maules Creek Coal Mine Access Road, east of Therribri Road	25	19	122	42	26	178

^A Refer to Figure 2-1 for locations

AM Peak = 6.00am to 7.00am (vehicles/hour), PM Peak = 5.00pm to 6.00pm (vehicles/hour), Daily = vehicles/day

4.4 Maules Creek Construction Traffic

The construction traffic generated by the Maules Creek Coal Mine during the traffic surveys in 2015 would be expected to have ceased by 2020. This would result in a decrease in traffic by the volumes indicated in Table 3.14.

4.5 Boggabri Coal Mine

The Boggabri Coal Mine is located approximately 15 km north-east of the town of Boggabri, and to the south of the Maules Creek Coal Mine. The traffic impact assessment for the Boggabri EA (Parsons Brinckerhoff, 2010) estimated that the maximum production would occur in Year 5 with approximately 500 full time operational employees, which would coincide with a construction workforce of 150 workers. It is understood that construction is now effectively complete.

Boggabri Coal Pty Limited has advised that at the time of the traffic surveys in June 2015, mining operations at Boggabri Coal Mine employed approximately 518 people. In addition, construction activity employed approximately 25 people. On weekdays, operational activity shifts currently employ some 307 people on site each day.

In 2020, it is expected that the construction activity at Boggabri would have ceased, and thus the traffic generated by those 25 construction workers would no longer occur.

Parsons Brinckerhoff (2010) indicates that construction staff would generate 1.8 trips per day, with 0.83 vehicles per staff member. On this basis, the 25 construction workers would generate 38 vehicle trips per day. The majority of construction employees would work the 7.00am to 7.00pm shift, thus the busiest hours for traffic generation would occur from 6.00am to 7.00am, and from 7.00pm to 8.00pm. The morning peak hour thus coincides with the peak hour associated with the Maules Creek Coal Mine traffic, when the 25 construction workers would arrive, generating 19 vehicle trips on the road network.

Boggabri has its vehicular access off Leard Forest Road, and north of Rangari Road. Parsons Brinckerhoff estimated the distribution of the construction traffic as follows:

- 20 percent to/from Kamilaroi Highway north of Rangari Road;
- 50 percent to/from Kamilaroi Highway south of Rangari Road;
- 20 percent to/from Rangari Road east of Leard Forest Road; and
- 10 percent to/from Goonbri Road east of Leard Forest Road.

On this basis, the contribution of the 25 construction workers to traffic at the surveyed locations relevant to the Maules Creek Coal Mine assessment is summarised in Table 4.8. It is expected that the construction workers would no longer be accessing the Boggabri Coal Mine in 2020.

It is also noted that Idemitsu (proponents of Boggabri Coal Mine) is also proposing a new access road directly off the Kamilaroi Highway to its current access road, which may serve to mitigate impacts on the local road network (Hansen Bailey, 2013). In accordance with Boggabri Coal Mine's Condition 59, Schedule 3 of Project Approval 09_0182), the intersections are to be constructed to the requirements of RMS.

Table 4.8: Boggabri Coal Mine Construction Traffic

Site ^A	Road and Location	Year 2015			Year 2020		
		AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily
M01	Kamilaroi Highway north of Rangari Road	2	0	8	0	0	0
M02	Kamilaroi Highway south of Rangari Road	5	0	18	0	0	0
M03	Rangari Road east of Kamilaroi Highway	7	0	26	0	0	0
M04	Rangari Road east of Therribri Road	7	0	26	0	0	0
M05	Therribri Road north of Rangari Road	0	0	0	0	0	0
M09	Rangari Road east of Barbers Lagoon Road	2	0	8	0	0	0
M10	Barbers Lagoon Road south of Rangari Road	0	0	0	0	0	0
M12	Maules Creek Coal Mine Access Road, east of Therribri Road	0	0	0	0	0	0

^A Refer to Figure 2-1 for locations

AM Peak = 6.00am to 7.00am (vehicles/hour), PM Peak = 5.00pm to 6.00pm (vehicles/hour), Daily = vehicles/day

Similarly, the contribution of the current workforce to the traffic volumes on the surrounding roads can be estimated using the travel characteristics presented by Parsons Brinckerhoff (2010) and the current workforce. On a typical weekday, 307 operational workers attend the site, which would generate 256 vehicle trips per day. For the purpose of this assessment, no change to the operational workforce at the Boggabri Coal Mine is expected between 2015 and 2020 (Table 4.9).

It is further assumed that by 2020, the alternative access for the Boggabri Coal Mine directly from Kamilaroi Highway would have been completed and commissioned, such that a significant proportion of the traffic travelling to and from the Boggabri Coal Mine would enter and exit directly to and from the Kamilaroi Highway. Based on the distribution of Boggabri Coal Mine operational traffic estimated by Parsons Brinckerhoff, 70 percent would use the new access directly to and from Kamilaroi Highway. Assuming that the existing Leard Forest Road access remains open, 30 percent would continue to use the Leard Forest Road access as they would be approaching and departing to and from the east.

Table 4.9 presents the resulting distribution of the operational Boggabri Coal Mine traffic on the surrounding road network during 2015 and 2020.

Table 4.9: Boggabri Coal Mine Operational Traffic

Site ^A	Road and Location	Year 2015			Year 2020		
		AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily
M01	Kamilaroi Highway north of Rangari Road	10	11	52	25	27	128
M02	Kamilaroi Highway south of Rangari Road	25	27	128	25	27	128
M03	Rangari Road east of Kamilaroi Highway	34	38	180	0	0	0
M04	Rangari Road east of Therribri Road	34	38	180	0	0	0
M05	Therribri Road north of Rangari Road	0	0	0	0	0	0
M09	Rangari Road east of Barbers Lagoon Road	10	11	52	10	11	52
M10	Barbers Lagoon Road south of Rangari Road	0	0	0	0	0	0
M12	Maules Creek Coal Mine Access Road, east of Therribri Road	0	0	0	0	0	0

^A Refer to Figure 2-1 for locations

AM Peak = 6.00am to 7.00am (vehicles/hour), PM Peak = 5.00pm to 6.00pm (vehicles/hour), Daily = vehicles/day

4.6 Tarrawonga Coal Mine

The Tarrawonga Coal Mine (TCM) is an existing coal mine operated by Whitehaven, located approximately 10 km south east of the Maules Creek Coal Mine. The Tarrawonga Coal Project, a brownfields expansion of Tarrawonga, was approved in 2012. Halcrow (2011) described that the majority of TCM-generated traffic would use the mine's haul road and Blue Vale Road, with only a relatively small number of movements on Rangari Road related to Tarrawonga.

Halcrow (2011) described that employment would increase from 86 to 120 personnel due to the expansion project. However, Tarrawonga Coal Pty Limited (2014) describes the current employment levels at around 96. Notwithstanding the potential for slightly more employment at Tarrawonga (i.e. relative to the Tarrawonga Coal Project employment projections), it is considered that the June 2015 traffic surveys would include traffic relevant to Tarrawonga and therefore, the Tarrawonga Coal Mine is not considered further in this report.

4.7 Background Growth

Traffic growth may be expected to occur which is not directly related to any specific major project in the region. Hyder Consulting (2010) examined changes in traffic volumes on Kamilaroi Highway and Rangari Road, and applied a 2.1 percent per annum growth rate on the Kamilaroi Highway, and a 0.8 percent per annum growth rate for Rangari Road, Therribri Road and Barbers Lagoon Road.

For the purpose of this assessment, these same growth rates have been applied to forecast increases in background traffic on these roads (Table 4.10). The growth has been applied to the surveyed traffic volumes excluding that traffic which is directly associated with the Maules Creek or Boggabri Mines at the time of the traffic surveys.

Table 4.10: Daily Background Traffic 2015 and 2020 (vehicles/day)

Site ^A	Road and Location	Surveyed	Maules Creek	Boggabri	Non-Mine	Growth to 2020
M01	Kamilaroi Highway north of Rangari Road	2,200	51	60	2,089	219
M02	Kamilaroi Highway south of Rangari Road	2,796	312	148	2,336	245
M03	Rangari Road east of Kamilaroi Highway	957	363	206	388	16
M04	Rangari Road east of Therribri Road	669	32	206	431	17
M05	Therribri Road north of Rangari Road	446	395	0	51	2
M09	Rangari Road east of Barbers Lagoon Road	385	12	60	313	13
M10	Barbers Lagoon Road south of Rangari Road	67	20	0	47	2
M12	Maules Creek Coal Mine Access Road, east of Therribri Road	395	395	0	0	0

^A Refer to Figure 2-1 for locations

4.8 Future Traffic Volumes

Table 4.11 presents the forecasts of traffic volumes on the surrounding road system, assuming that 90 percent of the Maules Creek operational workforce travel by shuttle bus and 10 percent travel by light vehicle in accordance with the consent condition's reference to the EA traffic assessment.

Table 4.11: Traffic Volumes at Approved Shuttle Bus Usage 2015 and 2020

Site ^A	Road and Location	Year 2015			Year 2020		
		AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily
M01	Kamilaroi Highway north of Rangari Road	99	156	2,188	121	188	2,459
M02	Kamilaroi Highway south of Rangari Road	159	231	2,622	170	251	2,857
M03	Rangari Road east of Kamilaroi Highway	82	112	771	51	79	572
M04	Rangari Road east of Therribri Road	64	92	643	23	56	458
M05	Therribri Road north of Rangari Road	38	25	234	46	28	231
M09	Rangari Road east of Barbers Lagoon Road	40	59	375	38	61	382
M10	Barbers Lagoon Road south of Rangari Road	3	6	51	2	7	54
M12	Maules Creek Coal Mine Access Road, east of Therribri Road	35	23	183	42	26	178

^A Refer to Figure 2-1 for locations

AM Peak = 6.00am to 7.00am (vehicles/hour), PM Peak = 5.00pm to 6.00pm (vehicles/hour), Daily = vehicles/day

4.9 Midblock Operating Conditions

The Austroads (2013) *Guide to Traffic Management Part 3: Traffic Studies and Analysis* provides guidelines for the capacity and Levels of Service (LOS) 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 describes 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 are roads 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 roads serving the Maules Creek Coal Mine 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 4.12.

Table 4.12: Level of Service Criteria for Class II Two Lane Roads

Level of Service	Percent-Time-Spent-Following (PTSF)
A	≤ 40
B	> 40-55
C	> 55-70
D	> 70-85
E	≥ 85

The forecast peak hour volumes have been assessed and the PTSF and Levels of Service results are presented in Table 4.13.

Table 4.13: Midblock Levels of Service at Approved Shuttle Bus Usage 2015 and 2020

Site ^A	Location	Year	North or Eastbound				South or Westbound			
			AM Peak		PM Peak		AM Peak		PM Peak	
			PTSF	LOS	PTSF	LOS	PTSF	LOS	PTSF	LOS
M01	Kamilaroi Highway north of Rangari Road	2015	25.9	A	30.4	A	24.4	A	27.0	A
		2020	25.0	A	35.4	A	27.9	A	26.7	A
M02	Kamilaroi Highway south of Rangari Road	2015	33.8	A	30.2	A	23.6	A	38.9	A
		2020	33.8	A	31.1	A	25.2	A	41.1	B
M03	Rangari Road east of Kamilaroi Highway	2015	27	A	14.2	A	14.0	A	29.3	A
		2020	29.7	A	4.2	A	5.1	A	31.0	A
M04	Rangari Road east of Therribri Road	2015	21.8	A	25.0	A	17.1	A	18.4	A
		2020	15.8	A	27.2	A	17.0	A	7.8	A
M05	Therribri Road north of Rangari Road	2015	27.0	A	3.4	A	2.8	A	24.5	A
		2020	28.4	A	2.2	A	5.6	A	26.2	A
M09	Rangari Road east of Barbers Lagoon Road	2015	19.0	A	18.5	A	16.7	A	19.3	A
		2020	19.9	A	18.7	A	15.7	A	19.3	A
M10	Barbers Lagoon Road south of Rangari Road	2015	8.9	A	17.1	A	19.7	A	13.8	A
		2020	8.7	A	14.6	A	20.0	A	15.8	A
M12	Maules Creek Coal Mine Access Road, east of Therribri Road	2015	26.6	A	2.8	A	2.6	A	24.7	A
		2020	27.8	A	1.5	A	5.7	A	26.5	A

^A Refer to Figure 2-1 for locations

The results indicate that the roads would all operate at good levels of service during the peak periods with the approved rate of use of the shuttle bus services. Drivers would have freedom to select their desired travel speed and have opportunities to overtake.

4.10 Intersection Operating Conditions

The operation of the surveyed intersection has been analysed using the SIDRA Intersection program assuming that 90 percent of the operational workforce travel using the shuttle bus service. SIDRA Intersection is an analysis program which determines characteristics of intersections operating conditions including the degree of saturation, average delays, and levels of service. The degree of saturation, or x-value, is the ratio of the arrival rate of vehicles to the capacity. The operating characteristics can be compared with the performance criteria set out in Table 4.14. It is noted that average delay per vehicle is expressed in seconds per vehicle (sec/veh) and is measured for the movement with the highest average delay at priority intersections such as the surveyed intersection.

Table 4.14: Level of Service Criteria at Priority Intersections

Level of Service	Worst Movement Average Delay per Vehicle (sec/veh)	Operational Character
A	less than 14	Good operation
B	15 to 28	Acceptable delays and spare capacity
C	29 to 42	Satisfactory, but accident study required
D	43 to 56	Near capacity and accident study required
E	57 to 70	At capacity, requires other control mode
F	> 70	Extreme delay, traffic signals or other major treatment required

The results of the analyses are summarised in Table 4.15.

Table 4.15: Peak Hour Intersection Operating Conditions Approved Shuttle Bus Usage

Intersection	X-value		Average Delay (sec/veh)		Level of Service	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Kamilaroi Highway and Rangari Road						
Year 2015	0.07	0.10	8.3	9.1	A	A
Year 2020	0.07	0.10	8.6	9.5	A	A

Note average delay is for the movement with the highest average delay per vehicle

The SIDRA Intersection results indicate that the intersection of Rangari Road with Kamilaroi Highway would operate with spare capacity and only short delays to turning traffic with the approved rate of use of the shuttle bus services at Maules Creek.

5. Traffic Conditions – Modification

5.1 The Proposed Modification

The Modification proposes amendment of Condition 63 to reflect the usage levels for the shuttle buses which have been achieved at the Maules Creek Coal Mine. The current use of the shuttle bus by the operational workforce is established in Section 3, with key characteristics of the travel characteristics of the operational workforce summarised in Section 3.11.

With the Modification, the travel characteristics of the operational workforce would be consistent with the current travel characteristics of the operational workforce (Table 3.5) with the adjustment for the change in shift times for the future scenario (Section 4.1). The implications of the Modification on the traffic characteristics of the Maules Creek Coal Mine are described in this section. The assessment which follows assumes that all of the workforce would be present each weekday, while in reality, a proportion would not be present due to rostering, illness or leave.

5.2 Modification Operational Workforce Traffic Generation

Table 5.1 presents the estimated light vehicle and shuttle bus trips generated by the future operational workforce assuming that the travel characteristics of the operational workforce are consistent with the current travel characteristics of the operational workforce. As noted in Section 4.2.2, the number of shuttle buses would not necessarily change in direct proportion to the change in the number of passengers travelling by bus, as each bus is not currently operating at capacity. For the purpose of this assessment, it is conservatively assumed that laden buses would carry an average of 10 passengers in the future. From the gate survey results, for every approximately four laden buses arriving at the site, there was one unladen bus arriving.

Table 5.1: Operational Workforce Traffic Generation in 2020 with Modification

	Light Vehicles	Shuttle Buses
Workforce (people)	470	
People by Mode	177 Whitehaven employees 123 contractors	117
Vehicle Occupancy (people per vehicle)	1.60 Whitehaven employees 1.27 contractors	10 (laden)
Number of Vehicles	208	18 (laden) 5 (unladen)
Daily Inbound Vehicles	208	23
Daily Outbound Vehicles	208	23
AM Peak Inbound Vehicles per Hour	65	10
AM Peak Outbound Vehicles per Hour	18	2
PM Peak Inbound Vehicles per Hour	3	0
PM Peak Outbound Vehicles per Hour	48	7

5.3 Modification Operational Workforce Trip Distribution

The distribution of light vehicles and shuttle buses on the surrounding road network is assumed to be similar to that surveyed in 2015 for the operational workforce (Table 3.6 and Table 3.7). The resulting vehicle trips on the road network are summarised in Table 5.2 for the expected 2020

workforce level, assuming that the travel characteristics of the operational workforce would be consistent with the current travel characteristics of the operational workforce.

Table 5.2: Operational Workforce Vehicle Distribution with Modification 2020

Site ^A	Road and Location	Light Vehicles			Shuttle Buses		
		AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily
M01	Kamilaroi Highway north of Rangari Road	6	4	30	2	1	8
M02	Kamilaroi Highway south of Rangari Road	68	42	340	10	6	38
M03	Rangari Road east of Kamilaroi Highway	74	46	370	12	7	46
M04	Rangari Road east of Theribri Road	9	5	46	0	0	0
M05	Theribri Road north of Rangari Road	83	51	416	12	7	46
M09	Rangari Road east of Barbers Lagoon Road	4	2	18	0	0	0
M10	Barbers Lagoon Road south of Rangari Road	5	3	28	0	0	0
M12	Maules Creek Coal Mine Access Road, east of Theribri Road	83	51	416	12	7	46

^A Refer to Figure 2-1 for locations

AM Peak = 6.00am to 7.00am (vehicles/hour), PM Peak = 5.00pm to 6.00pm (vehicles/hour), Daily = vehicles/day

5.4 Modification Traffic Volumes

The traffic volumes forecast on the surrounding road system are presented in Table 5.3 assuming that the travel characteristics of the operational workforce are consistent with the current travel characteristics of the operational workforce.

Table 5.3: Traffic Volumes with Modification 2015 and 2020

Site ^A	Road and Location	Year 2015			Year 2020		
		AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily
M01	Kamilaroi Highway north of Rangari Road	100	156	2,200	8	189	2,475
M02	Kamilaroi Highway south of Rangari Road	186	250	2,796	78	278	3,089
M03	Rangari Road east of Kamilaroi Highway	111	132	957	86	107	820
M04	Rangari Road east of Theribri Road	68	95	669	9	60	494
M05	Theribri Road north of Rangari Road	71	48	446	95	60	515
M09	Rangari Road east of Barbers Lagoon Road	43	61	385	4	63	396
M10	Barbers Lagoon Road south of Rangari Road	4	8	67	5	9	76
M12	Maules Creek Coal Mine Access Road, east of Theribri Road	68	46	395	95	58	462

^A Refer to Figure 2-1 for locations

AM Peak = 6.00am to 7.00am (vehicles/hour), PM Peak = 5.00pm to 6.00pm (vehicles/hour), Daily = vehicles/day

5.5 Modification Midblock Operating Conditions

The midblock levels of service expected on the primary access routes with the Modification are summarised in Table 5.4.

Table 5.4: Midblock Levels of Service with Modification 2015 and 2020

Site ^A	Location	Year	North or Eastbound				South or Westbound			
			AM Peak		PM Peak		AM Peak		PM Peak	
			PTSF	LOS	PTSF	LOS	PTSF	LOS	PTSF	LOS
M01	Kamilaroi Highway north of Rangari Road	2015	25.8	A	30.3	A	24.7	A	27.0	A
		2020	24.7	A	35.5	A	28.4	A	26.6	A
M02	Kamilaroi Highway south of Rangari Road	2015	37.6	A	28.8	A	21.7	A	41.3	B
		2020	39.2	A	29.7	A	25.8	A	44.3	B
M03	Rangari Road east of Kamilaroi Highway	2015	30.9	A	13.4	A	11.6	A	32.6	A
		2020	36.6	A	4.7	A	8.9	A	38.6	A
M04	Rangari Road east of Therribri Road	2015	20.9	A	25.8	A	18.6	A	18.0	A
		2020	17.2	A	32.1	A	23.3	A	8.4	A
M05	Therribri Road north of Rangari Road	2015	31.3	A	2.7	A	2.7	A	28.2	A
		2020	36.5	A	2.7	A	9.8	A	34.6	A
M09	Rangari Road east of Barbers Lagoon Road	2015	17.6	A	19.2	A	17.9	A	18.8	A
		2020	22.5	A	23.0	A	19.9	A	22.4	A
M10	Barbers Lagoon Road south of Rangari Road	2015	14.5	A	13.4	A	16.1	A	18.5	A
		2020	20.3	A	14.2	A	16.8	A	23.1	A
M12	Maules Creek Coal Mine Access Road, east of Therribri Road	2015	30.9	A	2.3	A	2.6	A	28.3	A
		2020	35.9	A	2.2	A	9.8	A	34.6	A

^A Refer to Figure 2-1 for locations

AM Peak = 6.00am to 7.00am (vehicles/hour), PM Peak = 5.00pm to 6.00pm (vehicles/hour)

Table 5.4 demonstrates that drivers on these routes would continue to experience good levels of service, with very little restriction on their desired travel speed or overtaking. Comparing the forecast levels of service with the approved shuttle bus usage (Table 4.13) with that expected with the Modification (Table 5.4), the Modification would not alter the peak hour levels of service with the exception of southbound on Kamilaroi Highway south of Rangari Road during the evening peak. The impact of the Modification on PTSF would be low. The PTSF with the approved shuttle bus usage would be just under the lower threshold for LOS B, and with the Modification would be just over the threshold. The difference in the conditions as perceived by drivers would be negligible.

5.6 Modification Intersection Operating Conditions

The operation of the intersection of Kamilaroi Highway and Rangari Road has been assessed using SIDRA Intersection to determine how it would be expected to operate with the Modification. The results of the analyses are presented in Table 5.5.

Table 5.5: Peak Hour Intersection Operating Conditions Modification Shuttle Bus Usage

Intersection	X-value		Average Delay (sec/veh)		Level of Service	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Kamilaroi Highway and Rangari Road						
Year 2015	0.09	0.11	8.2	9.0	A	A
Year 2020	0.09	0.11	8.4	9.1	A	A

Note: Average delay is for the movement with the highest average delay per vehicle

The results in Table 5.5 indicate that the intersection would be expected to operate at good levels of service during the peak hours, with spare capacity and short delays to traffic.

5.7 Mitigation Measures

Traffic conditions with the Modification would very similar to those as approved, with the small differences being barely perceptible to most drivers. As a consequence, no specific measures would be required to mitigate or minimise implications of the Modification with regard to the capacity, efficiency and safety of the road network.

As identified in the Maules Creek Coal Mine TMP, transport operations and their potential for interaction with school bus operations will be monitored by management, with ongoing consultation with the local community and residents, and inclusion of road and transport issues in regular newsletters and community consultation meetings. The measures identified in the TMP to minimise conflict with school bus services are considered to be satisfactory, and no additional measures are warranted by the Modification.

6. Summary and Conclusion

Based on the analysis and discussions presented within this report, the following has been determined:

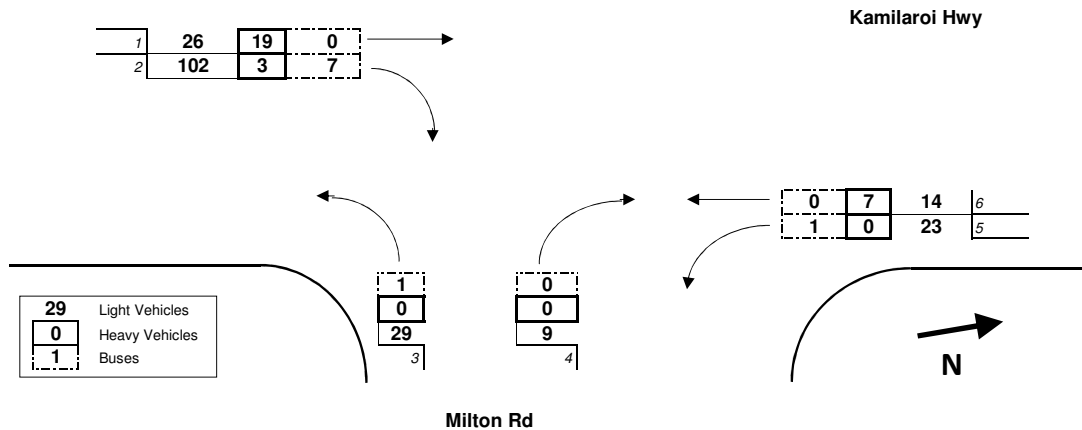
- The operational workforce at the Maules Creek Coal Mine currently generates approximately 284 light vehicle trips per day and 50 shuttle bus trips per day.
- Should the mode of travel continue as at present, in 2020, the peak operational workforce of the Maules Creek Coal Mine is expected to generate approximately 416 light vehicle trips per day and 46 shuttle bus trips per day.
- With this trip generation, the surrounding road network and key intersections would operate at good levels of service, with spare capacity, short delays to vehicles, and with drivers having freedom to select their desired travel speed.
- Should the mode of travel be consistent with the assumptions in the EA traffic assessment, in 2020, the peak operational workforce of the Maules Creek Coal Mine would be expected to generate approximately 66 light vehicle trips per day and 112 shuttle bus trips per day.
- With this trip generation, the surrounding road network and key intersections would operate at good levels of service, with spare capacity, short delays to vehicles, and with drivers having freedom to select their desired travel speed.

It is concluded that the impacts of the Modification on the road transport environment in the vicinity of the Maules Creek Coal Mine would be very minor, and that no specific measures would be required to mitigate the impacts of the altered traffic arrangements.

Appendix A

Traffic Survey Data

Summary:	
Kamilaroi Hwy / Rangari Rd	
203	Total Light Vehicles
29	Total Heavy Vehicles
9	Total Buses



11/6/2015 - Kamilaroi Hwy / Milton Rd, Boggabri

Light Vehicles							Total Vehicles	
1	2	3	4	5	6		15 MIN	HOURLY
05:45	10	29	5	1	5	0	50	
06:00	1	28	4	2	15	4	54	
06:15	4	25	11	3	1	4	48	
06:30	11	20 <	9	3 <	2 <	6	51	203 <
06:45	11	12	8 <	1 <	1	9	42	195
07:00	4	8	1	1	1	6	21	162
07:15	6	3	3	1	1	11	25	139
07:30	16 <	1	5	3	1	15	41	129
07:45	10	1	2	2	2	13	30	117
08:00	3	1	4	0	1	21	30	126
08:15	6	2	2	0	0	13 <	23	124
08:30	8	2	2	1	1	13	27	110

Heavy Vehicles							Total Vehicles	
1	2	3	4	5	6		15 MIN	HOURLY
05:45	5	0	0	0	0	0	5	
06:00	6	1	0	0	0	2	9	
06:15	4	1	0	0	0	3	8	
06:30	4	1	0	0	0	2	7	29
06:45	0	0	0	0	0	0	0	24
07:00	4	2	3	0	0	1	10	25
07:15	2	2 <	0	0	0	6	10	27
07:30	3	1 <	0	0	1	5	10	30
07:45	7	0 <	2 <	0	0	4	13	43
08:00	4	1	0	1	2	3	11	44
08:15	10	0	0	0	1 <	9 <	20	54
08:30	8 <	4 <	0	1 <	0	5 <	18	62 <

Buses							Total Vehicles	
1	2	3	4	5	6		15 MIN	HOURLY
05:45	0	1	0	0	0	0	1	
06:00	0	5	0	0	1	0	6	
06:15	0	1	0	0	0	0	1	
06:30	0	0 <	1	0	0 <	0	1	9 <
06:45	0	0	1	0	0 <	0	1	9 <
07:00	0	1	1 <	0	0	0	2	5
07:15	0	0	0 <	1 <	0	0	1	5
07:30	0	0	0	0 <	0	0	0	4
07:45	0	0	0	0 <	1 <	1 <	2	5
08:00	0	0	1	0 <	0 <	0 <	1	4
08:15	0	0	0	0	0 <	0 <	0	3
08:30	0	0	0	0	0 <	0 <	0	3

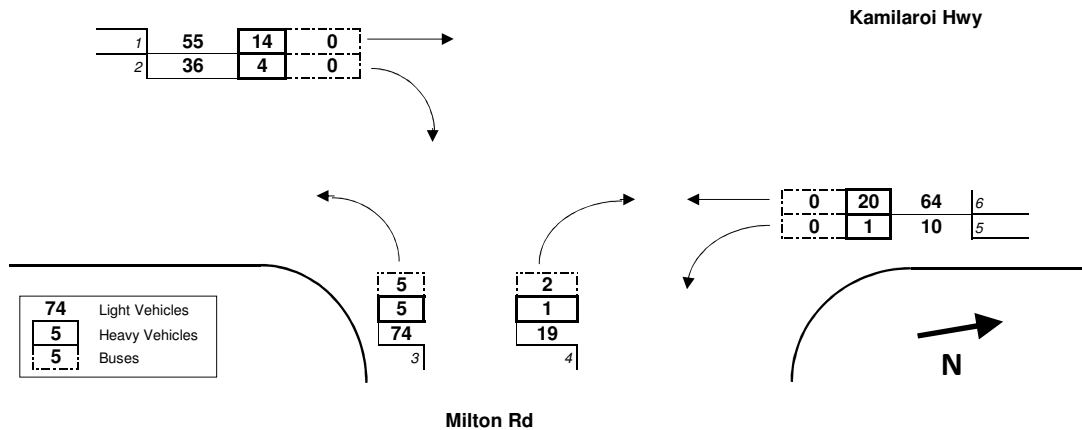
All Vehicles							Total Vehicles	
1	2	3	4	5	6		15 MIN	HOURLY
05:45	15	30	5	1	5	0	56	
06:00	7	34	4	2	16	6	69	
06:15	8	27	11	3	1	7	57	
06:30	15	21 <	10	3 <	2 <	8	59	241 <
06:45	11	12	9	1 <	1	9	43	228
07:00	8	11	5 <	1	1	7	33	192
07:15	8	5	3	2	1	17	36	171
07:30	19	2	5	3	2	20	51	163
07:45	17	1	4	2	3	18	45	165
08:00	7	2	5	1	3	24	42	174
08:15	16 <	2	2	0	1	22 <	43	181
08:30	16	6	2	2	1	18	45	175

Note : Arrows "<" indicate the end time for the peak hour for each turning movement.

Summary:

Kamilaroi Hwy / Rangari Rd

258	Total Light Vehicles
45	Total Heavy Vehicles
7	Total Buses



10/6/2015 - Kamilaroi Hwy / Milton Rd, Boggabri

Light Vehicles							Total Vehicles	
	1	2	3	4	5	6	15 MIN	HOURLY
16:15	13	5	6	3	1	10	38	
16:30	16	6	7	2	1	8	40	
16:45	23	8	8	2	1	15	57	
17:00	14	9	12	2	3	23	63	198
17:15	14	8	11	3	1	17	54	214
17:30	17 <	14 <	24	5	4	10 <	74	248
17:45	10	5	27	9	2 <	14	67	258 <
18:00	11	1	19	5	1	12	49	244
18:15	11	3	34 <	6 <	2	7	63	253
18:30	11	3	18	2	0	7	41	220
18:45	13	4	6	1	1	6	31	184
19:00	4	2	10	0	1	4	21	156

Heavy Vehicles							Total Vehicles	
	1	2	3	4	5	6	15 MIN	HOURLY
16:15	7	3	1	1	0	8	20	
16:30	6	0	1	0	1	3	11	
16:45	0	1	1	0	0	4	6	
17:00	6 <	1 <	0	0 <	1 <	4	12	49 <
17:15	3	0	2	0	0 <	5	10	39
17:30	2	1	0	0	0	4	7	35
17:45	3	2	3 <	1 <	0	7	16	45
18:00	8	1	0 <	0 <	0	1	10	43
18:15	1	0	1	0 <	0	11 <	13	46
18:30	2	1	1 <	0 <	0	2	6	45
18:45	8 <	0	0	0	1	3	12	41
19:00	4	0	0	0	0	3	7	38

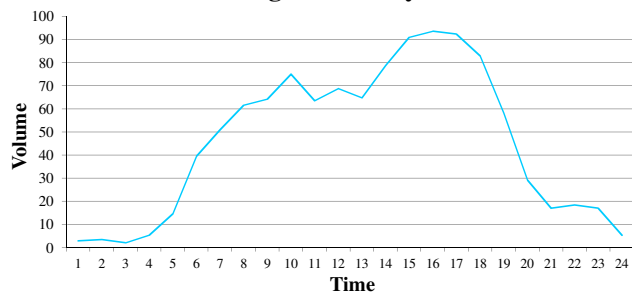
Buses							Total Vehicles	
	1	2	3	4	5	6	15 MIN	HOURLY
16:15	0	1	0	0	0	0	1	
16:30	0	2	0	0	1	1	4	
16:45	0	0	0	0	0	0	0	
17:00	0	0 <	2	0	0 <	0 <	2	7
17:15	0	0	1	0	0 <	0 <	1	7
17:30	0	0	0	0	0	0	0	3
17:45	0	0	2	2	0	0	4	7
18:00	0	0	3 <	1	0	0	4	9 <
18:15	0	0	0	1 <	0	0	1	9 <
18:30	0	0	0	0 <	0	0	0	9 <
18:45	0	0	0	0	0	0	0	5
19:00	0	0	0	0	0	0	0	1

All Vehicles							Total Vehicles	
	1	2	3	4	5	6	15 MIN	HOURLY
16:15	20	9	7	4	1	18	59	
16:30	22	8	8	2	3	12	55	
16:45	23	9	9	2	1	19	63	
17:00	20 <	10	14	2	4	27	77	254
17:15	17	8	14	3	1	22	65	260
17:30	19	15 <	24	5	4	14	81	286
17:45	13	7	32	12	2 <	21 <	87	310 <
18:00	19	2	22	6	1	13	63	296
18:15	12	3	35 <	7 <	2	18	77	308
18:30	13	4	19	2	0	9	47	274
18:45	21	4	6	1	2	9	43	230
19:00	8	2	10	0	1	7	28	195

Note : Arrows "<" indicate the end time for the peak hour for each turning movement.

Site 1 Kamilaroi Hwy, 200m north of Boggabri-Manilla Rd [100]
Northbound
Lane 0

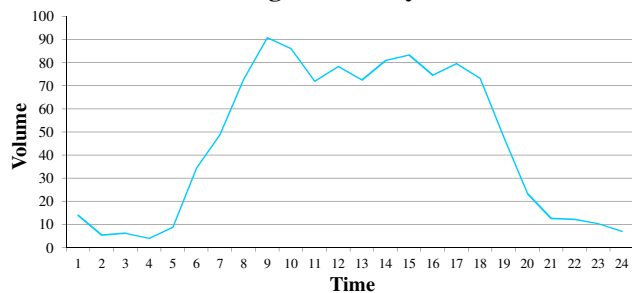
Day Time	Thu 11/06/2015	Fri 12/06/2015	Sat 13/06/2015	Sun 14/06/2015	Mon 15/06/2015	Tue 16/06/2015	Wed 17/06/2015	W/Day Ave.	W/End Ave.	7 Day Ave
0:00	4	3	7	3	2	1	4	3	5	3
1:00	3	3	3	1	3	2	6	3	2	3
2:00	2	2	2	1	0	3	3	2	2	2
3:00	5	6	7	3	5	10	1	5	5	5
4:00	13	15	11	7	17	12	16	15	9	13
5:00	38	39	19	18	43	40	38	40	19	34
6:00	57	57	23	13	63	39	39	51	18	42
7:00	70	68	96	26	64	57	49	62	61	61
8:00	66	52	163	48	79	59	65	64	106	76
9:00	66	64	64	41	92	81	72	75	53	69
10:00	76	50	71	46	49	85	58	64	59	62
11:00	58	65	64	54	83	78	60	69	59	66
12:00	64	79	81	63	63	58	60	65	72	67
13:00	73	101	60	67	75	64	81	79	64	74
14:00	94	115	62	72	90	78	78	91	67	84
15:00	93	110	48	111	105	89	71	94	80	90
16:00	100	84	66	132	98	92	88	92	99	94
17:00	81	101	99	61	82	62	89	83	80	82
18:00	47	62	45	57	79	53	50	58	51	56
19:00	36	28	29	33	31	24	27	29	31	30
20:00	20	14	13	16	24	15	12	17	15	16
21:00	20	14	7	19	25	16	17	18	13	17
22:00	18	8	5	20	26	15	18	17	13	16
23:00	5	8	5	3	2	6	6	5	4	5
Total	1109	1148	1050	915	1200	1039	1008	1101	983	1067

Average Week Day

Summary

	from	to	
AM Peak	9:00 AM	10:00 AM	92
PM Peak	2:00 PM	3:00 PM	115
Week Day Average			1101
Weekend Day Average			983
7 Day Average			1067

Site 1 Kamilaroi Hwy, 200m north of Boggabri-Manilla Rd [100]
Southbound
Lane 0

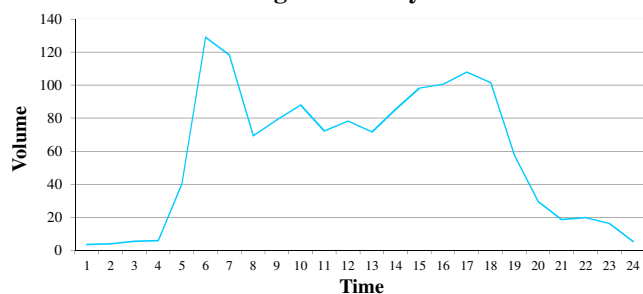
Day Time	Thu 11/06/2015	Fri 12/06/2015	Sat 13/06/2015	Sun 14/06/2015	Mon 15/06/2015	Tue 16/06/2015	Wed 17/06/2015	W/Day Ave.	W/End Ave.	7 Day Ave
0:00	20	12	17	1	5	17	16	14	9	13
1:00	7	5	4	2	9	1	5	5	3	5
2:00	10	6	3	3	4	6	5	6	3	5
3:00	3	5	4	2	7	2	3	4	3	4
4:00	9	12	8	4	8	8	7	9	6	8
5:00	34	28	14	14	37	38	35	34	14	29
6:00	40	63	41	28	57	42	42	49	35	45
7:00	79	97	56	96	62	54	72	73	76	74
8:00	83	112	58	79	91	78	90	91	69	84
9:00	102	86	74	54	75	84	84	86	64	80
10:00	87	67	58	51	55	88	63	72	55	67
11:00	77	93	76	61	73	70	79	78	69	76
12:00	60	99	81	69	55	86	63	73	75	73
13:00	91	107	92	70	58	62	87	81	81	81
14:00	96	95	127	51	71	81	74	83	89	85
15:00	87	80	117	72	60	63	83	75	95	80
16:00	90	86	53	41	83	76	63	80	47	70
17:00	97	83	58	52	59	63	64	73	55	68
18:00	63	52	39	32	41	42	41	48	36	44
19:00	28	28	31	34	19	27	15	23	33	26
20:00	11	14	12	18	11	15	12	13	15	13
21:00	19	13	12	15	10	11	8	12	14	13
22:00	8	14	12	12	14	5	11	10	12	11
23:00	8	6	7	1	12	6	3	7	4	6
Total	1209	1263	1054	862	976	1025	1025	1100	958	1059

Average Week Day

Summary

	from	to	
AM Peak	8:00 AM	9:00 AM	112
PM Peak	1:00 PM	2:00 PM	107
Week Day Average			1100
Weekend Day Average			958
7 Day Average			1059

Site 2 Kamilaroi Hwy, 200m south of Boggabri-Manilla Rd [100]
Northbound
Lane 0

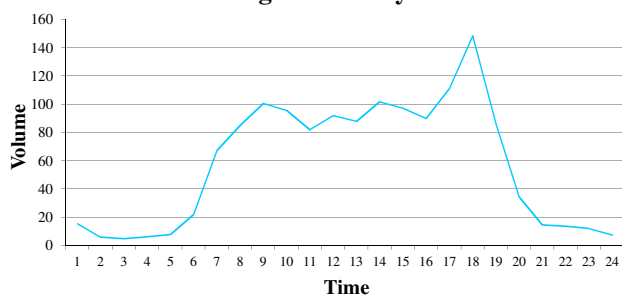
Day Time	Thu 11/06/2015	Fri 12/06/2015	Sat 13/06/2015	Sun 14/06/2015	Mon 15/06/2015	Tue 16/06/2015	Wed 17/06/2015	W/Day Ave.	W/End Ave.	7 Day Ave
0:00	2	5	7	3	2	2	6	3	5	4
1:00	3	4	4	1	3	2	7	4	3	3
2:00	6	7	5	4	3	7	4	5	5	5
3:00	6	7	5	2	6	8	2	6	4	5
4:00	39	45	32	29	41	35	42	40	31	38
5:00	139	118	64	56	120	144	125	129	60	109
6:00	130	118	40	27	119	122	104	119	34	94
7:00	74	81	92	29	64	67	61	69	61	67
8:00	84	74	168	52	89	69	80	79	110	88
9:00	81	84	65	49	112	84	79	88	57	79
10:00	86	61	79	52	57	93	65	72	66	70
11:00	70	70	71	63	91	91	70	78	67	75
12:00	76	80	85	76	76	61	66	72	81	74
13:00	75	107	68	74	85	64	97	86	71	81
14:00	95	117	64	81	101	89	90	98	73	91
15:00	98	113	51	118	115	97	80	101	85	96
16:00	107	99	81	150	119	105	110	108	116	110
17:00	92	116	116	82	102	86	112	102	99	101
18:00	47	59	48	52	72	55	55	58	50	55
19:00	35	25	28	33	30	29	29	30	31	30
20:00	20	16	17	18	25	17	15	19	18	18
21:00	18	15	10	19	25	21	20	20	15	18
22:00	17	10	6	19	24	15	15	16	13	15
23:00	6	5	6	3	3	7	6	5	5	5
Total	1406	1436	1212	1092	1484	1370	1340	1407	1152	1334

Average Week Day

Summary

	from	to	
AM Peak	5:00 AM	6:00 AM	144
PM Peak	4:00 PM	5:00 PM	119
Week Day Average			1407
Weekend Day Average			1152
7 Day Average			1334

Site 2 Kamilaroi Hwy, 200m south of Boggabri-Manilla Rd [100]
Southbound
Lane 0

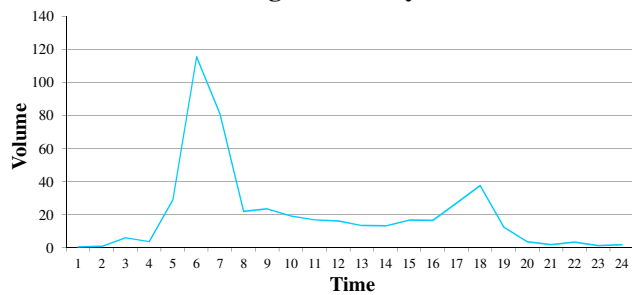
Day Time	Thu 11/06/2015	Fri 12/06/2015	Sat 13/06/2015	Sun 14/06/2015	Mon 15/06/2015	Tue 16/06/2015	Wed 17/06/2015	W/Day Ave.	W/End Ave.	7 Day Ave
0:00	19	16	18	1	4	20	18	15	10	14
1:00	6	6	5	2	9	2	6	6	4	5
2:00	10	4	3	2	3	3	4	5	3	4
3:00	5	7	7	4	10	7	2	6	6	6
4:00	7	9	5	2	5	5	12	8	4	6
5:00	15	17	14	8	20	23	35	22	11	19
6:00	73	82	66	47	77	58	46	67	57	64
7:00	86	108	62	109	72	62	97	85	86	85
8:00	98	123	58	85	94	84	104	101	72	92
9:00	107	102	75	62	80	96	93	96	69	88
10:00	99	81	62	57	68	88	74	82	60	76
11:00	87	101	76	72	80	98	94	92	74	87
12:00	80	110	84	76	71	97	82	88	80	86
13:00	121	124	94	77	72	79	113	102	86	97
14:00	112	98	132	70	79	102	95	97	101	98
15:00	96	105	123	75	81	76	92	90	99	93
16:00	113	130	72	52	112	101	99	111	62	97
17:00	179	123	96	68	142	149	149	148	82	129
18:00	106	85	61	55	89	84	65	86	58	78
19:00	35	34	35	37	29	45	29	34	36	35
20:00	14	14	11	21	10	20	15	15	16	15
21:00	18	12	14	16	11	17	10	14	15	14
22:00	10	17	13	11	14	7	12	12	12	12
23:00	7	6	7	1	11	7	6	7	4	6
Total	1503	1514	1193	1010	1243	1330	1352	1388	1102	1306

Average Week Day

Summary

	from	to	
AM Peak	8:00 AM	9:00 AM	123
PM Peak	5:00 PM	6:00 PM	179
Week Day Average			1388
Weekend Day Average			1102
7 Day Average			1306

Site 3 Boggabri-Manilla Rd, 150m East of Kamilaroi Hwy [100]
Eastbound
Lane 0

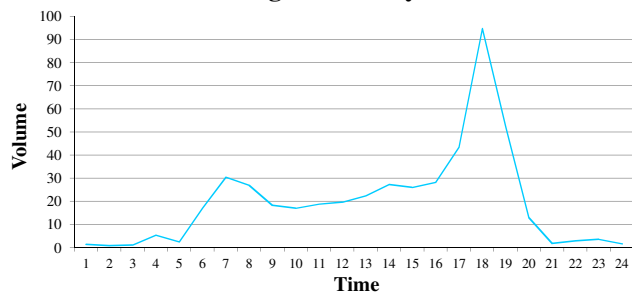
Day Time	Thu 11/06/2015	Fri 12/06/2015	Sat 13/06/2015	Sun 14/06/2015	Mon 15/06/2015	Tue 16/06/2015	Wed 17/06/2015	W/Day Ave.	W/End Ave.	7 Day Ave
0:00	0	0	0	0	1	1	0	0	0	0
1:00	1	1	1	0	1	0	1	1	1	1
2:00	6	8	4	4	5	7	4	6	4	5
3:00	4	4	0	1	3	4	3	4	1	3
4:00	31	34	26	25	27	26	27	29	26	28
5:00	127	99	56	47	106	131	115	116	52	97
6:00	87	74	28	23	75	95	74	81	26	65
7:00	20	25	10	8	14	26	24	22	9	18
8:00	25	29	8	8	20	21	22	23	8	19
9:00	24	20	5	9	30	9	13	19	7	16
10:00	26	11	8	13	12	24	11	17	11	15
11:00	17	13	12	11	14	24	12	16	12	15
12:00	20	11	17	17	14	12	10	13	17	14
13:00	10	19	16	11	17	7	13	13	14	13
14:00	13	22	13	10	20	16	12	17	12	15
15:00	17	16	13	8	17	15	17	16	11	15
16:00	26	22	20	20	34	25	27	27	20	25
17:00	37	41	40	39	32	40	38	38	40	38
18:00	13	11	11	10	11	14	13	12	11	12
19:00	5	4	1	3	3	1	4	3	2	3
20:00	1	3	4	2	2	1	1	2	3	2
21:00	4	1	3	2	3	5	3	3	3	3
22:00	1	2	1	1	1	0	1	1	1	1
23:00	2	0	1	0	5	1	0	2	1	1
Total	517	470	298	272	467	505	445	481	285	425

Average Week Day

Summary

	from	to	
AM Peak	5:00 AM	6:00 AM	131
PM Peak	5:00 PM	6:00 PM	41
Week Day Average			481
Weekend Day Average			285
7 Day Average			425

Site 3 Boggabri-Manilla Rd, 150m East of Kamilaroi Hwy [100]
Westbound
Lane 0

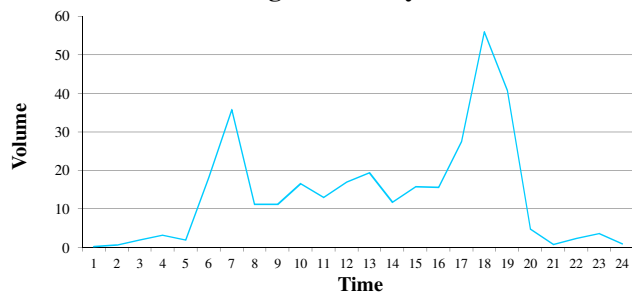
Day Time	Thu 11/06/2015	Fri 12/06/2015	Sat 13/06/2015	Sun 14/06/2015	Mon 15/06/2015	Tue 16/06/2015	Wed 17/06/2015	W/Day Ave.	W/End Ave.	7 Day Ave
0:00	1	2	1	0	0	3	1	1	1	1
1:00	1	1	1	0	1	1	0	1	1	1
2:00	1	1	1	1	1	0	2	1	1	1
3:00	5	5	6	4	5	11	1	5	5	5
4:00	4	2	2	1	1	1	4	2	2	2
5:00	15	12	10	4	15	13	31	17	7	14
6:00	42	34	34	28	37	26	13	30	31	31
7:00	25	24	20	16	21	26	39	27	18	24
8:00	21	19	9	10	15	19	17	18	10	16
9:00	17	18	7	9	15	20	15	17	8	14
10:00	27	13	7	11	16	21	17	19	9	16
11:00	14	18	6	16	14	37	15	20	11	17
12:00	30	22	13	12	16	22	22	22	13	20
13:00	39	29	14	11	19	23	26	27	13	23
14:00	28	30	15	24	22	30	20	26	20	24
15:00	25	44	15	7	32	21	19	28	11	23
16:00	39	53	26	15	45	39	41	43	21	37
17:00	110	68	60	33	95	105	96	95	47	81
18:00	56	51	30	39	70	51	33	52	35	47
19:00	12	12	6	5	11	15	15	13	6	11
20:00	5	1	0	3	0	2	1	2	2	2
21:00	3	0	1	3	3	6	2	3	2	3
22:00	4	4	1	1	3	2	5	4	1	3
23:00	0	1	0	0	3	1	3	2	0	1
Total	524	464	285	253	460	495	438	476	269	417

Average Week Day

Summary

	from	to	
AM Peak	6:00 AM	7:00 AM	42
PM Peak	5:00 PM	6:00 PM	110
Week Day Average			476
Weekend Day Average			269
7 Day Average			417

Site 4 100m East of Therribri Rd on Boggibri-Manilla Rd [40] - Roadworks
Northbound
Lane 0

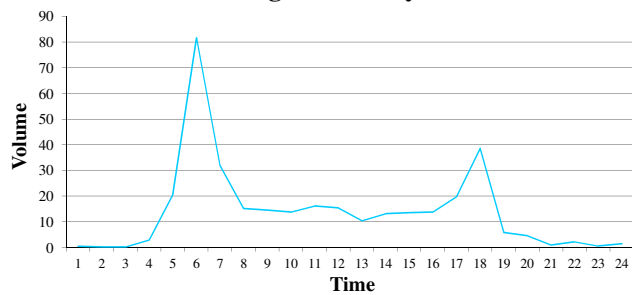
Day Time	Thu 11/06/2015	Fri 12/06/2015	Sat 13/06/2015	Sun 14/06/2015	Mon 15/06/2015	Tue 16/06/2015	Wed 17/06/2015	W/Day Ave.	W/End Ave.	7 Day Ave
0:00	0	1	3	0	0	0	0	0	2	1
1:00	1	0	1	0	1	1	0	1	1	1
2:00	2	3	1	0	1	1	3	2	1	2
3:00	3	3	3	0	2	7	1	3	2	3
4:00	1	2	0	0	1	4	2	2	0	1
5:00	18	14	9	4	15	12	32	18	7	15
6:00	39	34	36	28	46	36	24	36	32	35
7:00	8	14	12	3	9	10	15	11	8	10
8:00	14	11	6	6	14	8	9	11	6	10
9:00	17	25	7	6	20	12	9	17	7	14
10:00	16	12	6	8	13	11	13	13	7	11
11:00	15	17	5	12	17	26	10	17	9	15
12:00	19	24	9	7	19	17	18	19	8	16
13:00	18	10	13	7	12	10	9	12	10	11
14:00	18	21	9	12	18	14	8	16	11	14
15:00	10	24	8	4	17	15	12	16	6	13
16:00	23	28	22	9	30	25	32	28	16	24
17:00	62	40	34	25	55	61	62	56	30	48
18:00	43	46	30	38	54	35	26	41	34	39
19:00	4	5	0	2	1	7	7	5	1	4
20:00	0	0	0	2	1	2	1	1	1	1
21:00	3	1	1	1	2	4	2	2	1	2
22:00	4	3	1	1	3	3	5	4	1	3
23:00	1	1	0	0	2	1	0	1	0	1
Total	339	339	216	175	353	322	300	331	196	292

Average Week Day

Summary

	from	to	
AM Peak	6:00 AM	7:00 AM	46
PM Peak	5:00 PM	6:00 PM	62
Week Day Average			331
Weekend Day Average			196
7 Day Average			292

Site 4 100m East of Therribri Rd on Boggibri-Manilla Rd [40] - Roadworks
Southbound
Lane 0

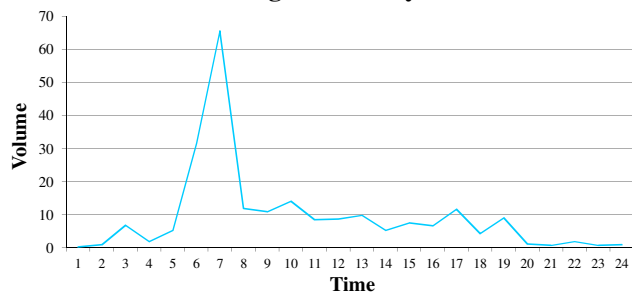
Day Time	Thu 11/06/2015	Fri 12/06/2015	Sat 13/06/2015	Sun 14/06/2015	Mon 15/06/2015	Tue 16/06/2015	Wed 17/06/2015	W/Day Ave.	W/End Ave.	7 Day Ave
0:00	0	0	3	0	1	1	0	0	2	1
1:00	0	0	0	0	0	0	1	0	0	0
2:00	0	0	0	0	0	1	0	0	0	0
3:00	4	4	2	1	1	3	3	3	2	3
4:00	24	21	19	21	19	22	17	21	20	20
5:00	79	74	47	40	85	87	83	82	44	71
6:00	28	31	12	7	36	41	24	32	10	26
7:00	14	19	9	8	12	12	19	15	9	13
8:00	15	16	3	5	11	13	18	15	4	12
9:00	12	17	5	4	19	8	13	14	5	11
10:00	22	18	6	9	14	18	9	16	8	14
11:00	20	13	5	9	18	14	12	15	7	13
12:00	10	14	12	7	14	11	3	10	10	10
13:00	18	19	14	14	15	7	7	13	14	13
14:00	7	21	11	4	18	16	6	14	8	12
15:00	18	12	9	4	14	14	11	14	7	12
16:00	20	18	11	12	28	13	20	20	12	17
17:00	33	40	38	41	35	43	42	39	40	39
18:00	6	5	6	1	3	10	5	6	4	5
19:00	4	5	2	4	5	3	6	5	3	4
20:00	1	3	1	0	0	1	0	1	1	1
21:00	1	1	3	1	2	3	4	2	2	2
22:00	1	1	0	1	1	0	0	1	1	1
23:00	2	0	1	0	5	0	0	1	1	1
Total	339	352	219	193	356	341	303	338	206	300

Average Week Day

Summary

	from	to	
AM Peak	5:00 AM	6:00 AM	87
PM Peak	5:00 PM	6:00 PM	43
Week Day Average			338
Weekend Day Average			206
7 Day Average			300

Site 5 50m South of Maules Ck Mine Access on Therribri Rd [40] - Roadworks
Northbound
Lane 0

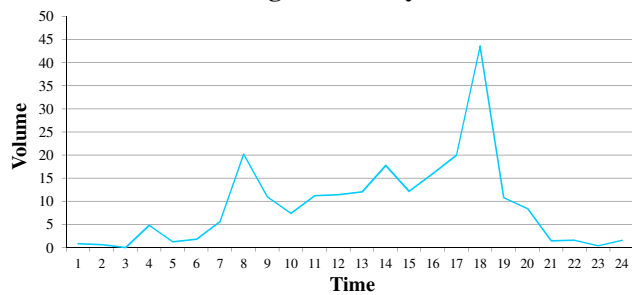
Day Time	Thu 11/06/2015	Fri 12/06/2015	Sat 13/06/2015	Sun 14/06/2015	Mon 15/06/2015	Tue 16/06/2015	Wed 17/06/2015	W/Day Ave.	W/End Ave.	7 Day Ave
0:00	0	0	0	0	0	1	0	0	0	0
1:00	1	1	1	0	1	0	1	1	1	1
2:00	6	10	5	4	6	7	5	7	5	6
3:00	2	2	1	1	3	1	1	2	1	2
4:00	5	7	3	3	5	4	5	5	3	5
5:00	39	24	11	6	19	42	34	32	9	25
6:00	76	55	23	22	61	73	63	66	23	53
7:00	10	10	4	1	7	18	14	12	3	9
8:00	11	14	7	1	13	7	9	11	4	9
9:00	20	13	1	6	17	12	8	14	4	11
10:00	11	9	4	4	8	10	4	8	4	7
11:00	9	8	6	1	6	14	6	9	4	7
12:00	12	8	4	3	10	11	8	10	4	8
13:00	5	4	3	2	5	4	8	5	3	4
14:00	12	6	2	5	11	3	5	7	4	6
15:00	6	10	4	5	7	4	6	7	5	6
16:00	11	13	8	8	10	11	13	12	8	11
17:00	8	6	5	1	0	2	5	4	3	4
18:00	9	8	9	10	9	9	10	9	10	9
19:00	2	0	0	1	3	0	0	1	1	1
20:00	0	0	1	1	1	0	2	1	1	1
21:00	3	1	0	1	2	2	1	2	1	1
22:00	0	2	0	0	0	1	0	1	0	0
23:00	2	0	1	0	1	1	0	1	1	1
Total	260	211	103	86	205	237	208	224	95	187

Average Week Day

Summary

	from	to	
AM Peak	6:00 AM	7:00 AM	76
PM Peak	4:00 PM	5:00 PM	13
Week Day Average			224
Weekend Day Average			94
7 Day Average			187

Site 5 50m South of Maules Ck Mine Access on Therribri Rd [40] - Roadworks
Southbound
Lane 0

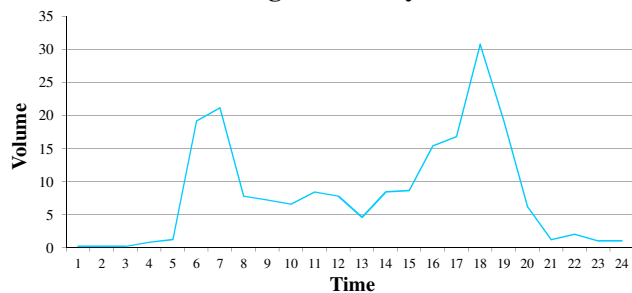
Day Time	Thu 11/06/2015	Fri 12/06/2015	Sat 13/06/2015	Sun 14/06/2015	Mon 15/06/2015	Tue 16/06/2015	Wed 17/06/2015	W/Day Ave.	W/End Ave.	7 Day Ave
0:00	0	1	0	0	0	2	1	1	0	1
1:00	0	1	0	0	1	0	1	1	0	0
2:00	0	0	1	1	0	0	0	0	1	0
3:00	5	5	8	6	5	5	4	5	7	5
4:00	1	1	0	0	2	1	1	1	0	1
5:00	2	1	3	1	4	1	1	2	2	2
6:00	8	10	4	6	1	3	6	6	5	5
7:00	23	12	10	15	18	20	28	20	13	18
8:00	13	13	3	3	7	10	12	11	3	9
9:00	7	4	1	2	6	12	8	7	2	6
10:00	11	11	2	4	8	19	7	11	3	9
11:00	12	10	3	4	8	17	10	11	4	9
12:00	17	12	4	4	11	10	10	12	4	10
13:00	29	17	3	4	11	18	14	18	4	14
14:00	13	12	5	11	9	15	12	12	8	11
15:00	18	23	6	3	17	9	13	16	5	13
16:00	18	27	4	4	19	18	18	20	4	15
17:00	52	29	28	12	45	58	34	44	20	37
18:00	15	8	4	2	13	9	9	11	3	9
19:00	9	7	4	6	10	9	7	8	5	7
20:00	4	1	0	2	1	0	1	1	1	1
21:00	1	1	0	0	2	2	2	2	0	1
22:00	0	0	0	0	1	1	0	0	0	0
23:00	1	1	0	0	3	0	3	2	0	1
Total	259	207	93	90	202	239	202	222	92	185

Average Week Day

Summary

	from	to	
AM Peak	7:00 AM	8:00 AM	28
PM Peak	5:00 PM	6:00 PM	58
Week Day Average			222
Weekend Day Average			91
7 Day Average			185

Site 9 Boggabri-Manilla Rd, 200m east of Braymont Rd [80]
Eastbound
Lane 0

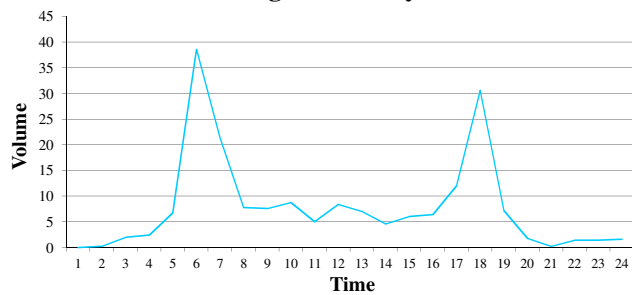
Day Time	Thu 11/06/2015	Fri 12/06/2015	Sat 13/06/2015	Sun 14/06/2015	Mon 15/06/2015	Tue 16/06/2015	Wed 17/06/2015	W/Day Ave.	W/End Ave.	7 Day Ave
0:00	0	0	1	0	0	0	1	0	1	0
1:00	0	0	0	0	0	0	1	0	0	0
2:00	0	0	1	1	1	0	0	0	1	0
3:00	0	1	1	1	1	2	0	1	1	1
4:00	1	3	1	0	1	0	1	1	1	1
5:00	17	20	11	9	17	14	28	19	10	17
6:00	26	24	18	16	23	25	8	21	17	20
7:00	9	7	7	4	5	4	14	8	6	7
8:00	7	11	4	6	5	6	7	7	5	7
9:00	0	8	5	5	7	8	10	7	5	6
10:00	10	9	4	6	10	11	2	8	5	7
11:00	6	8	2	4	8	9	8	8	3	6
12:00	6	6	5	5	4	4	3	5	5	5
13:00	7	13	16	9	8	7	7	8	13	10
14:00	8	16	14	5	9	9	1	9	10	9
15:00	15	20	8	2	13	20	9	15	5	12
16:00	21	13	8	4	15	14	21	17	6	14
17:00	28	28	15	21	30	43	25	31	18	27
18:00	24	21	19	19	27	14	10	19	19	19
19:00	7	5	3	7	6	7	6	6	5	6
20:00	1	3	1	1	1	1	0	1	1	1
21:00	3	1	2	2	2	2	2	2	2	2
22:00	0	0	2	0	0	3	2	1	1	1
23:00	2	1	0	0	2	0	0	1	0	1
Total	198	218	148	127	195	203	166	196	138	179

Average Week Day

Summary

	from	to	
AM Peak	5:00 AM	6:00 AM	28
PM Peak	5:00 PM	6:00 PM	43
Week Day Average			196
Weekend Day Average			138
7 Day Average			179

Site 9 Boggabri-Manilla Rd, 200m east of Braymont Rd [80]
Westbound
Lane 0

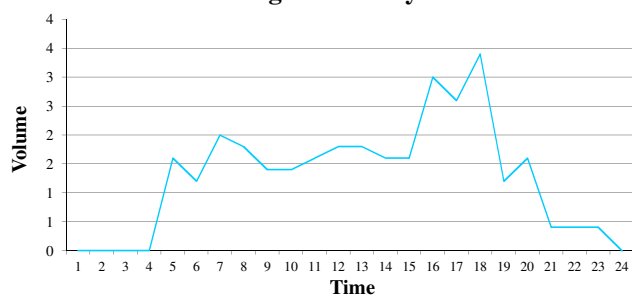
Day Time	Thu 11/06/2015	Fri 12/06/2015	Sat 13/06/2015	Sun 14/06/2015	Mon 15/06/2015	Tue 16/06/2015	Wed 17/06/2015	W/Day Ave.	W/End Ave.	7 Day Ave
0:00	0	0	0	0	0	0	0	0	0	0
1:00	1	0	0	0	0	0	0	0	0	0
2:00	1	3	1	0	1	1	4	2	1	2
3:00	2	2	3	0	2	5	1	2	2	2
4:00	5	5	2	2	10	7	7	7	2	5
5:00	46	45	24	25	33	37	32	39	25	35
6:00	19	16	12	5	23	30	19	21	9	18
7:00	4	10	11	4	6	10	9	8	8	8
8:00	12	6	3	3	8	8	4	8	3	6
9:00	13	11	5	3	11	3	6	9	4	7
10:00	5	3	4	5	5	6	6	5	5	5
11:00	9	9	2	6	9	9	6	8	4	7
12:00	8	10	8	4	5	5	7	7	6	7
13:00	9	4	6	9	6	3	1	5	8	5
14:00	6	9	5	5	6	5	4	6	5	6
15:00	3	9	4	4	10	7	3	6	4	6
16:00	15	15	13	8	7	11	12	12	11	12
17:00	35	31	25	24	31	27	29	31	25	29
18:00	7	6	7	10	8	9	6	7	9	8
19:00	2	2	0	0	0	2	3	2	0	1
20:00	1	0	1	1	0	0	0	0	1	0
21:00	1	2	0	1	3	0	1	1	1	1
22:00	2	1	0	1	2	1	1	1	1	1
23:00	4	3	0	0	0	1	0	2	0	1
Total	210	202	136	120	186	187	161	189	128	172

Average Week Day

Summary

	from	to	
AM Peak	5:00 AM	6:00 AM	46
PM Peak	5:00 PM	6:00 PM	35
Week Day Average			189
Weekend Day Average			128
7 Day Average			172

Site 10 Braymont Rd, 50m south of Boggabri-Manilla Rd [80]
Northbound
Lane 0

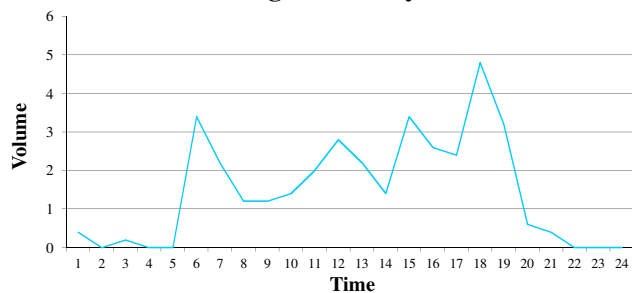
Day Time	Thu 11/06/2015	Fri 12/06/2015	Sat 13/06/2015	Sun 14/06/2015	Mon 15/06/2015	Tue 16/06/2015	Wed 17/06/2015	W/Day Ave.	W/End Ave.	7 Day Ave
0:00	0	0	0	0	0	0	0	0	0	0
1:00	0	0	0	0	0	0	0	0	0	0
2:00	0	0	0	0	0	0	0	0	0	0
3:00	0	0	0	0	0	0	0	0	0	0
4:00	1	1	0	0	2	3	1	2	0	1
5:00	2	1	0	2	1	1	1	1	1	1
6:00	3	2	0	0	2	2	1	2	0	1
7:00	4	2	3	1	1	1	1	2	2	2
8:00	1	2	1	1	2	1	1	1	1	1
9:00	2	2	4	3	1	1	1	1	4	2
10:00	3	1	2	3	3	1	0	2	3	2
11:00	2	4	2	1	1	0	2	2	2	2
12:00	2	3	0	4	3	1	0	2	2	2
13:00	1	3	7	1	3	0	1	2	4	2
14:00	2	1	2	2	4	0	1	2	2	2
15:00	1	5	5	1	4	2	3	3	3	3
16:00	5	1	4	4	3	2	2	3	4	3
17:00	4	6	6	5	3	2	2	3	6	4
18:00	0	1	0	3	4	1	0	1	2	1
19:00	2	2	0	3	2	1	1	2	2	2
20:00	1	0	0	2	0	1	0	0	1	1
21:00	1	1	2	1	0	0	0	0	2	1
22:00	1	1	0	0	0	0	0	0	0	0
23:00	0	0	0	0	0	0	0	0	0	0
Total	38	39	38	37	39	20	18	31	38	33

Average Week Day

Summary

	from	to	
AM Peak	7:00 AM	8:00 AM	4
PM Peak	5:00 PM	6:00 PM	6
Week Day Average			31
Weekend Day Average			38
7 Day Average			33

Site 10 Braymont Rd, 50m south of Boggabri-Manilla Rd [80]
Southbound
Lane 0

Day Time	Thu 11/06/2015	Fri 12/06/2015	Sat 13/06/2015	Sun 14/06/2015	Mon 15/06/2015	Tue 16/06/2015	Wed 17/06/2015	W/Day Ave.	W/End Ave.	7 Day Ave
0:00	0	1	0	0	0	0	1	0	0	0
1:00	0	0	0	0	0	0	0	0	0	0
2:00	0	0	0	0	0	0	1	0	0	0
3:00	0	0	0	0	0	0	0	0	0	0
4:00	0	0	0	0	0	0	0	0	0	0
5:00	3	3	3	11	4	5	2	3	7	4
6:00	4	1	4	4	4	2	0	2	4	3
7:00	1	2	0	2	2	0	1	1	1	1
8:00	3	2	1	1	0	1	0	1	1	1
9:00	2	1	0	3	2	1	1	1	2	1
10:00	1	3	3	1	1	3	2	2	2	2
11:00	4	5	4	1	2	2	1	3	3	3
12:00	3	4	3	3	3	0	1	2	3	2
13:00	4	2	1	5	1	0	0	1	3	2
14:00	1	8	3	1	7	1	0	3	2	3
15:00	4	1	3	3	4	2	2	3	3	3
16:00	2	3	3	0	4	1	2	2	2	2
17:00	6	3	2	5	6	6	3	5	4	4
18:00	6	1	4	4	2	4	3	3	4	3
19:00	1	0	1	0	1	1	0	1	1	1
20:00	1	0	0	0	0	0	1	0	0	0
21:00	0	0	0	1	0	0	0	0	1	0
22:00	0	0	0	0	0	0	0	0	0	0
23:00	0	0	0	0	0	0	0	0	0	0
Total	46	40	35	45	43	29	21	36	40	37

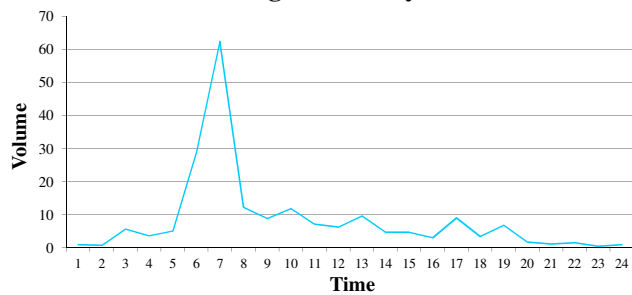
Average Week Day

Summary

	from	to	
AM Peak	5:00 AM	6:00 AM	5
PM Peak	2:00 PM	3:00 PM	8
Week Day Average			36
Weekend Day Average			40
7 Day Average			37

Site 11 Maules Ck Mine Access Rd, Approx 2km inside of Boggabri Mine Access [80] Northbound Lane 0

Day Time	Thu 11/06/2015	Fri 12/06/2015	Sat 13/06/2015	Sun 14/06/2015	Mon 15/06/2015	Tue 16/06/2015	Wed 17/06/2015	W/Day Ave.	W/End Ave.	7 Day Ave
0:00	1	1	0	0	0	1	1	1	0	1
1:00	1	1	1	0	0	0	1	1	1	1
2:00	5	7	4	3	5	7	4	6	4	5
3:00	3	5	1	1	4	3	3	4	1	3
4:00	4	7	2	3	6	4	4	5	3	4
5:00	35	22	8	6	18	36	34	29	7	23
6:00	74	53	22	18	50	74	61	62	20	50
7:00	10	9	3	1	11	16	15	12	2	9
8:00	10	10	5	0	11	8	5	9	3	7
9:00	14	9	0	5	11	14	11	12	3	9
10:00	10	6	1	2	9	6	4	7	2	5
11:00	5	7	1	0	3	12	4	6	1	5
12:00	9	7	0	1	12	12	8	10	1	7
13:00	3	3	0	1	4	4	9	5	1	3
14:00	4	4	2	1	8	1	6	5	2	4
15:00	1	3	1	1	6	3	2	3	1	2
16:00	7	11	7	6	8	12	7	9	7	8
17:00	4	3	0	1	2	3	5	3	1	3
18:00	5	5	7	7	7	7	10	7	7	7
19:00	0	2	3	1	3	2	1	2	2	2
20:00	2	0	1	1	0	0	3	1	1	1
21:00	1	1	1	2	4	1	0	1	2	1
22:00	0	1	0	0	1	0	0	0	0	0
23:00	1	0	1	0	1	2	0	1	1	1
Total	209	177	71	61	184	228	198	199	66	161

Average Week Day



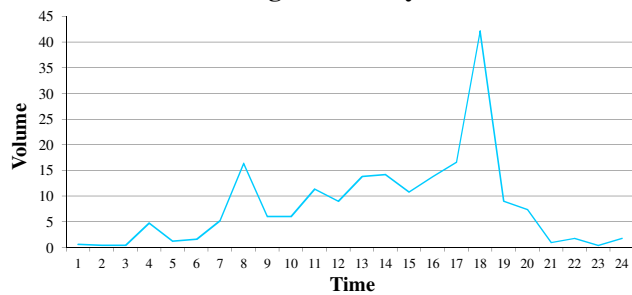
Summary

	from	to	
AM Peak	6:00 AM	7:00 AM	74
PM Peak	12:00 PM	1:00 PM	12
Week Day Average			199
Weekend Day Average			66
7 Day Average			161

Site 11 Maules Ck Mine Access Rd, Approx 2km inside of Boggabri Mine Access [80] Southbound Lane 0

Day Time	Thu 11/06/2015	Fri 12/06/2015	Sat 13/06/2015	Sun 14/06/2015	Mon 15/06/2015	Tue 16/06/2015	Wed 17/06/2015	W/Day Ave.	W/End Ave.	7 Day Ave
0:00	0	0	0	0	0	2	1	1	0	0
1:00	0	1	0	0	0	0	1	0	0	0
2:00	0	0	1	0	0	2	0	0	1	0
3:00	5	5	7	6	5	5	4	5	7	5
4:00	1	1	0	1	2	1	1	1	1	1
5:00	3	1	3	0	2	1	1	2	2	2
6:00	7	5	4	4	1	3	10	5	4	5
7:00	15	9	7	10	15	17	26	16	9	14
8:00	6	5	1	2	5	8	6	6	2	5
9:00	3	3	1	2	6	10	8	6	2	5
10:00	13	12	2	1	7	17	8	11	2	9
11:00	9	5	1	3	9	15	7	9	2	7
12:00	24	14	2	0	8	13	10	14	1	10
13:00	17	14	3	1	9	16	15	14	2	11
14:00	8	11	4	10	9	16	10	11	7	10
15:00	16	21	4	1	14	7	11	14	3	11
16:00	14	20	1	2	16	16	17	17	2	12
17:00	45	27	22	12	46	59	34	42	17	35
18:00	13	5	2	3	11	8	8	9	3	7
19:00	8	7	5	2	9	8	5	7	4	6
20:00	1	1	0	2	1	0	2	1	1	1
21:00	1	1	0	0	3	2	2	2	0	1
22:00	1	0	0	0	1	0	0	0	0	0
23:00	1	1	0	0	3	1	3	2	0	1
Total	211	169	70	62	182	227	190	196	66	159

Average Week Day



Summary

	from	to	
AM Peak	7:00 AM	8:00 AM	26
PM Peak	5:00 PM	6:00 PM	59
Week Day Average			196
Weekend Day Average			66
7 Day Average			159

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APPENDIX B
ROAD NOISE ADVICE

16 March 2016

Mr Scott Mitchell
Maules Creek Coal Pty Ltd
c/- Resource Strategies Pty Ltd
PO Box 1842
MILTON QLD 4064

Dear Scott,

Regarding: Maules Creek Coal – Road Traffic Noise Assessment

1 INTRODUCTION

This letter provides advice on road traffic noise levels to support an Environmental Assessment (EA) being prepared for a Project Approval Modification. The Modification is required to address changes to employee road transport movements at Maules Creek Coal (MCC) relative to those assumed for the original EA compiled to support the Project Approval.. It is understood MCC has lodged a draft EA with the Department of Planning & Environment (DP&E). In response DP&E has requested a specific assessment of road traffic noise as part of the Modification EA.

Definitions of terminology that may be used in this document are provided in Table 1.1.

Table 1.1: TERMINOLOGY

Descriptor	Definition
dB	Decibels. For sound pressure level this is 10 times the logarithm to the base 10 of the ratio of the mean-square sound pressure to the square of the reference sound pressure (20 μ Pa);
dB(A)	Noise level measurement units are decibels (dB). The A-weighting scale is used to approximate human perception of noise
SEL	Sound exposure level (SEL), the A-weighted noise energy during a measurement period normalised to one second
SPL	Sound pressure level
L_n	The noise level (in dB) exceeded for n percent of a measurement period
L_{Aeq}	The average A-weighted noise energy (in dB) for a measurement period
L_{A90}	The noise level (in dB) exceeded for 90 percent of a measurement period, also known as the background level

2 ASSESSMENT

2.1 Receiver

Resource Strategies indicated the nearest private residential receiver (NSR) that may be impacted by employee road traffic noise is located 37 metres from Therribri Road. This NSR was referred to as Receiver 264 in the original noise impact assessment prepared for the Project Approval. Calculations have been undertaken for this NSR.

2.2 Criteria

In 2011 the NSW state government department responsible for the environment (the Department of Environment, Climate Change and Water¹) released the NSW Road Noise Policy (RNP). The RNP outlines traffic noise criteria applicable to this project. The policy applies different noise limits dependent upon the road category and type of project/land use.

Table 2.1 presents noise criteria from the RNP for various road categories.

Table 2.1: ROAD TRAFFIC NOISE CRITERIA - dB

Road Category	Type of Project/Land use	Day	Night
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	L _{Aeq} ,1hour ⁵⁵ (external)	L _{Aeq} ,1hour ⁵⁰ (external)
Sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	L _{Aeq} ,15hour ⁶⁰	L _{Aeq} ,9hour ⁵⁵

Therribri Road is considered a local road in accordance with RNP definitions.

2.3 Monitoring Data

Road traffic noise levels were measured for individual vehicle pass-by events at a location 37 metres from Therribri Road, in the immediate vicinity of Receiver 264, on 1 March 2016. These data were supplemented by additional measurements taken at 37 metres from the Kamilaroi Highway on 2 March 2016. Data measured at the two locations were similar, although a higher SEL was measured for light vehicles in Therribri Road due to the higher proportion of 4wd vehicles.

L_{Aeq} and duration of audibility for each vehicle pass-by were recorded. Corresponding sound exposure level (SEL) for each pass-by was calculated. Thirty-three light vehicle and eight heavy vehicle movements were measured.

¹ Now the Environment Protection Authority

Average measured SEL were:

- Light vehicles: 65.4 dB for all measured light vehicles, and, 66.3 dB for light vehicles on Therribri Road only; and
- Heavy vehicles: 74.8 dB.

Calibration certificates and details of equipment used during monitoring can be provided upon request.

2.4 Calculations

Road traffic noise criteria for local roads are expressed in terms of $L_{Aeq,1hour}$. Therefore, road traffic noise predictions have been calculated for morning and afternoon peak hour traffic volumes.

Resource Strategies provided currently approved and proposed Modification road traffic volumes for Therribri Road for 2015 and 2020. Volumes are presented in Table 2.2.

Table 2.2: THERRIBRI ROAD TRAFFIC VOLUMES

	6am-7am (veh/h)			5pm-6pm (veh/h)			Daily (veh/day)		
	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total
2015 Approved	17	21	38	11	14	25	92	142	234
2015 Modification	56	15	71	39	9	48	330	116	446
2020 Approved	15	31	46	9	19	28	95	136	231
2020 Modification	84	15	99	51	9	60	445	70	515

Table 2.3 presents calculated road traffic noise levels as $L_{Aeq,1hour}$. These are calculated using average measured SEL for light and heavy vehicles, and the total number of each vehicle type forecast for the relevant period. $L_{Aeq,24hour}$ predictions are also provided for informative purposes. Therribri Road SEL were used for light vehicle calculations. A facade correction of plus 1.5 dB was added to predicted levels.

Results in bold type exceed the relevant criterion. Differences between approved and proposed Modification levels are indicated.

Table 2.3: THERRIBRI ROAD TRAFFIC NOISE PREDICTIONS - dB

	6am-7am LAeq,1hour			5pm-6pm LAeq,1hour			Daily LAeq,24hour		
	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total
2015 Approved	44.5	54.0	54.5	42.6	52.2	52.7	38	48.5	48.9
2015 Modification	49.7	52.5	54.3	48.1	50.3	52.3	43.6	47.6	49.1
Difference	5.2	-1.5	-0.2	5.5	-1.9	-0.4	5.6	-0.9	0.2
2020 Approved	44	55.7	56	41.7	53.5	53.8	38.2	48.3	48.7
2020 Modification	51.4	52.5	55	49.3	50.3	52.8	44.9	45.4	48.2
Difference	7.4	-3.2	-1.0	7.6	-3.2	-1.0	6.7	-2.9	-0.5

Results in Table 2.3 indicate:

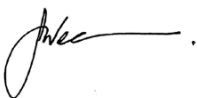
- Morning peak hour predictions exceed the RNP night period criterion for local roads of LAeq,1hour 50 dB for approved and proposed Modification volumes, for both 2015 and 2020. Heavy vehicle movements are primarily responsible for these predicted exceedances;
- Afternoon peak hour predictions comply with the RNP day period criterion for local roads of LAeq,1hour 55 dB for approved and proposed Modification volumes, for both 2015 and 2020; and
- A general decrease is predicted for proposed Modification volumes relative to approved volumes, due to the reduction in heavy vehicle movements.

3 CONCLUSION

Based on the above, it is apparent that heavy vehicles are primarily responsible for predicted levels. Despite the overall increase in traffic volumes proposed, a reduction in noise levels is predicted due to the lower quantity of heavy vehicles.

I trust this information meets your requirements. If you have any questions or need further details please contact me.

Regards,



Jeremy Welbourne
Civil Engineer (Acoustics)