GTAconsultants

Tarrawonga and Rocglen Coal Mines

Temporary Road Haulage Increase Modification

Road Transport Assessment

Client //	Whitehaven Coal Limited
Office //	NSW
Reference //	N106010
Date //	5/10/16

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Quality Record

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References

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1. Introduction

This report has been prepared on behalf of Whitehaven Coal Limited (Whitehaven) to present the findings of an assessment of the road transport implications of a proposal to temporarily increase the combined road haulage limits for the Tarrawonga Coal Mine and Rocglen Coal Mine.

This report accompanies an Environmental Assessment prepared in accordance with Section 75W of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). This report has been prepared with reference to the specific advice issued by the Department of Planning and Environment (DP&E):

Traffic/Haulage

- *Provide details of current and proposed haulage parameters on a like for like basis.*
- *Complete a traffic/safety audit to inform an assessment of the likely transport impacts of the development on the capacity, condition, safety and efficiency of the haulage route, particularly interactions with public road networks.*
- *Clearly identify existing controls implemented by each mine to manage coal/reject haulage, including spillage and tracking of materials from the mines sites/CHPP onto the public road network.*
- *Clearly identify further controls (where required).*

A Road Safety Audit has been conducted by GTA Consultants (2016), and the results of that audit have informed the findings of this assessment.

2. Approved Operations and Modification

2.1 Approved Whitehaven Mines

Whitehaven owns or has a controlling interest in a number of operational mine sites and the Whitehaven Coal Handling and Preparation Plant and rail load out facility (Whitehaven CHPP) which processes run-of-mine (ROM) coal from the Tarrawonga and Rocglen Coal Mines.

The location of the relevant mines is presented in Figure 1.

2.1.1 Rocglen Coal Mine

The Rocglen Coal Mine (Project Approval 06_0198) was approved in 2008 to extract some 1.5 million tonnes per annum (Mtpa) of ROM coal for an approved mine life of 12 years.

Subsequently, in September 2011, the Rocglen Extension Project was approved under Part 3A of the EP&A Act (Project Approval 10_0015). The Rocglen Extension Project involved an additional 4 years of mine life and continuation of the approved extraction rate of 1.5 Mtpa ROM coal.

Sized ROM coal from the Rocglen Coal Mine is trucked to the Whitehaven CHPP for processing and train loading, and coal reject from the Whitehaven CHPP is trucked back to the Rocglen Coal Mine for disposal in accordance with Project Approval 10_0015.

2.1.2 Tarrawonga Coal Mine

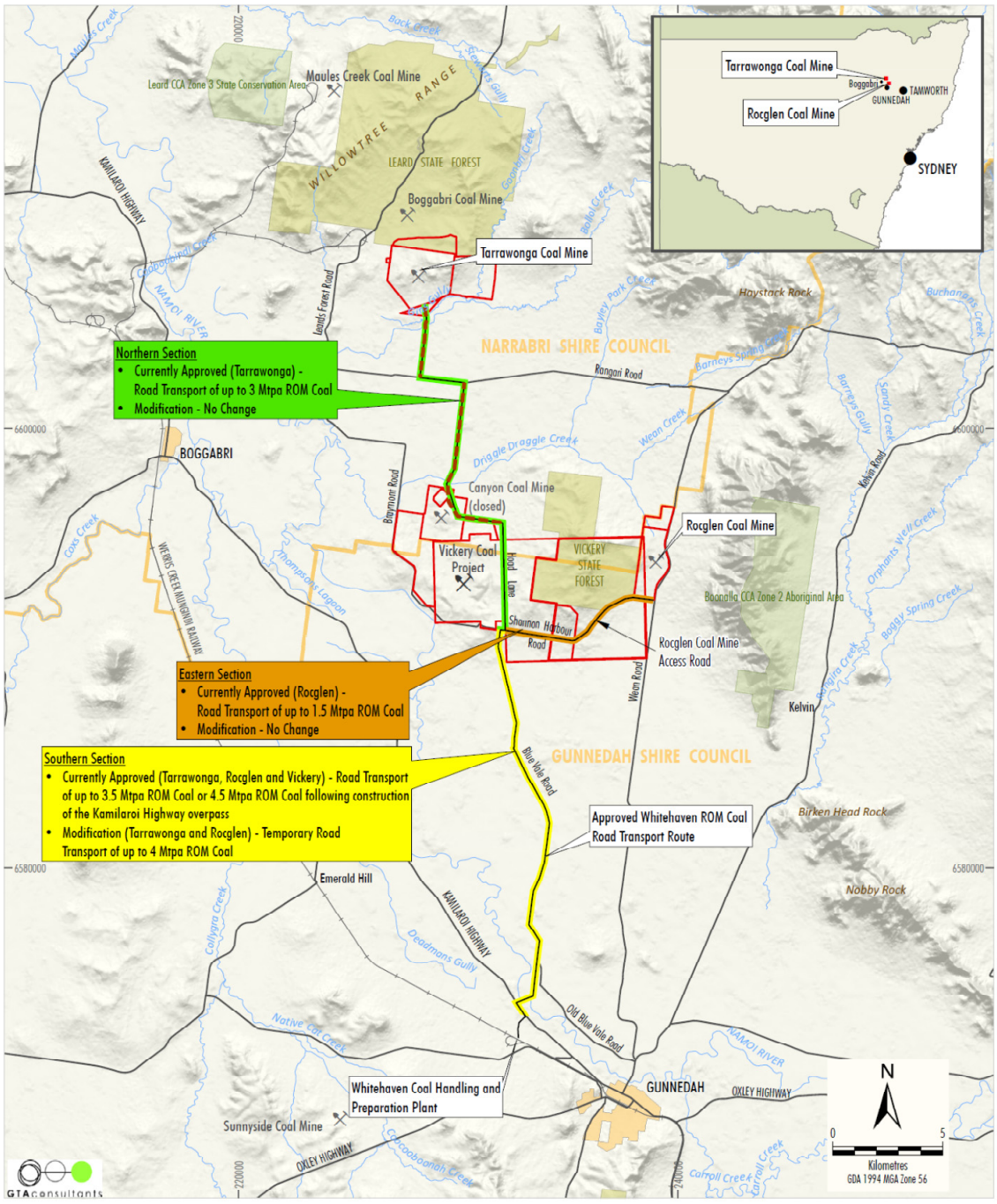
The Tarrawonga Coal Mine (Development Consent DA-88-4-2005) was approved in 2005 and subsequently modified in 2010 to extract some 2 Mtpa ROM coal until 2017.

The Tarrawonga Coal Project was approved under Part 3A of the EP&A Act in January 2013 (Project Approval 11_0047). The Tarrawonga Coal Project involved production of up to 3 Mtpa of ROM coal over a 17 year mine life and the transport of up to 2 Mtpa of ROM coal by road to the Whitehaven CHPP until approvals and upgrades are in place for the transfer of ROM coal from the Tarrawonga Coal Mine to the Boggabri Coal Mine Infrastructure Facilities.

In November 2014, approval was granted to modify Project Approval 11_0047 to increase the road transport of ROM coal from the Tarrawonga Coal Mine to the Whitehaven CHPP from 2 to 3 Mtpa. The increase in ROM coal transport rate was sought as commercial arrangements are not in place transport and process Tarrawonga Coal Mine ROM coal via the Boggabri Coal Mine Infrastructure Facilities.

Sized ROM coal from the Tarrawonga Coal Mine is trucked to the Whitehaven CHPP for processing (where required) and train loading, and coal reject from the Whitehaven CHPP is backfilled to either the Tarrawonga or Rocglen Coal Mines in accordance with Project Approvals (11_0047) and (10_0015), respectively.

Figure 1: Regional Location



Source: LPMA - Topographic Base (2010); NSW Department of Industry (2015)

Figure 1

2.1.3 Other Cumulative Effects

Maules Creek Coal Mine

On 23 October 2012, the Maules Creek Coal Mine received Project Approval (10_0138). The Maules Creek Coal Mine includes development of a 21 year open cut mining operation with an extraction rate of up to 13 Mtpa ROM coal, and the construction and use of associated surface infrastructure. Two modifications to Project Approval 10_0138 for the Maules Creek Coal Mine have been approved. Maules Creek utilises Therribri Road as its primary access. Some heavy vehicle deliveries associated with Maules Creek Coal Mine use the Approved Whitehaven ROM Coal Road Transport Route (Approved Road Transport Route).

Vickery Coal Project

Development Consent for the Vickery Coal Project was granted under Part 4 of the EP&A Act (SSD-5000) on 19 September 2014. The Vickery Coal Project will involve open cut mining with annual ROM coal production of up to 4.5 Mtpa over a 30 year mine life. Construction and operation of the Vickery Coal Project has not yet commenced. With regard to the road transport environment, the Vickery Coal Project includes:

- vehicular access via Blue Vale Road;
- realignment of sections of Braymont Road, Blue Vale Road, Shannon Harbour Road and Hoad Lane;
- construction of an approximately 1 kilometre(km) long section of private haul road (including an overpass over the Kamilaroi Highway) between Blue Vale Road and the Whitehaven CHPP (referred to as the private haul road and highway overpass) prior to any cumulative road haulage of ROM coal along the Approved Road Transport Route (from all Whitehaven mines) exceeding 3.5 Mtpa;
- transport of up to a total of 3.5 Mtpa, or up to 4.5 Mtpa of ROM coal to the Whitehaven CHPP located approximately 5 km west of Gunnedah subject to the construction of the approved private haul road and Kamilaroi Highway overpass;
- transport of coarse rejects and tailings generated at the Whitehaven CHPP via truck to the Vickery Coal Project for emplacement within an in-pit emplacement area and co-disposal storage areas in the open cut and/or disposal in existing off-site licensed facilities, respectively; and
- extraction of up to 90,000 cubic metres (m^3) of gravel from the site for collection by customers, utilising the Approved Road Transport Route from Gunnedah, or via Kamilaroi Highway, Rangari Road and the Approved Road Transport Route from Boggabri Coal Mine and surrounding areas.

Vickery Extension Project

The Vickery Extension Project Environmental Impact Statement (EIS) is currently in preparation to accompany a Development Application, in accordance with Part 4 of the EP&A Act. A Preliminary Environmental Assessment was lodged with the DP&E in January 2016. The Secretary's Environmental Assessment Requirements were issued by the DP&E on 19 February 2016. The EIS will address the potential environmental impacts of the Vickery Extension Project and is anticipated to be lodged in late 2016.

The Vickery Extension Project would involve mining the coal reserves associated with Vickery Coal Project, as well as accessing additional coal reserves. However, it is not anticipated to be constructed or become operational within the duration of this Modification (i.e. prior to the end of 2017).

The Vickery Extension Project would also involve the construction and operation of an on-site CHPP, rail load out facility and rail loop and rail spur. This infrastructure would be used for the handling, processing and transport of coal from the Vickery Coal Project, as well as other existing Whitehaven mining operations (e.g. the Tarrawonga and Rocglen Coal Mines).

Whitehaven CHPP and Rail Load Out Facility

The Whitehaven CHPP is located approximately 5 km west of Gunnedah and currently processes ROM coal from the surrounding operating Whitehaven coal mining operations (namely the Tarrawonga and Rocglen Coal Mines).

The Whitehaven CHPP operates in accordance with Development Consent (DA 0079.2002). The consent is valid for a period of 20 years and expires in December 2022.

The Whitehaven CHPP and the rail load out facility is approved to handle up to 4.1 Mtpa of product coal (i.e. including loading of Whitehaven CHPP bypass coal) and up to 3 Mtpa of sized ROM coal is approved to be processed at the Whitehaven CHPP.

2.2 ROM Coal Haulage

The Approved Road Transport Route includes a combination of public and private roads and provides the shortest and least trafficked route from Tarrawonga Coal Mine and Rocglen Coal Mine to the Whitehaven CHPP. It is not used by Whitehaven's other operational mines, however the southern section is proposed to be used by the Vickery Coal Project, when this Project is commenced. The approved private haul road and highway overpass will create a direct private road link from Blue Vale Road on the eastern side of Kamilaroi Highway into the Whitehaven CHPP on the western side of Kamilaroi Highway.

The current Project Approvals permit road transport of ROM coal using the Approved Road Transport Route of:

- up to 3.5 Mtpa of ROM coal to the Whitehaven CHPP prior to commissioning of the private haul road and Kamilaroi Highway overpass, sourced from either:
  - Tarrawonga Coal Mine (up to 3.0 Mtpa).
  - Rocglen Coal Mine (up to 1.5 Mtpa).
- up to 4.5 Mtpa of ROM coal to the Whitehaven CHPP using the Approved Road Transport Route following commissioning of the private haul road and Kamilaroi Highway overpass sourced from either:
  - Tarrawonga Coal Mine (up to 3.0 Mtpa).
  - Rocglen Coal Mine (up to 1.5 Mtpa).

In addition, coal reject generated at the Whitehaven CHPP are permitted to be transported via truck back to Tarrawonga Coal Mine or Rocglen Coal Mine, which is undertaken by backloading of ROM coal haulage trucks. Up to 90,000 m^3 of gravel from Tarrawonga may also be transported on the Approved Road Transport Route, noting this transport is undertaken by customers, not by Whitehaven.

The approved hours for ROM coal haulage on the Approved Road Transport Route from the Tarrawonga and Rocglen Coal Mines to the Whitehaven CHPP are listed in Table 2.1.

Table 2.1: Approved ROM Coal Road Haulage Hours from the Tarrawonga and Rocglen Coal Mines

Day	Tarrawonga Coal Mine	Rocglen Coal Mine
Weekday	6.00 am to 9.15 pm	7.00 am to 9.15 pm
Saturday	7.00 am to 5.15 pm	7.00 am to 5.15 pm
Sunday	-	-
Public Holidays	-	-

Note: The last haul trucks leave the Tarrawonga or Rocglen Coal Mines at the specified end time.

ROM coal haulage is thus limited to approximately 15.25 hours per weekday[1] and 86.5 hours per week. Haulage occurs over approximately 48 weeks per year using trucks with a capacity of 42 tonnes. On this basis, Table 2.2 summarises the average vehicle trips generated on the Approved Road Transport Route per weekday and per haulage hour under the currently approved combined maximum haulage conditions. A trip is a one way movement, thus one delivery of ROM coal from a mine to the Whitehaven CHPP and return of the empty (or backloaded rejects) truck to the mine generates two vehicle trips on the Approved Road Transport Route.

Table 2.2: Approved Average Coal Haulage and Weekday Vehicle Trips

Section of Approved Road Transport Route	Maximum ROM Coal (Mtpa)	Average Weekday Trips	Average Hourly Trips[B]
Tarrawonga Coal Mine to Shannon Harbour Road	3.0	524	34
Rocglen Coal Mine to Blue Vale Road	1.5	262	17
Shannon Harbour Road to Whitehaven CHPP[A]	3.5	612	40

Note: Average vehicle trips under approved maximum ROM coal haulage scenario.

[A] Prior to commissioning of private haul road and highway overpass

[B] During approved haulage hours only

Under the Project Approvals, maximum ROM coal haulage from Tarrawonga Coal Mine and Rocglen Coal Mine is expected to generate an average of 612 vehicle trips per weekday on the Approved Road Transport Route between Shannon Harbour Road and the Whitehaven CHPP.

Over the approved haulage hours, haulage at the maximum ROM coal rate of 3.5 Mtpa) generates an average of 40 vehicle trips per hour on the Approved Road Transport Route, being 20 trips to the Whitehaven CHPP and 20 trips returning from the Whitehaven CHPP.

In accordance with the requirements of the Tarrawonga Coal Mine Project Approval 11_0047, Whitehaven has entered into road maintenance agreements with the Narrabri Shire Council and Gunnedah Shire Council in relation to the Approved Road Transport Route. The road maintenance agreement with Narrabri Shire Council requires the roads and intersections along the Approved Road Transport Route within the Narrabri local government area to be maintained in good condition at all times at Whitehaven's cost. The road maintenance agreement with Gunnedah Shire Council requires Whitehaven to pay 95 percent of road maintenance costs incurred by the Gunnedah Shire Council for Hoad Lane and Blue Vale Road.

A road maintenance agreement with Gunnedah Shire Council on the back of an agreement the council has with Roads & Maritime Service (RMS) requires Whitehaven to pay 100% of road

[1] Weekday haulage of 15.25 hours has been selected as a conservative estimate as it reflects the currently approved hours for the Tarrawonga Coal Mine (from which the majority of coal hauled originates). The 15.25 hours does not include trucks returning to the Gunnedah CHPP after 9.15 pm, however this is partly offset by the slight variations in the start times between the sites (i.e. Rocglen Coal Mine haulage commences at 7.00 am, rather than 6.00 am as for Tarrawonga Coal Mine). Notwithstanding these variables, it is a conservative estimate of the haulage hours of the combined Tarrawonga and Rocglen Coal Mines.

maintenance costs incurred by the Gunnedah Shire Council for the section of the Kamilaroi Hwy Whitehaven uses along the Approved Road Transport Route.

2.3 Coal Transport Management

Management procedures are in place for both the Tarrawonga Coal Mine and Rocglen Coal Mine, which are set out in the Traffic Management Plan.

With regard to tracking of materials, Whitehaven publishes their Coal Movements Records for Tarrawonga Coal Mine and Rocglen Coal Mine on the Whitehaven Coal website.

The Environment Protection Licences (EPL) for the Whitehaven CHPP (EPL 3637), Tarrawonga Coal Mine (EPL 12365) and Rocglen Coal Mine (EPL 12870) contain conditions related to dust management.

Whitehaven's primary contractor for coal haulage has prepared an Emergency Management Plan. It addresses various emergencies, including:

- fire, including those involving vehicles;
- collision/rollover of vehicles;
- spills of hazardous and dangerous goods or of non-hazardous and general wastes;
- structural failures;
- personal injury of employees or the public; and
- medical alerts.

2.4 The Modification

The Modification proposes temporarily increasing the combined limit for transport of ROM coal prior to commissioning of the private haul road and highway overpass from 3.5 Mtpa to 4.0 Mtpa. The increased haulage would occur during 2016 and 2017. The Modification thus proposes transport of:

- northern section (i.e. from Tarrawonga Coal Mine only), up to 3.0 Mtpa of ROM coal (no change);
- eastern section (i.e. from Rocglen Coal Mine only), up to 1.5 Mtpa of ROM coal (no change); and
- southern section (i.e. cumulative from Tarrawonga Coal Mine and Rocglen Coal Mine) up to 4.0 Mtpa of ROM coal (increase of approved haulage rate from 3.5 Mtpa).

The Modification period is not anticipated to correspond with activity associated with development of the Vickery Coal Project (or the Vickery Extension Project). For the purpose of this assessment, as this allows for maximum growth in background traffic conditions over the period of the Modification. Traffic generated by other developments in the region is not expected to vary significantly over the period of the Modification, thus 2017 represents the "worst case" with regard to total traffic volumes on the road network.

The maximum coal haulage on the Approved Road Transport Route north of Shannon Harbour Road and on Shannon Harbour Road would be consistent with the currently approved maximums. Compared with approved conditions, the Modification would only impact traffic conditions on the Approved Road Transport Route south of Shannon Harbour Road, which is made up of Blue Vale Road, Kamilaroi Highway and the Whitehaven CHPP Access Road (private road) and includes the intersections of Kamilaroi Highway with Blue Vale Road, and Kamilaroi Highway with the Whitehaven CHPP Access Road.

3. Existing Road Transport Environment

3.1 Road Network

The existing road network in the vicinity of the Tarrawonga Coal Mine and Rocglen Coal Mine is described below and presented on Figure 2.

Kamilaroi Highway (Route B51) is a State Road which runs generally north-south to the west of Tarrawonga Coal Mine and Rocglen Coal Mine, and provides a link between the upper Hunter region and the north-west of NSW, providing access to regional centres such as Gunnedah, Boggabri, Narrabri and Bourke. Kamilaroi Highway has a single travel lane in each direction, with auxiliary turn lanes at some intersections, and a posted speed limit of 100 kilometres per hour (km/h). The intersections with Blue Vale Road and with the Whitehaven CHPP access road have separate deceleration and acceleration lanes to accommodate the slower moving coal trucks with minimum disruption to the through traffic.

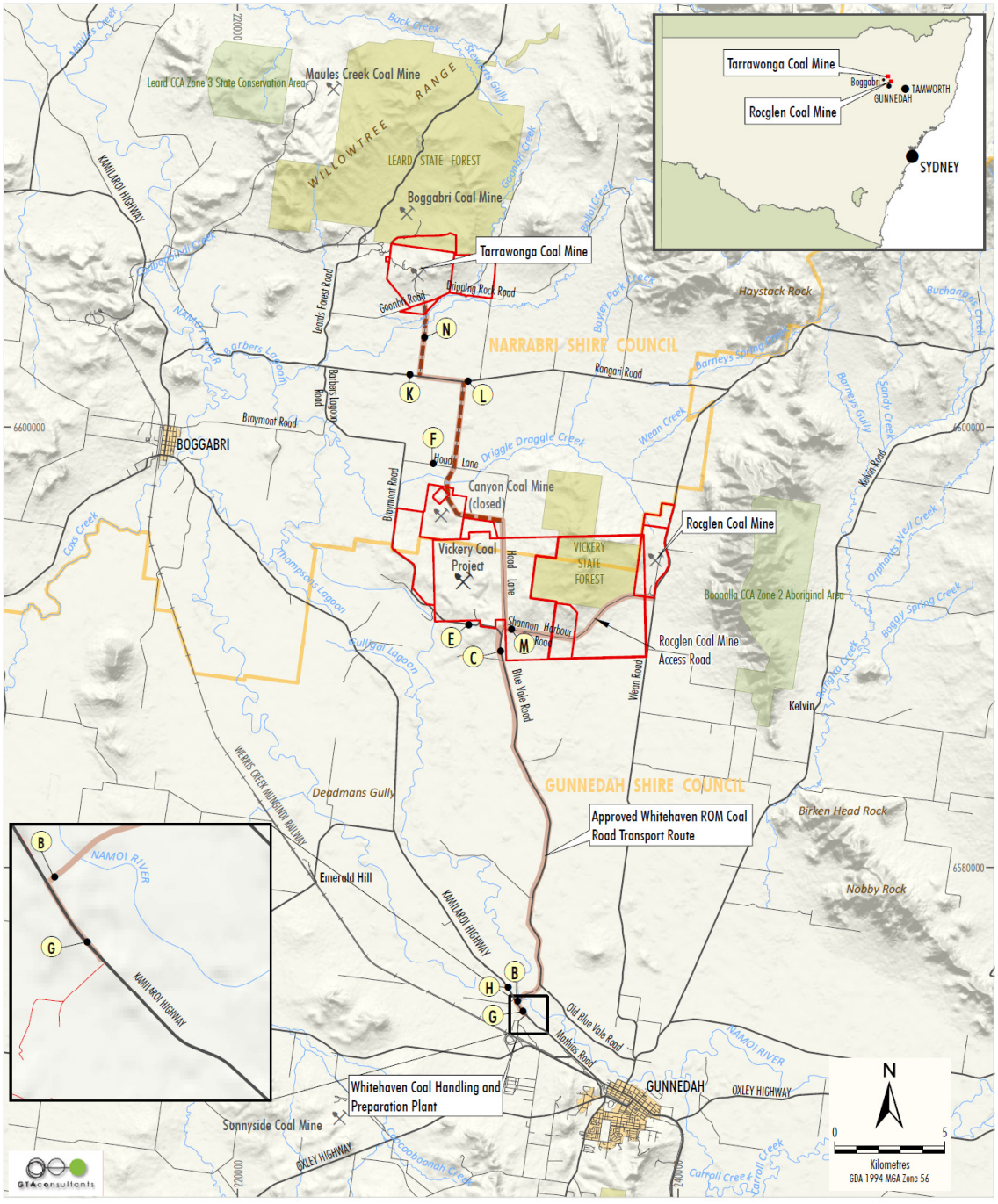
Rangari Road (Main Road 357) is a Regional Road which runs approximately east-west to the south of the Tarrawonga Coal Mine, and links between Kamilaroi Highway to the west and Manilla to the east. Rangari Road typically has a single travel lane in each direction, and a posted speed limit of 80 km/h. Rangari Road is also known as Boggabri-Manilla Road and Manilla Road. Rangari Road has a sealed surface between Kamilaroi Highway and the Approved Road Transport Route, with an unsealed surface east of the Approved Road Transport Route.

Hoad Lane provides a local road connection northwards from Blue Vale Road at Braymont Road to north-east of the Canyon Coal Mine, then an east-west connection from there to intersection with Braymont Road to the north-west of the Canyon Coal Mine. A private road access to the Canyon Coal Mine intersects with Hoad Lane at a tee intersection. South of the Canyon Coal Mine access road, Hoad Lane has a sealed surface, with a single travel lane in each direction, and centre road markings along most of its length. A right turn deceleration lane is provided in Hoad Lane for northbound vehicles turning right into Shannon Harbour Road, and a southbound acceleration lane is provided in Hoad Lane for vehicles turning left from Shannon Harbour Road. To the north of the Canyon Coal Mine access road, and to the east of Braymont Road, Hoad Lane has an unsealed surface.

Shannon Harbour Road provides a local road connection from Blue Vale Road near Braymont Road to Wean Road via Riordan Road. A private road access to the Rocglen Coal Mine extends from Shannon Harbour Road at Riordan Road, which is an unsealed road between Shannon Harbour Road and Wean Road. Shannon Harbour Road has a sealed surface.

Blue Vale Road is a local road that provides a north-south connection from Kamilaroi Highway to the north-west of Gunnedah to the intersection of Hoad Lane and Braymont Road. At this intersection, Hoad Lane and Blue Vale Road form the main road, with Braymont Road being the minor road. Braymont Road and Shannon Harbour Road form staggered tee intersections along the Hoad Lane/Shannon Harbour Road route. Blue Vale Road has a sealed surface with a single travel lane in each direction and centre line marking along much of its length.

Figure 2: Local Road Network and Traffic Survey Locations



LEGEND

- Mining Tenement Boundary (ML, CL and AUTH)
- NSW State Forest
- State Conservation Area, Aboriginal Area
- Major Roads
- Railway
- Local Government Boundary
- WHC Private Haul Road
- (B) Traffic Count Location

WHITEHAVEN COAL

TEMPORARY ROAD HAULAGE INCREASE MODIFICATION

Local Road Network and Traffic Survey Locations

Source: LPMA - Topographic Base (2010); NSW Department of Industry (2015)

Figure 2

The **Approved Road Transport Route** (Figure 1) consists of:

- Whitehaven private haul road north-south between the Tarrawonga Coal Mine and Rangari Road;
- Rangari Road;
- Whitehaven private haul road south of Rangari Road, which crosses Hoad Lane and passes through the Canyon Coal Mine and east-west past the Project to Hoad Lane;
- Hoad Lane between the Whitehaven private haul road and Blue Vale Road;
- Blue Vale Road between Hoad Lane and Kamilaroi Highway;
- Kamilaroi Highway between Blue Vale Road and Whitehaven CHPP access road; and
- The Whitehaven CHPP access road.

The Approved Road Transport Route intersects with a number of public roads along its length:

- Goonbri Road – coal haulage trucks travel through the four way intersection in a north-south direction. Goonbri Road is unsealed in the vicinity of the intersection, however the Approved Road Transport Route is sealed along with a section either side of the transport route along Goonbri road.
- Rangari Road (west) – tee intersection at which Rangari Road is the main road. Coal haulage trucks turn left onto Rangari Road and right from Rangari Road.
- Rangari Road (east) – tee intersection at which Rangari Road is the main road. Coal haulage trucks turn left onto Rangari Road and right from Rangari Road.
- Hoad Lane (west) – coal haulage trucks travel through the four way intersection in a north-south direction. Through traffic on Hoad Lane has priority.
- Hoad Lane (east) – tee intersection with Hoad Lane being the main road. The coal haulage trucks turn left from Hoad Lane and right onto Hoad Lane.
- Shannon Harbour Road – tee intersection at which Hoad Lane (the Approved Road Transport Route) is the main road. Coal haulage trucks to and from Rocglen Coal Mine also turn right into Shannon Harbour Road and left out of Shannon Harbour Road at this intersection.
- Braymont Road – tee intersection, at which Blue Vale Road (the Approved Road Transport Route) is the main road.
- Old Blue Vale Road – tee intersection, at which Blue Vale Road (the Approved Road Transport Route) is the main road.
- Kamilaroi Highway – tee intersection at which Kamilaroi Highway is the main road. Coal haulage trucks turn left from Blue Vale Road and right into Blue Vale Road.
- Whitehaven CHPP Access Road – tee intersection at which Kamilaroi Highway is the main road. Coal haulage trucks turn left from the Whitehaven CHPP Access Road and right into the Whitehaven CHPP Access Road.

Coal haulage from Rocglen Coal Mine also occurs along Shannon Harbour Road to Hoad Lane (the Approved Road Transport Route).

3.2 2016 Traffic Survey Program

A program of traffic surveys was undertaken during August 2016 on the southern portion of the Approved Road Transport Route to quantify existing traffic conditions. The survey program included seven day classified automatic counts on Blue Vale Road and on Kamilaroi Highway, and a weekday peak period survey of vehicle turning movements at the intersections of Blue Vale Road with Kamilaroi Highway and of the Whitehaven CHPP Access Road with Kamilaroi Highway.

The automatic counts were conducted from 12 to 23 August 2016, and the intersection surveys were undertaken on 23 and 24 August 2016. AgQuip, a rural industry showcase event which attracts significant numbers of visitors and exhibitors to Gunnedah took place in Gunnedah from 16 to 18 August 2016. AgQuip increases traffic in the local region, thus the results of the automatic surveys over the period of AgQuip are conservatively high relative to average conditions.

At the time of the traffic surveys, Tarrawonga Coal Mine and Rocglen Coal Mine were operating at typical conditions for 2016.

The 2016 traffic survey program supplements traffic survey data collated on roads of relevance to the Modification. The majority of the available data was from surveys conducted over one week during November-December 2010, with some exceptions, namely two locations surveyed during February 2011, and three during October-November 2011. Some additional surveys were conducted in 2015, as well as the surveys conducted in August 2016.

The traffic surveys provided data on the composition of the traffic based on standard vehicle classifications. Light vehicles include motorcycles, cars, vans, 4WDs, and utes (including those towing a trailer or caravan). Heavy vehicles include single unit trucks and buses and articulated vehicles such as semi-trailers, rigid trucks with trailers, B-Doubles and road trains.

3.3 Midblock Traffic Volumes

The average weekday traffic volume results of the traffic surveys are summarised in Table 3.1, noting that the time of the hour with the highest traffic volume varied from location to location. The selected hours of between 6.00 am and 7.00 am, and between 6.00 pm and 7.00 pm represent the hours during which mining activity in the region are expected to generate their highest traffic volumes, with employees moving to and from the mines. They do not necessarily represent the busiest hours at each of the surveyed locations.

The results of the 2016 surveys separately present the volumes during the week of AgQuip and those outside of that week. The surveyed volumes on Kamilaroi Highway demonstrate that AgQuip had a significant influence on traffic volumes on that road, being the primary access road for Gunnedah to and from the north. The effect of AgQuip was less pronounced during the peak hours, however over the average weekday, there was some 970 additional vehicles per day during the AgQuip week. AgQuip would be expected to have less of a direct influence on traffic volumes on Blue Vale Road, as it would not typically be used by visitors travelling to or from Gunnedah. The surveys indicate that there was a moderate decline in traffic on Blue Vale Road during the week of AgQuip. This may be attributable to behavioural changes associated with the AgQuip activities.

Table 3.1: Surveyed Average Weekday Traffic On and Near the Approved Road Transport Route

Site[A]	Location	6.00 am to 7.00 am[B]		6.00 pm to 7.00 pm[B]		Daily[C]	
		Light	Heavy	Light	Heavy	Light	Heavy
Surveyed During August 2016							
B	Blue Vale Road Northeast of Kamilaroi Highway						
	- Non-AgQuip week	32	11	59	32	1,152	589
	- AgQuip week	43	9	63	31	947	610
	- Total	39	10	62	31	1,024	602
G	Kamilaroi Highway Southeast of Blue Vale Road						
	- Non-AgQuip week	138	31	146	56	2,997	1,188
	- AgQuip week	142	37	181	63	3,851	1,304
	- Total	140	35	168	61	3,531	1,260
Surveyed During 2010 and 2011							
B	Blue Vale Road Northeast of Kamilaroi Highway	30	27	40	32	912	603
C	Blue Vale Road South of Shannon Harbour Road	33	25	4	25	196	456
E	Braymont Road West of Blue Vale Road	13	21	8	4	156	118
F	Hoad Lane West of Approved Road Transport Route	5	0	6	1	42	7
G	Kamilaroi Highway Southeast of Blue Vale Road	83	28	120	52	2,223	1,065
H	Kamilaroi Highway Northwest of Blue Vale Road	64	46	50	70	1,122	1,366
K	Rangari Road West of Approved Road Transport Route	51	29	14	20	293	343
L	Rangari Road East of Approved Road Transport Route	7	0	7	0	62	6
M	Shannon Harbour Road East of Blue Vale Road	7	6	7	8	83	134
N	Approved Road Transport Route South of Dripping Rock Road	23	14	9	16	143	325

[A] Refer to Figure 2
[B] vehicles per hour
[C] vehicles per day

The survey results indicate that the volumes of traffic carried on the roads are generally consistent with the function each road is expected to fulfil within the local region. Kamilaroi Highway is the major road transport route in the region, reflecting its designation of State Road and the inter-regional function it fulfils, and carries the highest volumes of traffic. Rangari Road provides an east-west intra-regional access function, linking towns on the Kamilaroi Highway such as Narrabri and Boggabri to the Fossickers Way (B95) at Manilla, as well as being a key access route for several major mining developments in the region. A significant proportion of traffic on Blue Vale Road relates to its designation as part of the Approved Road Transport Route. The surveyed traffic volumes on the local roads are typically low.

3.4 Southern Approved Road Transport Route Traffic

The Modification would impact only the southern part of the Approved Road Transport Route, south of Shannon Harbour Road. The 2016 surveys provide information on existing conditions close to Kamilaroi Highway, however the traffic surveys undertaken in 2010 and 2011 (Table 3.1) indicate that the number of vehicles on the Approved Road Transport Route is significantly lower immediately to the south of Shannon Harbour Road than immediately northeast of Kamilaroi Highway.

The volume of traffic currently using the Approved Road Transport Route immediately south of Shannon Harbour Road has therefore been estimated as described in the subsections below. In addition to the ROM haulage trucks, this section of the Approved Road Transport Route is used by employees, deliveries and visitors to the Tarrawonga Coal Mine and Rocglen Coal Mine, trucks transporting gravel and domestic specification coal from the Tarrawonga Coal Mine (not operated by Whitehaven), as well as general background traffic not directly related to Whitehaven's activities.

3.4.1 Employee Traffic

Rocglen Coal Mine employs 54 workers (GSS Environmental, 2011) and Tarrawonga Coal Mine employs 120 workers (Halcrow, 2011). Halcrow (2011) provides data on the travel characteristics of the Tarrawonga Coal Mine workforce, which are expected to be similar to those of the Rocglen Coal Mine. The employee trips would be spread throughout the day according to the shift start and finish times. The nominal shift times at Tarrawonga Coal Mine comprise an administration shift between 7.00am and 5.00pm, a day shift between 6.30am and 7.00pm, and a night shift between 6.30pm and 7.00am. For the purpose of this assessment it is assumed that administration workers make up 25 percent of the workforce, and the day and night shifts employ equal number of workers.

Rocglen Coal Mine operations comprise a day shift between 7.00am and 5.00pm and a night shift between 4.30pm and 2.30am (GSS Environmental, 2011). For the purpose of this assessment, it is conservatively assumed that half of the workforce work each shift.

Whilst shift times may change from time-to-time; these shifts are consistent with those used previously for road transport assessment and are considered to provide for a conservative assessment given that they coincide with the key hours of 6.00am to 7.00am and 6.00pm to 7.00pm.

3.4.2 Deliveries and Visitor Traffic

GSS Environmental (2011) estimates that Rocglen Coal Mine generates 8 light and 8 heavy vehicles movements per day associated with equipment supplies and miscellaneous trips. For the purpose of this assessment, it is assumed that all these trips occur on the Approved Road Transport Route south of Shannon Harbour Road. Halcrow (2011) estimates that the Tarrawonga Coal Mine generates approximately 70 light and 12 heavy vehicle movements per day on Blue Vale Road south of Shannon Harbour Road. These would typically be spread throughout the day, with the majority occurring during daylight hours.

3.4.3 Gravel Sales

Tarrawonga Coal Mine is approved for the transport of up to 90,000 m^3 of crushed gravel per annum, which would nominally generate an average of four heavy vehicle trips per day on the Approved Road Transport Route south of Shannon Harbour Road (Halcrow, 2011). These trips may occur any time during the approved haulage hours.

3.4.4 Domestic Specification Coal

Customers collect up to 150,000 tonnes per annum of domestic coal per annum from the Tarrawonga Coal Mine. These trips may occur any time during the approved haulage hours. The haulage of domestic coal is included in the approved maximum of 3.0 Mtpa permitted to be transported from the Tarrawonga Coal Mine, thus this activity is included in the ROM coal haulage activity.

3.4.5 ROM Coal Haulage

The survey of Blue Vale Road in August 2016 found that on the average weekday, 436 of the surveyed heavy vehicles were medium combination vehicles consistent with the fleet of vehicles used for Whitehaven ROM coal haulage and operating within the approved haulage hours.

3.4.6 Total Operational Traffic on Southern Approved Transport Route

Table 3.2 presents the estimated components of traffic on Blue Vale Road south of Shannon Harbour Road in 2016.

Table 3.2: Operational Traffic on Blue Vale Road South of Shannon Harbour Road 2016

Hour Starting	Tarrawonga Coal Mine			Rocglen Coal Mine			Coal Haulage
	Employees	Deliveries/Visitors		Employees	Deliveries/Visitors		
	Light	Light	Heavy	Light	Light	Heavy	Heavy
12.00am	0	0	0	0	0	0	0
1.00am	0	0	0	0	0	0	0
2.00am	0	0	0	12	0	0	0
3.00am	0	0	0	0	0	0	0
4.00am	0	0	0	0	0	0	0
5.00am	0	0	0	0	0	0	0
6.00am	34	5	1	12	1	0	9
7.00am	20	5	1	0	1	1	25
8.00am	0	5	1	0	1	1	34
9.00am	0	5	1	0	1	1	40
10.00am	0	5	1	0	1	1	35
11.00am	0	5	1	0	1	1	34
12.00pm	0	5	1	0	1	1	39
1.00pm	0	5	1	0	1	1	31
2.00pm	0	5	1	0	0	1	33
3.00pm	0	5	1	0	0	0	33
4.00pm	0	5	1	12	0	0	34
5.00pm	14	5	1	12	0	0	28
6.00pm	20	5	0	0	0	0	18
7.00pm	20	5	0	0	0	0	19

Hour Starting	Tarrawonga Coal Mine			Rocglen Coal Mine			Coal Haulage
	Employees	Deliveries/Visitors		Employees	Deliveries/Visitors		
	Light	Light	Heavy	Light	Light	Heavy	Heavy
8.00pm	0	0	0	0	0	0	19
9.00pm	0	0	0	0	0	0	9
10.00pm	0	0	0	0	0	0	0
11.00pm	0	0	0	0	0	0	0
Total	**108**	**70**	**12**	**48**	**8**	**8**	**440**

3.4.7 Background Traffic

Halcrow (2011) found that during the 2010-11 surveys, immediately south of Shannon Harbour Road, the background traffic component was negligible. As a robust assessment, it has been conservatively assumed that background traffic on the Approved Road Transport Route south of Shannon Harbour Road is equivalent to approximately 10 percent of the operational traffic in Table 3.2.

3.4.8 Summary of Approved Road Transport Route Traffic 2016

Table 3.3 summarises the existing traffic at key locations on the southern portion of the Approved Road Transport Route in 2016.

Table 3.3: Approved Road Transport Route Average Weekday Traffic in 2016

Hour Starting	Kamilaroi Highway Southeast of Blue Vale Road		Blue Vale Road Northeast of Kamilaroi Highway		Blue Vale Road South of Shannon Harbour Road	
	Light	Heavy	Light	Heavy	Light	Heavy
12.00am	13	5	0	1	0	0
1.00am	9	2	1	0	0	0
2.00am	5	2	1	0	12	0
3.00am	13	2	7	0	0	0
4.00am	56	11	12	4	0	0
5.00am	137	20	53	10	0	0
6.00am	137	31	39	10	**57**	**10**
7.00am	166	75	**96**	**38**	29	27
8.00am	**215**	**81**	47	37	6	36
9.00am	196	89	54	46	7	42
10.00am	185	102	36	47	7	37
11.00am	173	79	43	37	7	37
12.00pm	175	90	49	45	7	42
1.00pm	197	77	57	43	7	33
2.00pm	203	77	42	39	5	35
3.00pm	230	89	55	45	5	34
4.00pm	249	78	73	47	19	35
5.00pm	**257**	**76**	**89**	**45**	**34**	**29**
6.00pm	145	56	62	31	28	18
7.00pm	86	46	74	25	28	19
8.00pm	56	44	63	26	0	19
9.00pm	52	39	59	21	0	9

Hour Starting	Kamilaroi Highway Southeast of Blue Vale Road		Blue Vale Road Northeast of Kamilaroi Highway		Blue Vale Road South of Shannon Harbour Road	
	Light	Heavy	Light	Heavy	Light	Heavy
10.00pm	31	12	11	4	0	0
11.00pm	11	5	1	1	0	0
Total	**2,997**	**1,188**	**1,024**	**602**	**258**	**462**

The highest volumes during the morning and afternoon periods do not necessarily coincide along the Approved Road Transport Route.

3.5 Approved Road Transport Route Performance

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

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

Level of Service (LOS) is defined as a qualitative measure describing the operational conditions within a traffic stream as perceived by drivers and/or passengers. A LOS definition generally describes these conditions in terms of factors such as speed and travel time, freedom to manoeuvre, traffic interruptions, comfort, convenience and safety. LOS A provides the best traffic conditions, with no restriction on desired travel speed or overtaking. LOS B to D 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 roads are those on which motorists expect to travel at relatively high speeds. They most often serve long-distance trips or provide connecting links between facilities that serve long-distance trips. Class II roads are those on which motorists do not necessarily expect to travel at high speeds, and may function as access routes to Class I facilities, serve as scenic or recreational routes or pass through rugged terrain. Class III roads serve moderately developed areas, and may be portions of a Class I or Class II highway that pass through small towns or developed recreational areas, where local traffic mixes with through traffic, and the density of unsignalised roadside access points increases.

Most arterial roads such as Kamilaroi Highway are considered to be Class I, however the primary determinant of a road's classification for operational analysis is the drivers' expectations, which may not necessarily agree with the functional classification. Blue Vale Road would typically be considered as a Class II road 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).

The HCM method does not however apply to the short section of the Approved Road Transport Route on Kamilaroi Highway between Blue Vale Road and the Whitehaven CHPP, due to the presence of the auxiliary lanes over much of this section. It does not truly function as a two-lane two-way rural road, with the merging and diverging movements in both directions. The capacity and efficiency of this section of Kamilaroi Highway is thus related to the operation of the intersections at either end of the section, and the ability of vehicles to merge when entering Kamilaroi Highway from Blue Vale Road or from the Whitehaven CHPP Access Road. The operation of the intersections and the operation of the merges are reviewed in Section 3.7.

On Class II roads such as Blue Vale Road, LOS is defined in terms of Percent Time Spent Following (PTSF). The PTSF is a measure of the level of opportunities to overtake, and is estimated from the demand traffic volumes, the directional distribution of that traffic, and the percentage of no-passing zones. The LOS criteria for Class II two lane roads are as shown in Table 3.4.

Table 3.4: Level of Service Criteria for Class II Two Lane Rural Roads

Level of Service	PTSF (%)
A	40
B	> 40 – 55
C	> 55 – 70
D	> 70 – 85
E	85

[A] Note that 1 mi/h is equivalent to approximately 1.6 km/h

Table 3.5 presents the results of the assessment of midblock conditions at key locations on the Approved Road Transport Route during 2016.

Table 3.5: Approved Road Transport Route Performance in 2016

Site[A]	Road and Location	AM Peak				PM Peak			
		North or Eastbound		South or Westbound		North or Eastbound		South or Westbound	
		PTSF	LOS	PTSF	LOS	PTSF	LOS	PTSF	LOS
B	Blue Vale Road Northeast of Kamilaroi Hwy	40	A	29	A	40	A	29	A
C	Blue Vale Road South of Shannon Harbour Road	32	A	1	A	6	A	28	A

[A] Refer to Figure 2

The results indicate that drivers on the southern portion of the Approved Road Transport Route would be expected to experience good levels of service under the surveyed conditions in 2016.

3.6 Intersection Survey Results

The results of the intersection turning movement surveys in August 2016 at the intersections of Kamilaroi Highway with Blue Vale Road and the Whitehaven CHPP Access Road indicate that the busiest hours at both intersections occurred from 8.30 am to 9.30 am, and from 4.30 pm to 5.30 pm.

Table 3.6: Peak Hour Intersection Turning Movement Survey Summary (vehicles per hour)

Road and Turning Movement	AM Peak			PM Peak		
	Light	Heavy	Total	Light	Heavy	Total
Blue Vale Road						
Left onto Kamilaroi Highway[A]	16	30	46	28	23	51
Right onto Kamilaroi Highway	18	0	18	0	0	0
Kamilaroi Highway						
Left into Blue Vale Road	1	1	2	1	0	1
Right into Blue Vale Road[A]	1	30	31	20	23	43
Southbound past Blue Vale Road	124	13	137	99	14	113
Northbound past Blue Vale Road	78	15	93	112	12	124
Left into Whitehaven CHPP Access Road	5	2	7	4	0	4
Right into Whitehaven CHPP Access Road[A]	3	26	29	0	22	22
Southbound past Whitehaven CHPP Access Road	137	17	154	127	15	142
Northbound past Whitehaven CHPP Access Road	75	18	93	131	12	143
Whitehaven CHPP Access Road						
Left onto Kamilaroi Highway[A]	4	27	31	1	23	24
Right onto Kamilaroi Highway	6	0	6	6	0	6

[A] Movement is on the Approved Road Transport Route

During the surveyed morning and evening hours (total six hours), the Whitehaven CHPP Access Road was used by 254 heavy vehicles turning left into and right out of Kamilaroi Highway, i.e. on the Approved Road Transport Route. During the same hours, Blue Vale Road was used by 276 heavy vehicles respectively turning left into and right out of Kamilaroi Highway, i.e. on the Approved Road Transport Route.

During the surveyed peak hours, the Whitehaven CHPP Access Road was used by 53 and 45 heavy vehicles turning left into and right out of Kamilaroi Highway, i.e. on the Approved Road Transport Route. Comparison with Table 2.2 indicates that this is above the average number of trips per haulage hour expected at the approved coal haulage rate of 3.5 Mtpa. Review of the survey data indicates that this is due at least in part to the observed hour-by-hour variation in the movements of the haulage vehicles throughout the day.

The average hourly volumes in Table 2.2 assume that haulage trips are evenly spread across approximately 15.25 hours per weekday, which is equivalent to approximately 6.5% of haulage trips occurring each hour. The data from the Blue Vale Road survey however suggests that the number of heavy vehicles of the type used for coal haulage during any one haulage hour varies between 0% and 12% of the daily trips over all haulage hours.

3.7 Intersection Performance

At unsignalised intersections with minor roads, where there are relatively low volumes of through and turning vehicles, capacity considerations are usually not significant, and detailed analysis of capacity is not warranted. As a guide, at volumes below the following combinations of maximum hourly volumes at a cross intersection with a two lane two way road, capacity analysis is not warranted:

- major road 400 vehicles per hour, minor road 250 vehicles per hour;
- major road 500 vehicles per hour, minor road 200 vehicles per hour; and
- major road 650 vehicles per hour, minor road 100 vehicles per hour.

The intersections along the Approved Road Transport Route are typically T-intersections and so have fewer potentially conflicting movements than a cross intersection. Comparison between these threshold volumes and the peak hourly volumes on the key roads indicates that the existing traffic volumes on all roads are well below the threshold volumes above, and as such, there is no capacity concerns regarding the operation of the intersections.

While the traffic volumes remain below those thresholds at which capacity may become a concern, the operating conditions at the intersections of Kamilaroi Highway with Blue Vale Road and with the Whitehaven CHPP Access Road have been assessed using SIDRA intersection analysis software. At these intersections, coal haulage trucks use the Kamilaroi Highway, which is the main thoroughfare between Gunnedah and towns to the northwest such as Boggabri, Narrabri and Moree. Due to the higher traffic volumes on this route than any other route which intersects with the Approved Road Transport Route, it is in thus in the vicinity of these intersections that changes to the haulage of coal can be expected to have the greatest potential to impact on conditions on the public road network.

SIDRA 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 3.7. 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 per vehicle at priority intersections such as the surveyed intersections.

Table 3.7: 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 3.8 and full results are presented in Appendix B.

Table 3.8: Surveyed Peak Hour Intersection Operating Conditions August 2016

Intersection		X-value	Average Delay (sec/veh)[A]	Level of Service	Kamilaroi Highway Queue[B]
Kamilaroi Highway and Blue Vale Road	AM Peak PM Peak	0.08 0.07	11.4 10.9	A A	0.1 0.2
Kamilaroi Highway and Whitehaven CHPP Access Road	AM Peak PM Peak	0.09 0.08	11.4 11.5	A A	0.1 0.1

[A] for movement with highest average delay per vehicle

[B] 95th percentile queue of vehicles turning right from Kamilaroi Highway into side road

The SIDRA Intersection results indicate that during the surveyed peak hours, the intersections operate at good levels of service, with low delays to vehicles and with spare capacity. The SIDRA results indicate that the queues of vehicles waiting to turn right into Blue Vale Road and the

Whitehaven CHPP Access Road are short, at less than one vehicle queued at most times during the peak hours. Delays experienced by drivers travelling through the intersections on Kamilaroi Highway are negligible, due to the provision of separate turn lanes for the turns along the Approved Road Transport Route, and very low turning volumes where separate turn lanes are not provided.

As the left turn lanes from Blue Vale Road and the Whitehaven CHPP provide long merge lengths, the ability for the vehicles to merge from the auxiliary lane into the though lane of Kamilaroi Highway is not included in the intersection assessment above. The review the capacity for the merge, SIDRA has been used to model the peak period merge volumes in each direction. The results are summarised in Table 3.9.

Table 3.9: Peak Hour Merge Operating Conditions August 2016

Merge		X-value	Average Delay (sec/veh)[A]	Level of Service
Blue Vale Road merge into Kamilaroi Highway	AM Peak PM Peak	0.08 0.07	0.4 0.3	A A
Whitehaven CHPP Access Road merge into Kamilaroi Highway	AM Peak PM Peak	0.07 0.08	0.3 0.6	A A

[A] for movement merging into Kamilaroi Highway

The results indicate that the merge movements from the Whitehaven CHPP Access Road and Blue Vale Road experience negligible delay when merging into Kamilaroi Highway, and operate well below the capacity of the merge.

3.8 School Buses

School buses operate on several of the roads which form the Approved Road Transport Route, primarily along Kamilaroi Highway and on Blue Vale Road.

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

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 7.20 am and 9.05 am, and between 2.50 pm and 4.45 pm. The Boggabri to Gunnedah High School service operates from Boggabri starting at 7.40 am and ending in Gunnedah at 8.35 am. In the afternoon, it starts in Gunnedah at 3.15 pm and ends at Boggabri at 4.15 pm.

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

Some of the school bus routes vary times, routes and services in response to the changing needs of the student population.

3.9 Road Safety

Validated crash data was obtained from the RMS for the most recent five year period available, being from 1 January 2011 to 31 December 2015. The data is based on crashes reported to the Police, and included the area approximately bounded by the Mudgee-Werris Creek railway line to the west, north to Baan Baa, east to Wean Road and south to the boundary of Gunnedah township. There were 85 reported crashes in the study area, which included two fatal crashes, 50 injury crashes, and 33 non-injury tow-away crashes.

Of the 85 crashes reported in the study region, 43 occurred on Kamilaroi Highway. The data shows that over the five year period, four crashes occurred along the Approved Road Transport Route, of which three occurred on Kamilaroi Highway. The crashes on the Approved Road Transport Route are summarised in Table 3.10.

Table 3.10: Crash History of the Approved Road Transport Route (1 January 2011 to 31 December 2015)

Location	Time Date	Description	Conditions	Factors
Kamilaroi Highway 2 m south of Blue Vale Road	1.00 pm 20/5/2011	Northbound semitrailer travelling at 100 km/h struck an object falling from a southbound B-Double	Fine weather, dry road	None
Blue Vale Road 11 km north of Kamilaroi Highway	6.00 pm 8/6/2011	Southbound utility travelling at 100 km/h struck a kangaroo	Fine weather, dry road	None
Kamilaroi Highway 30 m south of Blue Vale Road	7.40 am 16/7/2012	Southbound semitrailer travelling at 55 km/h lost control on a bend	Fog or mist, wet road surface	Speed
Kamilaroi Highway 5 km north of Warrabungle Street[A]	8.30 am 4/9/2013	Northbound large rigid truck struck an object falling from a northbound "other" motor vehicle[B]	Fine weather, dry road	None

[A] near intersection of Kamilaroi Highway with Whitehaven CHPP access road

[B] "other" includes motor vehicles not otherwise specified by the classification system, and includes taxis

The crashes which have occurred on the Approved Road Transport Route do not highlight any particular causation factors on the route or at its intersections with public roads. Further, Whitehaven has indicated only one crash was involved in coal haulage activities.

4. Road Environment with Approved Haulage

4.1 Background Traffic Growth

Historic Annual Average Daily Traffic data for Kamilaroi Highway was examined by Halcrow (2012), which found that daily traffic volumes have tended to fluctuate without resulting in significant increases or decreases over time. Notwithstanding, and for the purpose of this assessment, a conservative background growth in daily traffic of 2.0 percent per annum has been assumed to occur on the roads in the region.

4.2 Coal Haulage Trips at Approved Haulage Rate

With the currently approved maximum haulage rate of ROM coal, the traffic volumes on the Approved Road Transport Route would be expected to increase above those surveyed during August 2016, when the rate of coal haulage was somewhat lower than the maximum approved.

The impact of ROM coal haulage on future baseline conditions on the southern portion of the Approved Road Transport Route in 2017 has been assessed on the following basis:

- The survey of Blue Vale Road in August 2016 found that on the average weekday, 436 of the surveyed heavy vehicles were medium combination vehicles consistent with the fleet of vehicles used for Whitehaven ROM coal haulage and operating within the approved haulage hours.
- At the maximum approved coal haulage rate, Blue Vale Road would carry an average of 612 vehicles per day directly associated with the haulage of ROM coal (Table 2.2). This represents an increase of 40 percent, or 176 heavy vehicles per day above that surveyed on Blue Vale Road in August 2016.
- The additional 176 heavy vehicles per day would generate an average of 11 to 12 additional heavy vehicle movements per hour, however to take into account the observed variation in the hour-by-hour heavy vehicle trips, it has been assumed that the additional 176 heavy vehicles would be spread throughout the approved haulage hours on a pro rata basis compared with the surveyed distribution on Blue Vale Road.

Table 4.1 compares the surveyed variation in haulage trucks throughout the day with that assumed with the approved maximum haulage rate.

Table 4.1: Surveyed and Approved Maximum Haulage Trips per Hour

Hour Starting	Surveyed	Approved Maximum	Increase
6.00am	9	13	4
7.00am	25	35	10
8.00am	34	48	14
9.00am	40	56	16
10.00am	35	49	14
11.00am	32	45	13
12.00pm	37	52	15
1.00pm	31	44	13
2.00pm	33	46	13
3.00pm	33	46	13
4.00pm	34	48	14
5.00pm	28	39	11
6.00pm	18	25	7
7.00pm	19	27	8
8.00pm	19	27	8
9.00pm	9	12	3
Total	**436**	**612**	**176**

With haulage occurring at the approved maximum rate, it would therefore be expected that there would be an increase of between 3 and 16 vehicle trips per hour on the southern portion of the Approved Road Transport Route between Shannon Harbour Road and the Whitehaven CHPP.

4.3 Traffic Volumes with Approved Haulage Rate 2017

To account for background growth in traffic not associated with ROM coal haulage, the surveyed traffic (excluding coal haulage vehicles) is assumed to increase by a total of 2.0 percent from 2016 to 2017 (Section 4.1). Table 4.2 summarises the resulting hourly traffic volumes on Blue Vale Road and Kamilaroi Highway as surveyed and with the approved maximum ROM coal haulage.

At the approved maximum haulage rate, no changes to other operational traffic generated by the Tarrawonga Coal Mine or Rocglen Coal Mine are anticipated.

Table 4.2: Traffic Volumes with Approved Maximum Coal Haulage in 2017

Hour Starting	Kamilaroi Highway Southeast of Blue Vale Road		Blue Vale Road Northeast of Kamilaroi Highway		Blue Vale Road South of Shannon Harbour Road	
	Light	Heavy	Light	Heavy	Light	Heavy
12.00am	13	5	0	1	0	0
1.00am	9	2	1	0	0	0
2.00am	5	2	1	0	12	0
3.00am	14	2	7	0	0	0
4.00am	57	11	12	4	0	0
5.00am	139	20	54	10	0	0
6.00am	140	35	39	14	**58**	**14**
7.00am	169	87	**98**	**48**	30	37
8.00am	**220**	**96**	48	51	6	50
9.00am	200	106	55	62	7	58
10.00am	188	118	37	61	7	51
11.00am	176	94	44	50	7	50
12.00pm	179	106	50	60	7	57
1.00pm	201	91	58	56	7	46
2.00pm	207	90	42	52	5	48
3.00pm	234	104	56	58	5	47
4.00pm	254	93	74	61	19	49
5.00pm	**263**	**88**	**91**	**56**	**36**	**40**
6.00pm	148	64	64	38	29	25
7.00pm	88	54	75	33	29	27
8.00pm	58	52	64	34	0	27
9.00pm	53	42	60	24	0	12
10.00pm	31	12	11	4	0	0
11.00pm	11	5	1	1	0	0
Total	**3,057**	**1,379**	**1,042**	**778**	**264**	**638**

4.4 Road Network Performance 2017

The impact of the growth in background traffic and increase to the approved haulage maximum on the midblock operation of the southern portion of the Approved Road Transport Route has been assessed using the HCM method to assess rural road capacity and performance (Section 3.5). The resulting performance criteria are summarised in Table 4.3.

Table 4.3: Forecast Midblock Road Performance in 2017 with Approved Maximum Coal Haulage

Site[A]	Road and Location	AM Peak				PM Peak			
		North or Eastbound		South or Westbound		North or Eastbound		South or Westbound	
		PTSF	LOS	PTSF	LOS	PTSF	LOS	PTSF	LOS
B	Blue Vale Road Northeast of Kamilaroi Hwy	40	A	30	A	39	A	31	A
C	Blue Vale Road South of Shannon Harbour Road	32	A	1	A	7	A	30	A

[A] Refer to Figure 2

The results indicate that drivers on the Approved Road Transport Route and on intersecting public roads would be expected to experience good levels of service on the surrounding road network in 2017 with the approved maximum rate of ROM coal haulage from the Tarrawonga Coal Mine and Rocglen Coal Mine to the Whitehaven CHPP.

4.5 Intersection Performance with Approved Haulage 2017

During the busiest hours at the intersections of Kamilaroi Highway with Blue Vale Road and the Whitehaven CHPP Access Road, with the currently approved maximum haulage of ROM coal, the turning movements along the Approved Road Transport Route would be expected to increase. The impact of this on future baseline traffic conditions in 2017 has been assessed on the same basis as described in Section 4.1, with the surveyed vehicle movements generated by haulage of ROM coal increased by 40 percent to represent conditions with haulage occurring at the maximum approved rate. Traffic not associated with ROM coal haulage has been increased by 2 percent to take account of the potential for growth in background conditions between 2016 and 2017.

The resulting turning movements at the intersections of Blue Vale Road and the Whitehaven CHPP Access Road with Kamilaroi Highway are summarised in Table 4.4.

Table 4.4: Peak Hour Intersection Turning Movements in 2017 (vehicles per hour)

Road and Turning Movement	AM Peak			PM Peak		
	Light	Heavy	Total	Light	Heavy	Total
Blue Vale Road						
Left onto Kamilaroi Highway[A]	16	41	57	29	39	68
Right onto Kamilaroi Highway	18	0	18	0	0	0
Kamilaroi Highway						
Left into Blue Vale Road	1	1	2	1	0	1
Right into Blue Vale Road[A]	1	41	42	20	32	53
Southbound past Blue Vale Road	126	13	140	101	14	115
Northbound past Blue Vale Road	79	15	95	114	12	126
Left into Whitehaven CHPP Access Road	5	3	8	4	0	4
Right into Whitehaven CHPP Access Road[A]	3	37	40	0	31	31
Southbound past Whitehaven CHPP Access Road	140	17	157	130	15	145
Northbound past Whitehaven CHPP Access Road	77	18	95	134	12	146
Whitehaven CHPP Access Road						
Left onto Kamilaroi Highway[A]	4	38	42	1	32	33
Right onto Kamilaroi Highway	6	0	6	6	0	6

[A] Movement is on the Approved Road Transport Route

The operation of the intersections has been reanalysed using SIDRA to determine the impact of background growth and increase ROM coal haulage on the operating conditions. The results of the analyses are summarised in Table 4.5 and full results are presented in Appendix B.

Table 4.5: Peak Hour Intersection Operating Conditions 2017

Intersection	Time	X-value	Average Delay (sec/veh)[A]	Level of Service	Kamilaroi Highway Queue[B]
Kamilaroi Highway and Blue Vale Road	AM Peak PM Peak	0.08 0.07	11.4 11.0	A A	0.1 0.2
Kamilaroi Highway and Whitehaven CHPP Access Road	AM Peak PM Peak	0.09 0.09	11.4 11.5	A A	0.2 0.1

[A] for movement with highest average delay per vehicle

[B] 95th percentile queue of vehicles turning right from Kamilaroi Highway into side road

The results indicate that the intersections of Kamilaroi Highway with Blue Vale Road and the Whitehaven CHPP Access Road would continue to operate at good levels of service, with negligible queuing of vehicles waiting to turn right into the side roads.

The operation of the merge movements from Blue Vale Road and the Whitehaven CHPP onto Kamilaroi Highway have also been reassessed to determine their likely operation in 2017 at the approved maximum coal haulage rate. The results are summarised in Table 4.6.

Table 4.6: Peak Hour Merge Operating Conditions with Approved Maximum Haulage in 2017

Merge		X-value	Average Delay (sec/veh)[A]	Level of Service
Blue Vale Road merge into Kamilaroi Highway	AM Peak PM Peak	0.08 0.07	0.5 0.4	A A
Whitehaven CHPP Access Road merge into Kamilaroi Highway	AM Peak PM Peak	0.06 0.08	0.4 0.6	A A

[A] for movement merging into Kamilaroi Highway

The results indicate that with the approved maximum haulage of coal occurring in 2017, the merge movements from the Whitehaven CHPP Access Road and Blue Vale Road would continue to experience negligible delay when merging into Kamilaroi Highway, and operate well below the capacity of the merge.

5. Modification Traffic Implications

5.1 Modification ROM Coal Haulage Trip Generation

The Modification does not propose any change to the hours during which ROM coal haulage occurs, nor to the fleet of trucks used. On this basis, Table 5.1 summarises the average vehicle trips generated on the Approved Road Transport Route per weekday with the proposed Modification, and compares it against the approved trips (Table 2.2).

Table 5.1: Approved and Modification Approximate Coal Haulage and Average Weekday Vehicle Trips

	Approved Maximum			Modification Maximum		
	ROM Coal Mtpa	Weekday Trips	Hourly Trips[B]	ROM Coal Mtpa	Weekday Daily	Hourly Trips[B]
Tarrawonga Coal Mine to Whitehaven CHPP	3.0	524	34	3.0	524	34
Rocglen Coal Mine to Whitehaven CHPP	1.5	262	17	1.5	262	17
Cumulative Tarrawonga and Rocglen Coal Mines to Whitehaven CHPP[A]	3.5	612	40	4.0	700	46

[A] Prior to commissioning of private haul road and highway overpass

[B] During approved haulage hours only

The Modification is expected to generate up to approximately an additional 88 heavy vehicle trips per weekday as a cumulative total from both the Tarrawonga Coal Mine and Rocglen Coal Mine. Over the approved haulage hours, this is equivalent to an average of an additional six vehicle trips per hour, being three additional trips to the Whitehaven CHPP and three additional trips returning from the Whitehaven CHPP.

As observed during the August 2016 surveys, the coal haulage trips are not evenly spread throughout the haulage hours. To take this into account, it has been assumed that the future distribution of haulage trips would remain similar to that surveyed. The impact of the increase from the Approved to the Modification haul rates is summarised in Table 5.2.

Table 5.2: Approximate Haulage Trips per Hour at Approved and Modification Rates

Hour Starting	Approved Maximum	Modification	Increase
6.00am	13	14	1
7.00am	35	40	5
8.00am	48	55	7
9.00am	56	64	8
10.00am	49	56	7
11.00am	45	51	6
12.00pm	52	59	7
1.00pm	44	50	6
2.00pm	46	53	7
3.00pm	46	53	7
4.00pm	48	55	7
5.00pm	39	45	6
6.00pm	25	29	4
7.00pm	27	31	4
8.00pm	27	31	4
9.00pm	12	14	2
Total	**612**	**700**	**88**

Note: Approved Maximum indicative of haulage at 3.5 Mtpa; Modification indicative of haulage at 4 Mtpa.

5.2 Traffic Volumes in 2017 with Modification

The cumulative implications of the Modification with the various developments and background growth and 2017 have been determined, and the resulting peak hourly and daily traffic volumes are summarised at key locations in Table 5.3.

Table 5.3: Weekday Peak Hourly and Daily Traffic with Modification in 2017

Hour Starting	Kamilaroi Highway Southeast of Blue Vale Road		Blue Vale Road Northeast of Kamilaroi Highway		Blue Vale Road South of Shannon Harbour Road	
	Light	Heavy	Light	Heavy	Light	Heavy
12.00am	13	5	0	1	0	0
1.00am	9	2	1	0	0	0
2.00am	5	2	1	0	12	0
3.00am	14	2	7	0	0	0
4.00am	57	11	12	4	0	0
5.00am	139	20	54	10	0	0
6.00am	140	36	39	15	**58**	**15**
7.00am	169	92	**98**	**53**	30	42
8.00am	**220**	**103**	48	58	6	57
9.00am	200	114	55	70	7	66
10.00am	188	125	37	68	7	58
11.00am	176	100	44	56	7	56
12.00pm	179	113	50	67	7	64
1.00pm	201	97	58	62	7	52
2.00pm	207	97	42	59	5	55
3.00pm	234	111	56	65	5	54
4.00pm	254	100	74	68	19	56
5.00pm	**263**	**94**	**91**	**62**	**36**	**46**
6.00pm	148	68	64	42	29	29
7.00pm	88	58	75	37	29	31
8.00pm	58	56	64	38	0	31
9.00pm	53	44	60	26	0	14
10.00pm	31	12	11	4	0	0
11.00pm	11	5	1	1	0	0
Total	**3,057**	**1,467**	**1,042**	**866**	**264**	**726**

5.3 Road Network Performance in 2017 with Modification

The operational performance of the southern portion of the Approved Road Transport Route has been assessed for the forecast future conditions with the Modification during 2017 and the results are summarised in Table 5.4.

Table 5.4: Midblock Road Performance with Modification in 2017

Site[A]	Road and Location	AM Peak				PM Peak			
		North or Eastbound		South or Westbound		North or Eastbound		South or Westbound	
		PTSF	LOS	PTSF	LOS	PTSF	LOS	PTSF	LOS
B	Blue Vale Road Northeast of Kamilaroi Hwy	40	A	31	A	39	A	32	A
C	Blue Vale Road South of Shannon Harbour Road	32	A	1	A	8	A	30	A

The results demonstrate that the forecast conditions are expected to remain at satisfactory levels with the Modification in 2017.

5.4 Intersection Performance in 2017 with Modification

During the busiest hours at the intersections of Kamilaroi Highway with Blue Vale Road and the Whitehaven CHPP Access Road, the Modification would increase the number of heavy vehicles turning into and out of the side roads during the haulage hours. The impact of this on future baseline traffic conditions in 2017 has been assessed on the same basis as that of the approved maximum haulage (Section 4.2):

- At maximum coal haulage, Blue Vale Road would carry an average of 700 vehicles per day (Table 2.2). This represents an increase of some 60 percent above that surveyed on Blue Vale Road in August 2016.
- At the maximum coal haulage rate, the peak hourly heavy vehicle trips into and out of the Whitehaven CHPP is assumed to increase by 60 percent above that surveyed in 2016.
- Traffic not associated with the Whitehaven CHPP is assumed to increase by 2.0 percent from that surveyed in 2016 to 2017.

The resulting turning movements at the intersections of Blue Vale Road and the Whitehaven CHPP Access Road with Kamilaroi Highway are summarised in Table 5.5.

Table 5.5: Future Peak Hour Turning Movements with Modification in 2017 (vehicles per hour)

Road and Turning Movement	AM Peak			PM Peak		
	Light	Heavy	Total	Light	Heavy	Total
Blue Vale Road						
Left onto Kamilaroi Highway[A]	16	46	62	29	44	72
Right onto Kamilaroi Highway	18	0	18	0	0	0
Kamilaroi Highway						
Left into Blue Vale Road	1	1	2	1	0	1
Right into Blue Vale Road[A]	1	46	47	20	37	57
Southbound past Blue Vale Road	126	13	140	101	14	115
Northbound past Blue Vale Road	79	15	95	114	12	126
Left into Whitehaven CHPP Access Road	5	3	8	4	0	4
Right into Whitehaven CHPP Access Road[A]	3	42	45	0	35	35
Southbound past Whitehaven CHPP Access Road	140	17	157	130	15	145
Northbound past Whitehaven CHPP Access Road	77	18	95	134	12	146
Whitehaven CHPP Access Road						
Left onto Kamilaroi Highway[A]	4	43	47	1	37	38
Right onto Kamilaroi Highway	6	0	6	6	0	6

[A] Movement is on the Approved Road Transport Route

The operation of the intersections has been reanalysed using SIDRA to determine the impact of background growth and the increased ROM coal haulage associated with the Modification on the operating conditions. The results of the analyses are summarised in Table 5.6 and full results are presented in Appendix B.

Table 5.6: Peak Hour Intersection Operating Conditions 2017 with Modification

Intersection	Time	X-value	Average Delay (sec/veh)[A]	Level of Service	Kamilaroi Highway Queue[B]
Kamilaroi Highway and Blue Vale Road	AM Peak PM Peak	0.08 0.07	11.4 11.1	A A	0.2 0.2
Kamilaroi Highway and Whitehaven CHPP Access Road	AM Peak PM Peak	0.09 0.09	11.4 11.5	A A	0.2 0.2

[A] for movement with highest average delay per vehicle

[B] 95th percentile queue of vehicles turning right from Kamilaroi Highway into side road

The results indicate that with the Modification, the intersections of Kamilaroi Highway with Blue Vale Road and the Whitehaven CHPP Access Road would continue to operate at good levels of service, with negligible queuing of vehicles waiting to turn right into the side roads.

The operation of the merge movements from Blue Vale Road and the Whitehaven CHPP onto Kamilaroi Highway have also been reassessed to determine their likely operation in 2017 with the Modification. The results are summarised in Table 5.7.

Table 5.7: Peak Hour Merge Operating Conditions in 2017 with Modification

Merge	Time	X-value	Average Delay (sec/veh)[A]	Level of Service
Blue Vale Road merge into Kamilaroi Highway	AM Peak PM Peak	0.08 0.07	0.5 0.4	A A
Whitehaven CHPP Access Road merge into Kamilaroi Highway	AM Peak PM Peak	0.06 0.08	0.4 0.6	A A

[A] for movement merging into Kamilaroi Highway

The results indicate that in 2017 with the Modification, the merge movements from the Whitehaven CHPP Access Road and Blue Vale Road would continue to experience negligible delay when merging into Kamilaroi Highway, and operate well below the capacity of the merge.

5.5 Road Safety Implications of Modification

The increase in traffic expected to occur on the road network as a result of changes directly associated with the Project and unrelated to the Project would typically results in an increase in exposure to crashes, with a corresponding increase in the number of crashes.

The review of historic crashes in the region (Section 3.9) did not highlight any particular causation factors on the Approved Road Transport Route or Rangari Road, thus the Modification traffic is not expected to exacerbate any specific safety concerns at any particular location.

5.5.1 Road Safety Audit

A Road Safety Audit was also undertaken by GTA Consultants as per the DP&E's key issues for consideration (Section 1).

The Road Safety Audit was conducted on 12 September 2016, in accordance with the *Guidelines for Road Safety Audit Practises* (Roads and Traffic Authority, 2011) and the Austroads *Guide to Road Safety Part 6: Road Safety Audit* (2009). The key observations identified during the Road Safety Audit are presented in Table 5.8 with the full Road Safety Audit report included in Appendix C.

Table 5.8: Road Safety Audit Observations and Whitehaven Commitments

Observation	Whitehaven Commitment
During the night time audit it was observed that without high beam headlights on, the reflectivity of signage and guideposts along the haulage route at night is poor due to dust and dirt covering them.	*Whitehaven will develop a protocol to clean and maintain the designated haulage route, including visibility of signage, guideposts, lane delineation and pavement.*
During the night time audit it was observed that passing trucks caused a substantial amount of dust to circulate. Since the pavement is generally sealed along the haulage route, it is assumed that dust was cause by the loads carried by passing trucks.	*See response above regarding protocol to clean and maintain the designated haulage route.*
The right turn auxiliary lane at the intersection of Blue Vale Road and Shannon Harbour Road appears to be too short for deceleration from 100 km/h posted speed limit and storage of at least one truck. Trucks were observed to be decelerating within the northbound travel lane, which could potentially result in rear end collisions.	*Whitehaven notes that the intersection of Blue Vale Road and Shannon Harbour Road (part of the Rocglen designated haul route) has been in use for approximately eight years without incident.*
The delineation along the haulage is poor in some locations, which could result in inadequate guidance for drivers.	*See response above regarding protocol to clean and maintain the designated haulage route.*
There was a substantial amount of potholing observed along the length of the haulage route in both directions, which could result in drivers performing hazardous manoeuvres to avoid pot holes or loss of control should the pot holes be hit.	*See response above regarding protocol to clean and maintain the designated haulage route.* *Further Whitehaven notes that pavement maintenance is undertaken in consultation with the Gunnedah Shire Council.*
There was rutting of the pavement observed within the painted median at the intersection of Blue Vale Road and Shannon Harbour Road. Rutting was also observed at other various locations along the haulage route.	*See response above regarding protocol to clean and maintain the designated haulage route.*

5.6 Road Maintenance Implications

As described in Section 2.2, Whitehaven has entered into road maintenance agreements with both Narrabri Shire Council and Gunnedah Shire Council for the public road sections of the Approved Road Transport Route. It is anticipated that the existing road maintenance agreements would remain in place for the Approved Road Transport Route, noting that the Modification would only impact conditions on that part of the Approved Road Transport Route which lies within the Gunnedah Shire Council. The road maintenance agreement with Gunnedah Shire Council covers the maintenance of roads used by Whitehaven in association with the Whitehaven mines and facilities in the region, e.g. the Whitehaven CHPP and the Tarrawonga Coal Mine and Rocglen Coal Mine. Under this agreement, and relevant to the Modification, Whitehaven is required to pay 95 percent of road maintenance costs incurred by Gunnedah Shire Council for Hoad Lane and Blue Vale Road. The maintenance requirements are determined through an annual joint inspection, which would continue to occur during the term of the Modification.

5.7 Implications for School Buses

The Modification would increase the number of trucks on the Approved Road Transport Route from an average of 40 trips per hour to 46 trips per hour, i.e. on average, an additional three trucks in each direction per hour.

With the Modification there would be an increased potential for interaction between the haulage trucks and the school bus operating on Hoad Lane.

The Tarrawonga and Rocglen Project Approvals require a Traffic Management Plan that includes a protocol for operating haul trucks during school bus hours.

The existing interactions between haulage trucks and school buses on the Approved Road Transport Route are managed effectively, and no additional control measures are considered to be warranted as a result of the Modification.

5.8 Whitehaven Coal Transport Protocols

The existing management procedures for both the Tarrawonga Coal Mine and Rocglen Coal Mine are set out in the Traffic Management Plan, covering of truck loads is required by the EPL requirements for Tarrawonga Coal Mine, Rocglen Coal Mine and the Whitehaven CHPP, and the Emergency Management Plan addresses procedures in the event of spills and other emergency events. The existing management procedures (Section 2.3) thus include measures to manage:

- the operation of haul trucks during school bus hours;
- compliance with cumulative coal haulage limits;
- monitoring program to audit and report vehicle movements;
- induction and training of truck operators;
- covering of loads for truck except during loading and unloading;
- management of spills; and
- management of vehicle collisions.

The existing documented procedures implemented by Tarrawonga Coal Mine, Rocglen Coal Mine and the coal haulage contractors are considered to adequately control the movement of haulage trucks on the road network and their interaction with public roads. No additional controls are considered to be warranted by the Modification.

5.9 Mitigation Measures

This assessment has found that the existing road system would satisfactorily accommodate the expected future traffic generated by the Modification without need for additional specific measures or upgrades to address capacity concerns.

The TMP for the Tarrawonga Coal Mine and Rocglen Coal Mine, together with the EPL requirements for the Tarrawonga Coal Mine, Rocglen Coal Mine and Whitehaven CHPP, and the emergency management controls implemented by the haulage contractor adequately address matters relating to the movement of the haulage trucks on the Approved Road Transport Route, and no additional controls are considered to be warranted.

6. Conclusion

This study of the proposed temporary increase in combined ROM coal haulage from Tarrawonga Coal Mine and Rocglen Coal Mine to the Whitehaven CHPP would result in no significant impacts on the performance, efficiency and safety of the road network and no additional management or mitigation measures are considered to be warranted.

The daily haulage frequencies could vary by up to 25 per cent. However, based on the forecast operation of the road network under the Modification and the capacity available, the operation and Level of Service of the key routes and intersections is unlikely to be significantly impacted by these fluctuations.

A number of potential safety issues, generally pertaining to pavement condition, were identified for the existing conditions of the haulage route. With a proposed increase heavy vehicle movements, the risk of the safety issues identified could potentially increase. Therefore, the findings of the Road Safety Audit should be reviewed and upgrades considered to support the proposed temporary increase in combined ROM coal haulage from Tarrawonga Coal Mine and Rocglen Coal Mine to the Whitehaven CHPP.

Appendix A

Traffic Survey Results August 2016

Surveyed Two Way Traffic on Blue Vale Road Between Kamilaroi Highway and Namoi River Bridge

Hour Starting	Friday 12/08/16	Saturday 13/08/2016	Sunday 14/08/2016	Monday 15/08/2016	Tuesday 16/08/2016	Wednesday 17/08/2016	Thursday 18/08/2016	Friday 19/08/2016	Saturday 20/08/2016	Sunday 21/08/2016	Monday 22/08/2016	Tuesday 23/08/2016
0:00	2	1	0	0	0	1	4	2	0	0	0	0
1:00	1	0	0	0	1	2	0	6	2	0	0	0
2:00	2	2	0	0	3	1	0	2	0	0	1	1
3:00	7	5	2	2	11	10	7	10	10	0	1	7
4:00	15	11	5	17	19	17	21	17	7	8	11	9
5:00	56	27	11	54	74	56	56	68	30	15	64	68
6:00	47	29	20	42	64	39	67	49	38	26	39	42
7:00	169	70	7	162	109	134	125	144	34	6	119	112
8:00	86	62	6	100	94	78	79	73	81	3	78	82
9:00	93	88	13	94	87	82	102	94	74	9	136	105
10:00	91	69	11	65	72	73	82	61	46	13	117	111
11:00	81	114	15	74	59	82	97	56	72	19	115	73
12:00	115	71	12	81	85	75	82	102	37	15	110	103
13:00	88	115	11	96	77	104	92	95	61	16	141	101
14:00	92	98	8	78	56	68	84	65	38	18	118	86
15:00	115	113	23	69	112	82	84	109	43	23	137	89
16:00	117	78	23	106	122	146	108	102	64	28	117	139
17:00	131	96	25	151	137	111	116	110	70	28	163	150
18:00	90	26	15	68	85	92	121	104	32	18	86	97
19:00	107	2	7	119	93	81	106	76	4	3	138	81
20:00	69	6	1	76	67	95	91	94	10	7	106	114
21:00	81	1	4	69	82	82	82	115	3	1	78	61
22:00	20	2	2	16	16	14	12	11	2	3	18	16
23:00	3	5	1	2	3	1	1	4	7	2	2	3
Total	**1678**	**1091**	**222**	**1541**	**1528**	**1526**	**1619**	**1569**	**765**	**261**	**1895**	**1650**

Surveyed Two Way Traffic on Kamilaroi Highway Between Blue Vale Road and Whitehaven CHPP

Hour Starting	Friday 12/08/16	Saturday 13/08/2016	Sunday 14/08/2016	Monday 15/08/2016	Tuesday 16/08/2016	Wednesday 17/08/2016	Thursday 18/08/2016	Friday 19/08/2016	Saturday 20/08/2016	Sunday 21/08/2016	Monday 22/08/2016	Tuesday 23/08/2016
0:00	27	26	13	9	17	13	16	22	20	10	7	17
1:00	12	11	11	6	17	16	14	20	15	4	11	12
2:00	10	13	7	8	12	9	13	13	7	3	6	6
3:00	21	15	11	10	16	27	13	27	25	5	11	13
4:00	63	42	36	69	81	77	63	65	39	30	69	70
5:00	165	80	59	161	173	163	150	164	57	43	145	160
6:00	169	77	74	158	205	182	167	182	101	64	171	165
7:00	226	114	77	293	321	304	290	346	125	103	256	241
8:00	305	182	92	284	469	491	488	327	196	146	303	279
9:00	283	246	144	310	473	543	505	340	245	157	291	282
10:00	299	236	162	287	354	352	395	319	211	199	289	274
11:00	235	228	149	308	236	288	307	264	248	172	315	204
12:00	268	225	175	295	259	262	291	297	238	183	287	238
13:00	263	251	152	332	298	298	334	309	221	154	314	245
14:00	313	213	214	290	353	401	398	340	181	212	289	237
15:00	353	216	232	318	432	396	438	342	194	243	339	267
16:00	354	240	205	402	427	477	484	321	213	228	312	311
17:00	342	208	182	406	512	479	446	320	212	214	341	315
18:00	211	165	146	248	248	223	279	221	160	157	173	223
19:00	129	66	89	187	161	149	185	148	76	89	146	123
20:00	90	53	57	152	101	149	147	113	37	56	96	116
21:00	84	26	41	120	124	111	118	109	30	37	97	90
22:00	50	25	25	38	36	41	43	31	31	16	41	36
23:00	24	15	10	16	20	18	24	14	20	19	12	13
Total	**4296**	**2973**	**2363**	**4707**	**5345**	**5469**	**5608**	**4654**	**2902**	**2544**	**4321**	**3937**

Appendix B

SIDRA Analysis Results

MOVEMENT SUMMARY

Site: AM Ex Blue Vale Road and Kamilaroi Highway

Surveyed 23 August 2016
8.30am - 9.30am
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: Kamilaroi Highway											
5	T1	98	16.1	0.055	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
6	R2	33	96.8	0.033	11.4	LOS A	0.1	4.0	0.32	0.62	49.0
Approach		131	36.3	0.055	2.8	NA	0.1	4.0	0.08	0.15	79.3
NorthEast: Blue Vale Road											
7	L2	48	65.2	0.038	11.0	LOS A	0.0	0.0	0.00	0.57	60.8
9	R2	19	0.0	0.025	10.9	LOS A	0.1	0.7	0.42	0.86	71.3
Approach		67	46.9	0.038	10.9	LOS A	0.1	0.7	0.12	0.65	63.4
NorthWest: Kamilaroi Highway											
10	L2	2	50.0	0.080	9.1	LOS A	0.0	0.0	0.00	0.01	67.9
11	T1	144	9.5	0.080	0.0	LOS A	0.0	0.0	0.00	0.01	99.8
Approach		146	10.1	0.080	0.1	NA	0.0	0.0	0.00	0.01	99.1
All Vehicles		344	27.2	0.080	3.3	NA	0.1	4.0	0.05	0.19	82.1

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: PM Ex Blue Vale Road and Kamilaroi Highway

Surveyed 23 August 2016
4.30pm - 5.30pm
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: Kamilaroi Highway											
5	T1	131	9.7	0.071	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
6	R2	45	53.5	0.037	9.8	LOS A	0.2	3.0	0.27	0.61	57.5
Approach		176	21.0	0.071	2.5	NA	0.2	3.0	0.07	0.16	84.0
NorthEast: Blue Vale Road											
7	L2	54	45.1	0.038	10.6	LOS A	0.0	0.0	0.00	0.58	64.6
9	R2	1	0.0	0.001	10.9	LOS A	0.0	0.0	0.42	0.79	71.4
Approach		55	44.2	0.038	10.6	LOS A	0.0	0.0	0.01	0.58	64.7
NorthWest: Kamilaroi Highway											
10	L2	1	0.0	0.066	7.8	LOS A	0.0	0.0	0.00	0.01	88.5
11	T1	119	12.4	0.066	0.0	LOS A	0.0	0.0	0.00	0.01	99.8
Approach		120	12.3	0.066	0.1	NA	0.0	0.0	0.00	0.01	99.6
All Vehicles		351	21.6	0.071	2.9	NA	0.2	3.0	0.04	0.17	84.4

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: AM Ex CHPP Access Road and Kamilaroi Highway

Surveyed 23 August 2016
8.30am - 9.30am
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: Kamilaroi Highway											
10	L2	7	28.6	0.061	8.6	LOS A	0.0	0.0	0.00	0.05	74.7
11	T1	98	19.4	0.061	0.0	LOS A	0.0	0.0	0.00	0.05	98.6
Approach		105	20.0	0.061	0.6	NA	0.0	0.0	0.00	0.05	96.5
NorthWest: Kamilaroi Highway											
5	T1	162	11.0	0.089	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
6	R2	31	89.7	0.028	10.9	LOS A	0.1	3.3	0.27	0.61	50.3
Approach		193	23.5	0.089	1.7	NA	0.1	3.3	0.04	0.10	86.4
SouthWest: CHPP Access Road											
7	L2	33	87.1	0.028	11.4	LOS A	0.0	0.0	0.00	0.55	57.2
9	R2	6	0.0	0.009	11.0	LOS A	0.0	0.2	0.42	0.83	71.2
Approach		39	73.0	0.028	11.3	LOS A	0.0	0.2	0.07	0.60	59.0
All Vehicles		337	28.1	0.089	2.5	NA	0.1	3.3	0.03	0.14	84.5

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: PM Ex CHPP Access Road and Kamilaroi Highway

Surveyed 23 August 2016
4.30pm - 5.30pm
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: Kamilaroi Highway											
10	L2	4	0.0	0.084	7.8	LOS A	0.0	0.0	0.00	0.02	88.1
11	T1	151	8.4	0.084	0.0	LOS A	0.0	0.0	0.00	0.02	99.3
Approach		155	8.2	0.084	0.2	NA	0.0	0.0	0.00	0.02	99.0
NorthWest: Kamilaroi Highway											
5	T1	149	10.6	0.082	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
6	R2	23	100.0	0.024	10.2	LOS A	0.1	2.9	0.33	0.61	58.1
Approach		173	22.6	0.082	1.4	NA	0.1	2.9	0.04	0.08	91.1
SouthWest: CHPP Access Road											
7	L2	25	95.8	0.023	11.5	LOS A	0.0	0.0	0.00	0.55	55.8
9	R2	6	0.0	0.009	11.2	LOS A	0.0	0.2	0.44	0.84	71.0
Approach		32	76.7	0.023	11.5	LOS A	0.0	0.2	0.09	0.61	58.2
All Vehicles		359	21.1	0.084	1.8	NA	0.1	2.9	0.03	0.10	89.6

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: AM Ex Blue Vale Road Merge

Surveyed August 2016
8.30am to 9.30am

Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthWest: Blue Vale Road Slip											
27a	L1	48	65.2	0.040	0.4	LOS A	0.1	1.3	0.21	0.10	56.9
Approach		48	65.2	0.040	0.4	LOS A	0.1	1.3	0.21	0.10	56.9
West: Kamilaroi Highway											
11	T1	144	9.5	0.079	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		144	9.5	0.079	0.0	NA	0.0	0.0	0.00	0.00	100.0
All Vehicles		193	23.5	0.079	0.1	NA	0.1	1.3	0.05	0.03	88.7

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: PM Ex Blue Vale Road Merge

Surveyed August 2016
4.30pm to 5.30pm

Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthWest: Blue Vale Road Slip											
27a	L1	54	45.1	0.040	0.3	LOS A	0.1	1.2	0.18	0.07	61.2
Approach		54	45.1	0.040	0.3	LOS A	0.1	1.2	0.18	0.07	61.2
West: Kamilaroi Highway											
11	T1	119	12.4	0.066	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		119	12.4	0.066	0.0	NA	0.0	0.0	0.00	0.00	100.0
All Vehicles		173	22.6	0.066	0.1	NA	0.1	1.2	0.06	0.02	88.0

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: AM Ex CHPP Road Merge

Surveyed August 2016
8.30am to 9.30am

Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthWest: CHPP Access Road Slip											
27a	L1	33	87.1	0.028	0.3	LOS A	0.1	1.1	0.18	0.08	53.3
Approach		33	87.1	0.028	0.3	LOS A	0.1	1.1	0.18	0.08	53.3
West: Kamilaroi Highway											
11	T1	98	19.4	0.057	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		98	19.4	0.057	0.0	NA	0.0	0.0	0.00	0.00	100.0
All Vehicles		131	36.3	0.057	0.1	NA	0.1	1.1	0.04	0.02	87.2

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: PM Ex CHPP Road Merge

Surveyed August 2016
4.0pm to 5.30pm

Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthWest: CHPP Access Road Slip											
27a	L1	25	95.8	0.024	0.6	LOS A	0.1	0.9	0.22	0.11	51.6
Approach		25	95.8	0.024	0.6	LOS A	0.1	0.9	0.22	0.11	51.6
West: Kamilaroi Highway											
11	T1	151	8.4	0.081	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		151	8.4	0.081	0.0	NA	0.0	0.0	0.00	0.00	100.0
All Vehicles		176	21.0	0.081	0.1	NA	0.1	0.9	0.03	0.02	92.0

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: AM App Blue Vale Road and Kamilaroi Highway

Approved Haul Rate
8.30am - 9.30am
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: Kamilaroi Highway											
5	T1	99	16.0	0.056	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
6	R2	44	97.6	0.045	11.4	LOS A	0.2	5.5	0.33	0.62	48.8
Approach		143	41.2	0.056	3.5	NA	0.2	5.5	0.10	0.19	75.5
NorthEast: Blue Vale Road											
7	L2	60	71.9	0.049	11.1	LOS A	0.0	0.0	0.00	0.56	59.7
9	R2	19	0.0	0.026	11.1	LOS A	0.1	0.7	0.43	0.86	71.1
Approach		79	54.7	0.049	11.1	LOS A	0.1	0.7	0.10	0.63	62.0
NorthWest: Kamilaroi Highway											
10	L2	2	50.0	0.081	9.1	LOS A	0.0	0.0	0.00	0.01	67.9
11	T1	146	9.4	0.081	0.0	LOS A	0.0	0.0	0.00	0.01	99.8
Approach		148	9.9	0.081	0.1	NA	0.0	0.0	0.00	0.01	99.1
All Vehicles		371	31.5	0.081	3.8	NA	0.2	5.5	0.06	0.21	79.2

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: PM App Blue Vale Road and Kamilaroi Highway

Approved Haul Rate
4.30pm - 5.30pm
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: Kamilaroi Highway											
5	T1	133	9.5	0.072	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
6	R2	55	61.5	0.046	10.1	LOS A	0.2	4.2	0.28	0.61	55.7
Approach		187	24.7	0.072	3.0	NA	0.2	4.2	0.08	0.18	81.1
NorthEast: Blue Vale Road											
7	L2	72	57.4	0.054	10.8	LOS A	0.0	0.0	0.00	0.57	62.3
9	R2	1	0.0	0.001	11.0	LOS A	0.0	0.0	0.43	0.79	71.2
Approach		73	56.5	0.054	10.8	LOS A	0.0	0.0	0.01	0.58	62.4
NorthWest: Kamilaroi Highway											
10	L2	1	0.0	0.068	7.8	LOS A	0.0	0.0	0.00	0.01	88.5
11	T1	121	12.2	0.068	0.0	LOS A	0.0	0.0	0.00	0.01	99.8
Approach		122	12.1	0.068	0.1	NA	0.0	0.0	0.00	0.01	99.6
All Vehicles		382	26.7	0.072	3.5	NA	0.2	4.2	0.04	0.20	81.1

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: AM App CHPP Access Road and Kamilaroi Highway

Approved Haul Rate
8.30am - 9.30am
Stop (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: Kamilaroi Highway											
10	L2	8	37.5	0.063	8.8	LOS A	0.0	0.0	0.00	0.05	71.5
11	T1	100	18.9	0.063	0.0	LOS A	0.0	0.0	0.00	0.05	98.7
Approach		108	20.4	0.063	0.7	NA	0.0	0.0	0.00	0.05	95.8
NorthWest: Kamilaroi Highway											
5	T1	165	10.8	0.091	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
6	R2	42	92.5	0.040	11.0	LOS A	0.2	4.7	0.28	0.61	49.8
Approach		207	27.4	0.091	2.2	NA	0.2	4.7	0.06	0.12	83.0
SouthWest: CHPP Access Road											
7	L2	44	90.5	0.039	11.4	LOS A	0.0	0.0	0.00	0.55	56.6
9	R2	6	0.0	0.009	11.2	LOS A	0.0	0.2	0.44	0.84	71.0
Approach		51	79.2	0.039	11.4	LOS A	0.0	0.2	0.05	0.59	58.0
All Vehicles		366	32.5	0.091	3.0	NA	0.2	4.7	0.04	0.17	81.2

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: PM App CHPP Access Road and Kamilaroi Highway

Approved Haul Rate
4.30pm - 5.30pm
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: Kamilaroi Highway											
10	L2	4	0.0	0.085	7.8	LOS A	0.0	0.0	0.00	0.02	88.1
11	T1	154	8.2	0.085	0.0	LOS A	0.0	0.0	0.00	0.02	99.3
Approach		158	8.0	0.085	0.2	NA	0.0	0.0	0.00	0.02	99.0
NorthWest: Kamilaroi Highway											
5	T1	153	10.3	0.084	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
6	R2	33	100.0	0.034	10.3	LOS A	0.1	4.2	0.34	0.62	58.0
Approach		185	26.1	0.084	1.8	NA	0.1	4.2	0.06	0.11	88.7
SouthWest: CHPP Access Road											
7	L2	35	97.0	0.032	11.5	LOS A	0.0	0.0	0.00	0.55	55.7
9	R2	6	0.0	0.009	11.4	LOS A	0.0	0.2	0.45	0.84	70.8
Approach		41	82.1	0.032	11.5	LOS A	0.0	0.2	0.07	0.59	57.5
All Vehicles		384	24.7	0.085	2.2	NA	0.1	4.2	0.04	0.12	87.1

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: AM App Blue Vale Road Merge

Approved Haul Rate
8.30am to 9.30am

Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthWest: Blue Vale Road Slip											
27a	L1	60	71.9	0.051	0.5	LOS A	0.2	1.8	0.21	0.11	55.7
Approach		60	71.9	0.051	0.5	LOS A	0.2	1.8	0.21	0.11	55.7
West: Kamilaroi Highway											
11	T1	146	9.4	0.080	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		146	9.4	0.080	0.0	NA	0.0	0.0	0.00	0.00	100.0
All Vehicles		206	27.6	0.080	0.1	NA	0.2	1.8	0.06	0.03	86.3

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: PM App Blue Vale Road Merge

Approved Haul Rate
4.30pm to 5.30pm

Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthWest: Blue Vale Road Slip											
27a	L1	72	57.4	0.056	0.4	LOS A	0.2	1.8	0.19	0.08	58.6
Approach		72	57.4	0.056	0.4	LOS A	0.2	1.8	0.19	0.08	58.6
West: Kamilaroi Highway											
11	T1	121	12.2	0.067	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		121	12.2	0.067	0.0	NA	0.0	0.0	0.00	0.00	100.0
All Vehicles		193	29.0	0.067	0.1	NA	0.2	1.8	0.07	0.03	84.3

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: AM App CHPP Road Merge

Approved Haul Rate
8.30am to 9.30am

Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthWest: CHPP Access Road Slip											
27a	L1	44	90.5	0.039	0.4	LOS A	0.1	1.5	0.18	0.08	52.7
Approach		44	90.5	0.039	0.4	LOS A	0.1	1.5	0.18	0.08	52.7
West: Kamilaroi Highway											
11	T1	100	18.9	0.058	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		100	18.9	0.058	0.0	NA	0.0	0.0	0.00	0.00	100.0
All Vehicles		144	40.9	0.058	0.1	NA	0.1	1.5	0.06	0.03	84.1

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: PM App CHPP Road Merge

Approved Haul Rate
4.30pm to 5.30pm

Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthWest: CHPP Access Road Slip											
27a	L1	35	97.0	0.033	0.6	LOS A	0.1	1.3	0.23	0.12	51.4
Approach		35	97.0	0.033	0.6	LOS A	0.1	1.3	0.23	0.12	51.4
West: Kamilaroi Highway											
11	T1	154	8.2	0.083	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		154	8.2	0.083	0.0	NA	0.0	0.0	0.00	0.00	100.0
All Vehicles		188	24.6	0.083	0.1	NA	0.1	1.3	0.04	0.02	89.8

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: AM Mod Blue Vale Road and Kamilaroi Highway

Modification Haul Rate
8.30am - 9.30am
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: Kamilaroi Highway											
5	T1	99	16.0	0.056	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
6	R2	49	97.9	0.050	11.4	LOS A	0.2	6.2	0.33	0.63	48.8
Approach		148	43.3	0.056	3.8	NA	0.2	6.2	0.11	0.21	74.0
NorthEast: Blue Vale Road											
7	L2	65	74.2	0.054	11.1	LOS A	0.0	0.0	0.00	0.56	59.3
9	R2	19	0.0	0.026	11.1	LOS A	0.1	0.7	0.43	0.86	71.0
Approach		84	57.5	0.054	11.1	LOS A	0.1	0.7	0.10	0.63	61.5
NorthWest: Kamilaroi Highway											
10	L2	2	50.0	0.081	9.1	LOS A	0.0	0.0	0.00	0.01	67.9
11	T1	146	9.4	0.081	0.0	LOS A	0.0	0.0	0.00	0.01	99.8
Approach		148	9.9	0.081	0.1	NA	0.0	0.0	0.00	0.01	99.1
All Vehicles		381	33.4	0.081	4.0	NA	0.2	6.2	0.06	0.22	78.0

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: PM Mod Blue Vale Road and Kamilaroi Highway

Modification Haul Rate
4.30pm - 5.30pm
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: Kamilaroi Highway											
5	T1	133	9.5	0.072	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
6	R2	60	64.9	0.051	10.2	LOS A	0.2	4.8	0.28	0.61	55.0
Approach		193	26.8	0.072	3.2	NA	0.2	4.8	0.09	0.19	79.6
NorthEast: Blue Vale Road											
7	L2	77	60.3	0.059	10.9	LOS A	0.0	0.0	0.00	0.57	61.7
9	R2	1	0.0	0.001	11.1	LOS A	0.0	0.0	0.43	0.79	71.1
Approach		78	59.5	0.059	10.9	LOS A	0.0	0.0	0.01	0.57	61.8
NorthWest: Kamilaroi Highway											
10	L2	1	0.0	0.068	7.8	LOS A	0.0	0.0	0.00	0.01	88.5
11	T1	121	12.2	0.068	0.0	LOS A	0.0	0.0	0.00	0.01	99.8
Approach		122	12.1	0.068	0.1	NA	0.0	0.0	0.00	0.01	99.6
All Vehicles		393	28.7	0.072	3.7	NA	0.2	4.8	0.04	0.21	79.8

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: AM Mod CHPP Access Road and Kamilaroi Highway

Modification Haul Rate
8.30am - 9.30am
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: Kamilaroi Highway											
10	L2	8	37.5	0.063	8.8	LOS A	0.0	0.0	0.00	0.05	71.5
11	T1	100	18.9	0.063	0.0	LOS A	0.0	0.0	0.00	0.05	98.7
Approach		108	20.4	0.063	0.7	NA	0.0	0.0	0.00	0.05	95.8
NorthWest: Kamilaroi Highway											
5	T1	165	10.8	0.091	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
6	R2	47	93.3	0.045	11.0	LOS A	0.2	5.4	0.28	0.61	49.7
Approach		213	29.2	0.091	2.5	NA	0.2	5.4	0.06	0.14	81.5
SouthWest: CHPP Access Road											
7	L2	49	91.5	0.044	11.4	LOS A	0.0	0.0	0.00	0.55	56.5
9	R2	6	0.0	0.009	11.3	LOS A	0.0	0.2	0.44	0.84	70.9
Approach		56	81.1	0.044	11.4	LOS A	0.0	0.2	0.05	0.58	57.8
All Vehicles		377	34.4	0.091	3.3	NA	0.2	5.4	0.04	0.18	79.9

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: PM Mod CHPP Access Road and Kamilaroi Highway

Modification Haul Rate
4.30pm - 5.30pm
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: Kamilaroi Highway											
10	L2	4	0.0	0.085	7.8	LOS A	0.0	0.0	0.00	0.02	88.1
11	T1	154	8.2	0.085	0.0	LOS A	0.0	0.0	0.00	0.02	99.3
Approach		158	8.0	0.085	0.2	NA	0.0	0.0	0.00	0.02	99.0
NorthWest: Kamilaroi Highway											
5	T1	153	10.3	0.084	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
6	R2	37	100.0	0.038	10.3	LOS A	0.2	4.8	0.34	0.62	58.0
Approach		189	27.8	0.084	2.0	NA	0.2	4.8	0.07	0.12	87.6
SouthWest: CHPP Access Road											
7	L2	40	97.4	0.036	11.5	LOS A	0.0	0.0	0.00	0.55	55.6
9	R2	6	0.0	0.009	11.4	LOS A	0.0	0.2	0.46	0.84	70.7
Approach		46	84.1	0.036	11.5	LOS A	0.0	0.2	0.06	0.59	57.2
All Vehicles		394	26.5	0.085	2.4	NA	0.2	4.8	0.04	0.13	86.0

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: AM Mod Blue Vale Road Merge

Modification Haul Rate
8.30am to 9.30am

Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthWest: Blue Vale Road Slip											
27a	L1	65	74.2	0.056	0.5	LOS A	0.2	2.0	0.22	0.11	55.3
Approach		65	74.2	0.056	0.5	LOS A	0.2	2.0	0.22	0.11	55.3
West: Kamilaroi Highway											
11	T1	146	9.4	0.080	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		146	9.4	0.080	0.0	NA	0.0	0.0	0.00	0.00	100.0
All Vehicles		212	29.4	0.080	0.2	NA	0.2	2.0	0.07	0.03	85.3

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: PM Mod Blue Vale Road Merge

Modification Haul Rate
4.30pm to 5.30pm

Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthWest: Blue Vale Road Slip											
27a	L1	77	60.3	0.061	0.4	LOS A	0.2	2.0	0.19	0.09	58.0
Approach		77	60.3	0.061	0.4	LOS A	0.2	2.0	0.19	0.09	58.0
West: Kamilaroi Highway											
11	T1	121	12.2	0.067	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		121	12.2	0.067	0.0	NA	0.0	0.0	0.00	0.00	100.0
All Vehicles		198	30.9	0.067	0.1	NA	0.2	2.0	0.07	0.03	83.3

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: AM Mod CHPP Road Merge

Modification Haul Rate
8.30am to 9.30am

Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthWest: CHPP Access Road Slip											
27a	L1	49	91.5	0.044	0.4	LOS A	0.1	1.7	0.18	0.08	52.5
Approach		49	91.5	0.044	0.4	LOS A	0.1	1.7	0.18	0.08	52.5
West: Kamilaroi Highway											
11	T1	100	18.9	0.058	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		100	18.9	0.058	0.0	NA	0.0	0.0	0.00	0.00	100.0
All Vehicles		149	43.0	0.058	0.1	NA	0.1	1.7	0.06	0.03	82.8

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: PM Mod CHPP Road Merge

Modification Haul Rate
4.30pm to 5.30pm

Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthWest: CHPP Access Road Slip											
27a	L1	40	97.4	0.038	0.6	LOS A	0.1	1.5	0.23	0.12	51.4
Approach		40	97.4	0.038	0.6	LOS A	0.1	1.5	0.23	0.12	51.4
West: Kamilaroi Highway											
11	T1	154	8.2	0.083	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		154	8.2	0.083	0.0	NA	0.0	0.0	0.00	0.00	100.0
All Vehicles		194	26.6	0.083	0.1	NA	0.1	1.5	0.05	0.03	88.6

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Appendix C

Road Safety Audit Report

GTAconsultants

Tarrawonga and Rocglen Coal Mines

Temporary Road Haulage Increase Modification

Existing Conditions Road Safety Audit

Client // Whitehaven Coal Limited
Office // NSW
Reference // N106010
Date // 5/10/16

Tarrawonga and Rocglen Coal Mines

Temporary Road Haulage Increase Modification

Existing Conditions Road Safety Audit

Issue: C 5/10/16

Client: Whitehaven Coal Limited
Reference: N106010
GTA Consultants Office: NSW

Quality Record

Issue	Date	Description	Prepared By	Checked By	Approved By	Signed
A	16/09/16	Final	Brigette Humphrey-Robinson	Karen McNatty	Nicole Vukic	Nicole Vukic
B	27/09/16	Final - revised	Brigette Humphrey-Robinson	Karen McNatty	Nicole Vukic	Nicole Vukic
C	5/10/16	Final - revised	Brigette Humphrey-Robinson	Karen McNatty	Nicole Vukic	Nicole Vukic

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

Audit Summary

RSA No.:	N106010/1
Audited Project:	Tarrawonga and Rocglen Coal Mines, Temporary Haulage Increase Modification, Existing Conditions Road Safety Audit
Audit for:	Whitehaven Coal Limited
Address:	PO Box 600, Gunnedah NSW 2380
Telephone:	02 6741 9304 (phone), 0419 645 713 (mobile)
Project Sponsor	Mark Edmondson, General Manager – Technical Services
Auditors:	Nicole Vukic (Associate Director) Senior Road Safety Auditor (Level 3 Roads and Maritime Services [Roads and Maritime]) Lead Auditor Brigette Humphrey-Robinson (Senior Consultant) Road Safety Auditor (Level 1 Roads and Maritime) Audit Team Member Karen McNatty (Associate) Road Safety Auditor (Level 2 Roads and Maritime) Audit Reviewer
Audit type	Existing Conditions
Commencement meeting:	6 September 2016
Audit date:	12 September 2016
Completion meeting:	Email dated 15/09/16
Previous audit no:	N/A
Previous audit:	N/A

Table of Contents

Figures

Tables

1. Introduction

1.1 Background

GTA Consultants (GTA) has been commissioned by Resource Strategies on behalf of Whitehaven Coal Limited to undertake an existing conditions Road Safety Audit of part of the existing haul road between Whitehaven Coal Handling and Preparation Plant and the intersection of Blue Vale Road/ Shannon Harbour Road/ Hoad Lane, Gunnedah as presented by the yellow line in Figure 1.1. This section of the haulage route is subject to proposed increased haulage limits.

Figure 1.1: Haulage road map

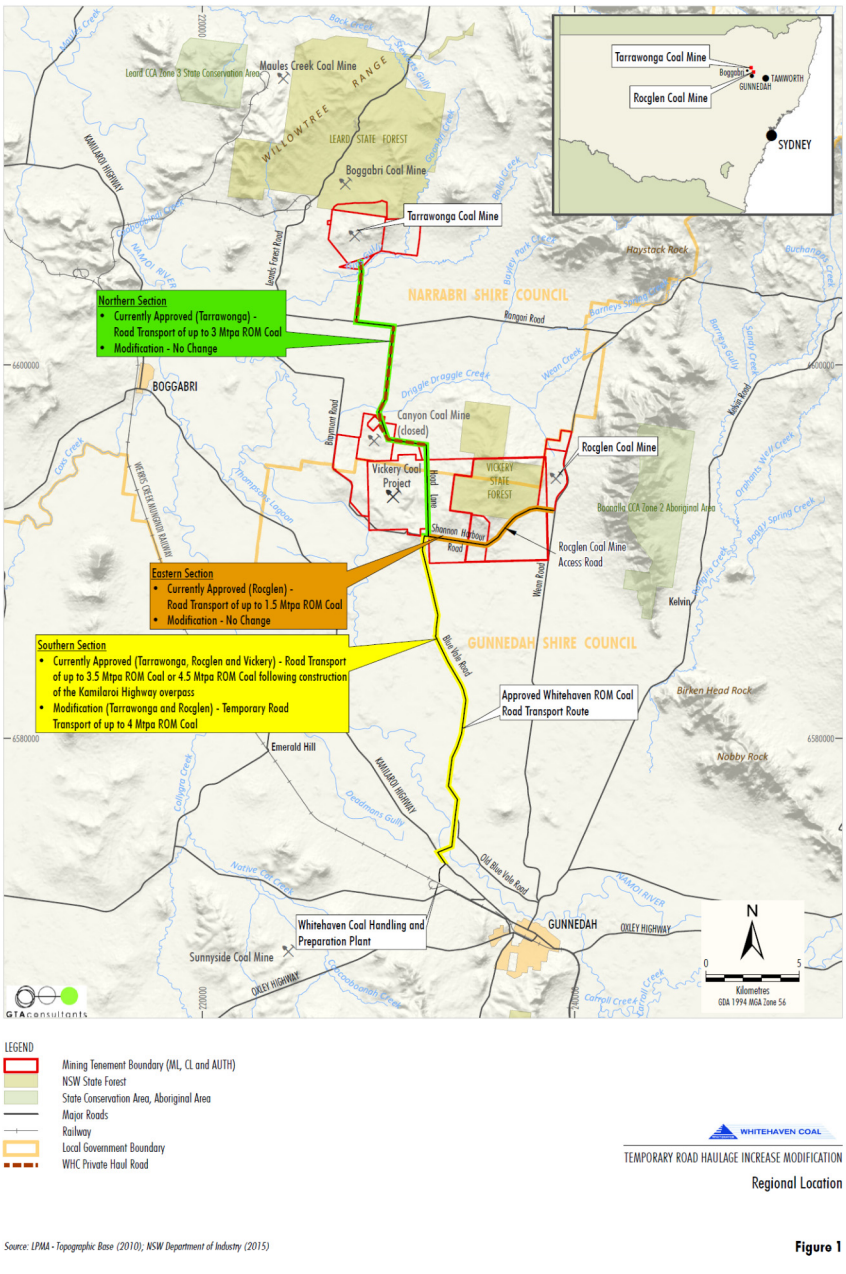


Image Source: Whitehaven Coal Limited

A section of the green route was driven for the audit team to appreciate the approaches to the audit route.

1.2 Audit Aim

A road safety audit is defined as "a formal examination of a future road or an existing road, in which an independent, qualified team reports on the project's crash potential and safety performance" (Austroads 2009).

The objective of a road safety audit is to identify potential safety risks for road users and to ensure that measures to eliminate or reduce the risks are fully considered.

1.3 Supporting Information

The following documents have been provided by the client:

- Haulage Road Map included as Figure 1.1.

A Road Transport Assessment was prepared by GTA (draft dated 5 September 2016) to assess the road transport implications to temporarily increase the combined road haulage limits for the Tarrawonga and Rocglen coal mines. This report was used by the audit team to understand the traffic impacts on the haulage route resulting from the increased haulage limits.

1.4 Checklists and Reference Material

The audit has been carried out in accordance with the Roads and Maritime Guidelines for Road Safety Audit Practises 2011 and the Austroads Guide to Road Safety Part 6: Road Safety Audit (2009). Key elements examined included:

- Fixed items adjacent to the roadway, including trees and electricity/light poles
- Roadside hazards
- Adjacent land use access points
- Sight distance and visibility
- Readability of alignment and intersections
- Intersection layout and geometry
- Signage and linemarking
- Vehicle turning paths
- Road surfacing
- Pavement condition, including presence of loose material
- Drainage
- Landscaping considerations
- Lighting.

2. Road Safety Audit Program

2.1 Commencement Meeting

The scope of the Road Safety Audit and extent of the audit route were provided to Whitehaven via email on 6 September 2016. This was conveyed to GTA via various correspondence by email and telephone.

2.2 Site and Field Audits

The field audit was conducted on Monday 12 September 2016 during both daytime and night-time periods by the lead road safety auditor and audit team member. The weather for the day audit was fine and sunny and the night audit was also fine.

2.3 Completion Meeting

Email dated 15 September 2016.

3. Road Safety Audit Findings

3.1 Introduction

The audit findings have been documented in Table 3.3, whilst a number of observations have also been recorded and summarised in Table 3.2.

Table 3.3 provides specific details of the nature of the audit non-conformances and a risk rating as high, medium or low. The risk ratings have been based on the risk matrix presented in Table 3.1, which has been adapted from the standard Austroads Risk Matrix.

Table 3.1: Risk matrix

LIKELIHOOD / SEVERITY	Improbable	Occasional	Highly probable
Minor	Low	Low	Medium
Moderate	Low	Medium	High
Major	Medium	High	High

The terms in Table 3.1 are described below.

Likelihood:

- Highly probable: It is likely that more than one crash of this type could occur within a five-year period.
- Occasional: It is likely that less than one crash of this type could occur within a five-year period.
- Improbable: Less than one crash of this type could occur within a 10-year period.

Severity:

- Major: The crash is likely to result in a fatality or serious injuries.
- Moderate: The crash is likely to result in minor injuries or large scale of property damage.
- Minor: The crash is likely to result in minor property damage or many near miss crash events.

Priority:

- High: Very important, and needs to be addressed urgently.
- Medium: Important, and needs to be addressed as soon as possible.
- Low: Needs to be considered as part of regular maintenance/planning program.

Checklist 6 – Existing Roads: Road Safety Audit from the Austroads Guide to Road Safety Part 6: Road Safety Audit (2009) was referenced during the audit.

3.2 Responding to the Audit Report

As set out in the road safety guidelines, responsibility for the road design always rests with the designer/project sponsor, and not with the auditor. A project sponsor is under no obligation to accept all of the audit findings. Also, it is not the role of the auditor to agree to or approve of the project sponsor's response to the audit. Rather, the audit provides the opportunity to highlight potential problems and have them formally considered by the project sponsor, in conjunction with all other project considerations.

Acceptance of a finding may require no further comment, but an explanation of how or when the action will be taken may be useful, and should be provided where possible.

3.3 Key Findings in Previous Audits

No details were provided of any previous Road Safety Audit for this project.

3.4 Findings

Table 3.2 includes a number of general observations and assumptions that are to be noted. The key issues identified from the audit are presented in the log in Table 3.3.

Table 3.2: Road Safety Audit observations and assumptions

No.	Description of observation or assumption
1	During the night time audit it was observed that without high beam headlights on, the reflectivity of signage and guideposts along the haulage route at night is poor due to dust and dirt covering them.
2	During the night time audit it was observed that passing trucks caused a substantial amount of dust to circulate. Since the pavement is generally sealed along the haulage route, it is assumed that dust was cause by the loads carried by passing trucks.
3	The right turn auxiliary lane at the intersection of Blue Vale Road and Shannon Harbour Road appears to be too short for deceleration from 100 km/h posted speed limit and storage of at least one truck. Trucks were observed to be decelerating within the northbound travel lane, which could potentially result in rear end collisions.

Table 3.3: Road Safety Audit Findings

No.	Location	Description of Risk in Road Safety	Category	Likelihood	Severity	Risk Rating
DAY TIME – NORTHBOUND						
1	Intersection of Kamilaroi Highway and WCHPP access road	The delineation for the merge lane travelling northbound on the Kamilaroi Highway is faded, which could result in drivers being unclear of the end of the merge and performing erratic manoeuvres to enter the adjacent travel lane.	Delineation	Improbable	Moderate	Low
2	Intersection of Kamilaroi Highway and Blue Vale Road	The edgeline around the intersection of Kamilaroi Highway and Blue Vale Road appears to be in poor condition, which could lead to drivers having insufficient guidance when tuning into and out of Blue Vale Road and driving in the shoulder or leaving the carriageway.	Delineation	Improbable	Moderate	Low
3	North of unsealed section located at approximately 1.9 km from the Kamilaroi Highway intersection	The edgeline appears to be in poor condition north of the unsealed section, which could lead to drivers driving within the shoulder or too close to the edge of pavement and leaving the carriageway.	Delineation	Improbable	Minor	Low

No.	Location	Description of Risk in Road Safety	Category	Likelihood	Severity	Risk Rating
4	Various locations	There was potholing located at numerous location along Blue Vale Road, which could result in drivers performing hazardous manoeuvres to avoid pot holes or loss of control should the pot holes be hit. The following locations were identified to have notable pot holes (approximate measurements from Kamilaroi Highway intersection): ○ North of the floodway located at approximately 3 km north from the Kamilaroi Highway intersection ○ 4 km (on approach to concrete floodway) ○ 8 to 8.1 km ○ 9.2 km ○ 9.5 to 9.6 km ○ 9.8 to 10 km ○ 10.2 to 10.6 km (scattered potholing) ○ 10.8 to 10.9 km ○ 11 km (significant pot hole) ○ 11.4 km ○ 11.8 km ○ 12.4 km ○ 13.1 km ○ 14.1 km ○ 14.5 to 14.6 km ○ 14.8 km (some pot holes appear to have been patched at this location) ○ 16.7 km ○ 17.5 km ○ 19.2 km ○ 19.9 km.	Road pavement	Occasional	Moderate	Medium
5	Blue Vale Road, approximately 11.5 km north of the Kamilaroi Highway intersection	Delineation from about 11.5 km north of the Kamilaroi Highway intersection was difficult to see during afternoon sunlight hours, which could result in drivers having insufficient guidance of travel path and potentially driving in the opposing travel lane or leaving the carriageway.	Delineation	Improbable	Moderate	Low
6	Approximately 17.5 km north of Kamilaroi Highway	There appears to be rutting along the edgeline at this location, which could result in errant vehicles losing control should the wheel path hit the defective pavement. This issue is exacerbated by the high volume of heavy vehicles, which could cause drivers to shy away from the centreline and oncoming traffic, travelling closer to the edge of pavement.	Road pavement	Occasional	Moderate	Medium

No.	Location	Description of Risk in Road Safety	Category	Likelihood	Severity	Risk Rating
		DAY TIME – SOUTHBOUND				
7	Intersection of Blue Vale Road and Shannon Harbour Road	There is substantial rutting on the painted median of the intersection on its southbound approach. This could result in errant vehicles losing control should the wheel path hit the defective pavement.	Road pavement	Highly probable	Moderate	High
8 8	Various locations	There was potholing located at numerous location along Blue Vale Road, which could result in drivers performing hazardous manoeuvres to avoid pot holes or loss of control should the pot holes be hit. The following locations were identified to have notable pot holes (approximate measurements from Shannon Harbour Road intersection): ○ 0.4 to 0.5 km ○ 0.7 to 0.8 km ○ 0.9 km ○ 2.3 to 2.5 km ○ 2.7 to 2.8 km ○ 3 to 3.1 km ○ 3.2 to 3.3 km (some patching appears to have been done at this location) ○ 3.5 km ○ 4 to 4.1 km ○ 4.8 to 5.4 km ○ 5.6 to 5.7 km ○ 5.9 to 6.1 km ○ 6.4 to 6.7 km ○ 7.1 km	Road pavement	Occasional	Moderate	Medium

No.	Location	Description of Risk in Road Safety	Category	Likelihood	Severity	Risk Rating
		○ 7.2 to 7.3 km ○ 7.5 km ○ 7.7 to 7.8 km ○ 7.9 to 8.1 km ○ 8.6 km ○ 8.8 km ○ 8.9 km ○ 9.3 km ○ 9.7 to 9.8 km ○ 10 to 10.1 km ○ 10.5 to 11 km ○ 11.1 km (substantial pot hole) ○ 11.5 to 11.8 km (with very poor pavement condition for this length) ○ 15.4 km ○ 15.8 km ○ 16.1 km ○ 16.3 to 16.4 km ○ 16.7 to 16.8 km ○ 17 km ○ 17.2 km ○ 17.6 km ○ 18 km.				
9	Approximately 3 to 3.1 km south of Shannon Harbour Road	There appears to be rutting in the southbound lane at this location, which could result in errant vehicles losing control should the wheel path hit the defective pavement.	Road pavement	Occasional	Moderate	Medium
10	Approximately 7.1 km south of Shannon Harbour Road	The shoulder appears to be in poor condition, which could result in errant vehicles losing control should the wheel path hit the defective pavement.	Road pavement	Improbable	Moderate	Low
11	Approximately 9.5 km south of Shannon Harbour Road	There appears to be rutting in the shoulder of the southbound lane at this location, which could result in errant vehicles losing control should the wheel path hit the defective pavement. This issue is exacerbated by the high volume of heavy vehicles, which could cause drivers to shy away from the centreline and oncoming traffic, travelling closer to the edge of pavement.	Road pavement	Occasional	Moderate	Medium
12	Concrete floodways on Blue Vale Road at approximately 15.6 km and 16.5 km south of Shannon Harbour Road	The concrete and asphalt interface on the approaches to floodways appears to be in poor condition, which could result in errant vehicles losing control should the wheel path hit the defective pavement.	Road pavement	Improbable	Moderate	Low

No.	Location	Description of Risk in Road Safety	Category	Likelihood	Severity	Risk Rating
13	Blue Vale Road at approximately 13.1 km south of Shannon Harbour Road	The flood depth sign for the southbound traffic appears to be bent over and cannot be seen by drivers. This could potentially cause drivers not to be aware of depth of water in flood conditions, resulting in loss of control.	Traffic signs	Improbable	Moderate	Low
NIGHT TIME AUDIT – NORTHBOUND						
14	Intersection of Blue Vale Road and Shannon Harbour Road	The delineation on the approaches to and at the intersection of Blue Vale Road and Shannon Harbour Road is poorly visible at night due to tracked dirt. This could result in drivers being unsure of their path of travel at this location and performing hazardous manoeuvres to correct. Additionally, the give way line on Shannon Harbour Road is not clearly visible, which could result in vehicles encroaching into the southbound travel lane on Blue Vale Road, causing crashes with vehicles from adjacent approaches.	Delineation	Improbable	Moderate	Low

4. Formal Statement

We, the undersigned, declare that we have reviewed the material and data listed in this report and identified the safety and operational issues presented in Table 3.2 and Table 3.3.

It should be noted that while every effort has been made to identify potential safety hazards, no guarantee can be made that every risk in road safety has been identified.

Further, if all the findings in this report were to be addressed, this would not guarantee that the site is "safe", rather, the level of safety of the facility should be improved.

We recommend that points of concern be investigated and corrective actions implemented as soon as is practicable.

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Road Safety Reviewer

Date: 5 October 2016

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