11. Traffic and Noise Assessments

This Chapter details the expected traffic generation and noise impacts of the proposed W2CP both during construction and ongoing operations. The assessment takes into account matters raised by government agencies and the community during the course of investigating and developing the W2CP.

The assessment and proposed mitigation of noise related impacts presented in this Chapter are in accordance with the "Leading Practice in Sustainable Development Handbook Series – Air Contaminants, Noise and Vibration", Australian Government Department of Resources, Energy and Tourism (2009).

11.1 Traffic Assessment

Parsons Brinckerhoff Australia Pty Ltd (PB) was commissioned by WACJV to prepare a traffic and transport report to accompany the main EA document for the W2CP. The report assesses the traffic and transport impacts due to the proposed mine construction and operation scenarios, and is contained in full in Appendix O and summarized below. It is also anticipated that a Traffic Management Plan will be required for the project prior to construction which will include updated traffic counts and take into account any official revised traffic predictions covering new developments in the area such as the Warner Business Park, or other specific developments within the Wyong Employment Zone.

11.1.1 Existing Road Network and Traffic Situation

Data obtained from the Roads and Traffic Authority (RTA) have shown that local roads around the proposed infrastructure sites have all recorded a consistent increase in traffic volumes between 1995 and 2004 (period surveyed). The average annual increase for this period was approximately 4.06% per annum. These roads also show two distinct peak periods of 6 am to 9 am, and 3 pm to 6 pm.

Mid block counts were undertaken at key locations for a continuous seven-day period between 24 November 2006 and 1 December 2006 as shown on Figure 11.1. The tube counts produce 24 hour traffic profiles and traffic composition using vehicle classes defined by Austroads. The counts are conducted at the following locations:

- Hue Hue Road, north of Sparks Road;
- Hue Hue Road at Sydney-Newcastle Freeway overpass; and
- Bushells Ridge Road at Sydney-Newcastle Freeway overpass.

The two-way peak hour traffic for the average weekday at three locations generally occurred from 8:00 am to 9:00 am and 3:00 pm to 4:00 pm during the morning and afternoon peak periods, respectively. Peak hour volumes are summarised in Table 11.1.

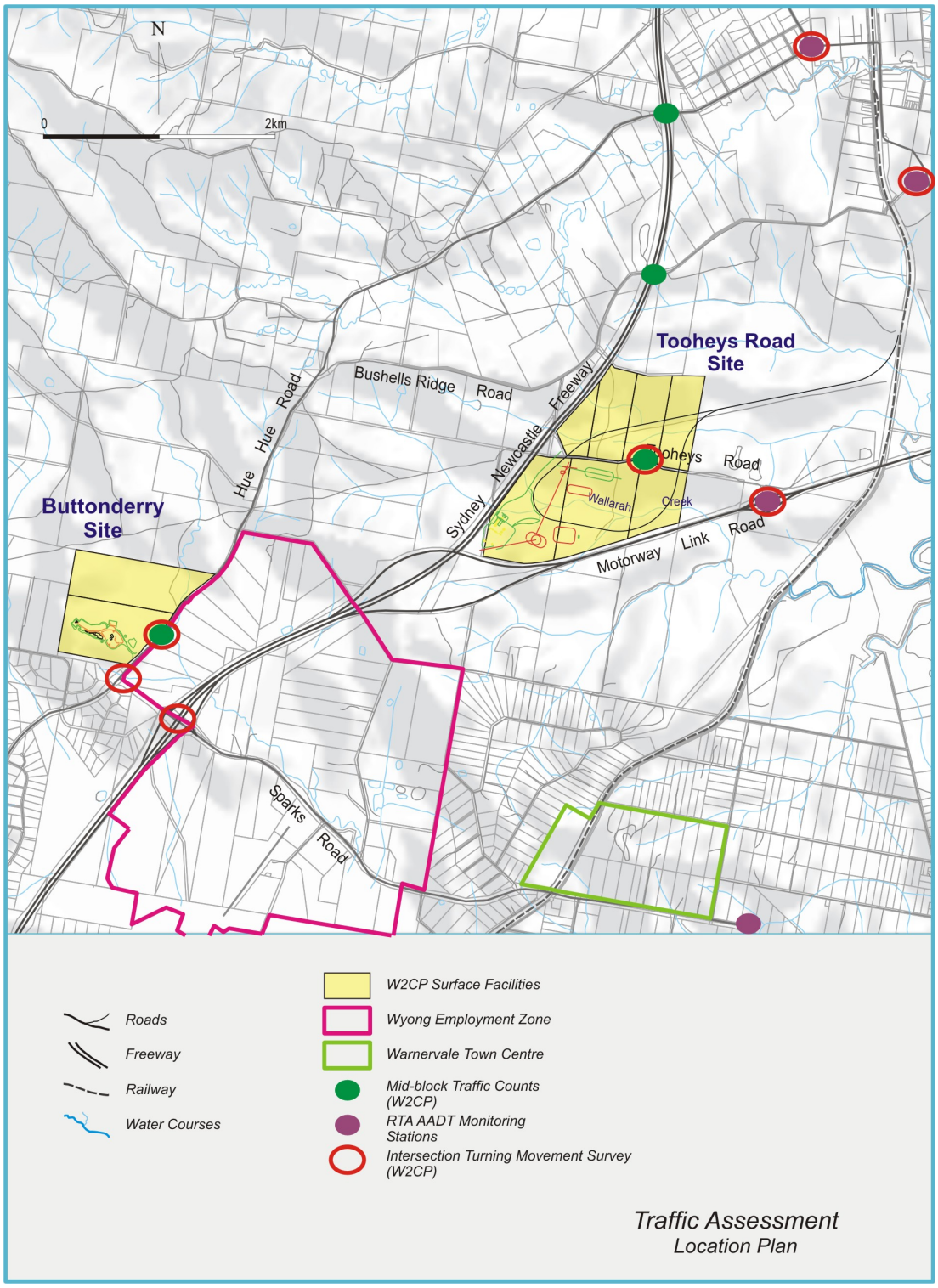

Figure 11.1 Traffic Assessment Locations

Table 11.1 Average Weekday Peak Hour Volumes at Key Locations

Location	Morning Peak Hour			Afternoon Peak Hour		
	NB/EB	SB/WB	2-way	NB/EB	SB/WB	2-way
Hue Hue Road, north of Sparks Road	86 (5.5%)	154 (10.2%)	240 (15.7%)	158 (10.0%)	115 (7.6%)	273 (17.6%)
Hue Hue Road at Sydney-Newcastle Fwy overpass	70 (5.9%)	102 (9.1%)	173 (15.0%)	135 (11.3%)	94 (8.4%)	229 (19.7%)
Bushells Ridge Road at Sydney-Newcastle Fwy overpass	6 (6.6%)	6 (6.8%)	13 (13.4%)	8 (8.7%)	16 (8.3%)	24 (17.1%)

Note: Percentages in brackets indicate the peak hour traffic as a percentage of the daily traffic.

At Hue Hue Road, north of Sparks Road, the average weekday traffic (AWT) volume is 3,085 vehicles per day (vpd). The classification count shows that of the 3,085 vehicles:

- 62 percent (or 1,903 vehicles) were light vehicles including cars, vans, car towing boat, etc (Classes 1 and 2);
- 35 percent (or 1,071 vehicles) were rigid trucks and buses (Classes 3, 4 and 5);
- 3 percent (or 108 vehicles) were articulated trucks with three to six axles (Classes 6, 7, 8 and 9); and
- less than 1 percent (or 3 vehicles) were B-Doubles including road trains (Classes 10, 11 and 12).

The analysis also shows that at this location, Class 3 vehicles (two axle truck or bus) are significantly higher for southbound, that is 53 percent of southbound daily traffic is of Class 3 vehicles, whereas it is only 5 percent for northbound traffic.

The average weekday traffic by vehicle class (using *Austroads* classification) for northbound, southbound and two-way combined traffic on Hue Hue Road, north of Sparks Road are presented graphically in Figure 11.2, Figure 11.3 and Figure 11.4, respectively.

At Hue Hue Road at Sydney-Newcastle Freeway overpass, the average weekday traffic (AWT) volume is 2,318 vpd. The classification count shows that of the 2,318 vehicles:

- 91 percent (or 2,101 vehicles) were light vehicles including cars, vans, car towing boat, etc (Classes 1 and 2);
- 8 percent (or 176 vehicles) were rigid trucks and buses (Classes 3, 4 and 5);
- 2 percent (or 39 vehicles) were articulated trucks with three to six axles (Classes 6, 7, 8 and 9); and
- less than 1 percent (or 2 vehicles) were B-Doubles including road trains (Classes 10, 11 and 12).

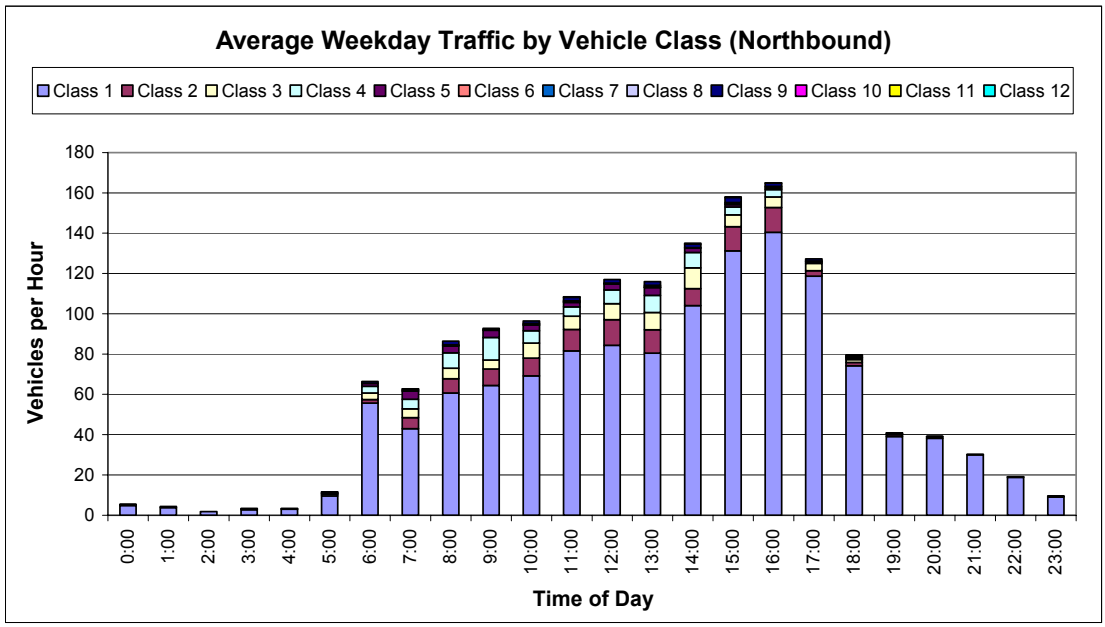

Figure 11.2 Average Weekday Traffic by Vehicle Class (Northbound) on Hue Hue Road, North of Sparks Road

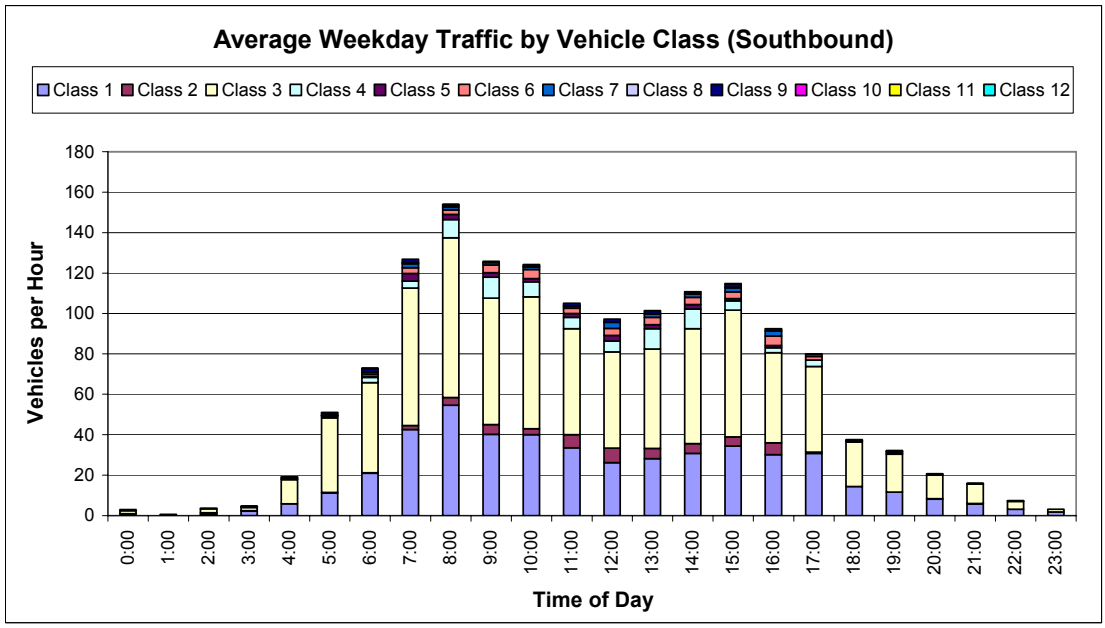

Figure 11.3 Average Weekday Traffic by Vehicle Class (Southbound) on Hue Hue Road, North of Sparks Road

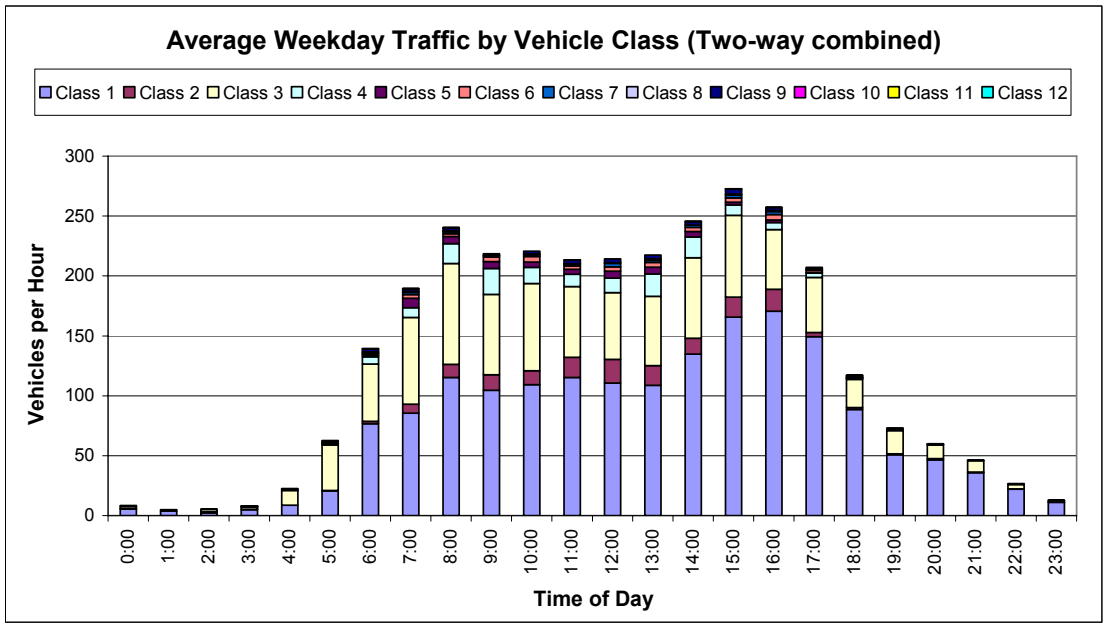

Figure 11.4 Average Weekday Traffic by Vehicle Class (Two-way Combined) on Hue Hue Road, North of Sparks Road.

The vehicle compositions are similar in both directions.

The average weekday traffic by vehicle class for eastbound, westbound and two-way combined traffic on Hue Hue Road at Sydney-Newcastle Freeway overpass are presented graphically in Figure 11.5, Figure 11.6 and Figure 11.7, respectively.

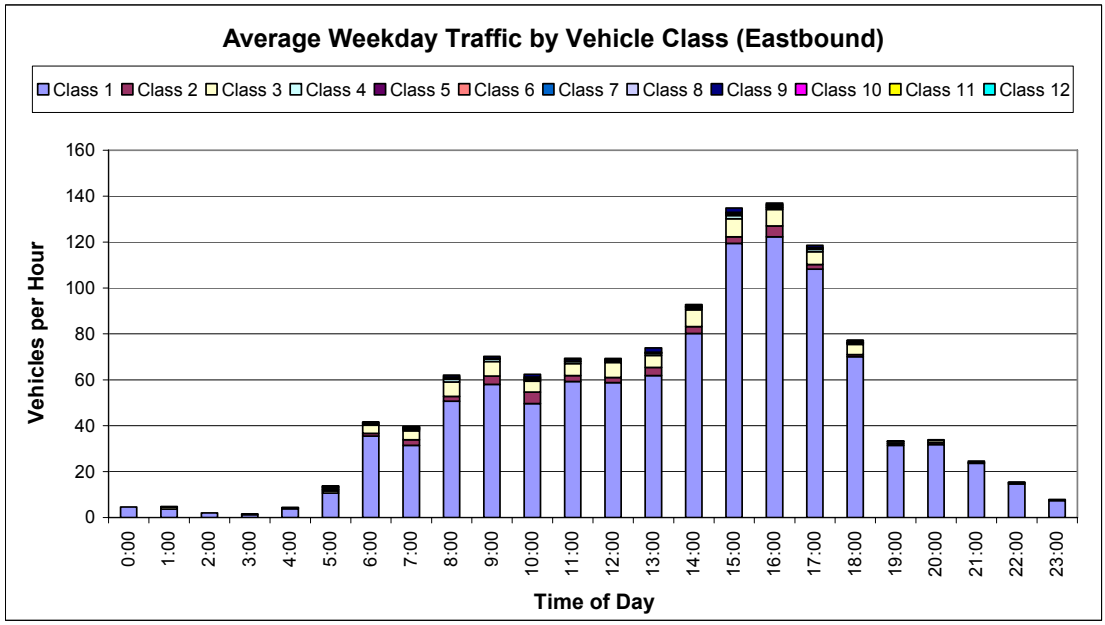

Figure 11.5 Average Weekday Traffic by Vehicle Class (Eastbound) on Hue Hue Road at Sydney-Newcastle Freeway Overpass

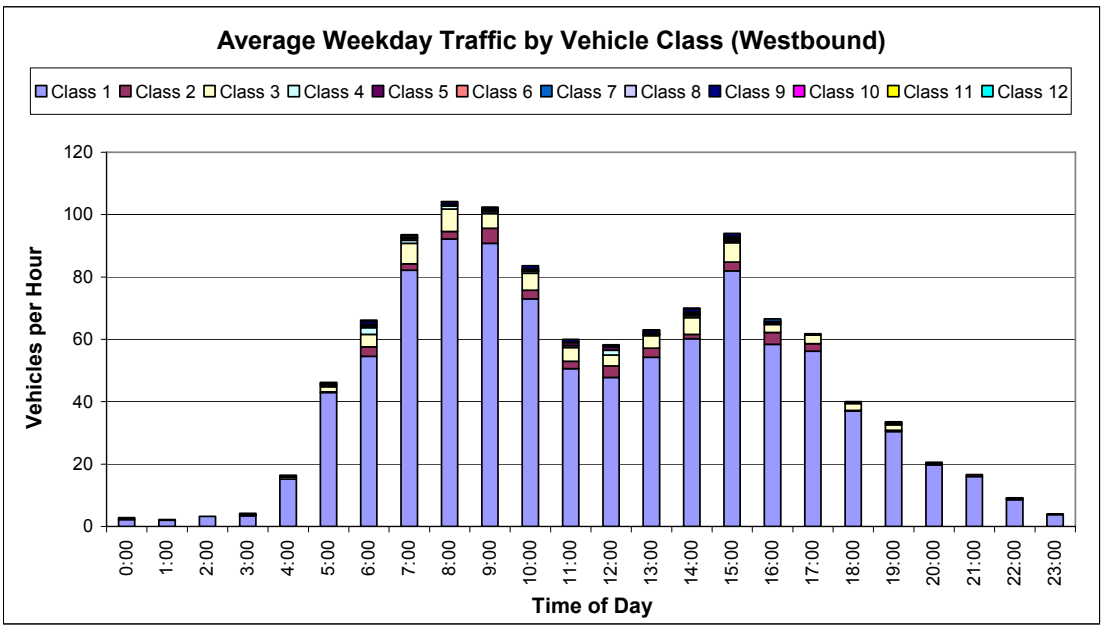

Figure 11.6 Average Weekday Traffic by Vehicle Class (Westbound) on Hue Hue Road at Sydney-Newcastle Freeway Overpass.

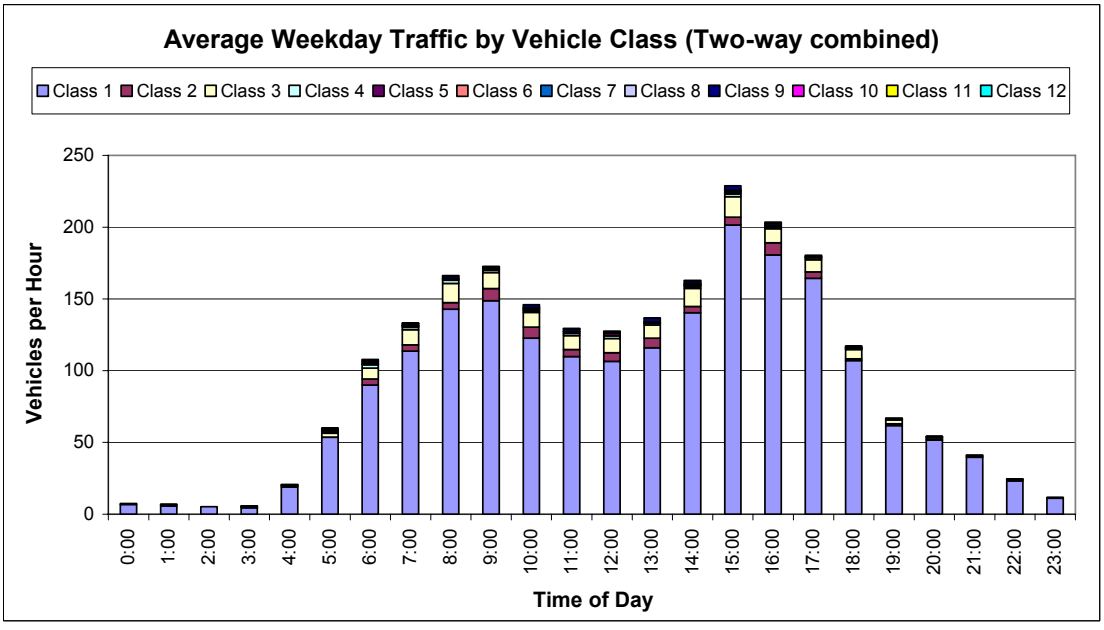

Figure 11.7 Average Weekday Traffic by Vehicle Class (Two-way Combined) on Hue Hue Road at Sydney-Newcastle Freeway Overpass

At Bushells Ridge Road at Sydney-Newcastle Freeway overpass, the average weekday traffic (AWT) volume is 187 vpd. The classification count shows that of the 187 vehicles:

- 78 percent (or 146 vehicles) were light vehicles including cars, vans, car towing boat, etc (Classes 1 and 2);
- 20 percent (or 38 vehicles) were rigid trucks and buses (Classes 3, 4 and 5);
- 2 percent (or 3 vehicles) were articulated trucks with three to six axles (Classes 6, 7, 8 and 9); and
- none were B-Doubles (Classes 10, 11 and 12).

The vehicle compositions are similar in both directions. However, it should be noted that Class 3 vehicles (two axle truck or bus) have the second highest number of vehicle count through the day in both directions after Class 1 vehicles (passenger cars).

The average weekday traffic by vehicle class for eastbound, westbound and two-way combined traffic on Bushells Ridge Road at Sydney-Newcastle Freeway overpass are presented graphically in Figure 11.8, Figure 11.9 and Figure 11.10, respectively.

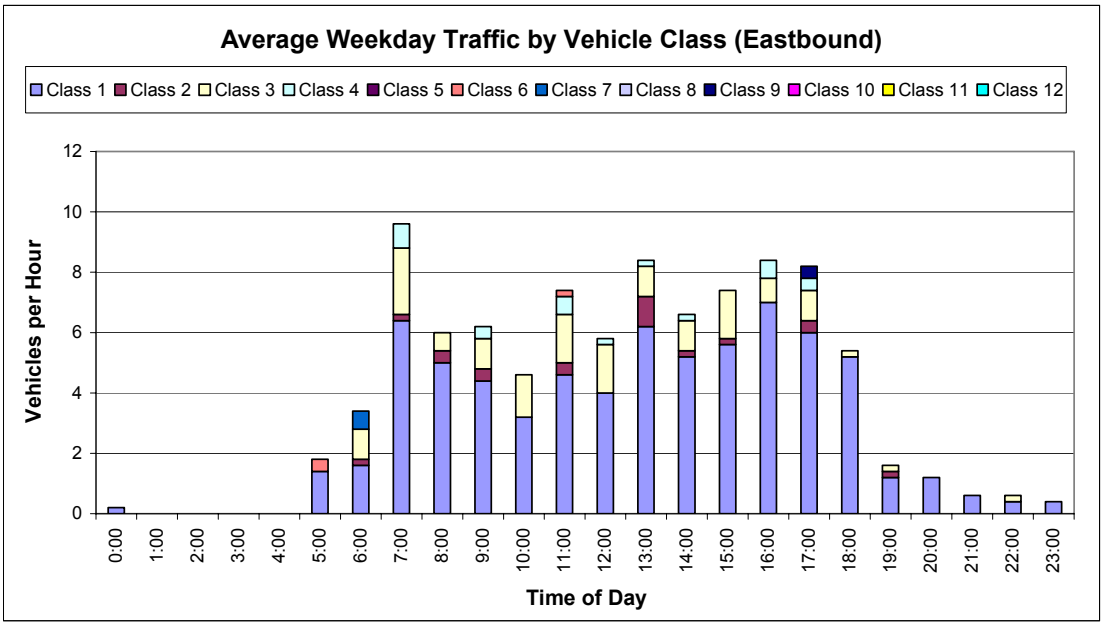

Figure 11.8 Average Weekday Traffic by Vehicle Class (Eastbound) on Bushells Ridge Road at Sydney-Newcastle Freeway Overpass

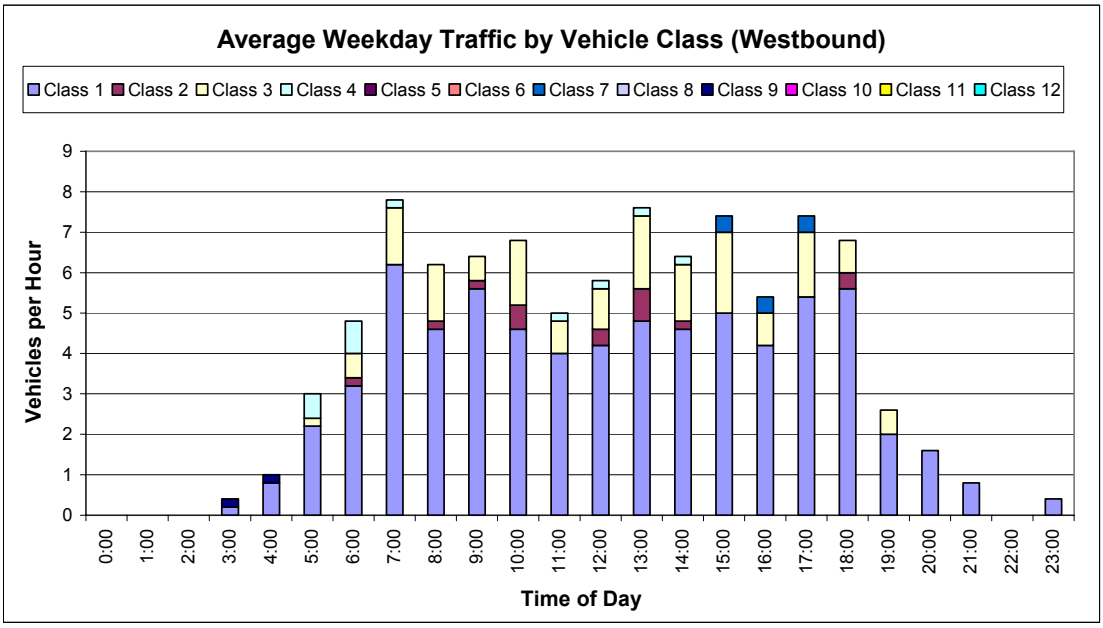

Figure 11.9 Average Weekday Traffic by Vehicle Class (Westbound) on Bushells Ridge Road at Sydney-Newcastle Freeway Overpass

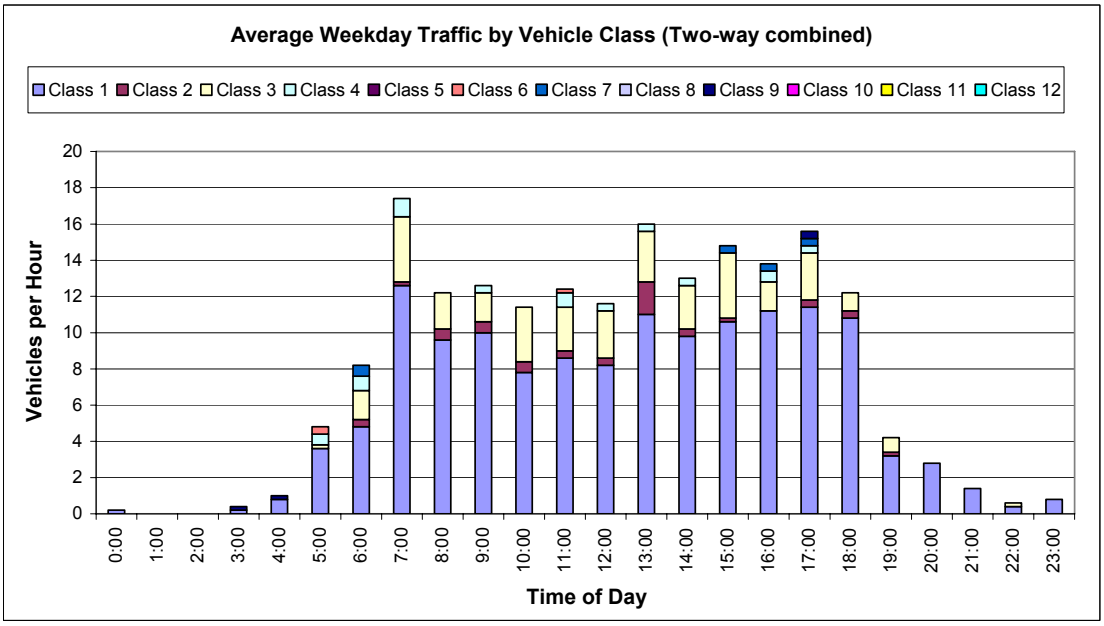

Figure 11.10 Average Weekday Traffic by Vehicle Class (Two-way Combined) on Bushells Ridge Road at Sydney-Newcastle Freeway Overpass

In addition to existing traffic volumes, surveys of the following intersections were undertaken:

- Sydney-Newcastle Freeway – Sparks Road interchange;
- Sparks Road – Hue Hue Road;

- ❒ Hue Hue Road – Wyee Road;
- ❒ Gosford Road – Wyee Road; and
- ❒ Motorway Link – Tooheys Road interchange.

The surveys were conducted during the period of 29 November 2006 and 13 December 2006 for one morning and afternoon peak periods at each intersection. The morning peak period surveys were generally conducted from 6:00AM to 9:30AM and the afternoon peak period from 3:30PM to 7:00PM.

From the survey results, it can be seen that two-way peak hour volumes on Sparks Road are in the order of 500 vph (east of Hue Hue Road) to 1,500 vph (east of Sydney-Newcastle Freeway). Assuming that the peak hour volume is between 8 to 12 percent of the daily volumes, this translates to a daily traffic volume in range of 5,000 vehicles per day (vpd) to 15,000 vpd. The results also indicate that Sparks Road has a dominant peak direction: eastbound in the afternoon peak period and westbound in the morning peak period.

The survey results also indicate that two-way peak hour volumes on Hue Hue Road are in the order of 200 vph to 250 vph, which is equivalent to 2,000 vpd to 2,500 vpd using the same conversion factor from peak hour to daily volume as above. Similar to Sparks Road, the results also indicate that Hue Hue Road has a dominant peak direction: northbound in the afternoon peak period and southbound in the morning peak period.

Table 11.2 Traffic Survey Information at Key Intersections

Intersections	Survey Dates	Survey Times	Peak Hours
Sydney-Newcastle Fwy / Sparks Road Interchange	13 Dec 06	6.00am – 9.30am 3.30pm – 7.00pm	8am – 9.00am 4.30pm – 5.30pm
Sparkes Road / Hue Hue Road	29 Nov 06	6.00am – 9.30am 3.30pm – 7.00pm	8.15am – 9.15am 4.30pm – 5.30pm
Hue Hue Road / Wyee Road	29 Nov 06	6.00am – 9.30am 3.30pm – 7.00pm	8.15am – 9.15am 3.30pm – 4.30pm
Gosford Road / Wyee Road	29 Nov 06	6.00am – 9.30am 3.30pm – 7.00pm	7.15am – 8.15am 3.30pm – 4.30pm
Motorway Lind Road / Tooheys Road Interchange	29 Nov 06	6.30am – 10.00am 3.30pm – 7.00pm	7.30am – 8.30am 4.30pm – 5.30pm

From the survey results, it can also be seen that two-way peak hour volumes on Wyee Road are in the order of 500 vph to 650 vph, which is equivalent to 5,000 vpd to 6,500 vpd using the same conversion factor from above. This is significantly lower than the expected traffic volume for a main road.

Both Gosford Road and Tooheys Road carry substantially less traffic in the range of 10 vph to 40 vph.

11.1.2 W2CP Site Vehicle Access

It is proposed to access the sites via the access points as shown in Table 11.3. The likely routes taken by construction vehicles, employee traffic and delivery and service vehicles during the construction and operating phases are also shown in Table 11.3:

Table 11.3 Site Access Points and Access Routes

W2CP Site	Main Access Point	Access to / from Via			
		North	South	East	West
Tooheys Road	Off Motorway Link Road to Tooheys Road	F3 Freeway, turn back via Sparks Road	F3 Freeway	Motorway Link Road	Bushells Ridge Road and Tooheys Road
Buttonderry	Off Hue Hue Road, directly north of intersection with Sparks Road	Hue Hue Road / F3 Freeway	Hue Hue Road / F3 Freeway	Sparks Road	Sandra St
Western Shaft (construction phase only)	Off Little Jilliby Road	Jilliby Road	Jilliby Road, Hue Hue Road	Jilliby Road, Hue Hue Road	Little Jilliby Road

11.1.3 W2CP Traffic Generation

All movements of coal from the site would be undertaken by rail. Therefore under normal day-to-day operation, the site would only generate external traffic accessing Hue Hue Road and the Motorway Link Road. The external traffic during operation is expected to be from employee, service and delivery vehicles.

Predicted Construction Traffic

It is expected that most spoil excavated during construction will largely remain on-site. The most spoil will be generated at the Tooheys Road site however this will be reused on site.

There is the potential for the removal of 13,660 cubic metres of spoil from the Buttonderry site to the Tooheys Road site over its construction period of 26 months. During detailed design, the overall cut and fill quantities are expected to be balanced with any additional fill material used in landscaping works. However for the purposes of the traffic assessment, the removal of any excess fill has been assumed as a worse case scenario. The Western Shaft will generate 5,600 cubic metres of spoil over its construction period of 60 weeks.

The worst case traffic generating concrete pour is expected to be for the construction of the drift invert road slab at the Tooheys Road site. This will require 2,000 cubic metres of concrete to be delivered over a 10 week period. This works out at a weekly delivery of 34 concrete trucks per week. For the sake of the analysis it has been assumed that 50 concrete trucks would arrive per week.

The estimated construction traffic from each of the three sites for different vehicle types is shown in Table 11.4. It should be noted that whilst the Tooheys Road and Buttonderry sites would be undergoing construction at the same time, the Western shaft site is not expected to be under construction until around year ten of mining.

Table 11.4 Estimated Construction Traffic

W2CP Site	Vehicle Type	Number / Day	Number / Day (PCU)
Tooheys Road	Light (employees)	150	150
	Light (deliveries)	60	60
	Rigid Truck	20	40
	Articulated Truck	20	70
	Total		*320*
Buttonderry	Light (employees)	75	75
	Light (deliveries)	40	40
	Rigid Truck	10	20
	Articulated Truck	20	70
	Total		*205*
Western Shaft	Light (employees)	25	25
	Light (deliveries)	10	10
	Rigid Truck	5	10
	Articulated Truck	5	18
	Total		*63*

PCU = Passenger Car Units

Equipment and vehicles that potentially would need to be delivered and would be operating on any of the sites during the construction period include:

- ❒ 30-45T Excavators;
- ❒ D-D10 dozers;
- ❒ shotcrete robot,
- ❒ rockbolting machine;
- ❒ flat bed trucks;
- ❒ mobile cranes;
- ❒ haul trucks;
- ❒ concrete trucks;
- ❒ concrete pump truck;
- ❒ roadheader (approx. 300kW power rating);
- ❒ tipper trucks;
- ❒ 15t bogie trucks;
- ❒ graders;
- ❒ 10t vibratory rollers;
- ❒ 815-825 compactor;
- ❒ skidsteer loaders;
- ❒ asphalt pavers;
- ❒ water carts;
- ❒ Tack laying machine;
- ❒ tamping machine;
- ❒ ballast regulator;
- ❒ rail grinding machine;
- ❒ hi-rail excavator with sleeper grabs;
- ❒ forklifts; and
- ❒ drill rig.

Construction vehicle traffic for the Tooheys Road site is expected to last for approximately 12 months. Construction vehicle traffic would be at the highest intensity during the main earthworks and civil construction as follows:

- Access to the work areas would be provided off Tooheys Road and by the existing vehicle gates along the railway corridor;
- Construction materials such as premix concrete, reinforcement, concrete blocks, ballast, sleepers, pavement materials, portal/culvert/bridge units would be transported to the work areas using trucks, concrete mixers and excavators;
- Construction vehicle traffic would generally travel by the most direct route; however consideration would be given to RTA road weight restrictions, bridge height clearances and sensitive land uses; and
- The workforce would arrive in their cars and would park at or near the work area. Traffic movements related to the workforce would be limited to personal journeys (i.e. for lunch) and trips to a trade store for building materials.

Construction vehicle traffic for the Buttonderry Site is expected to last for approximately two years, and would be at the highest intensity during the main earthworks and buildings works as follows:

- Access to the work areas would be provided off Hue Hue Road;
- Construction materials such as reinforcement and pre-fabricated units for lining the shaft, pavement gravels and culvert units would be transported to the work areas using trucks; and
- The workforce would arrive in their cars and would park at or near the work area. Traffic movements related to the workforce would be limited to personal journeys (i.e. for lunch) and trips to a trade store for building materials.

Construction traffic for the Western Shaft site would access the work area off Little Jilliby Road. It would be preferable for Brothers Forest Road to be closed whilst it is upgraded and the ventilation shaft is constructed. This would have to be agreed with the relevant authorities.

Excess material from the shaft excavation would have to be taken off site by road. At this stage the destination of this material has not been identified however efforts would be made to minimise the construction traffic on the local road network.

Predicted Employee Traffic

It is anticipated that the W2CP would generate up to 300 full-time positions. It is assumed that approximately 70% of employment opportunities would be taken by local applicants from the Central coast.

The proposed hours of operation for the coal mine would be 24 hours per day, seven days per week. On-site employees would be rostered over three daily working shifts, and it is anticipated that none of these shifts would generate significant employee traffic movements on and off the site during traditional traffic peak periods.

Service and Delivery Traffic

It is anticipated that service vehicles and deliveries will include:

- ❒ Stores deliveries, 3 articulated trucks per week to Buttonderry site and 2 per week to Tooheys Road site; and

- ❒ Removal of waste, 1 semi trailer from the Tooheys Road site per week.

However it is expected that there will be a number of smaller delivery and service vehicles operating throughout the week.

11.1.4 Traffic Impact

Construction

During the construction period of the proposed mine sites, it was assumed during the morning peak hour, all inbound trips would be made up of construction workers entering the sites. Similarly during the afternoon peak hour, all outbound trips would be made up of construction workers leaving the sites. The estimated construction vehicle trips for Buttonderry and Tooheys Road sites are 100 vehicles per day (vpd) and 70 vpd, respectively. It was assumed that construction vehicle trips would be made throughout the day and would be equally distributed between 8 hour period. It is estimated that 13 and 9 construction vehicles are assumed to enter and leave the sites during the morning and afternoon peak periods. Table 11.5 shows the number of trips generated by the proposed mine sites during the construction period.

Table 11.5 Inbound and Outbound Trips During Construction Period

W2CP Site	Morning Peak Hour			Afternoon Peak Hour		
	Inbound	Outbound	Total	Inbound	Outbound	Total
Buttonderry						
Workforce	150	-	150	-	150	150
Construction	13	13	26	13	13	26
Total	*163*	*13*	*176*	*13*	*163*	*176*
Tooheys Road						
Workforce	75	-	75	-	75	75
Construction	9	9	18	9	9	18
Total	*84*	*9*	*93*	*9*	*84*	*93*

During the construction period, it is assumed that the trip distribution of the construction workers would be the same as the distribution of employee trips under the normal day-to-day operation, which is mentioned previously.

For the construction vehicles, the following assumptions have been made for the distribution of the trips in and out of the proposed mine sites.

For Buttonderry site, the construction vehicle trips would be made up of:

- ❒ 10% to/from North using Sydney-Newcastle Freeway/Sparks Road/Hue Hue Road;
- ❒ 20% to/from South using Sydney-Newcastle Freeway/Sparks Road/Hue Hue Road;
- ❒ 35% to/from East using Sparks Road/Hue Hue Road; and
- ❒ 35% to/from East using Motorway Link/Sparks Road/Hue Hue Road.

For Tooheys Road site, the trips would be made up of:

- ❒ 10% to/from North using Sydney-Newcastle Freeway/Motorway Link/Tooheys Road;
- ❒ 20% to/from South using Sydney-Newcastle Freeway/Motorway Link/Tooheys Road;
- ❒ 35% to/from East using Sparks Road/ Sydney-Newcastle Freeway/Motorway Link/Tooheys Road; and
- ❒ 35% to/from East using Motorway Link/Tooheys Road.

Operation

Traffic generation for the W2CP has been estimated based on employment trips and service and delivery traffic generated by the development. A conservative rate of 1.0 per peak hour was assumed for employment trips, based on the characteristics of the local area and the lack of public transport in the vicinity of the subject sites.

Under the normal day-to-day operation, it was assumed during the morning peak hour, all inbound trips would be made up of employees and dayshift mine workers entering the sites and all outbound trips would be of nightshift mine workers leaving the sites. Similarly during the afternoon peak hour, all inbound trips would be made up of afternoon shift mine workers entering the sites and all outbound would be of employees and dayshift mine workers leaving the sites. As a conservative approach, 10 service and delivery vehicles are assumed to enter and leave the sites during the morning and afternoon peak periods. Table 11.6 shows the number of trips generated by the proposed mine sites under the normal day-to-day operation.

Table 11.6 Inbound and Outbound Trips Under Normal Operation

W2CP Site	Morning Peak Hour			Afternoon Peak Hour		
	Inbound	Outbound	Total	Inbound	Outbound	Total
Buttonderry						
Workforce	120	80	200	80	120	200
Service	10	10	20	10	10	20
Total	*130*	*90*	*220*	*90*	*130*	*220*
Tooheys Road						
Workforce	15	3	18	5	15	20
Service	10	10	20	10	10	20
Total	*25*	*13*	*39*	*15*	*25*	*40*

Under the normal day-to-day operation, the following assumptions have been made for the distribution of the workforce trips in and out of the proposed mine sites.

For Buttonderry site, the trips would be made up of:

- ❒ 35% to/from North using Sydney-Newcastle Freeway/Sparks Road/Hue Hue Road;
- ❒ 30% to/from South using Sydney-Newcastle Freeway/Sparks Road/Hue Hue Road;
- ❒ 15% to/from East using Sparks Road/Hue Hue Road;
- ❒ 10% to/from North using Wyee Road/Hue Hue Road; and
- ❒ 10% to/from South using Hue Hue Road.

For Tooheys Road site, the access to and from the north of the site such as Lake Macquarie is not well served using Sydney-Newcastle Freeway as there is no turnoff at Motorway Link Road for southbound traffic. The southbound traffic would need to

use the Sparks Road ramp then travel northbound on Sydney-Newcastle Freeway to turnoff at Motorway Link to access the Tooheys Road site. This would be the same for outbound traffic to travel to Lake Macquarie using Sydney-Newcastle Freeway.

The trips would be made up of:

- 35% to/from North using Sydney-Newcastle Freeway/Motorway Link/Tooheys Road;
- 30% to/from South using Sydney-Newcastle Freeway/Motorway Link/Tooheys Road;
- 30% to/from East using Sparks Road/ Sydney-Newcastle Freeway/Motorway Link/Tooheys Road; and
- 5% to/from North using Wyee Road/Hue Hue Road/Bushells Ridge Road/Tooheys Road.

Since the estimated number of trips for both the morning and afternoon peak periods are less than 30 vehicular trips per hour for Tooheys Road site, 30% additional trips are assumed to be traveling to and from east of Motorway Link as a conservative approach.

For all service and delivery traffic, it is assumed to use Sydney-Newcastle Freeway to access to and from the proposed mine sites.

11.1.5 Impact Criteria

Level of Service

Level of service (LoS) is one of the basic performance parameters used to describe the operation of an intersection (refer to Table 11.7). The levels of service range from A (indicating good intersection operation) to F (indicating over saturated conditions with long delays and queues). At signalised and roundabout intersections, the LoS criteria are related to average intersection delay (seconds per vehicle). At priority controlled intersections, the LoS is based on the average delay (seconds per vehicle) for the worst movement.

Table 11.7 Level of Service Criteria for Intersections

Level of Service	Average Delay (seconds / vehicle)	Traffic Signals, Roundabouts	Give Way and Stop Signs
A	Less than 14	Good operation	Good operation
B	15 - 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 - 42	Satisfactory	Satisfactory, but accident study required.
D	43 – 56	Operating near capacity	Near capacity and accident study required
E	57 – 70	At capacity. At signals, incidents will cause excessive delays. Roundabouts require other control mode.	At capacity, requires other control mode.
F	Greater than 71	Unsatisfactory with excessive queuing	Unsatisfactory with excessive queuing; requires other control mode.

Source: RTA Guide to Traffic Generating Developments, 2002.

Degree of Saturation
Degree of saturation (DoS) is defined as the ratio of demand flow to capacity, and therefore has no unit. As it approaches 1.0, extensive queues and delays could be expected. For DoS greater than 1.0, a small increment in traffic volumes would result in an exponential increase in delays and queue length. For a satisfactory situation, the DoS should be less than the nominated practical degree of saturation, usually 0.9. The intersection DoS is based on the movement with the highest ratio for all types of intersection.

Average Delay
Delay is the difference between interrupted and uninterrupted travel times through the intersection and is measured in seconds per vehicle. The delays include queued vehicles decelerating and accelerating to and/or from stop, as well as delays experienced by all vehicles negotiating the intersection. At signalised and roundabout intersections, the average intersection delay is usually reported and is taken as the weighted average delay by summing the product of the individual movement traffic volume and its corresponding calculated delays and dividing by the total traffic volume at the intersection. At priority controlled intersections, the average delay for the worse movement is usually reported.

Maximum Queue Length
Queue length is the number of vehicles waiting at the stop line and is usually quoted as the 95th percentile back of queue, which is the value below which 95 percent of all observed queue lengths fall. It is measured as the number of vehicles per traffic lane at the start of the green period, when traffic starts moving again after a red signal. The intersection queue length is usually taken from the movement with the longest queue length.

11.1.6 Intersection Performance

To accurately test the traffic impact on the surrounding road network due to the proposed development, intersection analysis is performed for the future (2016) base condition without the generated traffic from the developments. The average growth rate on the nearby road is approximately 4% per annum for the previous 10 year period. As a conservative approach a global 4% increase per annum was applied to the surveyed intersection movements and shown in Table 11.8.

Table 11.8 Intersection Performance Without the W2CP

Intersection Name	Peak Period	Ints Control Type	Ints DOS	Delay (sec)	Ints LOS	Queue (m)
Sydney-Newcastle Fwy / Sparks Road Interchange*	Morning	Priority	0.95	56	D	92
	Afternoon	Priority	>1.40	>70	F	843
Sparkes Road / Hue Hue Road	Morning	Priority	0.52	12	A	21
	Afternoon	Priority	0.34	11	A	9
Hue Hue Road / Wyee Road	Morning	Priority	0.18	15	A	5
	Afternoon	Priority	0.29	18	B	10
Gosford Road / Wyee Road	Morning	Priority	0.22	15	A	1
	Afternoon	Priority	0.29	17	B	1
Motorway Link Road / Tooheys Road Interchange	Morning	Priority	0.02	9	A	0
	Afternoon	Priority	0.02	9	A	1

* Note: Prior to traffic lights being installed in 2009

Intersection analysis result for the future base condition show that all but one intersection would operate at LoS B or better during both the morning and afternoon peak periods. The expected delay at all other intersections are in the order of 20 seconds or less with short queue length, in the order of 25 m or less for both the morning and afternoon peak periods.

It is important to acknowledge that even without the development traffic Sydney-Newcastle Freeway/Sparks Road interchange would operate at LoS F with long delays and queuing during afternoon peak period. Subsequently, Sydney-Newcastle Freeway/Sparks Road interchange was noted to require upgrading prior to the year 2016 to accommodate the background traffic growth. Traffic management improvements were implemented at this location in late 2009.

Construction

The intersection analysis results for the construction conditions are summarised in Table 11.9. It can be seen that all intersections analysed would operate at LoS A during both morning and afternoon peak periods except for one intersection, Sydney-Newcastle Freeway/Sparks Road. It is noted that this intersection has recently been upgraded. The expected delay at all other intersections are in the order of 15 seconds or less for both the morning and afternoon peak periods. Similar to the existing conditions, the majority (all but one) of intersections currently operate with low degree of saturation, less than 0.5 with short queue length, in the order of 20 m or less.

Table 11.9 Construction Period Intersection Performance

Intersection Name	Peak Period	Ints Control Type	Ints DOS	Delay (sec)	Ints LOS	Queue (m)
Sydney-Newcastle Fwy / Sparks Road Interchange	Morning	Priority	0.75	23	B	46
	Afternoon	Priority	0.89	48	D	145
Sparkes Road / Hue Hue Road	Morning	Priority	0.41	12	A	16
	Afternoon	Priority	0.28	11	A	8
Hue Hue Road / Wyee Road	Morning	Priority	0.14	13	A	3
	Afternoon	Priority	0.20	14	A	6
Gosford Road / Wyee Road	Morning	Priority	0.17	13	A	1
	Afternoon	Priority	0.23	14	A	1
Motorway Link Road / Tooheys Road Interchange	Morning	Priority	0.12	9	A	3
	Afternoon	Priority	0.05	9	A	1
Hue Hue Road / Buttonderry Access	Morning	Priority	0.17	11	A	11
	Afternoon	Priority	0.25	12	A	9
Tooheys Road / Tooheys Access Road	Morning	Priority	0.07	9	A	3
	Afternoon	Priority	0.07	9	A	3

As indicated previously, the critical movements at Sydney-Newcastle Freeway/Sparks Road intersection are turning movements from northbound and southbound exit ramp to Sparks Road. It is noted that the northbound F3 Freeway exit at Sparks Road has recently been modified to incorporate traffic lights. For all other movements, the degree of saturation is less than 0.55 with short queue length of 25 m or less and the delays in the order of 20 seconds or less for both the morning and afternoon peak periods.

As can be seen from the results, the newly created intersections formed by the Buttonderry access with Hue Hue Road and Tooheys access with Tooheys Road would also operate with LoS A with ample capacity and minimal delay and queue during the construction periods.

Operation

Intersection analysis for the five key intersections and the newly created intersections on Hue Hue Road and Tooheys Road are repeated for the post development scenario, that is once construction is complete and the W2CP is operational. The predicted traffic generated by the proposed mine sites using the trip generation rate and distribution assumptions are added to the future (2016) base traffic estimates.

The intersection analysis results for the post development conditions are summarised in Table 11.10.

Table 11.10 Future Intersection Performance

Intersection Name	Peak Period	Ints Control Type	Ints DOS	Delay (sec)	Ints LOS	Queue (m)
Sydney-Newcastle Fwy / Sparks Road Interchange	Morning	Priority	1.14	>70	F	273
	Afternoon	Priority	>1.40	>70	F	>1 km
Sparkes Road / Hue Hue Road	Morning	Priority	0.53	14	A	25
	Afternoon	Priority	0.39	13	A	18
Hue Hue Road / Wyee Road	Morning	Priority	0.18	15	B	5
	Afternoon	Priority	0.30	18	B	10
Gosford Road / Wyee Road	Morning	Priority	0.22	15	A	1
	Afternoon	Priority	0.29	17	B	1
Motorway Link Road / Tooheys Road Interchange	Morning	Priority	0.07	9	A	1
	Afternoon	Priority	0.07	9	A	1
Hue Hue Road / Buttonderry Access	Morning	Priority	0.20	12	A	14
	Afternoon	Priority	0.27	14	A	14
Tooheys Road / Tooheys Access Road	Morning	Priority	0.04	9	A	2
	Afternoon	Priority	0.04	9	A	2

Table 11.10 shows that the Sydney-Newcastle Freeway/Sparks Road interchange would operate at LoS F with long delays and queuing during both the morning and afternoon peak periods.

For both peak periods, the long delay and queue would be experienced at the freeway exit ramps as the through movements along the Sparks Road interchange would exceed 1,300 vehicles per hour (vph) and 1,700 vph for the morning and afternoon peak periods, respectively. As mentioned previously, Sydney-Newcastle Freeway/Sparks Road interchange would need to be upgraded to accommodate both the background traffic growth and the development generated traffic. The issue of queuing has been recently addressed by installation in late 2009 of traffic lights on the northbound F3 exit to Sparks Road.

From the results shown in Table 11.10, it can be seen that all intersections analysed would operate at LoS B or better during both morning and afternoon peak periods, except for one intersection, Sydney-Newcastle Freeway/Sparks Road. At this

location, separate traffic management solutions have already commenced as mentioned above. The expected delay at all other intersections are in the order of 20 seconds or less for both the morning and afternoon peak periods. Similar to the existing conditions, the majority (all but one) of intersections currently operate with low degree of saturation, less than 0.55 with short queue length, in the order of 25 m or less.

As can be seen from the results, the newly created intersections formed by the Buttonderry access with Hue Hue Road and Tooheys access with Tooheys Road would operate with LoS A with ample capacity and minimal delays and queue for both peak periods analysed.

11.1.7 Mitigation Strategies

Proposed Intersection Upgrade
As indicated previously, the Sydney-Newcastle Freeway/Sparks Road interchange was considered likely to require being upgraded with a roundabout, in order to accommodate the background traffic growth and the anticipated traffic that would be generated by the proposed mine sites. However, recent traffic modifications including traffic lights at this location have already been implemented to address this issue.

Auxiliary Turn Lanes
During the construction period and normal day-to-day operation, Hue Hue Road/ Buttonderry site access and Tooheys Road/ Tooheys site access intersections would operate satisfactorily, without the need for an additional turning lane from a capacity perspective.

However, it is recommended that for safety and maintenance purposes the Hue Hue Road intersection with the Buttonderry access be installed as a Type B (right turn) intersection which allows for passing of right turning traffic.

Construction Traffic
Traffic Management Plans will be developed for the construction of rail bridges for the new rail spur line crossing over Tooheys Road. The proposed Traffic Management Plans will include the following matters that are outlined in the Roads and Traffic Authority's Procedures for use in the Preparation of a Traffic Management Plan (2001) and the Australian Standard 1742.3 – 2002 Manual of Uniform Traffic Control Devices, Part 3: Traffic Control Devices for Works on Roads:

- A description or detailed plan of the proposed works and the context of nearby developments and land use proposals such as the Warnervale Business Park and Wyong Employment Zone;
- Identification and assessment of the expected traffic impacts of the proposed works;
- An assessment of impacts to any affected public transport services;
- Details of all provisions made for emergency vehicles, heavy vehicles, cyclists and pedestrians; and
- Measures to ameliorate the expected impacts.

In addition to the proposed Traffic Management Plans and Traffic Management Reports, it is also proposed that Traffic Control Plans be prepared for all works that

would take place in the road or that would affect trafficable areas in accordance with the RTA's Traffic Control at Work Sites Guidelines, 2003.

11.2 Noise Assessment

Atkins Acoustics was commissioned to carry out an acoustic assessment of the W2CP. The report is contained in full in Appendix N and summarised below.

The noise report presents the results, findings and recommendations of site investigations, noise modeling and assessment of the proposal. The main aims of the assessment were to:

- Identify nearby residential dwellings and other sensitive areas potentially exposed to noise impacts from the proposal, including the Bluehaven Residential Estate;
- Measure, review and comment on the pre development ambient background noise levels;
- Establish noise assessment goals in accordance with DECCW guidelines and procedures including the Industrial Noise Policy (INP), Environmental Noise Control Manual (ENCM), the Environmental Criteria for Road Traffic Noise (ECRTN);
- Predict and evaluate noise emissions from the proposal;
- Assess potential noise impacts from the operation and transport; and
- Where assessment goals are exceeded, recommend ameliorative control measures.

The W2CP will produce noise during two different phases – construction and operation. Each of these phases will generate different types and levels of noise, and are assessed and reported separately. The following sections outline the methods used to determine the most appropriate infrastructure option from a noise perspective, noise sources from the development, details of the existing acoustic environment around the surface infrastructure and rail corridor, assessment methodology and results for both construction and operation of the W2CP.

11.2.1 Infrastructure Options

Several infrastructure options were considered during the evaluation and assessment process for the noise study. The options covered various infrastructure arrangements, each of which provided advantages and disadvantages to the overall operation and noise emissions as well as other potential factors such as visual impact and operational suitability. Each option was the subject of detailed acoustic modeling and assessment but also detailed operational assessment. This iterative process has enabled the most optimal infrastructure arrangements to be developed for the project. The various options are described in more detail in the specialist report contained in Appendix N, and summarised below:

1. Base Case – standard noise controls with three active dozers, two working the project stockpile and the third operating the ROM stockpile;