Wallarah 2
COAL PROJECT

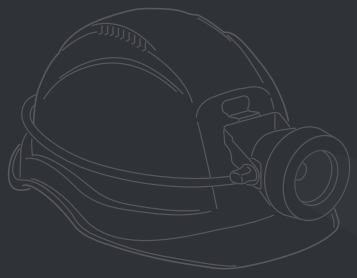
Wallarah 2 Coal Project

Environmental Impact Statement

April 2013

Appendix Q

Traffic and Transport Impact Assessment



Hansen Bailey
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Wallarah 2 Coal Project Traffic and Transport Impact Assessment

February 2013

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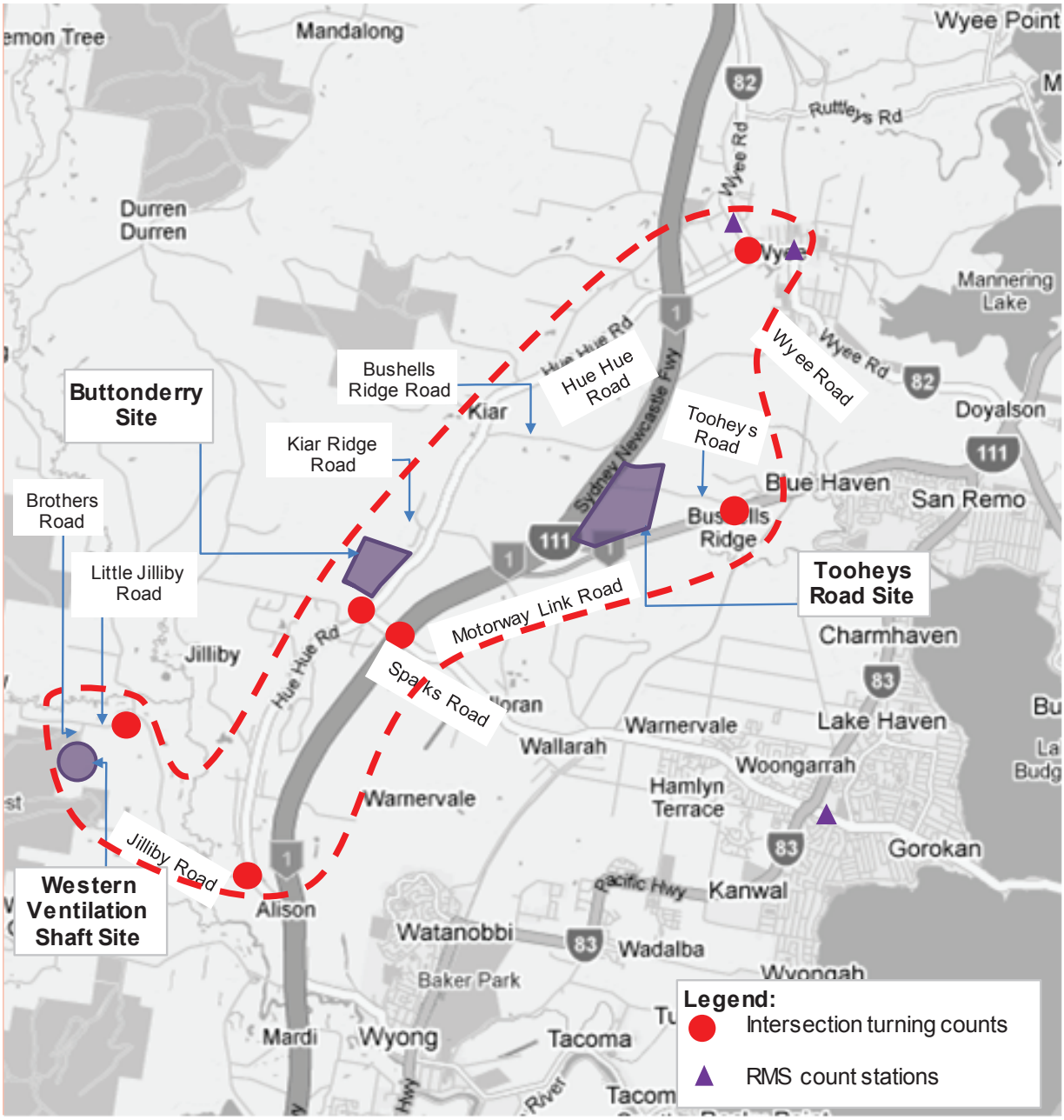
Executive summary

A traffic and transport impact assessment was undertaken by Parsons Brinckerhoff for the Wallarah 2 Coal Project (Project). This report provides an assessment of the impacts on the surrounding road network as a result of the increased traffic associated with the construction and operational activities as along with the associated road safety implications.

Study area

The surface facilities of the Project are located within the Traffic Study Boundary as shown on figure below, approximately 4.7-kilometres to the north of Wyong, within the local government area of Wyong Shire Council.



Existing road network

The following roads are located along the proposed access routes to/from the Project sites:

- The Sydney-Newcastle Freeway (F3) is part of the Auslink National Network linking Sydney, the Central Coast and Newcastle. It is a four/six-lane divided road with a posted speed limit of 110 km/h.
- Sparks Road is a two-lane road intersecting the F3 at the Warnervale Interchange. The western part of the full diamond interchange was upgraded to a traffic signal controlled design prior to 2010. The eastern part of the interchange remains in a 'seagull' layout. Sparks Road has a posted speed limit of 70 km/h near the interchange whilst the outlying sections to the east of the intersection have posted speed limits of 80 km/h to 90 km/h.
- Hue Hue Road is a rural two-lane road connecting Wyee to the north and Mardi to the south. The posted speed limit is generally 80 to 90 km/h.
- Wyee Road is a two-lane road connecting Morisset to the north and the Pacific Highway (Motorway Link) to the south. The road has a posted speed limit of 60 km/h on the urban section and 90 km/h on the rural section between the east of Bukkai Road and the Pacific Highway. There is a 40 km/h school zone located to the east of Hue Hue Road, in close proximity to Wyee Public School which is located off Wyee Road.
- Motorway Link Road is a divided road connecting the F3 with the Pacific Highway at Doyalson.
- Tooheys Road is a local, unsealed road about 6.5 m wide. As there are no speed limit signs on display on Tooheys Road, the default speed limit is 80 km/h on this rural road. Although a 'GROSS LOAD LIMIT 5 t' sign is on display on Tooheys Road, adjacent to Bushells Ridge Road, there is no such sign provided on the eastern side of the road.
- Bushells Ridge Road is a two-lane road linking Gosford Road to the east and Hue Hue Road to the west. The road has a posted speed limit of 80 km/h.
- Jilliby Road is a two-lane road linking Little Jilliby Road to the north and Hue Hue Road to the south. The road has various posted speed limits of between 60 and 80 km/h. As Jilliby Public School is located on Jilliby Road immediately to the south of Little Jilliby Road, a 40 km/h school zone is provided.
- Little Jilliby Road is a narrow two-lane local road and has no line marking. As there is no posted speed limit sign on display, the default speed limit is 80 km/h on a rural road. There is a 40 km/h school zone on the Little Jilliby Road section just to the west of the Jilliby Road/Little Jilliby Road intersection.
- Brothers Road is a 4–5 m wide gravel road intersecting Little Jilliby Road at a T-junction. There is no posted speed limit sign on display. The default speed limit is 80 km/h on a rural road.

Regional traffic growth

In order to measure the impacts from the Project, the surrounding road network was observed and key intersections were identified for analysis, supported by traffic turning movement counts, which were conducted in December 2011. Regional traffic growth was estimated based on traffic data collected from the relevant Roads and Maritime Services (RMS) traffic counting stations, and discussion with RMS and Wyong Shire Council. Annual growth rates in the range of 1.0 to 2.7% p.a. depending on locations were identified and adopted for this project.

Bus and school bus services

Public and school bus services are currently provided along Sparks Road, Hue Hue Road, Jilliby Road and Bushells Ridge Road.

Pedestrian and cyclist facilities

Generally there is a very low level of pedestrian and cyclist activities in the study area. As such, no pedestrian and bicycle facilities are provided on the rural roads in the vicinity of the study area.

Road safety deficiencies

Generally the identified road safety deficiencies along the proposed access routes to/from the Project sites included:

- Insufficient delineation due to the deficiencies in signage, line markings and guideposts and reflectors; and the damaged/missing raised reflective pavement markers (RRPMs) along the road.
- Roadside hazards (e.g. large trees, culverts) located within the clear zone.
- Culverts are clogged by overgrown grass and accumulated debris.
- Damaged pavement including the drop in the pavement edge.
- Insufficient provision of road shoulder.

Future years scenarios

Construction is anticipated to begin in 2014, depending upon the project approval time-frame. The future years scenarios consider the peak construction activity year (2015), the peak production year of mine operations (2025), and the construction year of the Western Ventilation Shaft (2026, which is also the ten year traffic operations design horizon).

To determine the impact of the mine's construction and operation, a set of 'no-Project' scenarios have been analysed to determine what the comparable case would be if the Project did not proceed. The 'no-Project' scenarios take into consideration both the background traffic growth and the operation of other future identified developments near the Project. The surrounding developments both within and outside the Traffic Study Boundary include: the Woolworths retail facility; Wyong Employment Zone (Precincts 11, 13 and 14); Warner Industrial Park; Bushells Ridge Employment Estate; Tooheys Road subdivision; and the Warnervale Airport industrial subdivision.

The analysed scenarios summarised below:

Scenario	Year	Background traffic and growth	Surrounding developments (not part of Project)	Construction of the Buttonderry Site and Tooheys Road Site	Operation of the Buttonderry Site and Tooheys Road Site	Construction of the Western Ventilation Shaft
1	2015	✓	✓			
2	2015	✓	✓	✓		
3	2025	✓	✓			
4	2025	✓	✓		✓	
5	2026	✓	✓			
6	2026	✓	✓		✓	✓

Traffic generation and distribution

All produced coal is anticipated to be transported by rail, via a new rail loop to be constructed to the north of the Project. Therefore, road-based traffic movements would mainly be associated with:

- Construction workforce.
- Construction deliveries.
- Operational workforce.
- Deliveries and service vehicles once the mine is in operation.

The construction of the Tooheys Road Site and Buttonderry Site in 2015 is expected to generate up to 270 one-way trips per peak hour arriving and departing the sites during the shift change hours. Up to 20 two-way construction vehicle trips per hour would access the sites throughout the day, for delivering construction material, equipment, and concrete.

The operation of the Tooheys Road Site and Buttonderry Site in 2025 is expected to generate up to 105 one-way trips per peak hour associated with mine employees arriving and departing the sites during the shift change hours. There would be up to 20 service delivery trips per hour accessing the sites throughout the day.

The construction of the Western Ventilation Shaft in 2026 is expected to generate up to 25 one-way trips per peak hour associated with mine employees arriving before the work shift and departing after the work shift. Up to four two-way construction vehicle trips per hour would access the site throughout the day, for delivering construction material, equipment, and concrete. The continuous operation of the Tooheys Road site and Buttonderry site in 2026 was assumed to generate the same number of traffic trips as it would in 2025.

Peak hour selection

The future peak hours were assessed based on the sum of the following: the 2011 surveyed traffic; growth in the background traffic; traffic associated with the surrounding new developments; and traffic generated by the Project at key intersections.

Two separate peak hours have been assessed for each future year scenario:

- Total traffic peak hours: representing the highest traffic volumes in the morning and afternoon periods associated with the sum of the background traffic growth; the operation of the surrounding developments; and the inclusion of the Project.
- Project traffic generation peak hours: the identified hour associated with the maximum traffic generation volumes in the morning and afternoon peaks associated with the Project's employee trips and delivery trips.

Intersection performance analyses

Intersection performance was scaled using levels of service, which range between 'A' which is the best performance, to 'F' which is the worst. Degree of saturation was also assessed to determine the ratio of demand to capacity. The intersection performance results are reported in the following tables. The results depicted in red indicate intersection performance exceeding the acceptable level.

Table ES1 Current and 2015 traffic conditions

Intersection	2012 Base case benchmark		2015 No-Project (background traffic growth and the inclusion of other surrounding developments)				2015 With Project (Construction phase, with background traffic growth and the inclusion of other surrounding developments)			
	AM peak hour	PM peak hour	Total traffic peak – AM	Total traffic peak – PM	Project traffic generation peak - AM	Project traffic generation peak - PM	Total traffic peak – AM	Total traffic peak – PM	Project traffic generation peak - AM	Project traffic generation peak - PM
F3/Sparks Road interchange (western side of the interchange)	**0.95** C	0.90 D	**1.02** **E**	**0.93** D	**1.02** **E**	0.65 C	**1.02** **E**	**0.93** D	**1.02** D	0.65 C
F3/Sparks Road interchange (eastern side of the interchange)	0.42 B	0.38 B	0.54 B	0.39 B	0.33 B	0.29 B	0.58 B	0.39 B	0.55 B	0.30 B
Sparks Road/ Hue Hue Road	0.47 A	0.35 B	0.48 B	0.34 B	0.14 A	0.20 A	0.48 B	0.37 B	0.19 A	0.20 A
Hue Hue Road/ Wyee Road	0.13 B	0.35 B	0.14 B	0.34 B	0.23 B	0.19 B	0.14 B	0.34 B	0.23 B	0.19 A
Motorway Link Road/ Tooheys Road interchange (northern side of the interchange)	0.01 A	0.01 A	0.01 A	0.01 A	0.01 A	0.01 A	0.35 A	0.14 A	0.35 A	0.14 A
Motorway Link Road/ Tooheys Road interchange (southern side of the interchange)	0.02 A	0.01 A	0.01 A	0.01 A	0.01 A	0.01 A	0.02 A	0.15 A	0.02 A	0.15 A
Hue Hue Road/ Jilliby Road	0.38 B	0.22 B	0.46 C	0.25 B	0.14 B	0.12 B	0.46 C	0.25 B	0.15 B	0.12 B
Jilliby Road/ Little Jilliby Road	0.05 A	0.04 A	0.05 A	0.04 A	0.05 A	0.04 A	0.05 A	0.04 A	0.05 A	0.04 A
Tooheys Road Site access	-	-	-	-	-	-	0.15 A	0.24 A	0.15 A	0.24 A
Buttonderry Site access	-	-	-	-	-	-	0.11 B	0.11 B	0.11 A	0.12 A

Table ES2 Traffic conditions in 2025

Intersection	2025 No-Project (background traffic growth and the inclusion of other surrounding developments)				2025 With Project (Construction phase, with background traffic growth and the inclusion of other surrounding developments)			
	Total traffic peak – AM	Total traffic peak – PM	Project traffic generation peak - AM	Project traffic generation peak - PM	Total traffic peak – AM	Total traffic peak – PM	Project traffic generation peak - AM	Project traffic generation peak - PM
F3/Sparks Road interchange (western side of the interchange)	**3.70 F**	**3.38 F**	**1.02** C	**1.51 F**	**3.70 F**	**3.38 F**	**1.02** C	**1.51 F**
F3/Sparks Road interchange (eastern side of the interchange)	**11.0 F**	**1.18 F**	**1.02 F**	**2.82 F**	**11.1 F**	**1.25 F**	**1.18 F**	**3.00 F**
Sparks Road/ Hue Hue Road	0.58 B	0.38 A	0.30 B	0.38 A	0.59 B	0.38 B	0.32 B	0.38 B
Hue Hue Road/ Wyee Road	0.25 C	**0.89 F**	0.35 C	**0.89 F**	0.25 C	**0.89 F**	0.35 C	**0.89 F**
Motorway Link Road/ Tooheys Road interchange (northern side of the interchange)	**0.96** B	0.48 B	0.68 A	0.34 B	**0.99** B	0.49 B	0.71 A	0.36 B
Motorway Link Road/ Tooheys Road interchange (southern side of the interchange)	0.21 A	0.51 C	0.12 A	0.36 B	0.22 A	0.51 C	0.13 A	0.37 B
Hue Hue Road/ Jilliby Road	**1.27 F**	0.53 D	0.29 B	0.69 D	**1.27 F**	0.53 D	0.30 B	0.71 D
Jilliby Road/ Little Jilliby Road	0.06 A	0.06 A	0.03 B	0.06 A	0.06 A	0.06 A	0.03 B	0.06 A
Sparks Road/ Precinct 14 Access	0.55 B	0.48 B	0.32 B	0.32 B	0.57 B	0.50 B	0.37 B	0.37 B
Hue Hue Road/ Precinct 14 Access	0.13 A	0.14 A	0.10 A	0.13 A	0.13 A	0.14 A	0.10 A	0.14 A
Tooheys Road Site access	-	-	-	-	0.02 A	0.02 A	0.02 A	0.03 A
Buttonderry Site access	-	-	-	-	0.15 C	0.16 B	0.12 A	0.15 B

Table ES3 Traffic conditions in 2026

Intersection	2026 No-Project (background traffic growth and the inclusion of other surrounding developments)				2026 With Project (Construction phase, with background traffic growth and the inclusion of other surrounding developments)			
	Total traffic peak – AM	Total traffic peak – PM	Project traffic generation peak – AM	Project traffic generation peak - PM	Total traffic peak – AM	Total traffic peak – PM	Project traffic generation peak - AM	Project traffic generation peak - PM
F3/Sparks Road interchange (western side of the interchange)	**3.73 F**	**3.40 F**	**1.02** D	**1.53 F**	**3.73 F**	**3.40 F**	**1.02** C	**1.53 F**
F3/Sparks Road interchange (eastern side of the interchange)	**11.0 F**	**1.19 F**	**1.04 F**	**2.66 F**	**11.2 F**	**1.25 F**	**1.20 F**	**3.06 F**
Sparks Road/ Hue Hue Road	0.59 B	0.38 A	0.31 B	0.38 A	0.59 B	0.39 B	0.33 B	0.39 B
Hue Hue Road/ Wyee Road	0.27 C	**0.97 F**	0.36 C	0.97 **F**	0.27 C	**0.97 F**	0.37 C	0.97 **F**
Motorway Link Road/ Tooheys Road interchange (northern side of the interchange)	**0.96** B	0.48 B	0.68 A	0.34 B	**0.98** B	0.49 B	0.71 A	0.36 B
Motorway Link Road/ Tooheys Road interchange (southern side of the interchange)	0.21 A	0.51 C	0.12 A	0.36 B	0.22 A	0.51 C	0.13 A	0.37 B
Hue Hue Road/ Jilliby Road	**1.38 F**	0.58 D	0.31 B	0.74 D	**1.39 F**	0.59 D	0.33 B	0.79 D
Jilliby Road/ Little Jilliby Road	0.07 A	0.06 A	0.03 B	0.06 A	0.07 A	0.06 A	0.04 B	0.06 A
Sparks Road/ Precinct 14 Access	0.55 B	0.48 B	0.32 B	0.33 B	0.57 B	0.50 B	0.37 A	0.37 A
Hue Hue Road/ Precinct 14 Access	0.13 A	0.14 A	0.10 A	0.14 A	0.13 A	0.14 A	0.14 A	0.15 A
Tooheys Road Site access	-	-	-	-	0.02 A	0.02 A	0.02 A	0.03 A
Buttonderry Site access	-	-	-	-	0.15 C	0.16 B	0.12 A	0.16 B
Western Ventilation Shaft Site access	-	-	-	-	0.01 A	0.02 A	0.02 A	0.02 A

The key results are:

- The F3/Sparks Road interchange (western side) is currently operating near its practical capacity during the AM peak hour, despite operating at an acceptable LoS D during the PM peak hour.
- The Project would not impose any adverse impacts on the surrounding road network, as a result of the increased traffic associated with construction and operational activities.
- Five intersections would face capacity constraints in future years due to the forecast growth in background traffic and the operation of the surrounding new developments. However this congestion is not a result of the Project.

In order to maintain satisfactory intersection performance in the forecast years, irrespective of the Project proceeding, it is recommended that RMS and the Council proceed with planned upgrades as part of the Central Coast Transport Strategy which involves the widening of Sparks Road, signalisation of the F3/Sparks Road interchange (eastern side), as well as the upgrades of the F3/Sparks Road interchange (western side); in addition capacity improvement are required at the Hue Hue Road/Wyee Road intersection, Hue Hue Road/Jilliby Road intersection as well as the Motorway Link Road/Tooheys Road interchange (northern side).

The proposed layout at the newly created intersections, including the Tooheys Road Site, Buttonderry Site and the Western Ventilation Shaft Site accesses is adequate to accommodate the estimated future traffic.

Road safety considerations

The crash record at the F3/Sparks Road interchange as well as the Hue Hue Road/Sparks Road intersection is poor and includes a significant number of 'right turning/crossing' crashes. Project related traffic would marginally increase the risk exposure at this intersection.

Consultation with Wyong Shire Council indicated that the Hue Hue Road/Sparks Road intersection would be upgraded to provide an auxiliary right turn lane (Type CHR) for the right turning movement from Sparks Road onto Hue Hue Road. This would significantly improve the road safety outcome at this intersection.

The design of the access points at the Tooheys Road Site, Buttonderry Site and Western Ventilation Shaft has taken road safety into consideration. The proposed turning lanes reduce the potential rear end crashes on the frontage roads, resulting from the separation of the through traffic and the left turning traffic travelling at different speeds toward the site accesses.

The recommended roundabout at the Hue Hue Road/Wyee Road intersection would reduce the potential safety risks by simplifying conflicts, reducing vehicle speed and by simplifying a driver's decision by providing by a clearer indication of the driver's right of way.

A number of road safety issues were identified in relation to deficiencies in signs and linemarking, delineation, pavement, guardrail and drainage, and a number of mitigation measures could be implemented to improve road safety irrespective of whether the project does or does not proceed.

Public transport, pedestrian and cyclist considerations

Public transport, pedestrian and cyclist facilities would be improved along the Sparks Road corridor as a result of the Wyong Employee Zone project. However, the anticipated demand for mining employees to use public transport is not anticipated to be significant, and therefore would not impact on the public transport services.

The RMS has developed a strategic plan for an off-road cycleway on the southern side of Sparks Road.

School bus route considerations

The Project related traffic would impact on the school bus operation and pedestrian safety on Jilliby Road in the vicinity of Jilliby Public School. It is recommended that the movement of heavy vehicles is arranged so as to minimise disruption to traffic during the before and after school periods.

Conclusions

- The Project would not impose any adverse impacts on the surrounding road network as a result of the increased traffic associated with construction and operational activities.
- The main contributor to the future traffic volumes is the Wyong Employment Zone scheduled to be in operation in 2018.
- Model forecasts identify five intersections which would perform at unacceptable level in 2025, due to the growth of background traffic and the inclusion of other surrounding new developments, irrespective of whether or not the Project proceeds. It is recommended that the RMS and Wyong Shire Council consider increasing the intersections' capacity with the following upgrades:
  - Widening of Sparks Road.
  - Provision of additional through and turn lanes at the F3/Sparks interchange (western side).
  - Signalisation of the F3/Sparks interchange (eastern side).
  - Provision of a two-lane roundabout at the Hue Hue Road/Wyee Road intersection.
  - Provision of a short left turn lane on the eastbound on-ramp at the Motorway Link Road/Tooheys Road interchange (northern side).
  - Provision of a single lane roundabout at the Hue Hue Road/Jilliby Road intersection.

Tooheys Road is unlikely to efficiently and safely accommodate the future traffic volume as a result of the growth of background traffic and the inclusion of other surrounding new developments, irrespective of whether or not the Project proceeds. It is recommended that Tooheys Road be sealed and upgraded to provide four lanes in its section between the Bushells Ridge Employment Estate access and the Motorway Link Road Interchange.

Consideration should be given to providing shuttle bus service between the mine site and major towns during construction phase. This would reduce the number of employee vehicle trips, resulting in lower traffic impacts on the surrounding road network.

The Project's construction and operation activities should be undertaken in compliance with accepted traffic engineering practices, along with mitigation measures as recommended in this report.

1. Introduction

1.1 Project overview

The Wyong Areas Coal Joint Venture (WACJV) seeks a Development Consent under Division 4.1 in Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act) for the Wallarah 2 Coal Project (the Project). This Traffic and Transport Impact Assessment supports 'The Wallarah 2 Coal Project Environmental Impact Statement' (Wallarah 2 EIS) prepared by Hansen Bailey Environmental Consultants to support the application.

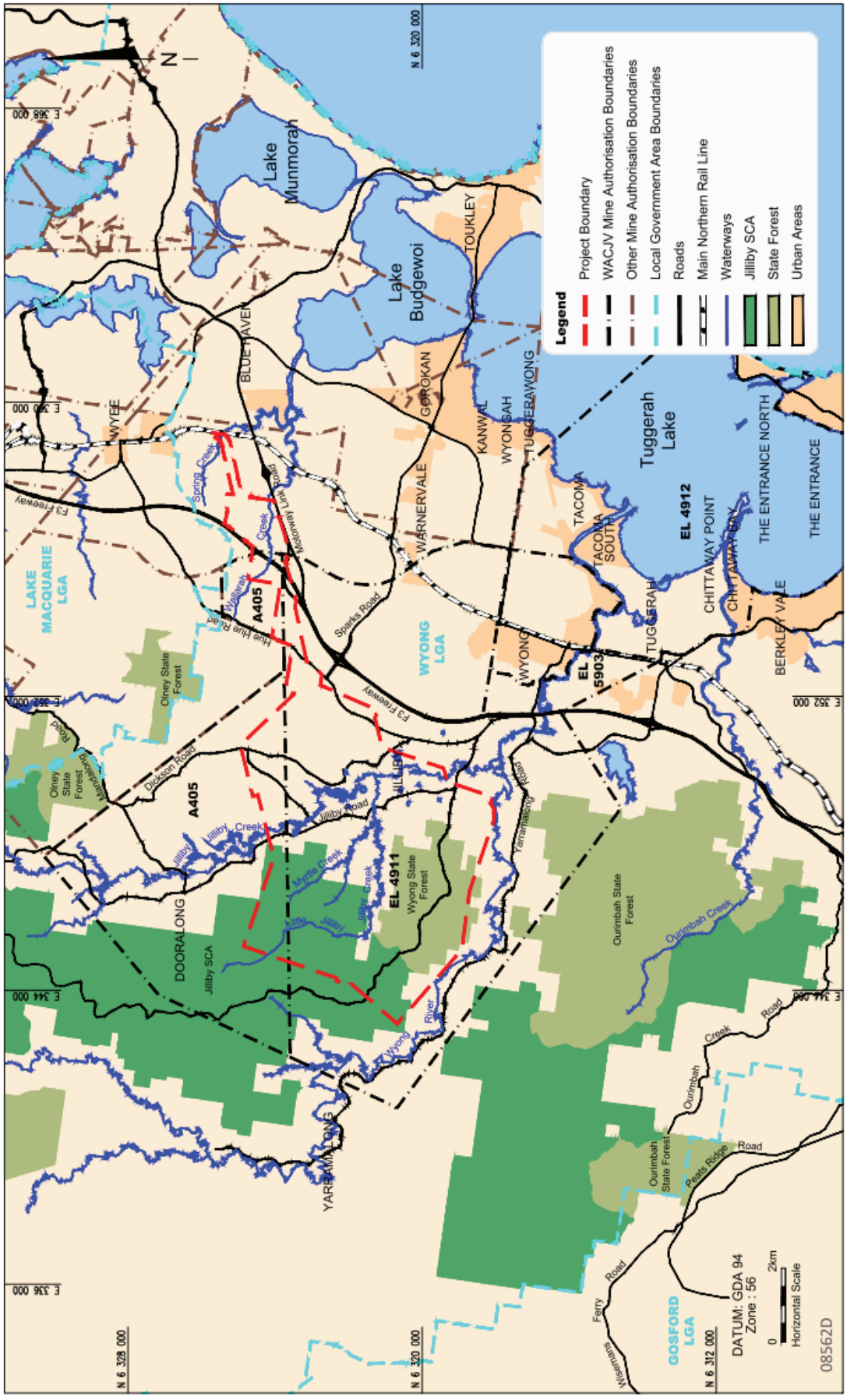
This Traffic and Transport Impact Assessment has been prepared consistent with the Director-General's Environmental Assessment Requirements (DGRs) for the Project issued 12 January 2012 (refer to section 1.3), in accordance with the requirements in Part 2 in Schedule 2 to the Environmental Planning & Assessment Regulation 2000 (EP&A Regs).

Development Consent is sought to mine coal within the Extraction Area for a duration of 28 years. The majority of this resource lies beneath the Wyong State Forest and surrounding ranges (including the Jilliby State Conservation Area (SCA)) while a proportion, to be extracted first, lies beneath a section of the Dooralong Valley and the Hue Hue area. The location of the Project is shown on Figure 1.1.

Key features of the Project include:

- The construction and operation of an underground mining operation extracting up to 5.0 Mtpa of export quality thermal coal by longwall methods at a depth of between 350 m and 690 m below the surface within the underground Extraction Area.
- Mining and related activities will occur 24 hours a day 7 days a week for a Project period of 28 years.
- Tooheys Road Site surface facilities on company owned and third party land (subject to a mining lease) between the Motorway Link Road and the F3 Freeway which will include (at least) a rail loop and spur, stockpiles, water and gas management facilities, workshop and offices.
- Buttonderry Site Surface Facilities on company owned land at Hue Hue Road between Sparks Road and the Wyong Shire Council's (WSC) Buttonderry Waste Management Facility. This facility will include (at least) the main personnel access to the mine, main ventilation facilities, offices and employee amenities.
- An inclined tunnel (or 'drift') constructed from the coal seam beneath the Buttonderry Site to the surface at the Tooheys Road Site.
- Construction and use of various mining related infrastructure including water management structures, water treatment plant (reverse osmosis or similar), generator, second air intake ventilation shaft, boreholes, communications, water discharge point, powerlines, and easements to facilitate connection to the WSC (after July 2013, the Central Coast Water Corporation) water supply and sewerage system.
- Capture of methane for treatment initially involving flaring as practicable for greenhouse emission management and ultimately for beneficial use of methane such as electricity generation at the Tooheys Road Site.

- Transport of coal by rail to either the Newcastle port for export or to domestic power stations.
- A workforce of approximately 300 full-time company employees (plus an additional 30 contractors).
- Rehabilitation and closure of the site at cessation of mining operations.



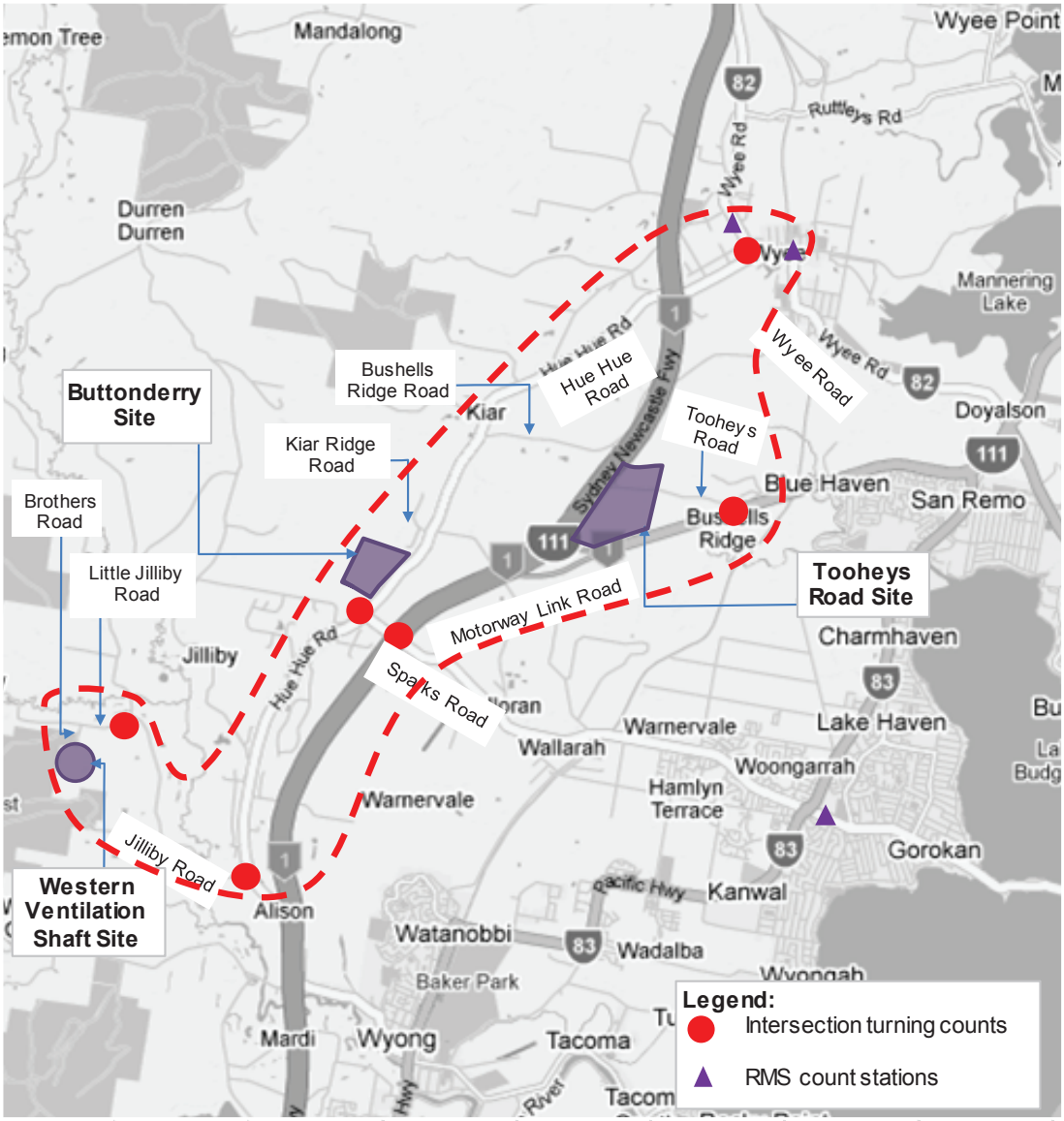
Source: Hansen Bailey

Figure 1.1 Regional locality

1.2 Study area

The Project is located within the Project Boundary as shown on Figure 1.1, approximately 4.7-kilometres to the north of Wyong, within the local government area of WSC.

The traffic study area is located north of Wyong and west of Blue Haven (refer to Figure 1.2). The locality map also shows the proposed Buttonderry Site, Tooheys Road Site and the Western Ventilation Shaft Site.



Source: Google maps

Figure 1.2 Traffic study area

The mine would consist of two main surface facility sites: Tooheys Road and Buttonderry Sites. An additional area will be required for future mine ventilation, referred to as the Western Ventilation Shaft. Access provision to these sites is detailed below:

- Buttonderry Site – a newly created access point off Hue Hue Road (western side) located approximately 250 m to the north of Sparks Road (refer to Figure 4.1).
- Tooheys Road Site – a newly created access point off Tooheys Road (southern side) located approximately 200 m to the south of the Motorway Link Road overpass (refer to Figure 4.2).
- Western Ventilation Shaft – access point is via Brothers Road (refer to Figure 4.3).

1.3 Study scope

The scope of this traffic and transport impact assessment includes:

- An assessment of the existing traffic and road conditions.
- An assessment of the traffic generation during the construction and operational periods and its impact on the surrounding road network.
- A cumulative assessment that includes surrounding development and their impacts on the surrounding road network.
- An assessment of potential road safety impacts.
- An assessment of the proposed site access points.
- Mitigation measures to address the identified potential impacts.

This report was prepared in accordance to the Roads and Traffic Authority (replaced by Roads and Maritime Services, or RMS) 2002, *Guide to Traffic Generating Developments*, and Department of Planning 1996, *EIS Guidelines: Road and Related Facilities*.

In addition, this assessment has been developed in accordance with the DGRs for the Environmental Assessment issued by Department of Planning & Infrastructure (DP&I) on 12 January 2012.

Table 1.1 provides the reference to the DGRs relevant to traffic and transport and identifies the individual section in this report where Parsons Brinckerhoff has explicitly addressed the DGR. It should be acknowledged that the DGRs associated with rail traffic have been excluded from Table 1.1, as the rail network is addressed in a separate rail impact assessment.

Table 1.1 Reference of addressing the DGRs

DGR No.	DGR	Location addressed in this report
15.	A detailed assessment of the project on the capacity, efficiency and safety of the local road network, with particular regard to the Wallarah interchange (F3 Freeway and Sparks Road), Motorway Link Road/Tooheys Road intersection and the Sparks Road/Hue Hue Road intersection. A description of the measures that would be implemented to maintain and/or improve the capacity, efficiency and safety of the road network in the surrounding area over the life of the project.	Section 6 assesses the Project's impacts on capacity, efficiency and safety on the local road network. Section 7 and Appendix E recommend mitigation measures for the road network.
31.	The large numbers of employee movements, concentrated at shift change times, which can constitute a risk to road safety and also damage pavement shoulders.	Sections 2.11 and 6.4 assess road safety. Section 7 recommends mitigation measures for the road network.
32.	TfNSW request that TfNSW, Roads and Maritime Services (RMS), RailCorp, the ARTC, Newcastle Ports Corporation and the Hunter Valley Coal Chain Coordinator be consulted by the Proponent during preparation of the Environmental Assessment.	Section 1.8 shows consultation with the relevant agencies.
39.	Surrounding road network, with particular regard to the Wallarah interchange (F3 Freeway and Sparks Road), Motorway Link Road/Tooheys Road intersection and the Sparks Road/Hue Hue Road intersection.	Table 2.2 provides a list of key intersections included in the analysis.
87	Increasing road traffic increases the opportunities for injury and death from accidents, and increases the chance of illness from exposure to air pollution, especially particulate air pollution from diesel engines. The Background Document mentions the possibility of using the rail connection to transport coal from other mines to Newcastle. If this were to occur, likely sources, truck routes and truck movements need to be assessed to reduce any risk to the environment or health.	Air quality issues are addressed in a separate air quality assessment. Section 6.4 assesses road safety implications. Sections 5.4.1 and 5.4.2.2 show the Project's truck routes. Section 7 recommends mitigation measures. Any future proposal to use the rail connection to transport non-W2CP coal will be subject of a separate assessment which may require modification of consent.
118.	The RMS primary interests are in the road network, traffic and broader transport issues, particularly in relation to the efficiency and safety of the classified road system, the security of property assets and the integration of land use and transport. In accordance with the Roads Act, 1993. RMS has powers in relation to road works, traffic control facilities, connections to roads and other works on the classified road network. The Pacific Highway (HWIO) is a classified (State) road. RMS concurrence is required for connections to classified roads with Council consent, under Section 138 of the Act. RMS consent is required for traffic control signals and facilities under Section 87 of the Act. Council is the Roads authority for all public roads in the area.	Section 6 assesses efficiency and safety of the classified road system.

DGR No.	DGR	Location addressed in this report
119.	RMS has reviewed the Wallarah 2 Background Document dated 13 October 2011 and there appears to be no major material difference to the previous proposal submitted, in terms of potential traffic impact. It is understood that all coal removed from the mine will be transported by rail and subsequent traffic movements would primarily be generated by construction activity, workforce, deliveries and service vehicles. Notwithstanding, RMS will require an assessment of up to date traffic and crash data to be undertaken to identify current and potential future road safety concerns in each locality which may be affected by the Development.	Sections 5.2 and 5.3 assess traffic generation associated with construction activity, workforce, deliveries and service vehicles. Sections 2.2 to 2.5 assess up to date traffic data. Section 2.6 assesses crash commonalities based on the latest crash data (January 2006 to December 2010). Sections 2.11 and 6.4 assess road safety concerns.
120.	The Environmental Impact Assessment (EA) should refer to the following guidelines with regard to the traffic and transport impacts of the proposed development: ▪ Department of Planning EIS Guidelines: ‣ Road and Related Facilities. ▪ Roads and Traffic Authority's Guide to Traffic Generating Developments: ‣ Section 2 Traffic Impact Studies.	Section 1.3.
121.	A traffic and transport study shall be based on current traffic data and be prepared in accordance with RMS's Guide to Traffic Generating Developments. All relevant vehicular traffic routes and intersections for access to/from the subject area.	Section 1.3 referenced the guidelines used in this assessment. Section 5.4 assesses trip distribution. Section 2.3 lists key intersections.
122.	Current traffic counts for all of the above traffic routes and intersections.	Sections 1.5, 2.2 and 2.3.
123.	The anticipated additional vehicular traffic generated from the proposed development, during construction and operational phase.	Sections 5.2 and 5.3 assess traffic generation associated with construction activity, workforce, deliveries and service vehicles.
124.	The distribution on the road network of the trips generated by the proposed development. It is requested that the predicted traffic flows are shown diagrammatically to a level of detail sufficient for easy interpretation.	Section 5.4 assesses trip distribution. Section 5.4.4 diagrammatically shows the peak hour traffic generation.

DGR No.	DGR	Location addressed in this report
125.	Consideration of the traffic impacts on existing and proposed intersections and the capacity of the local and classified road network to safely and efficiently cater for the additional vehicular traffic generated by the proposed development. The traffic impact shall also include the cumulative traffic impact of other proposed developments in the area.	Sections 6.1 to 6.3 assess traffic impacts on the capacity of the local and classified road network. Sections 2.11 and 6.4 assess road safety impacts on the local and classified road network. Section 1.4 discusses other surrounding developments included in the cumulative impact assessment. Section 6.1 assesses the cumulative traffic impact of the surrounding developments.
126.	Identify the necessary road network infrastructure upgrades that are required to maintain existing levels of service on both the local and classified road network. In this regard, strategic concept drawings shall be submitted with the Environmental Assessment for any identified road infrastructure upgrades. However, it should be noted that any identified road infrastructure upgrades will need to be to the satisfaction of RMS and Council.	Appendix E
127.	A master plan, which outlines any staging of the proposed development and the timing of implementation of the identified road network infrastructure upgrades.	The master plan is not applicable as the Project is not a staged development. Section 3.3 discusses the current capacity issue at the F3/Sparks Road interchange (western side). Section 6.1.3 discusses the timing of requiring intersection upgrades as a result of the increased traffic volume associated with the background traffic growth and inclusion of surrounding new developments, irrespective of whether or not the Project proceeds.

DGR No.	DGR	Location addressed in this report
128.	Intersection analysis (such as SIDRA) shall be submitted to determine the need for intersection and mid-block capacity upgrades. The intersection analysis shall include (but not limited to) the following: ▪ Current traffic counts and 10 year traffic growth projections. ▪ With and without development scenarios considered. ▪ 95th percentile back of queue lengths. ▪ Delays and level of service on all legs for the relevant intersections. ▪ Electronic modelling files for RMS review.	Section 2.3 provides current traffic counts. Section 5.6.5 and 6.1.5 provide the 10 year traffic growth projection (background traffic and its growth plus traffic generated by the approved surrounding developments in 2026 – year 10 of Project operation). Section 6.1 shows SIDRA analysis results. Electronic modelling files will be provided for RMS' review upon request.
129.	At a minimum, the following intersections must be assessed: ▪ Sparks Road/Hue Hue Road. ▪ Motorway Link Road/Tooheys Road. ▪ F3 Freeway/Sparks Road.	Section 2.2 lists the key intersections.
132.	Refer to the letter dated 29 March 2010 regarding the subject proposal for a new underground coal mine near Wyong on the Central Coast. The RTA has noted that the proposed development is classified as a Major Project and will be assessed under Part 3A of the Environmental Planning and Assessment Act 1979 and the Minister for Planning is the consent authority for this proposal. In accordance with the Roads Act 1993, the RTA has powers in relation to road works, traffic control facilities, connections to roads and other works on the classified road network. The Motorway Link (MR 675), and the F3-Freeway are classified roads and the RTA is the roads authority for both roads. RTA concurrence is required for works and structures in, on, under or over these roads under section 138 of the Act.	Section 7.
133.	Of concern was the SIDRA modelling of the Sparks Road Interchange shown in the traffic and transport report prepared by Parsons Brinckerhoff Pty Ltd dated June 2008. It was noted that the interchange was modelled as one intersection when in fact it forms two quite separate intersections.	Sections 3.3 and 6.1 assess current and forecast intersection performance. The F3/Sparks Road interchange has been analysed as two separate intersections.
134.	The western intersection is controlled by traffic control signals and the eastern intersection by stop signs. To determine the correct operational performance the intersections should have been analysed separately.	Sections 3.3 and 6.1. The F3/Sparks Road interchange has been analysed as two separate intersections.
135.	As a consequence a separate SIDRA intersection simulation software analysis was undertaken by the RTA. The results varied from that shown in the abovementioned traffic and transport report. Based on traffic volumes and queuing survey data undertaken on 10 February 2010 the SIDRA outputs completed by the RTA are noted under DGR No. 136–144.	No response required

DGR No.	DGR	Location addressed in this report
136.	Western Intersection With respect to the western intersection (northbound ramp) which is controlled by traffic control signals it presently operates at an acceptable Level of Service (LoS) C for all peak hours and all operational modes viz. existing volumes/construction traffic added/development operation traffic added. The operational performance is also at acceptable LoS D for both AM and PM peak periods for the year 2020 with the addition of development operation traffic.	Sections 3.3 assesses the existing performance of this intersection, based on the traffic volume data and the IDM data collected on 1 December 2011. Section 6.1 forecasts the future performance of the intersection. It is noted that in this occasion, the RMS only assesses intersection performance based on LoS, but not DoS and queue length. Refer to Section 3.2 for the intersection assessment criteria adopted in this assessment.
137.	Eastern Intersection The eastern intersection (southbound ramp) is controlled by stop signs and operated consistently at an acceptable LoS D in the AM peak period and a LoS C in the PM peak for all operational modes viz. existing volumes/construction traffic added/development operation traffic added. An unacceptable LoS F for both AM and PM peak periods for the year 2020 was predicted when the development operation traffic was added to the background traffic growth. Traffic control signals would be required before the intersections operational performance reached this point.	Sections 3.3 assesses the existing performance of this intersection, based on the traffic volume data collected on 1 December 2011. Section 6.1.3 discusses the timing of requiring intersection upgrades as a result of the increased traffic volume associated with the background traffic growth and inclusion of surrounding new developments, irrespective of whether or not the Project proceeds. Appendix E shows the recommended intersection layout.
138.	Further analysis was undertaken to establish two things: 1. What point in time would the intersection require the provision of traffic control signals when considering background traffic growth only? 2. What point in time traffic control signals would be required when development operation traffic is added to background traffic growth?	Section 6.1.3 discusses the timing of requiring intersection upgrades as a result of the increased traffic volume associated with the background traffic growth and inclusion of surrounding new developments, irrespective of whether or not the Project proceeds.

DGR No.	DGR	Location addressed in this report
139.	Summary The results of that analysis showed that traffic control signals would be required in 2015 to control traffic subject to background traffic growth only and 2012 with the inclusion of development operation traffic added to background traffic growth. Traffic control signals would be required by the year 2012.	Not applicable as the Project would not bring forward the intersection upgrade.
140.	The cost of bringing the installation of these signals forward by 3 years was calculated using a Net Present Value (NPV) analysis (NPV is an economic standard method for evaluating competing long-term projects in capital budgeting. NPV compares the value of a dollar today to the value of that same dollar in the future, taking inflation into account).	Not applicable as the Project would not bring forward the intersection upgrade.
141.	Using the cost of the recently completed traffic control signals on the western intersection (northbound ramp) as the capital cost of the project and a discount rate of 5% an NVP analysis was undertaken as follows: Cost of western intersection traffic control signals $1,158,000 NPV 2012 traffic control signals $1,050,000 NPV 20 15 traffic control signals $907,000	Not applicable as the Project would not bring forward the intersection upgrade.
142.	Based on this analysis a contribution of $143,000 would be required from the developer to bring the installation forward to 2012.	Not applicable as the Project would not bring forward the intersection upgrade.
143.	In conclusion the RTA has reviewed the information provided and has the following requirements for inclusion in the Director General's Requirements for the EA: Should approval be given to the proposed development, construction of traffic control signals at the eastern intersection (southbound ramp) would be required to be provided by the year 2012. A contribution of $143,000 would be required from the developer to bring the installation forward to 2012, however, the installation would still be dependent upon the availability of Government funds within the program to undertake these works. The trigger for payment would need to be set as the RTA commencing works. These signals would be coordinated with the existing traffic control signals at the western intersection (northbound ramp).	Not applicable as the Project would not bring forward the intersection upgrade.
144.	The developer is to be advised that conditions of consent determined by the Minister do not guarantee the RTA's final consent under the Roads Act 1993 to the specific roadwork, traffic control facilities and other structures works on the classified road network. In this regard, the developer would be required to enter into a Works Authorisation Deed (WAD) with the RTA to enable works on the classified State road network.	Not applicable as the Project would not bring forward the intersection upgrade.

1.4 Surrounding developments

Hansen Bailey provided some details of a number of reports for various proposed/approved developments surrounding the Project. Traffic generation associated with these developments was included in consideration of the future background traffic flow.

Figure 1.3 shows the location of the following developments near the Project:

1. Woolworths Retail Facility.
2. Wyong Employment Zone.
3. Warner Industrial Park.
4. Bluetongue Brewery.
5. Bushells Ridge Employment Estate.
6. Buttonderry Waste Management Facility Upgrade.
7. Tooheys Road 18 Lot Subdivision.
8. Warnervale Airport Industrial Subdivision.

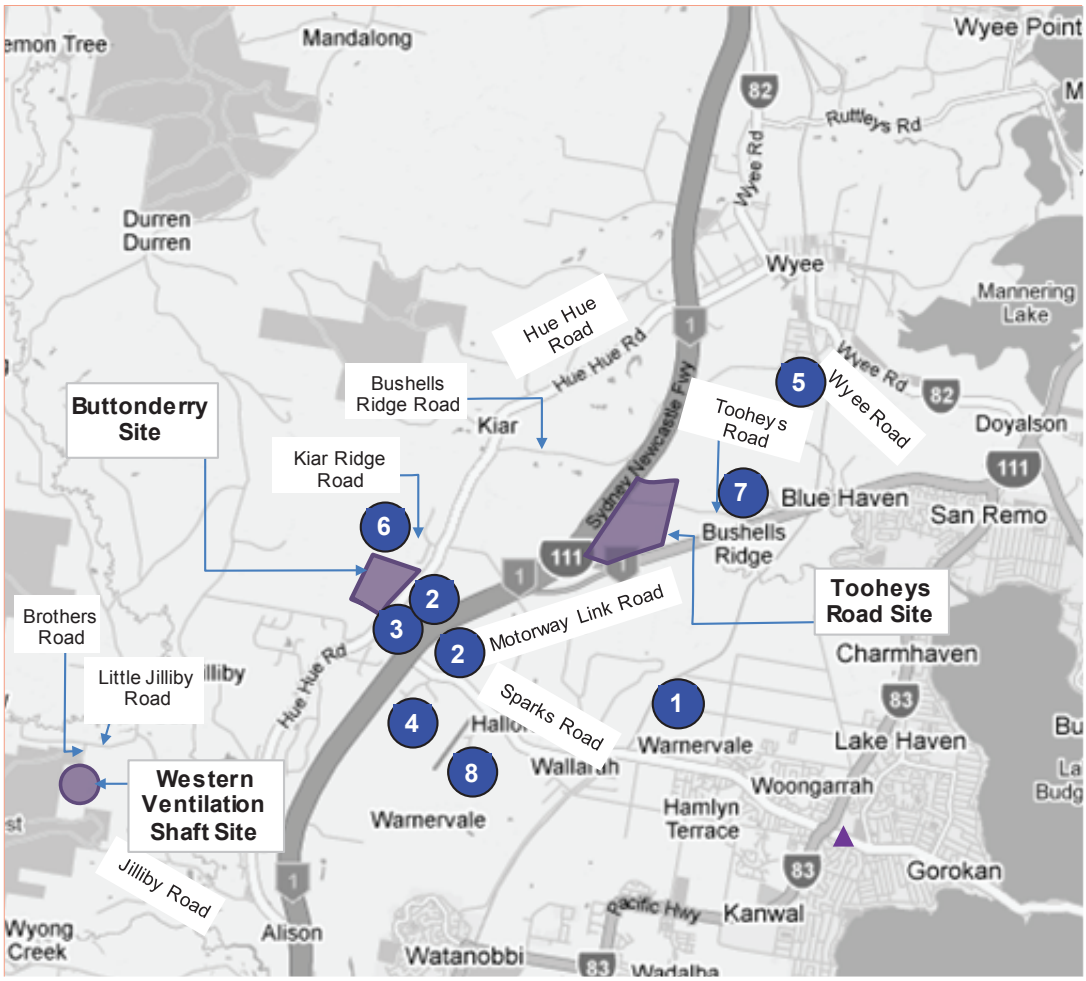


Figure 1.3 Location of surrounding developments

1.4.1 Woolworths Retail Facility

Located on 262 Hakone Road, Warnervale, the retail development provides ancillary commercial and leisure components, including Big W Discount Department Store, Woolworths supermarket, specialty retail, entertainment, gym, commercial and car park. Based on Colston Budd Hunt & Kafes (June 2011) *Report on the Transport Aspects of Proposed Retail Development, Warnervale Town Centre*, the development would generate approximately 1,000 vehicles per hour during the morning peak hour, and approximately 2,100 vehicles per hour during the afternoon peak hour. The development has been approved and, based on the report, is assumed to be operational in 2021.

Appendix A shows the traffic generation associated with this development which was included in the background traffic volumes in the future assessment years.

Traffic accessing the site would use Sparks Road, Hiawatha Road, Virginia Road and Minnesota Road.

Based on the report, Sparks Road upgrade is subject to Government funding to cater for background traffic growth to 2021. Sparks Road, in the vicinity of the site, requires duplication with traffic signals at the intersections with Hiawatha Road, Virginia Road, Minnesota Road, as well as a new access road (located between Virginia Road and Minnesota Road).

1.4.2 Wyong Employment Zone

Wyong Employment Zone consists of Precincts 11, 13 and 14, providing for a range of large scale industrial uses. Precincts 11 and 13 are divided into north and south sections by Sparks Road, between the F3 and the Sydney to Newcastle rail line. Precinct 14 is located to the north of Sparks Road, between the F3 and Hue Hue Road.

The following documents have been reviewed for the Wyong Employment Zone:

- Wyong Shire Council (2006) *Wyong Employment Zone Traffic Study*.
- Wyong Shire Council (2006) *Wyong Employment Zone Sparks Road Traffic Generation Report.*

Both reports indicate the development would be fully operational by 2018. Traffic impacts of progressive development have not been included in these reports.

The proposed access points of Precincts 11 and 13 are off Sparks Road at its intersections with Burnet Road, Jack Grant Avenue, Mountain Road and a proposed Link Road (located east of Mountain Road). The traffic generation associated with Precincts 11 and 13 is shown in Appendix A and included in the background traffic volumes in future assessment years.

Precinct 14 consists of the proposed Warner Industrial Park (refer to section 1.4.3). The proposed access points are off Hue Hue Road and Sparks Road.

Appendix A shows the traffic generation associated with this development which was included in the background traffic volumes in the future assessment years.

1.4.3 Warner Industrial Park

The Warner Industrial Park is a 90 lot subdivision of a parcel of land to be used for industrial and ancillary uses. It is a part of Precinct 14 of the Wyong Employment Zone. Based on TAR Technologies (2008) *Traffic Assessment for Warner Industrial Park – Concept Plan and Project Application*, the development would generate 306 light vehicles/hour during the AM peak hour, and 281 light vehicles/hour during the PM peak hour.

The proposed access points are on Hue Hue Road and Sparks Road.

The development has been approved and would be operational in 2018. The traffic generation associated with this development was included as a part of Precinct 14 and was considered in the background traffic volumes in future assessment years (refer to Appendix A).

1.4.4 Bluetongue Brewery

Located at the south western end of Burnet Road, a new brewery has been constructed within Warnervale Business Park. The brewery facilitates the production and packaging of a number of beer brands. The facility would operate 24 hours per day, 7 days per week.

Based on GHD (2008) *Proposed Brewery, Burnet Road, Warnervale Preliminary Environmental Assessment*, a total of 140 full time staff would be employed.

This development has been approved and is in operation. Traffic generation associated with this development has been captured in the traffic survey undertaken in December 2011 (refer to section 1.5).

1.4.5 Bushells Ridge Employment Estate

Located to the south of Bushells Bridge Road, on a parcel of land of 260 hectares, the proposed development would provide approximately 150 allotments of new employment facilities for warehousing and distribution purposes. Based on the JBA Planning (2010) *Preliminary Assessment for Bushells Ridge Employment Estate Concept Plan*, the developer sought shared road access to provide direct connection between the site off Tooheys Road and the Tooheys Road/Motorway Link interchange.

This development has yet to be approved. Based on the Department of Planning and Infrastructure website, no specialist assessments have been submitted following the submission of a Preliminary Assessment and the release of DGRS in March 2011. This provides no information on the proposed development or on traffic generation. For the purposes of this assessment, Parsons Brinckerhoff undertook a preliminary review of traffic generation based on its proposed land use (industrial warehousing and distribution) in accordance with the Roads and Traffic Authority 2002 *Guide to Traffic Generating Development*.

Appendix A shows the traffic generation associated with this development which was included in the background traffic volumes in the future assessment years.

1.4.6 Buttonderry Waste Management Facility Upgrade

The proposed upgrade works of the Buttonderry Waste Management Facility included: a new transfer station; office and education centre; widening of the incoming access road to the weighbridge; and a new car park at the existing site, located off Hue Hue Road.

Based on the *Statement of Environmental Effects for the Master Plan for the Upgrade to the Buttonderry Waste Management Facility*, the number of staff would not change as a result of the upgrade. However, traffic generation from the site would continue to grow due to the increased material consumption. Peak traffic volumes occur on holiday weekends, with Easter and Christmas holidays being particularly busy periods.

This development has been approved and is already in operation. Traffic generation associated with this development would have been captured in the traffic survey undertaken in December 2011 (refer to section 1.5).

1.4.7 Tooheys Road 18 Lot Subdivision

The proposed development would provide 18 industrial allotments off Tooheys Road, located to the north west of the Tooheys Road/Motorway Link interchange. Based on ADW Johnson (2010) *Statement of Environmental Effect for a Proposed 18 lot Industrial Subdivision*, the developer proposed to upgrade Tooheys Road between its site access and the existing sealed section near the interchange. Road upgrade works include constructing kerb and gutter, and pavement sealing along Tooheys Road.

The development involves the creation of 17 industrial allotments, ranging in size from 2,625 m^2 to 9,295 m^2, with an average allotment size of approximately 5,738 m^2. In addition, a separate allotment of 4.5 hectares containing a riparian zone would be created and dedicated to Council. In 2010, WSC has approved this development to proceed.

The Statement of Environment Effect does not provide information on either the proposed development design nor on the traffic generation. For the purposes of this assessment, Parsons Brinckerhoff undertook a preliminary review of traffic generation based on its land size in accordance with the RTA (2002) *Guide to Traffic Generating Development*.

Appendix A shows the traffic generation associated with this development which was included in the background traffic volumes in the future assessment years.

1.4.8 Warnervale Airport Industrial Subdivision

WSC proposed to provide industrial subdivision on 150–190 Sparks Road, to the east of the F3. Based on Trehy, Ingold and Neate Land Development (2011) *Section 96(1) Application to Modify Development Consent DA/3130/2004/A Proposing Subdivision of Land 150-190 Sparks Road, Warnervale*, this development would create two industrial lots (total land size 7.91 hectares), one temporary conservation lot, one residue parcel, construction of a road, and construction of an artificial wetland.

Traffic accessing the site would use Warren Road, Burnet Road and Sparks Road.

In January 2012, WSC granted approval for this development to proceed. The Application to Modify Development Consent provides no information on the proposed development or on the traffic generation. For the purposes of this assessment, Parsons Brinckerhoff undertook a preliminary review of traffic generation based on its land size in accordance with the Roads and Traffic Authority 2002 *Guide to Traffic Generating Development*.

Appendix A shows the traffic generation associated with this development which was included in the background traffic volumes in the future assessment years.

1.5 Surveys

Turning traffic volumes were counted at the following locations (refer to Figure 1.2) on Thursday 1 December 2011 from 5.00 am to 7.00 pm:

- F3/Sparks Road interchange.
- Sparks Road/Hue Hue Road intersection.
- Hue Hue Road/Wyee Road intersection.
- Motorway Link Road/Tooheys Road interchange.
- Hue Hue Road/Jilliby Road intersection.
- Jilliby Road/Little Jilliby Road intersection.

Other traffic volume data was obtained from the following permanent RMS' count stations collected between 1995 and 2004:

- 05.642 Wyee Road (MR454), east of Toronto Road at railway bridge.
- 05.514 Wyee Road (MR454) at Wyee Creek Bridge.
- 05.165 Sparks Road (MR509), east of Pacific Highway.

1.6 Site inspections

Site inspections were undertaken by Parsons Brinckerhoff staff on Thursday 16 February 2012, in wet weather conditions, and again on Friday 23 March 2012 in fine weather conditions.

1.7 Consultation with RMS and WSC

The preparation of this report included various discussions between the study team and the following agencies:

- Discussion with the RMS on 13 March 2012 regarding the DGRs 126 and 127 (refer to Table 1.1), and traffic growth rates on Sparks Road and future upgrade of Sparks Road.
- Discussion with the WSC on a number of occasions in March 2012 regarding traffic growth rates on the road network and any planned road upgrades in the vicinity of the Project, as well as the scheduling of the Wyong Employment Zone. WSC indicated that the timing of the Wyong Employment Zone is uncertain at this stage.
- Discussion with TfNSW on 7 June 2012 regarding DGRs 31, 32 and 39 in relation to road traffic.

1.8 Structure of the report

This document is structured as follow:

- Section 2 describes the existing road network and traffic demand.
- Section 3 assesses the existing performance of the key intersections.
- Section 4 describes the Project's proposed construction activities.
- Section 5 provides traffic generation and distribution of the Project, and the future traffic volumes of various assessment scenarios.
- Section 6 assesses the implication of the proposed development.
- Section 7 recommends mitigation measures for the surrounding road network.
- Section 8 provides considerations of the road dilapidation inspection.
- Section 9 provides a brief discussion on the subsidence assessment undertaken by MSEC (2012).
- Section 10 provides construction traffic management considerations.
- Section 11 summarises the findings of the study and provides a conclusion.
- Section 12 lists the references that were used in developing this study.

2. Existing road network and traffic demand

2.1 Existing road network

The Sydney-Newcastle Freeway (F3) is part of the Auslink National Network linking Sydney, the Central Coast and Newcastle. It is a four/six-lane divided road with a posted speed limit of 110 km/h. The F3 intersects with Sparks Road at the Warnervale Interchange in the vicinity of the Project Boundary.

Sparks Road is a two-lane road intersecting the F3 at the Warnervale Interchange. The western part of the full diamond interchange was upgraded to a traffic signal controlled design prior to 2010. The eastern part of the interchange remain in a 'seagull' layout, where an acceleration lane is provided on Sparks Road for the right turning traffic from the southbound off ramp onto Sparks Road. Sparks Road has a posted speed limit of 70 km/h near the interchange whilst the outlying sections to the east of the intersection have posted speed limits of 80 km/h to 90 km/h. Sparks Road forms part of the designated D and D1 Detour Routes - which means that if detour routes are activated, diverted traffic from the F3 would use this road as a detour route to re-join the main road as directed.

Hue Hue Road is a rural two-lane road connecting Wyee to the north and Mardi to the south. The posted speed limit is generally 80 to 90 km/h. Hue Hue Road also forms part of the D and D1 Detour Routes - which means that if detour routes are activated, diverted traffic from the F3 would use this road as a detour route to re-join the main road as directed.

Wyee Road is a two-lane road connecting Morisset to the north and the Pacific Highway (Motorway Link) to the south. The road has a posted speed limit of 60 km/h on the urban section and 90 km/h on the rural section between the east of Bukkai Road and the Pacific Highway. There is a 40 km/h school zone located to the east of Hue Hue Road, in close proximity to Wyee Public School - located off Wyee Road. Wyee Road is part of the designated D Detour Route - which means that if detour routes are activated, diverted traffic from the F3 would use this road as a detour route to re-join the main road as directed.

Motorway Link Road is a divided road connecting the F3 with the Pacific Highway at Doyalson. The Motorway Link Road is part of D Detour Route which means if detour routes are activated, diverted traffic from the F3 would use this road as a detour route to re-join the main road as directed.

Tooheys Road is a local, unsealed road about 6.5 m wide. At its eastern terminus, Tooheys Road intersects the Motorway Link road forming a full diamond interchange. At the western terminus, Tooheys Road crosses the F3 Freeway via an underpass to connect to Tooheys Road North and Bushells Ridge Road. As there are no speed limit signs on display on Tooheys Road, the default speed limit is 80 km/h on this rural road. Although a 'GROSS LOAD LIMIT 5 t' sign is on display on Tooheys Road, adjacent to Bushells Ridge Road, there is no such sign provided on the eastern side of the road.

Bushells Ridge Road is a two-lane road linking Gosford Road to the east and Hue Hue Road to the west. The road has a posted speed limit of 80 km/h.

Jilliby Road is a two-lane road linking Little Jilliby Road to the north and Hue Hue Road to the south. The road has various posted speed limits of between 60 and 80 km/h. As Jilliby Public School is located on Jilliby Road immediately to the south of Little Jilliby Road, a 40 km/h school zone is provided.

Little Jilliby Road is a narrow two-lane local road and has no line marking. As there is no posted speed limit sign on display, the default speed limit is 80 km/h on a rural road. There is a 40 km/h school zone on the Little Jilliby Road section just to the west of the Jilliby Road/Little Jilliby Road intersection.

Brothers Road is a 4–5 m wide gravel road intersecting Little Jilliby Road at a T-junction. There is no posted speed limit sign on display. The default speed limit is 80 km/h on a rural road.

2.2 Regional traffic growth

In order to determine the base future traffic growth rates, the published historical rates of traffic growth on the surrounding roads were analysed.

Annual average daily traffic (AADT) data was available for 1995 to 2004 (from the RMS count stations) for key roads in the vicinity of the proposed surface facilities (refer to Figure 1.2). Consultation with the RMS indicated that no AADT data is available post 2004.

Table 2.1 summarises the AADT at three RMS counting stations near the proposed sites.

Table 2.1 Historical traffic flows on nearby roads

Station ID	Location	1995	1998	2001	2004	Annual growth (95–04)
05.642	Wyee Road (MR454), east of Toronto Road at railway bridge	5,816	6,295	6,503	7,391	2.7%
05.514	Wyee Road (MR454) at Wyee Creek bridge	4,867	5,716	6,011	6,695	3.6%
05.165	Sparks Road (MR509), east of Pacific Highway	17,056	17,722	19,114	22,168	3.0%

Source: RMS Traffic Volume Data for Hunter and Northern Regions (2004)

All count stations recorded a consistent increase in traffic volumes between 1995 and 2004.

Annual traffic growth rate at individual locations were used for calculating the future background traffic growth for the construction and operational phases. The following annual growth rate was applied based on its proximity to the count station:

- 2.7% per annum at the Hue Hue Road/Wyee Road intersection.

An assumption was made to the following key intersection for a similar growth rate with Wyee Road:

- 2.7% per annum at the Hue Hue Road/Jilliby Road intersection.

WSC indicated the following annual growth rates:

- 1.0% per annum at the Motorway Link Road/Tooheys Road interchange.
- 1.0% per annum at the Jilliby Road/Little Jilliby Road intersection.

RMS indicated the future background traffic growth would be approximately 1% per annum for Sparks Road, excluding traffic generated by any future developments. Consequently, the following annual background traffic growth rates were applied:

- 1.0% per annum at the Sydney–Newcastle Freeway/Sparks Road intersection.
- 1.0% per annum at the Hue Hue Road/Sparks Road intersection.

2.3 Existing turning movement summary

Table 2.2 provides the intersection control type and the traffic peak hours at the eight key intersections.

Table 2.2 Key intersection control type and peak hours

Intersection	Intersection control	Peak hours
F3/Sparks Road interchange (western side)	Signals	8.00 am–9.00 am 4.00 pm–5.00 pm
F3/Sparks Road interchange (eastern side)	Priority	8.00 am–9.00 am 3.00 pm–4.00 pm
Sparks Road/Hue Hue Road	Priority	8.00 am–9.00 am 3.15 pm–4.15 pm
Hue Hue Road/Wyee Road	Priority	8.45 am–9.45 am 3.45 pm–4.45 pm
Motorway Link Road/Tooheys Road interchange (north side of the interchange)	Priority	5.15 am–6.15 am 4.15 pm–5.15 pm
Motorway Link Road/Tooheys Road interchange (south side of the interchange)	Priority	5.15 am–6.15 am 12.30 pm–1.30 pm
Hue Hue Road/Jilliby Road	Priority	8.15 am–9.15 am 4.30 pm–5.30 pm
Jilliby Road/Little Jilliby road	Priority	8.15 am–9.15 am 2.45 pm–3.45 pm

Note: Interchanges were reported and assessed as two separate intersections

Figure 2.1 and Figure 2.2 show the 2012 morning and afternoon peak hour turning traffic movement volumes (sum of the 2011 traffic volume and growth in the background traffic) at the key intersections. The traffic volumes in this figure are in vehicles per hour (vph).

It should be noted that intersection turning volumes may not add up at mid-block locations in the following figures since the peak hours at the intersections differ.

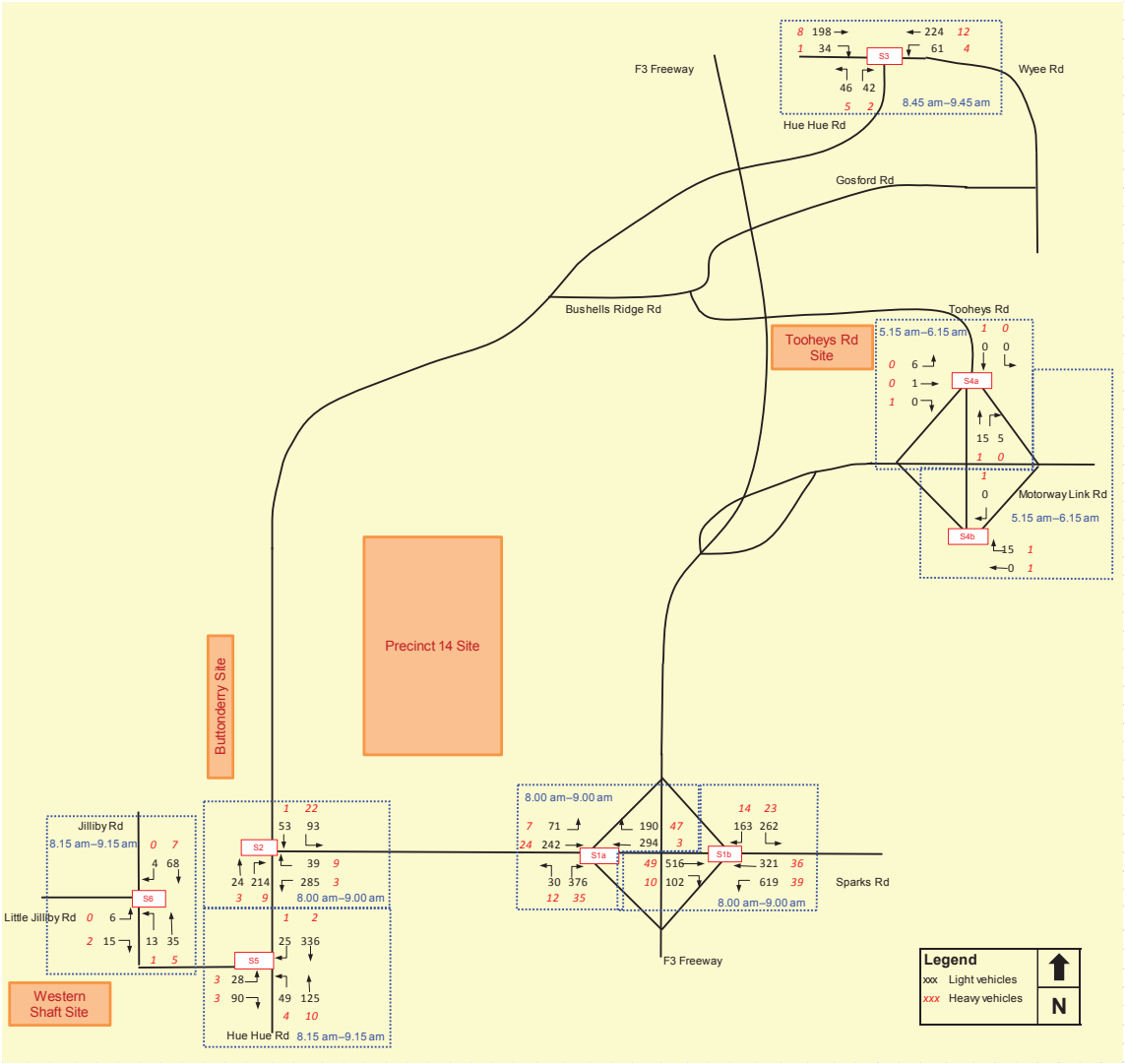


Figure 2.1 2012 AM peak hour traffic volumes at the key intersections (vph)

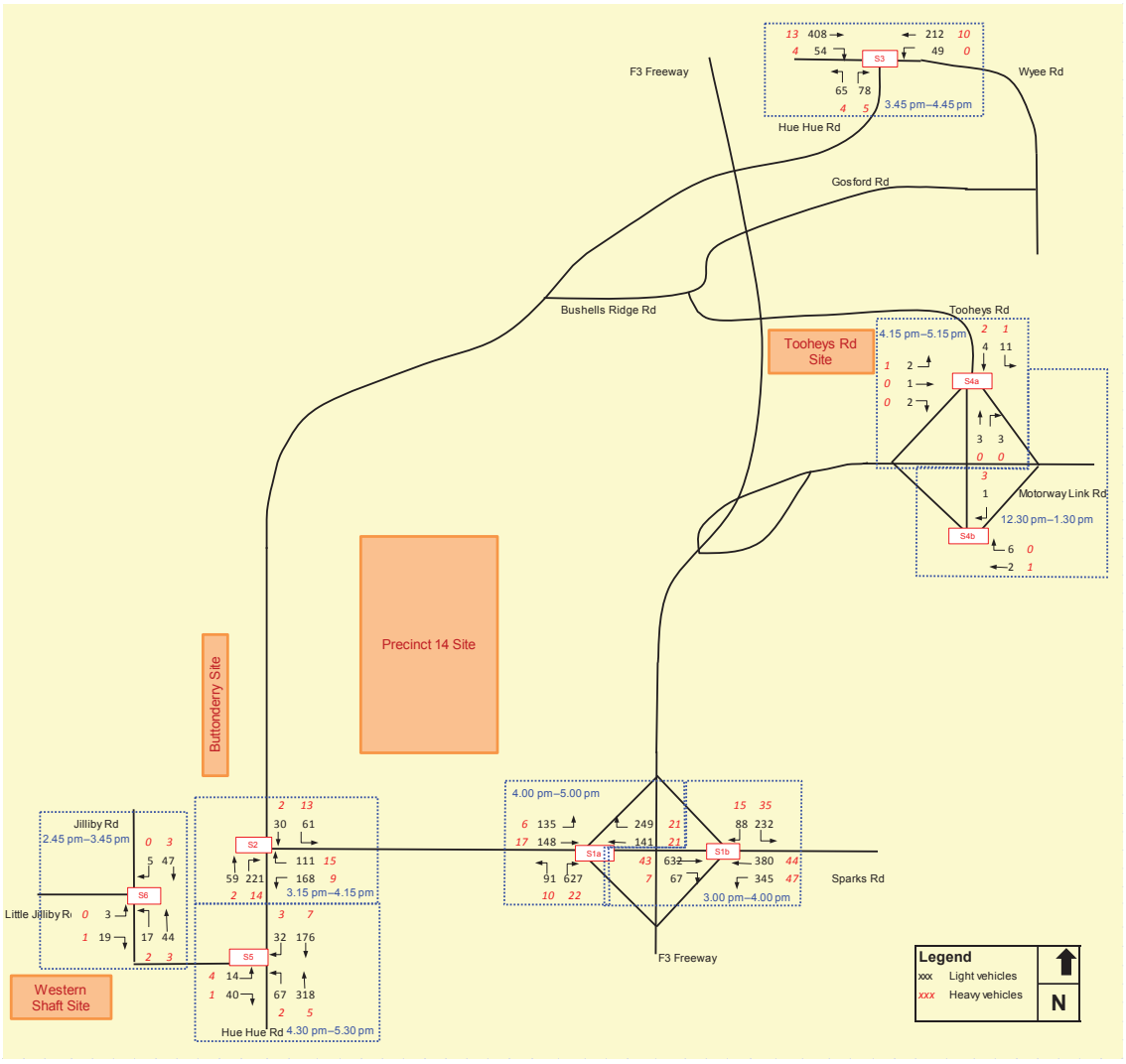


Figure 2.2 2012 PM peak hour traffic volumes at the key intersections (vph)

2.4 Surveyed queue length

The length of the peak hour traffic queues was recorded at the signal controlled intersection on the western side of F3/Sparks Road interchange on Thursday 1 December 2011. Table 2.3 summarises the 95th percentile back of queue calculated from the survey data which was then used in the calibration of the intersection analysis.

Table 2.3 Observed 95th percentile back of queue

Intersection	Peak hour	Approach	95th percentile back of queue (vehicles)
F3/Sparks Road interchange (western side)	AM (7.30 am–8.30 am)	South	10
		East	11
		West	7
	PM (4.15 am–5.15 am)	South	11
		East	8
		West	6

2.5 Existing operation of traffic signals

2.5.1 Operation of controllers

The F3/Sparks Road interchange (western side) is the only one of the eight key intersections that is controlled by traffic signals. Consultation with the RMS indicated that the intersection runs in an isolated mode, so intersection data available was limited to basic local times (e.g. min and max greens, approach timing, yellow and all red times). This intersection does not run under any form of masterlink control.

Appendix B shows the Intersection Diagnostic Monitor (IDM) data recorded between 6.00 am and 11.00 am, and between 2.00 pm and 6.00 pm on Thursday 1 December 2011.

2.5.2 Signal phasing

Figure 2.3 shows the three-phase single diamond overlap arrangement in operation by the signal controller during the surveyed morning and afternoon peak hours.

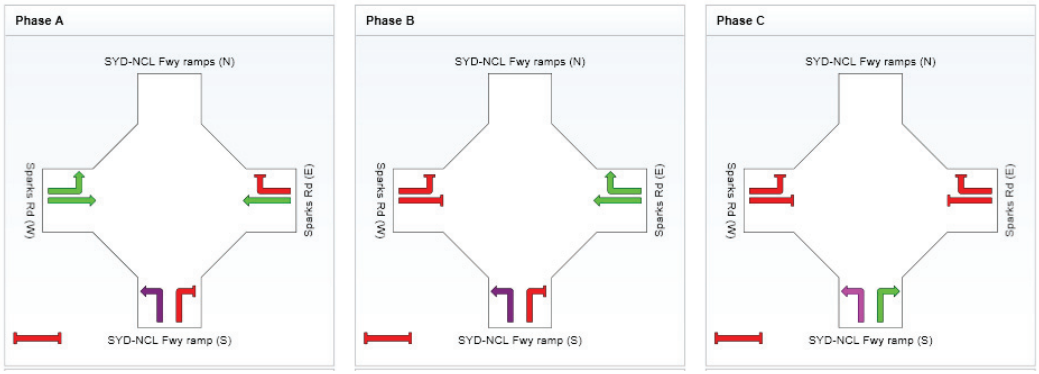


Figure 2.3 Existing signal phasing

2.5.3 Cycle time

Based on the IDM data, the cycle time was 80 seconds between 7.30 am and 8.30 am and 78 seconds between 4.15 pm and 5.15 pm on the survey day.

2.6 Crash data analysis

From January 2006 to December 2010, a total of 73 crashes occurred on the major road network within the boundary of the study area. Crash reports from the RMS are presented in Appendix C.

2.6.1 Sparks Road

A total of 45 crashes occurred on Sparks Road between Hue Hue Road and a point 100 m to the east of the F3/Sparks Road interchange between January 2006 and December 2010. These included two fatal crashes, 20 crashes incurring injury and 23 crashes not resulting in injury.

An analysis of the locations of the recorded crashes indicates that:

- 38 out of the 45 crashes (85%) occurred at the F3/Sparks Road interchange.

- Five out of the 45 crashes (11%) occurred at the Sparks Road/Hue Hue Road intersection.
- One out of the 45 crashes (2%) occurred at a mid-block location between Sparks Road and the F3 Interchange (western side).
- One out of the 45 crashes (2%) occurred at a mid-block location to the east of the F3 Interchange (eastern side).

An analysis by the type of crash has indicated that:

- A right-through crash was the most common (almost exclusive) crash type on Sparks Road at its intersection with the F3 and Hue Hue Road. This included one fatal crash that occurred at the F3/Sparks Road interchange – involving a car turning right from Sparks Road onto the southbound on-ramp, which collided with a truck travelling westbound on Sparks Road.
- Two rear end crashes occurred on Sparks Road with vehicles travelling westbound on approach to the Sparks Road/Hue Hue Road intersection.

2.6.2 Hue Hue Road

A total of 22 crashes occurred on Hue Hue Road between Wyee Road and Jilliby Road between January 2006 and December 2010. These crashes involved one fatal crash resulting in one fatality, 11 injury crashes incurring 19 injuries and 10 non-injury crashes not resulting in injury.

An analysis of the location of these recorded crashes found that:

- Five out of the 22 crashes (23%) occurred at the Hue Hue Road/Sparks Road intersection.
- The remaining 17 crashes (77%) occurred at other points along Hue Hue Road.

An analysis by type of crashes demonstrates that:

- The run-off-road crash (DCA 700–808) was the most common and almost exclusive crash type in mid-block locations. The most common run-off-road crash type was off-road-to-the-right-on-a-straight road section.
- The right-through crash was the most common crash type on Hue Hue Road at its intersection with Sparks Road.
- A single head-on crash which involved a vehicle travelling on the wrong side of the road and which collided with an opposing vehicle on a curved section of Hue Hue Road, to the north of the Kiar Ridge Road. This crash resulted in one fatality.

2.6.3 Tooheys Road

One injury crash occurred on Tooheys Road between Bushells Ridge Road and the Motorway Link Road/Tooheys Road interchange between January 2006 and December 2010. This crash resulted in two injuries and occurred when a vehicle was travelling eastbound on Tooheys Road and ran off the carriageway at a left hand bend. This crash involved alcohol and speeding as contributing factors.

2.6.4 Bushells Ridge Road

One injury crash occurred on Bushells Ridge between Hue Hue Road and Tooheys Road between January 2006 and December 2010. The crash involved a vehicle turning right from Bushells Ridge Road onto Tooheys Road and ran off the carriageway. Speeding was reported as a contributing factor in this crash.

2.6.5 Wyee Road

No crashes have occurred on Wyee Road in the vicinity of its intersection with Hue Hue Road intersection between January 2006 and December 2010.

2.6.6 Jilliby Road

Three crashes occurred on Jilliby Road between Hue Hue Road and Little Jilliby Road. These crashes involved one injury crash and two non-injury crashes between January 2006 and December 2010.

An analysis of the location of recorded crashes indicates that:

- One crash occurred at the Jilliby Road/Watagan Forest Drive intersection.
- Two crashes occurred at mid-block location between Watagan Forest and Hue Hue Road.

An analysis by type of crash found:

- Run-off-road crash (DCA 704, 803 and 804) was the exclusive crash type along Jilliby Road. Two of the three crashes involved vehicles running off the carriageway on a bend that collided with roadside objects.

2.6.7 Little Jilliby Road

One injury crash occurred on Little Jilliby Road, just to the south of its intersection with Jilliby Road between January 2006 and December 2010. A vehicle ran off the carriageway on a right bend and hit a fence.

2.6.8 Proposed Buttonderry Site access

No crashes have occurred on Hue Hue Road in the vicinity of the proposed Buttonderry Site access between January 2006 and December 2010.

2.6.9 Proposed Tooheys Road Site access

No crashes have occurred on Tooheys Road in the vicinity of the proposed Tooheys Road Site access between January 2006 and December 2010.

2.7 Existing provision of public transport services

Bus services are provided along Sparks Road, Hue Hue Road, Jilliby Road and Bushells Ridge Road. The bus services operate seven days a week, with the majority of services being provided during the morning and afternoon peak periods.

The following bus services are currently available within the study area:

- Bus route 10 – Wyee to Tuggerah via Wyong.
- Bus route 11 – Lake Haven to Tuggerah via Warnervale and Wyong.
- Bus route 12 – between Dickson Road and Tuggerah via Wyong.
- Bus route 13 – Dooralong to Tuggerah via Wyong.

Bus stops within the study area are located as follows:

- Hue Hue Road/Bushells Ridge Road intersection.
- Hue Hue Road/Wyee Farms Road intersection.
- Hue Hue Road/Sparks Road intersection.
- Hue Hue Road/Sandra Street intersection.
- Hue Hue Road/Jilliby Road intersection.

Bus movements have been captured in the intersection counts and are included in the intersection analyses.

2.8 Existing provision of school bus services

School bus services provided in the study area of the Project include:

- School bus route 1 – between Wyong High School and Wadalba Community School, via Jilliby Road and Hue Hue Road.
- School bus route 2 – between Wyong High School and Lakes Grammar College, via Hue Hue Road and Sparks Road.
- School bus route 3 – between Bushells Ridge Road and Lakes Grammar College via Hue Hue Road and Sparks Road.
- School bus route 4 – between Lakes Grammar College and Warnervale, via Sparks Road.
- School bus route 5 – between Lakes Grammar College and Tuggerah Westfield, via Sparks Road.
- School bus route 10 – between Jilliby and Wyong High School, via Bushells Ridge Road, Hue Hue Road and Sparks Road.
- School bus route 11 – between Jilliby and Warnervale, via Jilliby Road, Hue Hue Road and Sparks Road.

- School bus route 12 – between Mandalong and Wyong High School, via Hue Hue Road.
- School bus route 13 – between Dooralong Primary Club and Wyong High School, via Jilliby Road and Hue Hue Road.

A dedicated bus service is also provided for individual schools in the study area.

These buses are on the road generally between 40 km/h school zone hours (i.e. 8.00 am and 9.30 am, and between 2.30 pm and 4.00 pm).

Bus movements have been captured in the intersection counts and included in the intersection analyses.

There is a school zone located in the vicinity of the proposed Western Ventilation Shaft Site. Jilliby Public School provides a school bus pick-up and drop-off point on Jilliby Road. The bus zone is operational during school zone hours (between 8.00 am and 9.30 am, and between 2.30 pm and 4.00 pm). Refer to section 2.11.9 for road safety issues identified at this school bus zone.

2.9 Existing conditions of the roads in the vicinity of the proposed site accesses

Table 2.4 shows the existing conditions of the roads in the vicinity of the proposed access to the Buttonderry, Tooheys Road and the Western Ventilation Shaft Sites.

Table 2.4 Attributes of site accesses

	Buttonderry Site access	Tooheys Road Site access	Western Shaft Ventilation Site access
Location	Off Hue Hue Road (western side) located approximately 250 m to the north of Sparks Road	Off Tooheys Road (southern side) located approximately 200 m to the south of the Motorway Link Road overpass	Brothers Road, off Little Jilliby Road (southern side)
Posted speed limit along the road at the proposed accesses	80 km/h	Default speed limit in the absence of posted speed limit is 80 km/h on this rural road	Default speed limit in the absence of posted speed limit is 80 km/h on this rural road
Safe Intersection Sight Distance (SISD) requirement	181 m	181 m	181 m
Meets SISD requirement?	Yes	No. Sight line to the south is obstructed by trees.	Yes
Natural terrain of the access point off the road	Level	Level	Level
Existing pavement conditions in the vicinity of the access point	Sealed Acceptable	Unsealed	Unsealed
Existing clear zone	Vegetation within the clear zone	Vegetation within the clear zone	Vegetation within the clear zone

2.10 Pedestrian and cyclist activities and facilities

Pedestrian and cyclist activities were found to be of a low level in the study area, with the exception of the urban section of Wyee Road (generally between Hue Hue Road and Bungaree Street) where residential dwellings and a school are located.

A pedestrian footpath is provided on Wyee Road between Hue Hue Road and Bungaree Street, and an on-road cycle lane is provided on Sparks Road. However, no pedestrian and bicycle facilities are provided on the rural roads in the study area.

2.11 Existing road safety deficiencies

A daylight site inspection was carried out on Thursday 16 February 2012 in wet weather conditions, and again on Friday 23 March 2012 in fine weather conditions. The following road sections were driven in each direction to identify safety issues along the proposed access routes (refer to section 5.4.1) and a walk over was also undertaken to investigate concerns in details:

- Tooheys Road, between the Motorway Link Road and Bushells Ridge Road.
- Hue Hue Road, between Wyee Road and the south of Jilliby Road.
- Bushells Ridge Road, between Hue Hue Road and the east of Tooheys Road.
- Sparks Road, between Hue Hue Road and the east of the F3/Sparks Road interchange (eastern side).
- Jilliby Road, between Hue Hue Road and the north of Little Jilliby Road.
- Little Jilliby Road, between Jilliby Road and the west of Brothers Road.

Generally the areas of concern associated with the inspected road sections include:

- Insufficient delineation due to the deficiencies in signage, line markings and guideposts and reflectors; and the damaged/missing raised reflective pavement markers (RRPMs) along the road.
- Roadside hazards (e.g. large trees, culverts) located within the clear zone.
- Clogged culverts by overgrown grass and accumulated debris.
- Damaged pavement including the drop in the pavement edge.
- Insufficient provision of road shoulder.

The following sections present specific issues that were identified, which relate to road safety. Site photos are shown in Appendix D.

2.11.1 Motorway Link Road/Tooheys Road interchange

- The ‘NO LEFT TURN’ sign is covered by graffiti and not clearly visible (refer to Photo 1).
- The directional sign is faded, with low retro-reflectivity, and not clearly visible at night (refer to Photo 2).

- There is no stop line provided at the eastbound off ramp on approach to the interchange (refer to Photo 3).
- The pavement is damaged on the eastern end of Tooheys Road (refer to Photo 4).
- The number of reflectors would not provide sufficient delineation along the guardrail alongside Tooheys Road (refer to Photos 5 and 6).
- The guardrail located along the Tooheys Road overbridge is damaged, reducing its effectiveness for redirecting vehicles leaving the carriageway (refer to Photos 5 and 7).
- The centreline is faded affecting vehicles to position correctly within the traffic lane (refer to Photo 8).

2.11.2 Tooheys Road

- The unsealed road is not sufficiently wide (refer to Photo 9) to accommodate traffic travelling in opposite directions.
- No posted speed limit signs are on display on Tooheys Road. As a result, motorists may travel at an inappropriate speed.
- Overhanging tree branches are a potential hazard for vehicles with a high clearance (refer to Photo 10).
- Large trees are located within the clear zone (refer to Photo 11). The presence of these roadside hazards does not provide a safe recovery zone for an errant vehicle.
- The Chevron Alignment Markers (CAM) signs are covered by graffiti and not clearly visible at night (refer to Photo 12).
- The potholes in the north west of the F3 underpass are a hazard for road users and may significantly affect vehicle controllability and safety (refer to Photo 13).
- The limited forward visibility and insufficient delineation on the northern approach to the horizontal curve, located to the south of the F3 underpass, may give motorists a false impression that the road continues straight ahead, leading vehicles toward a private access road (refer to Photo 14).
- The ‘NARROW TUNNEL’ warning sign is damaged and is not clearly visible (refer to Photo 15).
- The curve warning sign should be placed in advance of the curve, not in the middle of the curve (refer to Photo 16).

2.11.3 Hue Hue Road/Wyee Road intersection

- There is no sight board at the intersection, thus drivers on Hue Hue Road may not be aware of the termination of Hue Hue Road (refer to Photo 17). Failure to give way to traffic on Wyee Road may result in crossing/turning crashes.
- A hold line and ‘GIVE WAY’ sign are missing at the intersection (refer to Photos 16 and 18). Failure to give way to traffic on Wyee Road may result in crossing/turning crashes.
- The ‘KEEP LEFT’ signs are covered with graffiti and damaged, and not clearly visible (refer to Photos 19 and 20).

2.11.4 Hue Hue Road/Bushells Ridge Road intersection

- There is insufficient delineation along a combined horizontal/vertical curve on Bushells Ridge Road on approach to the intersection (refer to Photo 21).
- There is no defined priority control provided at the intersection (refer to Photo 22).
- The sight line on Hue Hue Road's southern approach toward the intersection is obstructed by a large tree, located at the south eastern corner of the intersection (refer to Photo 23).

2.11.5 Bushells Ridge Road

- There is insufficient delineation along the road due to the lack of edge lines and the faded centreline marking along the road (refer to Photo 24).
- The damaged pavement may significantly affect vehicle controllability and safety (refer to Photo 24).

2.11.6 Sparks Road/Hue Hue Road intersection

- The hold line is faded on the Sparks Road approach to the intersection (refer to Photo 25). As a result, motorists may not position their vehicles correctly when yielding.

2.11.7 Hue Hue Road (between Wyee Road and south of Jilliby Road)

- There is insufficient provision of road shoulder (less than the required 2–3 m including the unsealed) at various locations along the road (refer to Photo 26). This presents a safety issue when drivers are faced with oncoming traffic.
- The edgeline is faded and is covered by overgrown grass and soil (refer to Photo 26), reducing its visibility by approaching motorists.
- There is insufficient delineation along the road due to lack of guideposts at various sections to mark the edge of the roadway. The centreline marking is faded resulting in insufficient road delineation (refer to Photos 27 to 29).
- A number of retro-reflective pavement markers (RRPMs) are missing or damaged along the centre line and edge lines on the road (refer to Photo 30).
- The guardrail terminal post located next to the northbound lane in the road section between Holloway Drive and Dickson Road has deteriorated significantly and requires replacement (refer to Photo 31).
- The drop in the pavement edge at various sections of Hue Hue Road (refer to Photo 32) would make it difficult for drivers to drive back onto the road if a vehicle leaves the carriageway.
- The culverts located to the south of Bushells Ridge Road are within the clear zone (refer to Photo 33), and are not traversable, not protected, and pose a significant risk for an errant vehicle. These culverts are clogged by overgrown grass and accumulated debris, with water ponding on both sides of the culverts, which may ultimately result in washing out the road and flooding.

- A large tree located to the south of Dickson Road is within the clear zone (refer to Photo 34).

2.11.8 Hue Hue Road/Jilliby Road intersection

- An incorrect type of hazard marker is installed, and should be replaced with a sight board to make motorists aware of the termination of Jilliby Road (refer to Photo 35).
- The stop line is faded on the Jilliby Road approach to the intersection (refer to Photo 36). As a result, motorists may not position their vehicles correctly when yielding.
- The direction sign and the detour sign are located too far from the intersection, thus having low visibility in relation to other signs (refer to Photo 37).

2.11.9 Jilliby Road

- There is insufficient provision of road shoulder (less than the required 2–3 m including the unsealed) at various locations along the road (refer to Photo 38). This is a safety issue when drivers are faced with oncoming traffic.
- There is insufficient delineation along the road due to a lack of guideposts and edge lines in various sections (refer to Photo 38) to mark the edge of the roadway.
- There are no chevron alignment markers (CAMs) installed along the curve to the north of Watagan Forest Drive (refer to Photo 39). This results in inadequate curve delineation – an important feature when travelling at night. Further evaluation is required to assess the need for these signs at this location.
- The guardrail on the bridge approach is not properly connected to the bridge rail (refer to Photo 40). Without a proper transition, there is nothing in place to successfully deflect impacting vehicles without colliding with the end of the bridge, which may result in crashes with very serious consequences. The sandstones are within the clear zone, and are not traversable, and pose a significant risk for an errant vehicle (refer to Photo 41).
- The 'END SCHOOL ZONE' and 60 km/h signs are faded, with low retro-reflectivity, and are not clearly visible (refer to Photo 42).
- A number of safety deficiencies have been identified at the bus zone adjacent to Jilliby Public School, located on Jilliby Road to the south of Little Jilliby Road:
  - Poor drainage at the bus zone resulting in water causing damage to the pavement (refer to Photos 43 and 44). The damaged pavement may affect vehicle controllability and safety.
  - During after school hours, heavy vehicles were observed to shy away from the parked vehicles on the road side, encroaching into the opposite lane over the double barrier centreline on Jilliby Road (refer to Photos 45 and 46).

2.11.10 Jilliby Road/Little Jilliby Road intersection

- There is no sight board or hold line at the intersection (refer to Photo 47), thus drivers on Little Jilliby Road may not be aware of the termination of the road and the yield location. Failure to give way to traffic on Jilliby Road may result in crossing/turning crashes.

- The culvert located at the south west corner of the intersection is within the clear zone (refer to Photo 48), and is not traversable, not protected, and poses a significant risk for an errant vehicle.

2.11.11 Little Jilliby Road/Brothers Road intersection

- Brothers Road is unsealed and not sufficiently wide (refer to Photo 49) to accommodate traffic travelling in opposite directions.
- There is insufficient space provision to allow safe manoeuvring for all vehicles at the intersection (refer to Photo 49).

2.12 Planned road upgrade

Consultation with the WSC has indicated that the Sparks Road/Hue Hue Road intersection would be upgraded to a CHR type intersection as part of the Wyong Employment Zone project. However, timing of the upgrade has not been determined at this stage.

The RMS has planned to upgrade Sparks Road between the F3 interchange and the Pacific Highway as part of the Central Coast Transport Strategy. The road upgrade would provide increased capacity to connect major established and emerging regional retail and commercial centres in Central Coast. Consultation with the RMS has indicated that the upgrade is still at a planning stage and, as such, no design is currently available. However, RMS have advised that it is being planned to ultimately provide six lanes on Sparks Road, and upgrade the eastern side of the F3/Sparks Road interchange to be a traffic signal controlled intersection. The RMS indicated that for the purposes of this traffic and transport impact assessment, the F3/Sparks Road interchange should be analysed based on its current layout.

3. Existing performance of the key intersections

3.1 Model performance indicators

The ability of each of the key intersections to cater for existing and future traffic forecasts was investigated using the SIDRA intersection software package. This package provides several useful indicators to determine the level of intersection performance.

3.1.1 Level of service (LoS)

LoS is a basic performance parameter used to describe the operation of an intersection. Levels of service indicators range from A (indicating good intersection operation) to F (indicating over-saturated conditions with long delays and queues). At signalised intersections, the LoS criteria relate to average intersection delay (seconds per vehicle). At priority controlled (give-way and stop controlled) and roundabout intersections, the LoS is based on the modelled delay (seconds per vehicle) for the most delayed movement (refer to Table 3.1).

Table 3.1 Level of service criteria for intersections

Level of Service	Average delay (seconds per vehicle)	Traffic signals, roundabout	Give Way and Stop signs
A	Less than 14	good operation	good operation
B	15 to 28	good with acceptable delays and spare capacity	acceptable delays and spare capacity
C	29 to 42	satisfactory	satisfactory, but accident study required
D	43 to 56	operating near capacity	near capacity and accident study required
E	57 to 70	at capacity At signals, incidents will cause excessive delays.	at capacity, requires other control mode
F	Greater than 71	unsatisfactory with excessive queuing	unsatisfactory with excessive queuing; requires other control mode

Source: RMS Guide to Traffic Generating Developments, 2002

3.1.2 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. The intersection DoS is based on the movement with the highest ratio for all types of intersection.

3.1.3 Delay

Delay is the difference between interrupted and uninterrupted travel times through the intersection and is measured in seconds per vehicle. At signalised intersections and roundabouts, the average intersection delay is usually reported. At priority controlled intersections, the average delay for the most delayed movement is usually reported.

3.1.4 Queue length

Queue length is measured in metres reflecting 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% of all observed queue lengths fall. It reflects 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.

3.2 Assessment criteria

Typically acceptable intersection performance is defined as follows:

Priority controlled intersections and roundabouts

- Degree of saturation (DoS) less than or equal to 0.8.
- LoS D or better (vehicles' highest delays less than or equal to 56 seconds).
- 95th percentile back of queue does not interfere with other traffic movements.

Signalised intersections

- Degree of saturation (DoS) less than or equal to 0.9.
- LoS D or better (vehicles' average delays less than or equal to 56 seconds).
- 95th percentile back of queue does not interfere with other traffic movements.

3.3 2012 current situation – performance of the key intersections

Table 3.2 shows the SIDRA modelling results of the key intersections' performance under the current traffic condition. The results depicted in red indicate intersection performance exceeding the acceptable level (refer to section 3.2).

Table 3.2 Existing intersection performance (2012)

Intersection	Intersection control type		Peak hour	DoS	Delay	LoS	Queue (m)
F3/Sparks Road interchange (western side)	Signals	AM	8.00 am–9.00 am	**0.95**	42	C	113
		PM	4.00 pm–5.00 pm	0.90	44	D	131
F3/Sparks Road interchange (eastern side)	Priority (seagull)	AM	8.00 am–9.00 am	0.42	21	B	22
		PM	3.00 pm–4.00 pm	0.38	23	B	14
Sparks Road/ Hue Hue Road	Priority	AM	8.00 am–9.00 am	0.47	14	A	12
		PM	3.15 pm–4.15 pm	0.35	20	B	16

Intersection	Intersection control type		Peak hour	DoS	Delay	LoS	Queue (m)
Hue Hue Road/ Wyee Road	Priority	AM	8.45 am–9.45 am	0.13	15	B	4
		PM	3.45 pm–4.45 pm	0.35	25	B	13
Motorway Link Road/ Tooheys Road interchange (north side of the interchange)	Priority	AM	5.15 am–6.15 am	0.01	14	A	1
		PM	4.15 pm–5.15 pm	0.01	10	A	1
Motorway Link Road/ Tooheys Road interchange (south side of the interchange)	Priority	AM	5.15 am–6.15 am	0.02	14	A	1
		PM	12.30 pm–1.30 pm	0.01	13	A	1
Hue Hue Road/ Jilliby Road	Priority	AM	8.15 am–9.15 am	0.38	27	B	17
		PM	4.30 pm–5.30 pm	0.22	27	B	12
Jilliby Road/ Little Jilliby Road	Priority	AM	8.15 am–9.15 am	0.05	12	A	3
		PM	2.45 pm–3.45 pm	0.04	11	A	2

Note: Intersection delays and LoS for signalised intersections are based on average intersection delays, whilst priority controlled intersections and roundabouts are based on the highest average delay.

The analysis indicates most of the key intersections operate at an acceptable LoS B or better and have spare capacity in both peak hours, with a single exception for the F3/Sparks Road interchange (western side), which is currently operating near its practical capacity during the AM peak hour, despite operating at an acceptable LoS D during the PM peak hour.

Specific movement results at the F3/Sparks Road interchange (western side) indicate the following:

- During the AM peak hour, the longest delay (72 seconds) is experienced by the northbound right turning traffic on the F3 northbound off ramp.
- During the PM peak hour, the longest delay (55 seconds) is experienced by the northbound right turning traffic on the F3 northbound off ramp.
- 113 m long queue in the westbound right turn movement occurred on Sparks Road during the AM peak, exceeding the available turn bay length of only 105 m.
- 131 m long queue in the northbound right turn movement occurred on the F3 northbound off ramp during the PM peak, within the available turn bay length of 150 m.

4. The Project

4.1 Indicative timeline

Construction is anticipated to begin in 2014, depending upon the determination of Development Consent. Based on this construction commencement year, the indicative timeline that has been adopted in this assessment is:

- 2014 (Year 1) construction commences.
- 2015 (Year 2) peak construction activity (second year of construction).
- 2016 (Year 3) construction completion (third year of construction).
- 2017 (Year 4) mining operations commences (first year of operation).
- 2025 (Year 12) peak production during mining operation (ninth year of operation).
- 2026 (Year 13) construction of Western Ventilation Shaft (tenth year of operation).
- 2041 (Year 28) end of operation (25th year of operation).

4.2 Description of the surface facility sites

The mine development would comprise of three surface facility sites:

- The Tooheys Road Site (refer to Figure 4.1), where the coal is conveyed to the surface via an inclined tunnel (drift) from the underground workings. The Tooheys Road Site would have facilities for the raw coal storage, product coal stockpiling, rail loop and rail loading infrastructure.
- The Buttonderry Site (refer to Figure 4.2), which would be used for the main office facilities, bathhouse and employee access to and from the underground mine.
- The Western Ventilation Shaft (refer to Figure 4.3), which would be required at Year 13, will serve to house a downcast shaft (i.e. air intake into the mine) and also serve as a secondary emergency access and egress point.

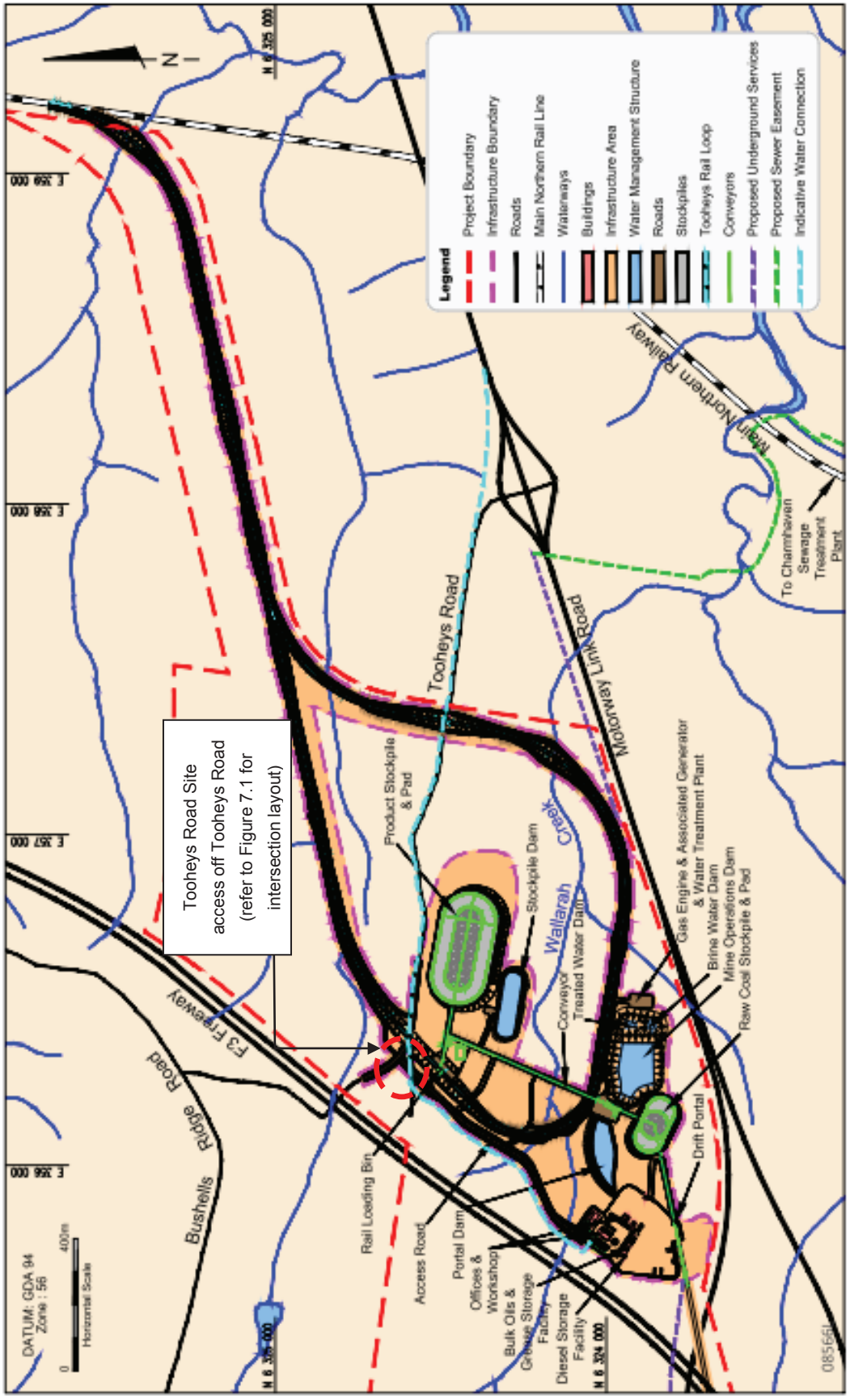


Figure 4.1 Conceptual layout of the Tooheys Road Site

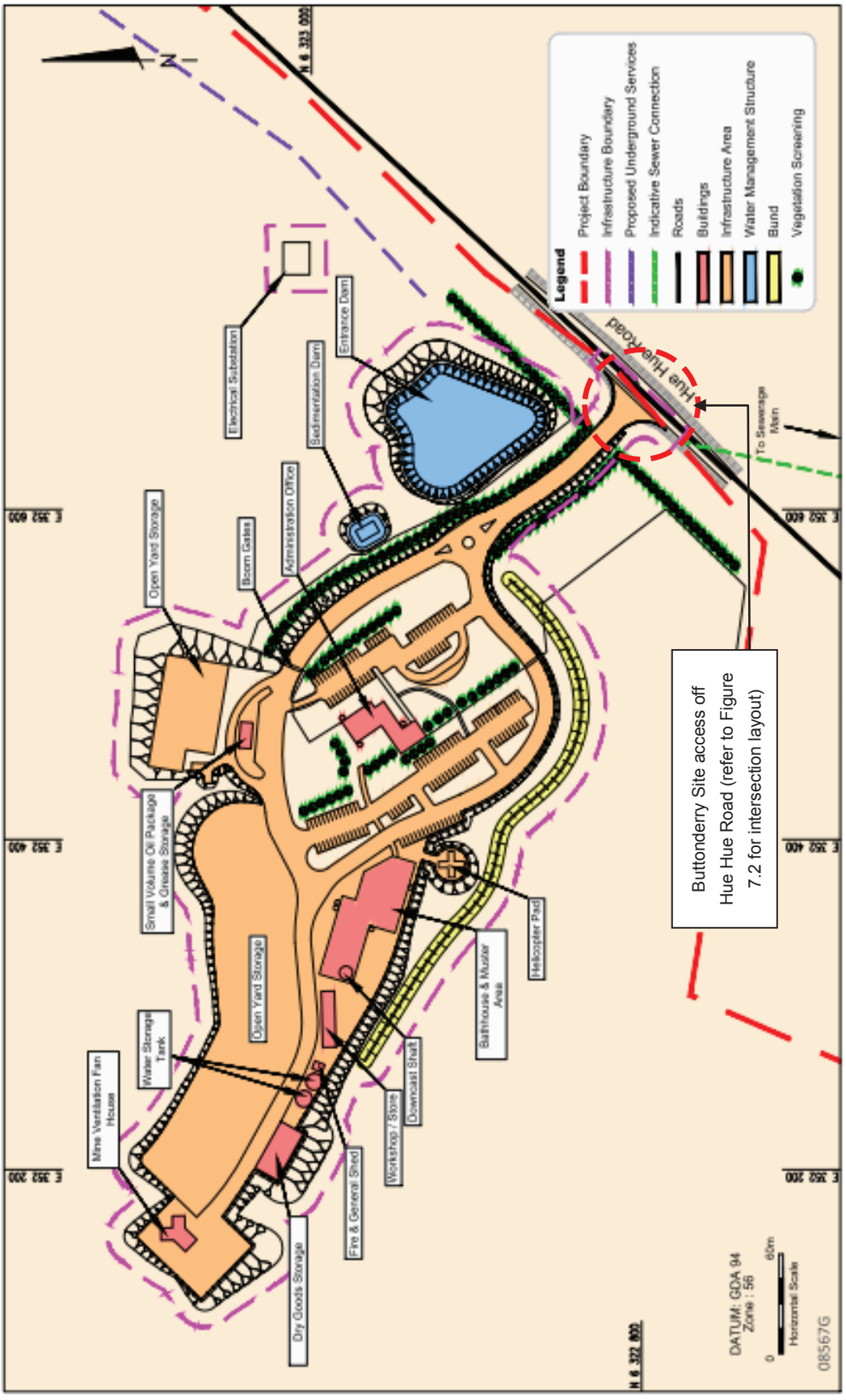


Figure 4.2 Conceptual layout of the Buttonderry Site

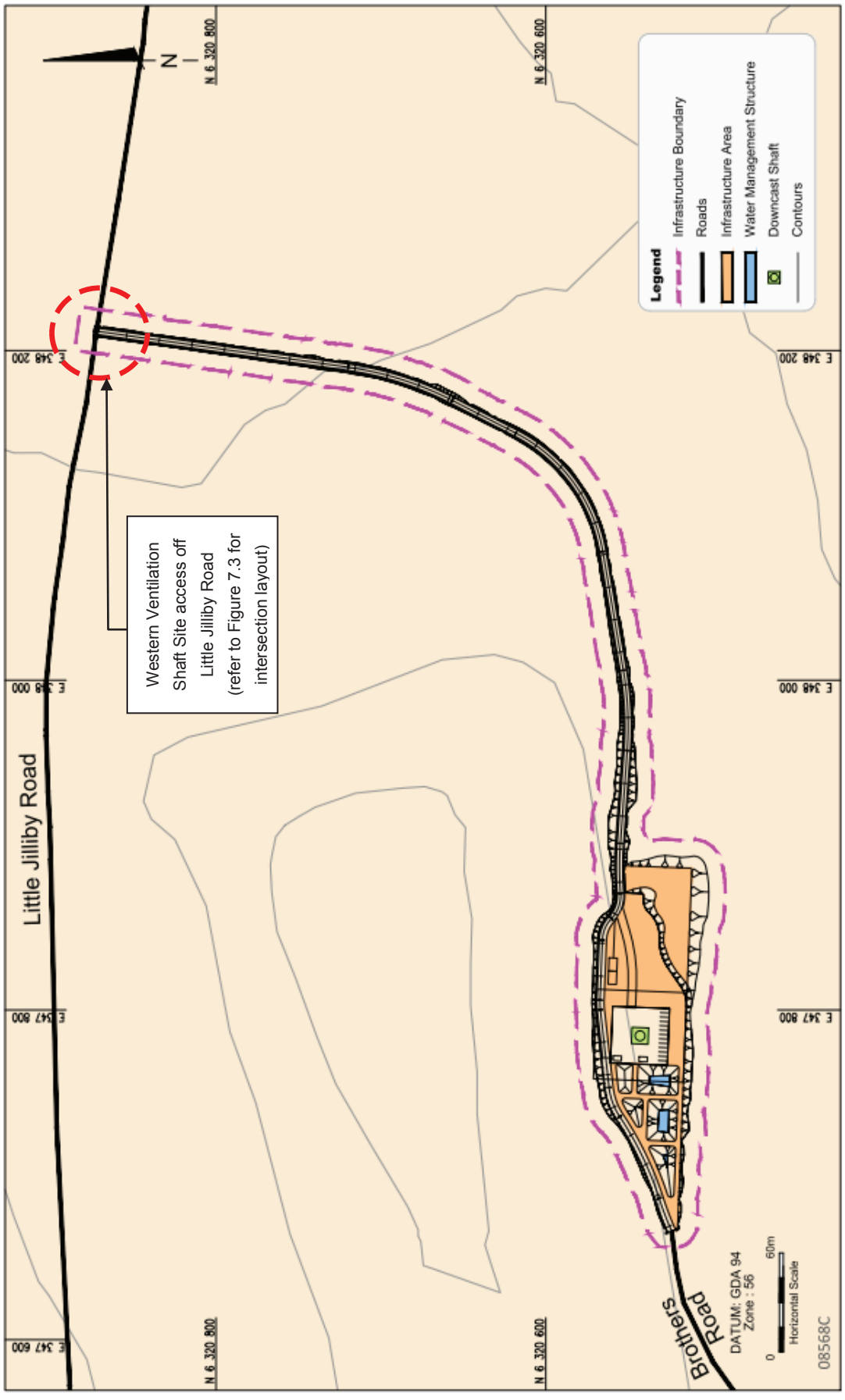


Figure 4.3 Conceptual layout of the Western Ventilation Shaft Site

4.3 Construction of the Project

4.3.1 Tooheys Road Site

Construction at the Tooheys Road Site is expected to take about three years to complete. Construction elements for the site have been split into the following groups:

- Decline tunnel (drift).
- Civil infrastructure.
- Rail loop and spur.
- Administration buildings and facilities.
- Mine operations dam and water treatment reverse osmosis plant.

Construction vehicle traffic would be at a maximum intensity during the main earthworks and civil construction period, where:

- 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 and 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 RMS road weight restrictions, bridge height clearances and sensitive land uses.
- The workforce would arrive by car 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.

4.3.2 Buttonderry Site

Construction at the Buttonderry Site is expected to take approximately three years to complete. Construction elements for the site have been split into the following groups:

- Shaft construction.
- Pit top facilities and associated infrastructure.
- Upgrade of the existing power supply and HV power to the site and other services to the site.
- Construction of power cabling and telecommunications to link Buttonderry Site and Tooheys Road Site.

Construction vehicle traffic would be at its maximum intensity during the main earthworks and buildings works undertaken during the second year of construction, where:

- 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.

- The workforce would arrive by car 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.

4.3.3 Western Ventilation Shaft

Due to the shaft's proposed location in relation to the underground mine workings, the shaft will be constructed at approximately Year 10. Construction is expected to take approximately 60 weeks to complete and would be carried out in the following stages:

- Stage 1: Partial upgrade of Brothers Road.

- Stage 2: Construction of a 5 m diameter concrete lined ventilation shaft of 485 m deep.

- Stage 3: Installation of car winder and erection of associated buildings.

Construction traffic would access the work area off Brothers Road.

Approximately 5,700 m^3 of 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 impacts on the local road network.

5. Forecast traffic demand

5.1 Future years scenarios

Traffic volumes associated with the Project relate to employees' vehicles and heavy vehicle movements and vary between the construction phase and the mining operations phase.

The future years scenarios consider the peak construction activity year (2015), the peak production year of mine operations (2025), and the construction year of the Western Ventilation Shaft (2026, which is also the ten year traffic operations design horizon).

To determine the impact of the mine's construction and operation, a set of 'no-Project' scenarios have been analysed to determine what the comparable case would be if the Project did not proceed. The 'no-Project' scenarios take into consideration both the background traffic growth **and** the operation of other future identified developments near the Project. The surrounding developments include: the Woolworth retail facility; Wyong Employment Zone (Precincts 11, 13 and 14); Warner Industrial Park; Bushells Ridge Employment Estate; Tooheys Road subdivision; and the Warnervale Airport industrial subdivision.

The following scenarios were analysed:

- Scenario 1: no-Project (2015) with background traffic growth and the inclusion of other surrounding developments.
- Scenario 2: construction phase for the Tooheys Road and Buttonderry Sites (2015), with background traffic growth and the inclusion of other surrounding developments.
- Scenario 3: no-Project (2025) with background traffic growth and the inclusion of other surrounding developments.
- Scenario 4: mine operational phase of the Tooheys Road Site and Buttonderry Site (2025) with background traffic growth and the inclusion of other surrounding developments.
- Scenario 5: no-Project (2026) with background traffic growth and the inclusion of other surrounding developments.
- Scenario 6: construction of the Western Ventilation Shaft, and mine operational phase of the Tooheys Road Site and Buttonderry Site (2026) with background traffic growth and the inclusion of other surrounding developments.

5.2 Trip generation during the construction phase

5.2.1 Daily traffic generation

During construction, the Project would generate employee traffic and construction material delivery traffic. Table 5.1 shows the estimated construction traffic associated with the major construction activities, including haulage of spoil and delivery of construction equipment and concrete, at a time when the construction is expected to be at its peak - during the second year of construction (2015). These traffic flow volumes include different vehicle types from the Tooheys Road and Buttonderry Sites.

Table 5.1 Estimated construction vehicle trips per day at the Tooheys Road Site and Buttonderry Site during peak construction activities in the second year of construction (2015)

Site	Vehicle type	Vehicles/day	Vehicle trips/day (2-way)
Tooheys Road	Light (employees – construction for surface facilities)	270	540
	Light (employees – drift construction)	30	60
	Light (deliveries)	60	120
	Rigid truck	20	40
	Articulated truck	20	40
	Total	**400**	**800**
Buttonderry	Light (employees – construction for surface facilities)	120	240
	Light (employees – shaft construction)	30	60
	Light (deliveries)	40	80
	Rigid truck	10	20
	Articulated truck	20	40
	Total	**220**	**440**

Source: WACJV (2 April 2012)

The Western Ventilation Shaft Site will be required approximately ten years after the mine becomes operational. Table 5.2 shows the estimated construction vehicle trips, by vehicles type, for the Western Ventilation Shaft site in 2026 (depending on timing of Development Consent), based on the anticipated construction activities, including haulage of spoil, and delivery of construction equipment and concrete.

Table 5.2 Estimated construction vehicle trips per day at the Western Ventilation Shaft during the 10th year of operation (2026)

Vehicle type	Vehicles/day	Vehicle trips/day (2-way)
Light (employees)	25	50
Light (deliveries)	10	20
Rigid truck	5	10
Articulated truck	5	10
Total	**45**	**90**

Source: WACJV (2 April 2012)

5.2.2 Hourly traffic generation

Working hours for the construction of surface facilities is assumed to be during daylight hours, while the working hours for the underground construction (i.e. shaft and drift at the Tooheys Road and Buttonderry Sites) is likely to be continuous – for 24 hours a day, seven days a week, as these activities, being underground may be undertaken with the likelihood of not exceeding noise criteria and other restrictions. The construction working hours and the assumed construction employees' arrival/departure times are shown below:

- Assumed working hours between 7.00 am and 6.00 pm for the construction of surface facilities (at the Tooheys Road, Buttonderry and Western Ventilation Shaft Sites). Construction employees are assumed to arrive at the site between 6.00 am and 7.00 am, and depart between 6.00 pm and 7.00 pm.

- Working hours for the underground construction activities at the Tooheys Road and Buttonderry Sites are rostered over three daily shifts: 6.00 am to 2.00 pm, 2.00 pm to 10.00 pm and 10.00 pm to 6.00 am (the next day). Construction employees are assumed to arrive at the site within an hour of the start of each shift, and depart within an hour at the end of each shift.

Light deliveries are assumed to be made throughout the day and would be equally distributed between 7.00 am and 6.00 pm.

The delivery of construction material by trucks, concrete mixers and excavators were also assumed to be made throughout the day and would be equally distributed between 7.00 am and 6.00 pm. The assumed hourly construction delivery trips are:

- Tooheys Road Site: six light vehicles and four heavy vehicles, totalling 10 vehicles per hour would enter the site and 10 vehicles per hour would depart.
- Buttonderry Site: four light vehicles and three heavy vehicles, totalling seven vehicles per hour would enter the site and seven vehicles per hour would depart.
- Western Ventilation Shaft Site: one light vehicle and one heavy vehicle, totalling two vehicles per hour would enter the site and two vehicles per hour would depart.

A conservative rate of 1.0 person per vehicle was adopted to convert construction employee numbers to the number of light vehicles. This assumption was made on the basis that, although the future public transport services may improve along Sparks Road as part of the Concept Plan for the Wyong Employment Zone (refer to section 6.5), it may not directly benefit the mine employees because the bus stops are not located in the immediate vicinity of the proposed mining site access points, and also because employees' arrival and departure times for the evening and night shifts are generally outside the public transport service hours.

Tables 5.3 and 5.4 show the assumed number of hourly trips generated by the construction of the surface facilities, shaft and drift at the Tooheys Road Site and Buttonderry Site when the construction activities are at their peak during the second year of the construction.

Table 5.3 Estimated hourly construction vehicle trips at the Tooheys Road Site (2015)

Working hours	Direction of traffic	Trip type	Time	Contributors
Between 7.00 am and 6.00 pm (construction of surface facilities)	Inbound traffic	Construction employee trip (light vehicles)	6.00 am to 7.00 am	▪ 270 construction employee trips by light vehicles at the start of their work
	Inbound and outbound traffic	Construction vehicle trip (heavy vehicles)	Throughout the day between 7.00 am and 6.00 pm	▪ six inbound and six outbound trips per hour for delivery by light vehicles throughout the day ▪ four inbound and four outbound heavy vehicle trips per hour throughout the day
	Outbound traffic	Construction employee trip (light vehicles)	6.00 pm to 7.00 pm	▪ 270 construction employee trips by light vehicles at the end of their work
Three working shifts per day (drift construction)	Inbound traffic	Construction employee trip (light vehicles)	5.00 am to 6.00 am	▪ 10 drift construction employee trips by light vehicles at the start of the day shift
	Outbound traffic	Construction employee trip (light vehicles)	6.00 am to 7.00 am	▪ 10 drift construction employee trips by light vehicles at the end of the night shift
	Inbound traffic	Construction employee trip (light vehicles)	1.00 pm to 2.00 pm	▪ 10 drift construction employee trips by light vehicles at the start of the afternoon shift
	Outbound traffic	Construction employee trip (light vehicles)	2.00 pm to 3.00 pm	▪ 10 drift construction employee trips by light vehicles at the end of the day shift
	Inbound traffic	Construction employee trip (light vehicles)	9.00 pm to 10.00 pm	▪ 10 drift construction employee trips by light vehicles at the start of the night shift
	Outbound traffic	Construction employee trip (light vehicles)	10.00 pm to 11.00 pm	▪ 10 drift construction employee trips by light vehicles at the end of the afternoon shift

Source: WACJV (27 April 2012)

Table 5.4 Estimated hourly construction traffic at the Buttonderry Site (2015)

Working hours	Direction of traffic	Trip type	Time	Contributors
Between 7.00 am and 6.00 pm	Inbound traffic	Construction employee trip (light vehicles)	6.00 am to 7.00 am	▪ 120 construction employee trips at the start of their work
	Inbound and outbound traffic	Construction vehicle trip (heavy vehicles)	Throughout the day between 7.00 am and 6.00 pm	▪ four inbound and four outbound trips per hour for delivery by light vehicles throughout the day ▪ three inbound and three outbound heavy vehicle trips per hour throughout the day
	Outbound traffic	Construction employee trip (light vehicles)	6.00 pm to 7.00 pm	▪ 120 construction employee trips at the end of their work
Three working shifts per day (shaft construction)	Inbound traffic	Construction employee trip (light vehicles)	5.00 am to 6.00 am	▪ 10 shaft construction employee trips by light vehicles at the start of the day shift
	Outbound traffic	Construction employee trip (light vehicles)	6.00 am to 7.00 pm	▪ 10 shaft construction employee trips by light vehicles at the end of the night shift
	Inbound traffic	Construction employee trip (light vehicles)	1.00 pm to 2.00 pm	▪ 10 shaft construction employee trips by light vehicles at the start of the afternoon shift
	Outbound traffic	Construction employee trip (light vehicles)	2.00 pm to 3.00 pm	▪ 10 shaft construction employee trips by light vehicles at the end of the day shift
	Inbound traffic	Construction employee trip (light vehicles)	9.00 pm to 10.00 pm	▪ 10 shaft construction employee trips by light vehicles at the start of the night shift
	Outbound traffic	Construction employee trip (light vehicles)	10.00 pm to 11.00 pm	▪ 10 shaft construction employee trips by light vehicles at the end of the afternoon shift

Source: WACJV (27 April 2012)

At the Western Ventilation Shaft site, the construction delivery trips would be made by two light vehicle trips and two heavy vehicle trips, therefore four vehicle trips per hour would enter the site and four vehicle trips per hour would depart.

Table 5.5 shows the number of hourly trips generated by the Western Ventilation Shaft site during the construction period (the 10th year of the mine operation) in 2026.

Table 5.5 Estimated hourly construction traffic at the Western Ventilation Shaft site (2026)

Working hours	Direction of traffic	Trip type	Time	Contributors
Between 7.00 am and 6.00 pm	Inbound traffic	Construction employee trip (light vehicles)	6.00 am to 7.00 am	▪ 25 construction employee trips at the start of their work
	Inbound and outbound traffic	Construction vehicle trip (heavy vehicles)	Throughout the day between 7.00 am and 6.00 pm	▪ one inbound and one outbound trips per hour for delivery by light vehicles throughout the day ▪ one inbound and one outbound heavy vehicle trips per hour throughout the day
	Outbound traffic	Construction employee trip (light vehicles)	6.00 pm to 7.00 pm	▪ 25 construction employee trips at the end of their work

Source: WACJV (2 April 2012)

5.3 Trip generation during operations

All movements of coal from the site would be by rail. Therefore under normal day-to-day operation, the Tooheys Road and Buttonderry Sites would only generate traffic associated with employees arriving to work and leaving after the shift, along with service and delivery vehicles.

The following presents the WACJV prediction of the maximum number of employees under the current proposed operation of the Buttonderry office and the mine operation at the two surface facility sites.

5.3.1 Employee traffic

It is anticipated that approximately 300 employees (including full time contractors) will work at the Buttonderry Site while only about 30 workers will have their work based at the Tooheys Road Site. However, the entire workforce does not travel to work every day, as a variety of shift patterns are utilised to facilitate seven day continuous production.

The proposed hours of operation for the Project would be 24 hours a day, seven days a week. However, shut-downs may occur from time to time to allow for major equipment upgrades. On-site employees are assumed to be rostered over three daily working shifts during week days as shown in Table 5.6. Although the shift times would be different on weekends and manning numbers less, for the purposes of this assessment, the traffic impact associated with the operational activities focuses on weekday traffic, considering the higher traffic volumes.

Table 5.6 Predicted number of employees (week days)

Employment type	Times	Number of employees at sites	
		Tooheys Road Site	Buttonderry Site
Daytime office	8.00 am to 5.00 pm	0	20
Mine operation day shift	6.00 am to 3.00 pm	15	90
Mine operation afternoon shift	2.00 pm to 11.00 pm	3	70
Mine operation evening shift	10.00 pm to 7.00 am (the next day)	3	70
Total		**21**	**250**

Source: WACJV (2 April 2012)

Note: Although the Project is seeking approval for 330 employees, only 271 will arrive at site on any day.

A conservative rate of 1.0 person per vehicle was adopted to convert mine operation employee numbers to the numbers of generated vehicles. This assumption was made on the basis that, although the future public transport services may improve along Sparks Road as part of the Concept Plan for the Wyong Employee Zone (refer to section 6.5), it may not directly benefit the mine employees because the bus stops are not located in the immediate vicinity of the proposed mining site access points, and also because employees' arrival and departure times for the evening and night shifts are generally outside the public transport service hours.

5.3.2 Service and delivery vehicles

According to the WACJV, the number of service vehicles and deliveries are expected to be:

- Approximately six trucks a week delivering fuel, oil and stores to the Buttonderry Site.
- Approximately four trucks a day delivering material and fuel supplies to Tooheys Road Site.

However, it is expected that there will be a number of delivery and service vehicles (heavy vehicles) operating throughout the week. Considering a worst case scenario, up to 10 service and delivery vehicles per hour would arrive the site, and 10 service and delivery vehicles per hour would depart from the site.

Delivery of materials and services can occur continuously for 24 hours over 7 days. However, it is assumed that this will generally occur between 7.00 am and 5.00 pm on weekdays.

5.3.3 Hourly traffic generation

The proposed sites will operate 24 hours a day, seven days a week. As shown in Tables 5.7 and 5.8, trips by employees were split into inbound and outbound trips based on different shift hours and different employment types. It is anticipated that service and delivery vehicles (heavy vehicles) would arrive and depart from the site throughout the day.

Table 5.7 shows the number of trips generated by the Tooheys Road Site under the normal day-to-day operation.

Table 5.7 Inbound and outbound trips for operation at the Tooheys Road Site

Time	Employee type	Direction of traffic	Contributors
5.00 am to 6.00 am	Day shift mine operation employee (light vehicles)	Inbound traffic	15 day shift mine operation employee trips at the start of the their day shift
7.00 am to 8.00 am	Night shift mine operation employee (light vehicles)	Outbound traffic	three night shift mine operation employee trips after the end of the night shift
Throughout the day between 7.00 am and 5.00 pm	Contractors for delivery of materials and services (heavy vehicles)	Inbound and outbound traffic	10 delivery and service vehicle trips per hour arriving and 10 delivery and service vehicle trips departing the site throughout the day
1.00 pm to 2.00 pm	Afternoon shift mine operation employee (light vehicles)	Inbound traffic	three afternoon shift mine operation employee trips at the start of the their afternoon shift
3.00 pm to 4.00 pm	Day shift mine operation employee (light vehicles)	Outbound traffic	15 day shift mine operation employee trips after the end of the day shift
9.00 pm to 10.00 pm	Night shift mine operation employee (light vehicles)	Inbound traffic	three night shift mine operation employee trips at the start of the their night shift
11.00 pm to 12.00 am (the next day)	Afternoon shift mine operation employee (light vehicles)	Outbound traffic	three afternoon shift mine operation employee trips after the end of the afternoon shift

Source: WACJV (2 April 2012)

Table 5.8 shows the number of trips generated by the Buttonderry Site under the normal day-to-day operation.

Table 5.8 Inbound and outbound trips for operation at the Buttonderry Site

Time	Employee type	Direction of traffic	Contributors
5.00 am to 6.00 am	Day shift mine operation employee	Inbound traffic	90 day shift mine operation employee trips at the start of the their day shift
7.00 am to 8.00 am	Night shift mine operation employee	Outbound traffic	70 night shift mine operation employee trips after the end of the night shift
7.00 am to 8.00 am	Daytime office employee	Inbound traffic	20 daytime office employee trips at the start of the their work day
Throughout the day between 7.00 am and 5.00 pm	Contractors for delivery of materials and services	Inbound and outbound traffic	10 delivery and service vehicle trips per hour arriving and departing the site throughout the day
1.00 pm to 2.00 pm	Afternoon shift mine operation employee	Inbound traffic	70 afternoon shift mine operation employee trips at the start of the their afternoon shift
3.00 pm to 4.00 pm	Day shift mine operation employee	Outbound traffic	90 day shift mine operation employee trips after the end of the day shift
5.00 pm to 6.00 pm	Daytime office employee	Outbound traffic	20 daytime office employee trips at the end of the their work day

Time	Employee type	Direction of traffic	Contributors
9.00 pm to 10.00 pm	Night shift mine operation employee	Inbound traffic	70 night shift mine operation employee trips at the start of the their night shift
11.00 pm to 12.00 am (the next day)	Afternoon shift mine operation employee	Outbound traffic	70 afternoon shift mine operation employee trips after the end of the afternoon shift

Source: WACJV (2 April 2012)

5.4 Trip distribution

5.4.1 Access routes

Table 5.9 describes the likely routes taken by construction vehicles, employee traffic and delivery and service vehicles travelling to the sites, during construction and operations.

Table 5.9 Site access points and access routes

Site	Access point	Access to/from via			
		North	South	East	West
Tooheys Road (construction and operations)	Off Tooheys Road	F3 Freeway, turn back via Sparks Road, Motorway Link Road, Tooheys Road	F3 Freeway, Motorway Link Road, Tooheys Road	Motorway Link Road, Tooheys Road	Hue Hue Road, Bushells Ridge Road and Tooheys Road
Buttonderry (construction and operations)	Off Hue Hue Road, directly north of the Hue Hue Road/Sparks Road intersection	F3 Freeway, Hue Hue Road	F3 Freeway, Hue Hue Road	Sparks Road, Hue Hue Road	-
Western Ventilation Shaft (construction only)	Off Brothers Road	Hue Hue Road, Jilliby Road, Little Jilliby Road	Hue Hue Road, Jilliby Road, Little Jilliby Road	Sparks Road, Hue Hue Road, Jilliby Road, Little Jilliby Road	Hue Hue Road, Jilliby Road, Little Jilliby Road

Source: WACJV (2 April 2012)

For the Tooheys Road Site, the connection from the north of the site (such as Lake Macquarie) is not well served using the F3, as there is no turnoff at the Motorway Link Road for southbound traffic. Therefore, the southbound traffic would travel to the Sparks Road, then travel back northbound on the F3, and then would turn off at Motorway Link to access the Tooheys Road Site. This would be the same for outbound traffic traveling north (such as Lake Macquarie) via the F3.

Due to the road geometry on the Tooheys Road section between Bushells Ridge Road and the F3 overpass, heavy vehicles would not be permitted to travel on this road section as an access route to/from the Tooheys Road Site due to safety reasons. Heavy vehicle access would be via the Motorway Link Road and Tooheys Road (to the east of the Tooheys Road Site access).

5.4.2 Construction phase

5.4.2.1 Employee workforce trips

The proponent assumed that approximately 70% of employees would be taken by local applicants from the Central Coast and immediately adjacent region. WACJV provided the distribution of the employee workforce trips to/from the proposed surface facilities. These assumptions are summarised in Figure 5.1 with full details provided in the following section.

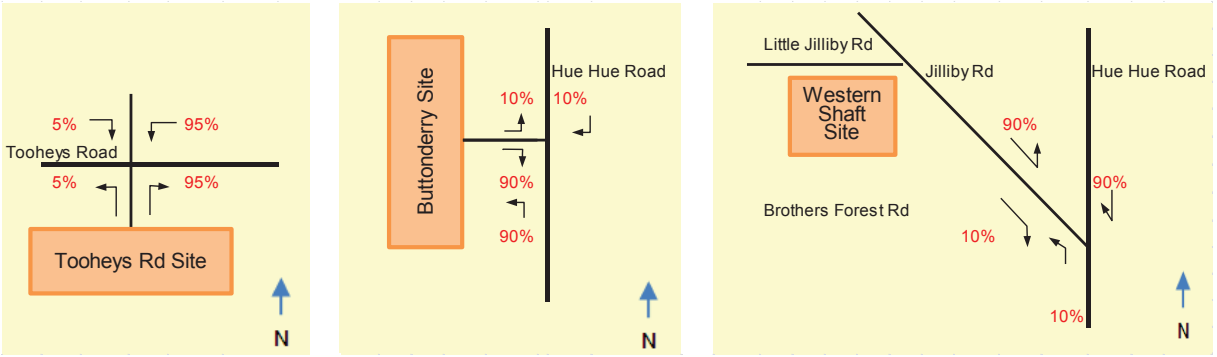


Figure 5.1 Traffic distribution for construction employee trips during construction phase

Tooheys Road Site

The employee workforce trips of the Tooheys Road Site would be made up of:

- 35% to/from the north, using F3/Sparks Road/ Motorway Link/Tooheys Road.
- 30% to/from the south, using F3/Motorway Link/Tooheys Road.
- 30% to/from the east, using Sparks Road/F3/Motorway Link/Tooheys Road.
- 5% to/from the west, using Wyee Road/Hue Hue Road/Bushells Ridge Road/Tooheys Road.

As a result, 95% of the employee workforce trips would access the Tooheys Road Site to/from the east on Tooheys Road, whilst would 5% access to/from the west on Tooheys Road.

Buttonderry Site

The employee workforce trips of the Buttonderry Site would be made up of:

- 35% to/from the north, using F3/Sparks Road/Hue Hue Road.
- 30% to/from the south, using F3/Sparks Road/Hue Hue Road.
- 15% to/from the east, using Sparks Road/Hue Hue Road.
- 10% to/from the west, using Wyee Road/Hue Hue Road.
- 10% to/from the south, using Hue Hue Road.

As a result, 90% of the employee workforce trips would access the Buttonderry Site to/from the south on Hue Hue Road, whilst 10% would access to/from the north on Hue Hue Road.

Western Ventilation Shaft Site

The employee workforce trips of the Western Ventilation Shaft Site would be made up of:

- 35% to/from the north, using F3/Sparks Road/Hue Hue Road/Jilliby Road/Little Jilliby Road/Brothers Road.
- 30% to/from the south, using F3/Sparks Road/Hue Hue Road/Jilliby Road/Little Jilliby Road/Brothers Road.
- 15% to/from the east, using Sparks Road/Hue Hue Road/Jilliby Road/Little Jilliby Road/Brothers Road.
- 10% to/from the west, using Wyee Road/Hue Hue Road/Jilliby Road/Little Jilliby Road/Brothers Road.
- 10% to/from the south, using Hue Hue Road/Jilliby Road/Little Jilliby Road/Brothers Road.

As a result, 90% of the employee workforce trips would access the Western Ventilation Shaft Site to/from the north on Hue Hue Road, whilst 10% would access to/from the south on Hue Hue Road.

The Western Ventilation Shaft employees would go to the Buttonderry Site for signing on and off before and after working hours. The only route between the Buttonderry Site and the Western Ventilation Shaft site is via Hue Hue Road, Jilliby Road, Little Jilliby Road and Brothers Road.

5.4.2.2 Construction and service vehicle trips

At this stage, it is uncertain as to which direction the construction and service vehicles would come from, as it depends on the location of the winning suppliers of each supply contract. Nonetheless, WACJV has provided an assumed distribution of construction and service vehicle trips to/from the proposed surface facilities. These assumptions are summarised in Figure 5.2 with full details provided in the following sections.

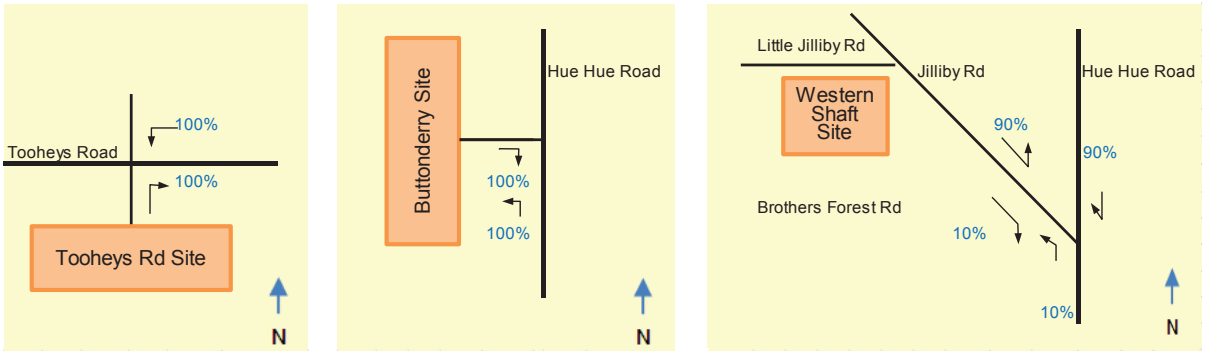


Figure 5.2 Traffic distribution for construction and service vehicle trips during construction phase

Tooheys Road Site

The construction and service vehicles trips of the Tooheys Road Site would be made up of:

- 10% to/from the north, using F3/Sparks Road/ Motorway Link/Tooheys Road.
- 20% to/from the south, using F3/Motorway Link/Tooheys Road.
- 35% to/from the east, using Sparks Road/F3/Motorway Link/Tooheys Road.
- 35% to/from the east, using Motorway Link Road/Tooheys Road.

As a result, all construction and service vehicle trips would access the Tooheys Road Site to/from the east on Tooheys Road.

Buttonderry Site

The construction and service vehicles trips of the Buttonderry Site would be made up of:

- 10% to/from the north, using F3/Sparks Road/Hue Hue Road.
- 35% to/from the east, using Sparks Road/Hue Hue Road.
- 35% to/from the east, using Motorway Link Road/Sparks Road/Hue Hue Road.
- 10% to/from the south, using F3/Sparks Road/Hue Hue Road.
- 10% to/from the south, using Old Maitland Road or Alison Road/Hue Hue Road.

As a result, all construction and service vehicle trips would access the Buttonderry Site to/from the south on Hue Hue Road.

Western Ventilation Shaft Site

The construction and service vehicles trips of the Western Ventilation Shaft Site would be made up of:

- 30% to/from the north, using F3/Sparks Road/Hue Hue Road/Jilliby Road/Little Jilliby Road/Brothers Road.
- 10% to/from the west, using Wyee Road/Hue Hue Road/Jilliby Road/Little Jilliby Road/Brothers Road.
- 30% to/from the south, using F3/Sparks Road/Hue Hue Road/Jilliby Road/Little Jilliby Road/Brothers Road.
- 10% to/from the south, using Old Maitland Road or Alison Road/Hue Hue Road/Jilliby Road/Little Jilliby Road/Brothers Road.
- 20% to/from east, using Sparks Road/Hue Hue Road/Jilliby Road/Little Jilliby Road/Brothers Road.

As a result, 90% of the construction and service vehicle trips would access the Western Ventilation Shaft site to/from the north on Hue Hue Road, whilst 10% would access to/from the south on Hue Hue Road.

5.4.3 Operational phase

The proponent provided the assumption that approximately 70% of employees would be taken by local applicants from the Central Coast and immediately adjacent regions, and that the trip distribution of the employee workforce during the operational phase would be the same as that used in the construction phase. All service and delivery traffic is assumed to use the F3 to access to and from the proposed surface facilities.

Figure 5.3 shows the assumed trip distribution of the mine employee trips accessing the proposed surface facilities during operational phase.

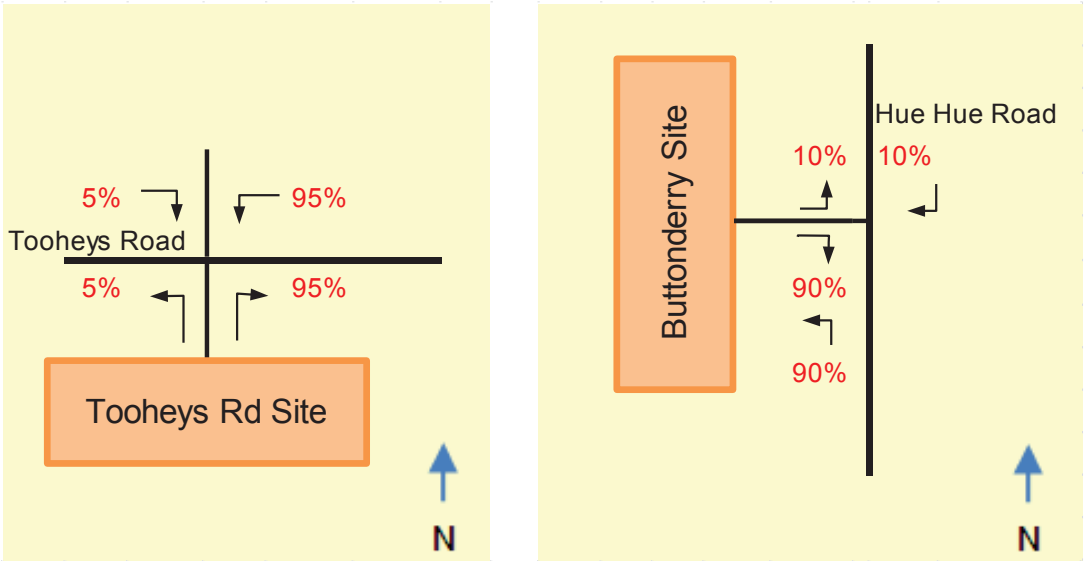


Figure 5.3 Traffic distribution for mine employee trips during operational phase

Figure 5.4 shows the assumed trip distribution of the service and delivery trips accessing the proposed surface facilities during operational phase.

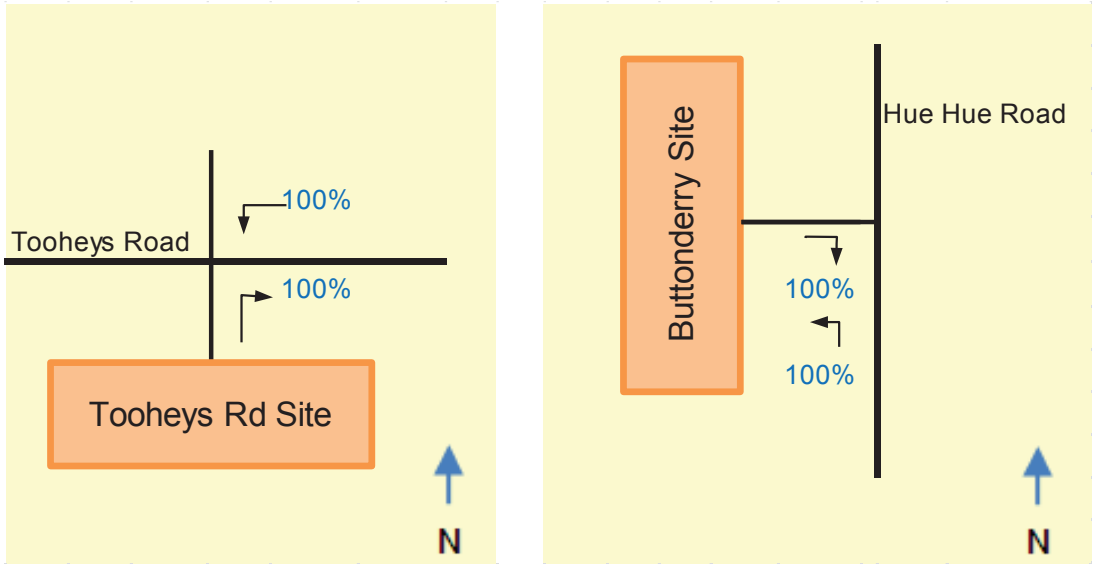


Figure 5.4 Traffic distribution for service and delivery trips during operational phase

5.4.4 Peak Project traffic generation

Figures 5.5 and 5.6 show the peak hour traffic generation volumes in the morning and afternoon periods associated with the construction activities at the Tooheys Road Site and Buttonderry Site in 2015.

Figures 5.7 and 5.8 show the peak hour traffic generation volumes in the morning and afternoon periods associated with the operational activities at the Tooheys Road Site and Buttonderry Site in 2025.

Figures 5.9 and 5.10 show the peak hour traffic generation volumes in the morning and afternoon periods associated with the construction activities at the Western Ventilation Shaft and the operational activities at the Tooheys Road Site and Buttonderry Site in 2026.

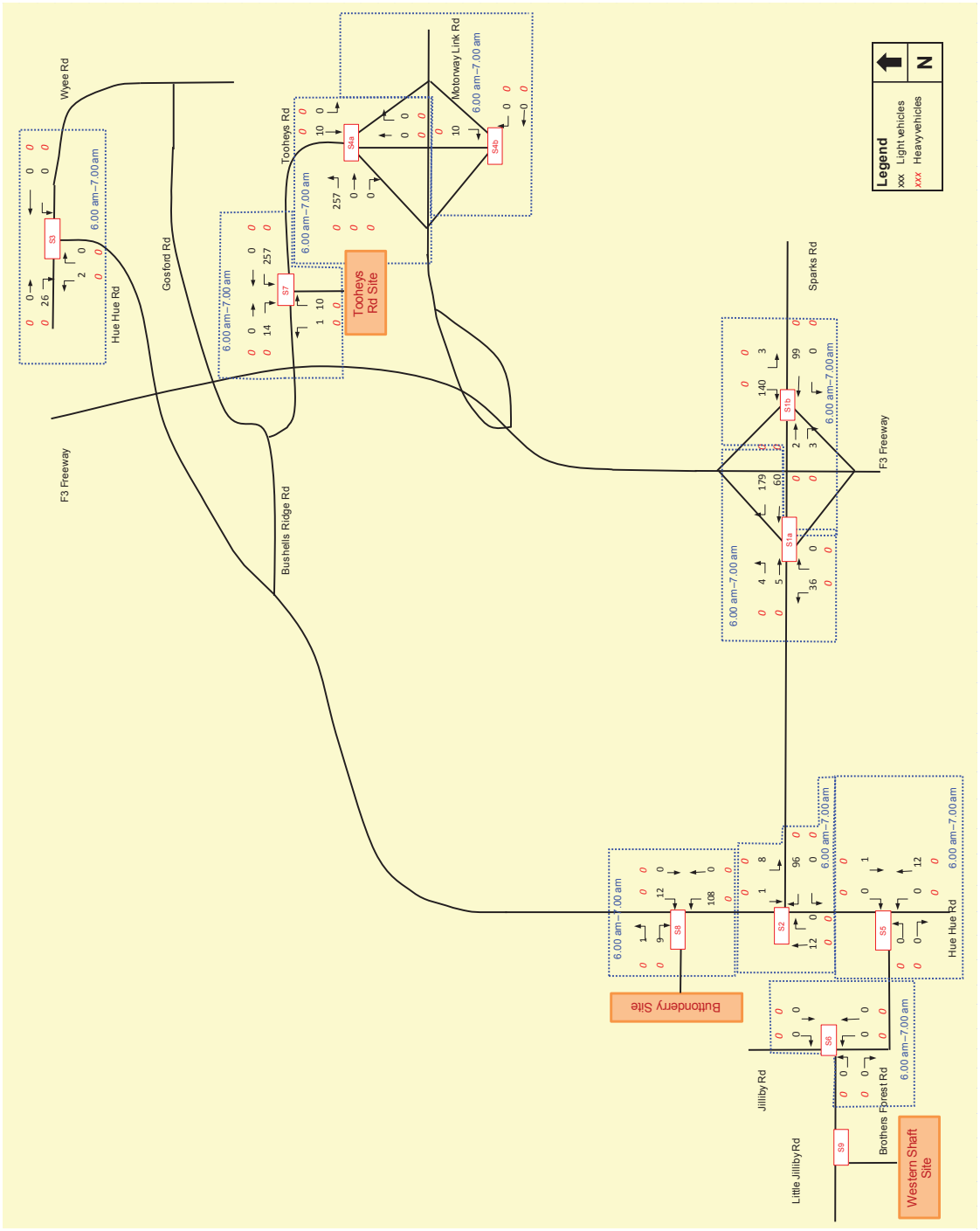


Figure 5.5 2015 traffic generation with mine construction AM peak hour traffic volumes at the key intersections

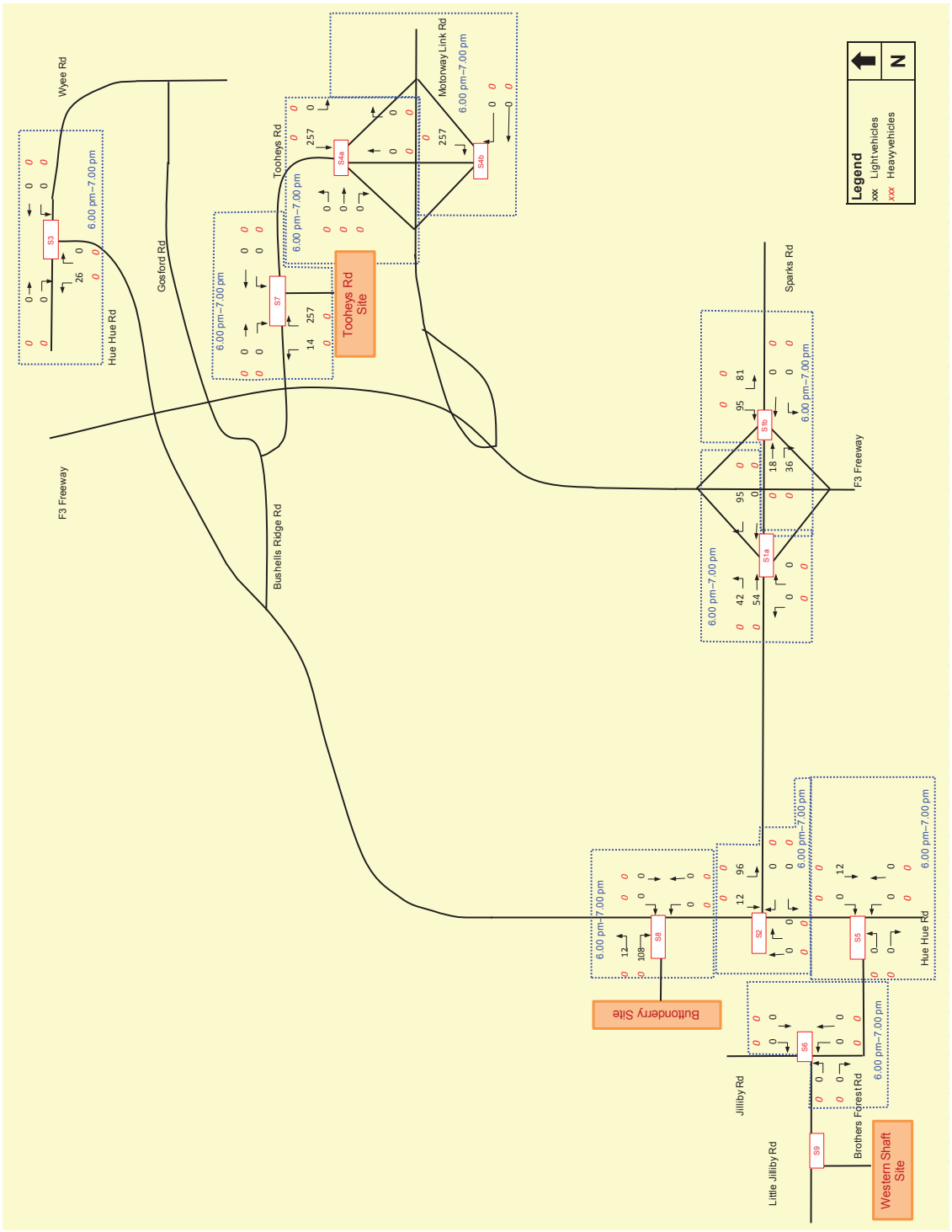


Figure 5.6 2015 traffic generation with mine construction PM peak hour traffic volumes at the key intersections

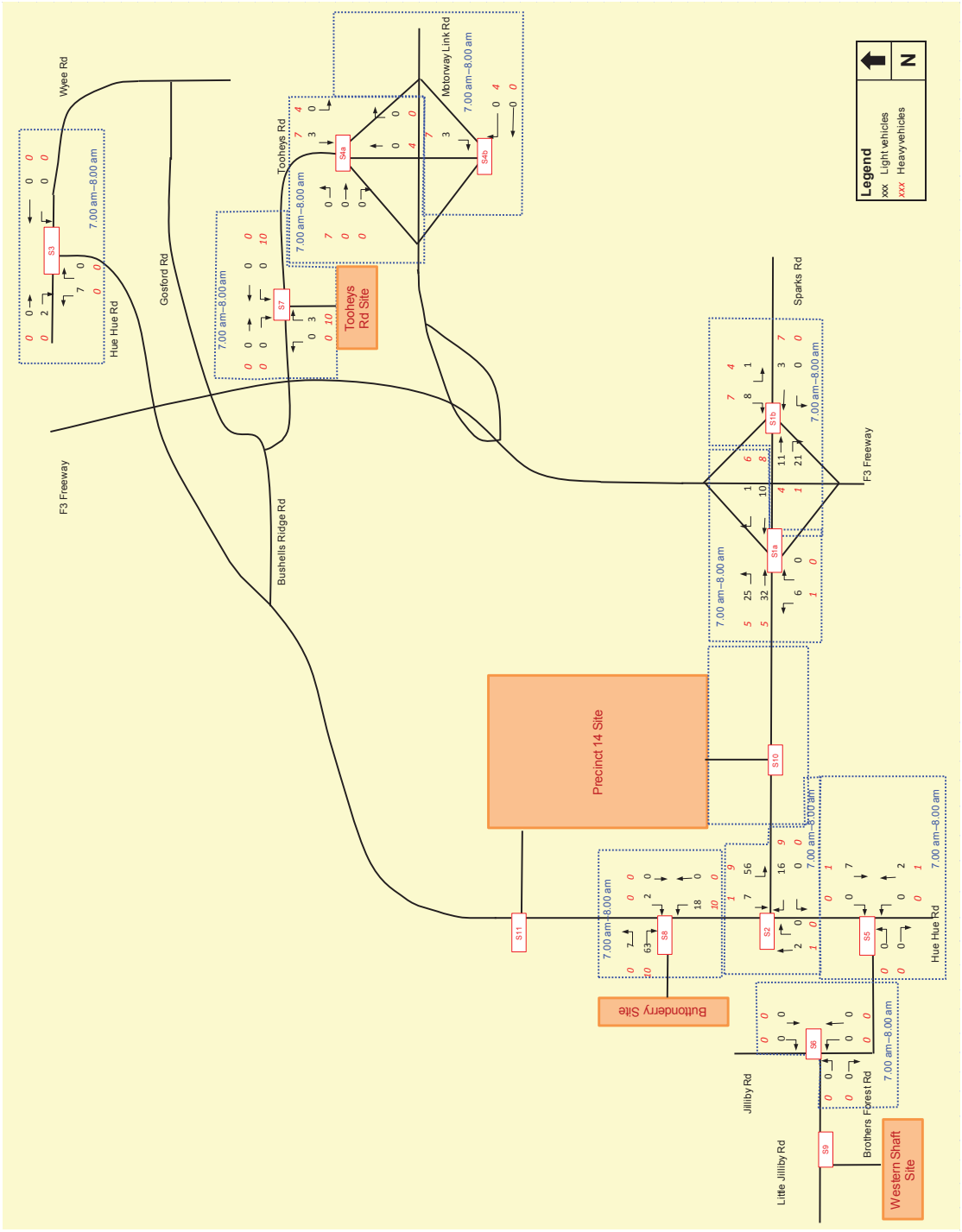


Figure 5.7 2025 traffic generation with mine operation AM peak hour traffic volumes at the key intersections

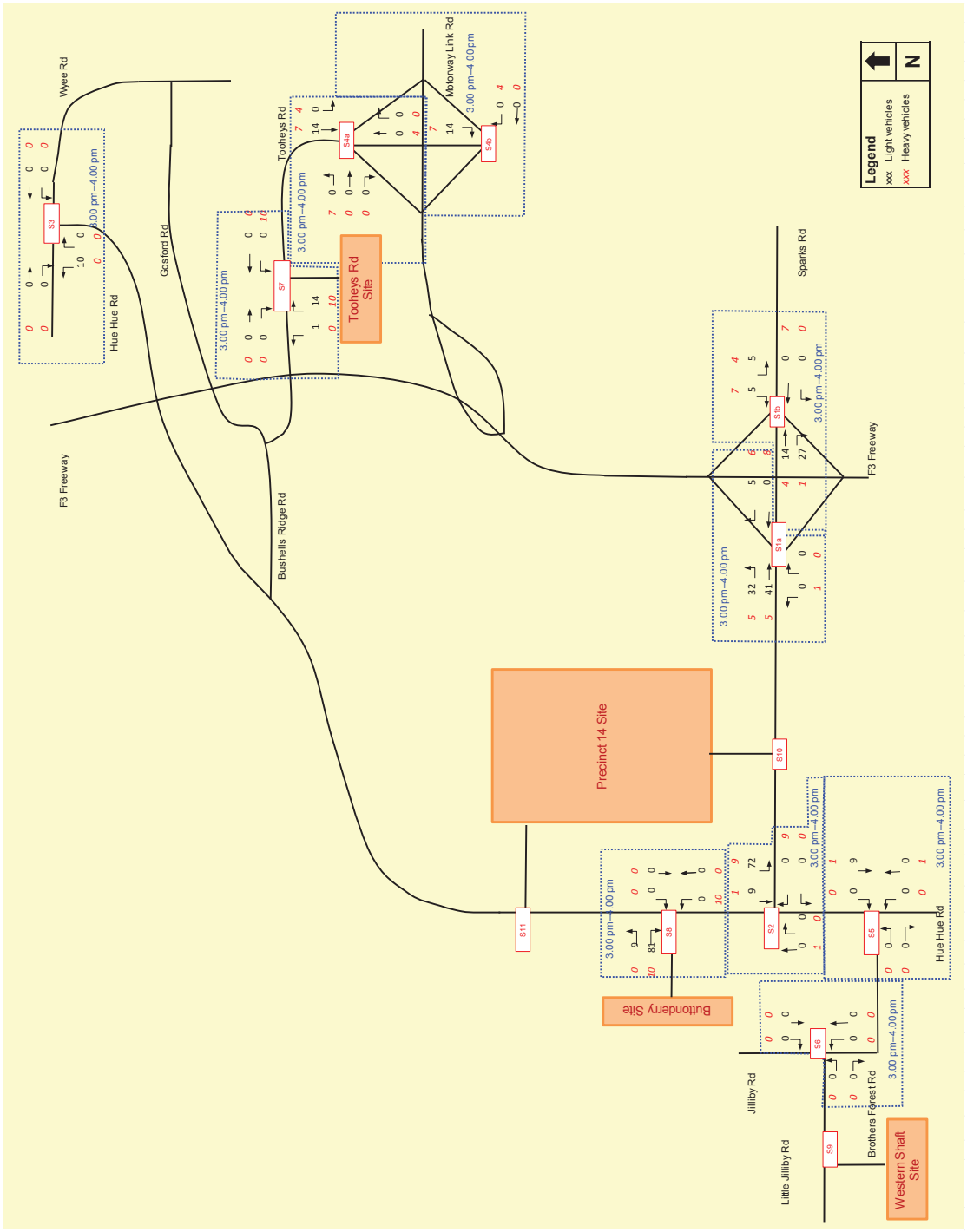


Figure 5.8 2025 traffic generation with mine operation PM peak hour traffic volumes at the key intersections

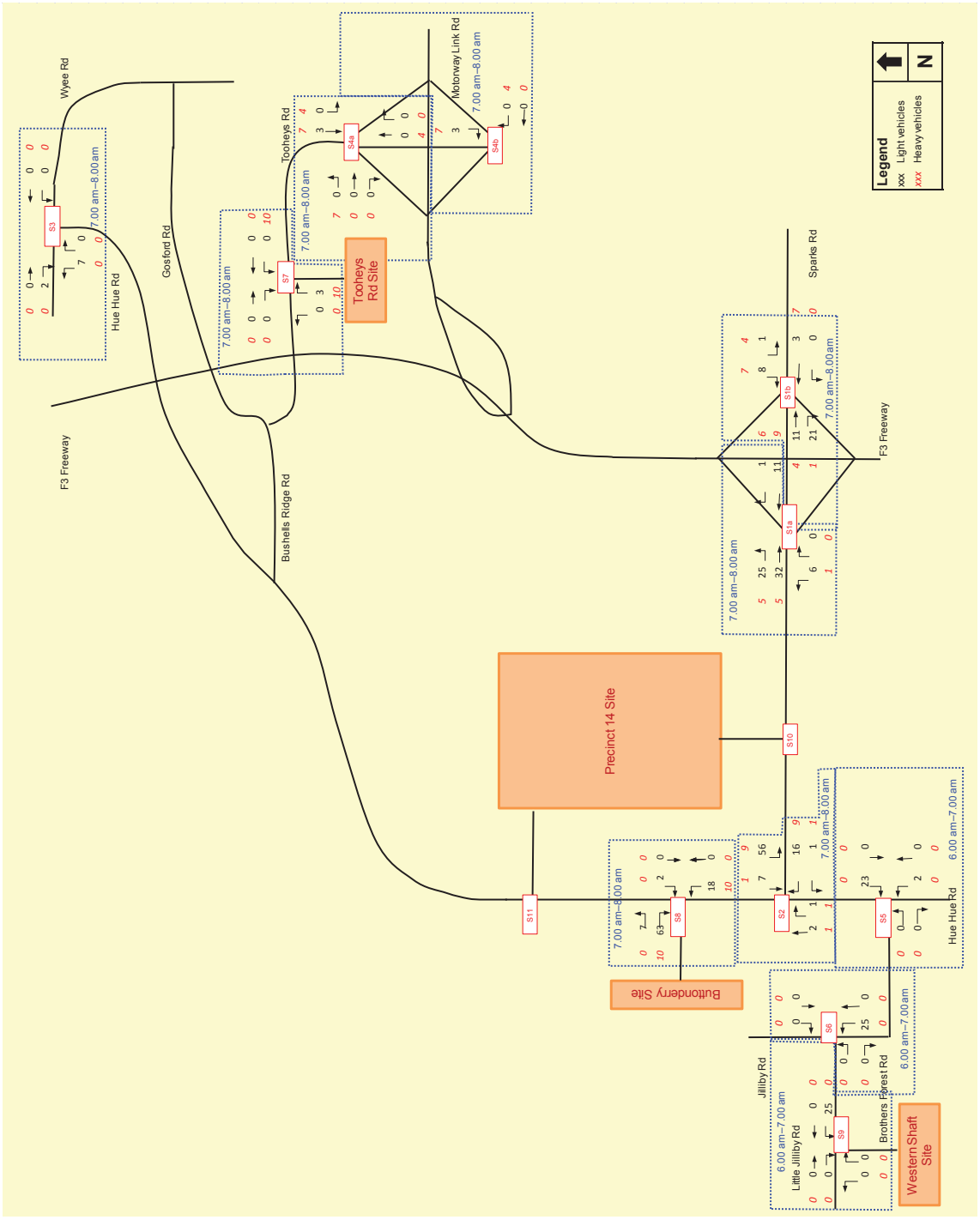


Figure 5.9 2026 traffic generation with mine operation and construction AM peak hour traffic volumes at the key intersections

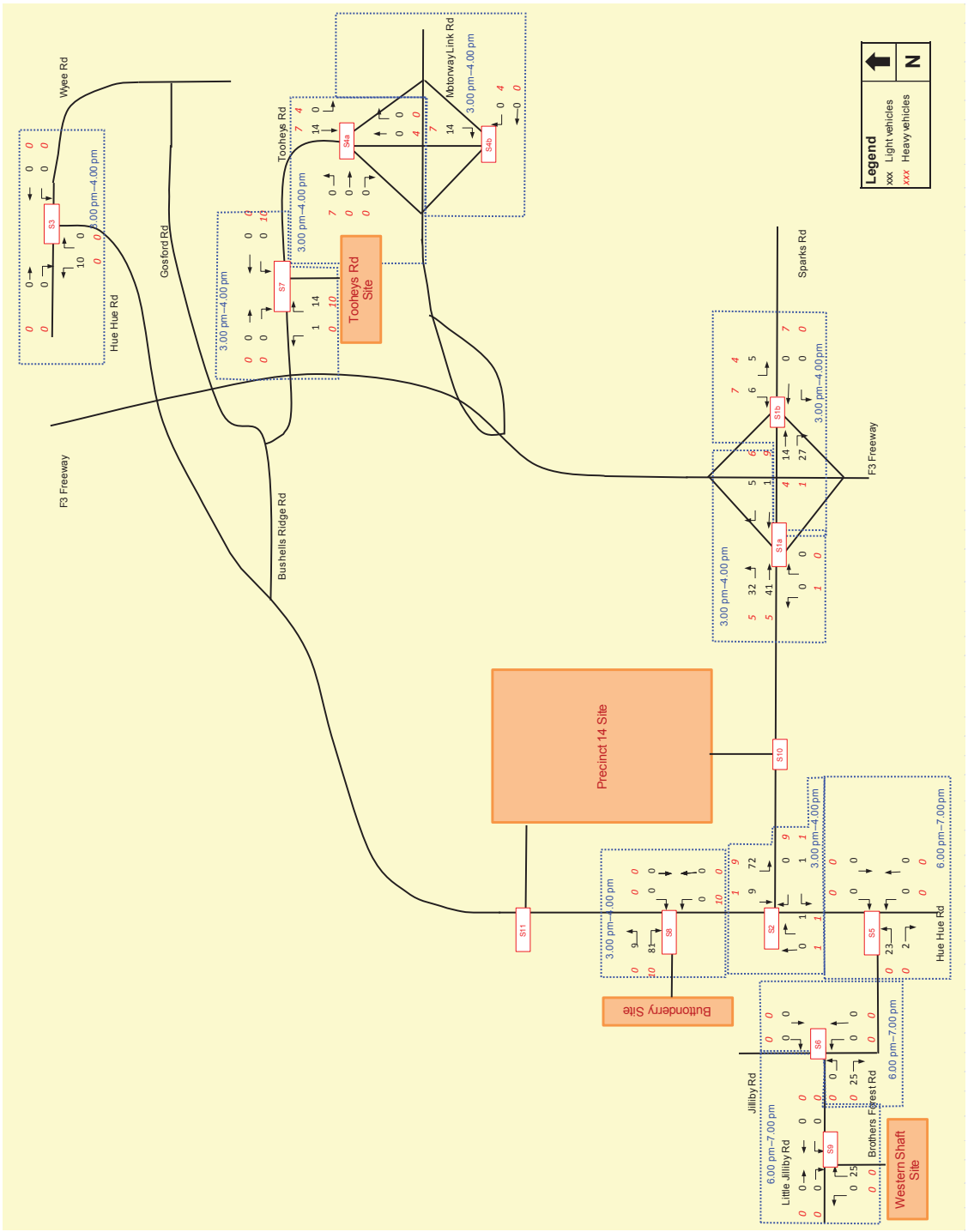


Figure 5.10 2026 traffic generation with mine operation and construction PM peak hour traffic volumes at the key intersections

5.5 Distribution by time of day

Two separate peak hours have been assessed for each future year scenario:

- Total traffic peak hours: representing the highest traffic volumes in the morning and afternoon periods associated with the sum of the background traffic growth; the operation of the surrounding developments; and the inclusion of the Project.
- Project traffic generation peak hours: the identified hour associated with the maximum traffic generation volumes in the morning and afternoon peaks associated with the Project's employee trips and delivery trips.

The selection of the peak hours for this assessment was in one-hour intervals at individual key intersections.

At some intersections, the total traffic peak hours are found to coincide with the Project traffic generation peak hours. In other circumstances, where there is a variance in the total traffic peak and the Project traffic generation peak, both peak hours are analysed for each future year scenario.

Figure 5.11 presents an example of the peak hour selection process for the Motorway Link Road/Tooheys Road intersection (northern side) for Scenario 6 (construction of the Western Ventilation Shaft, mine operational phase of the Tooheys Road Site and Buttonderry Site).

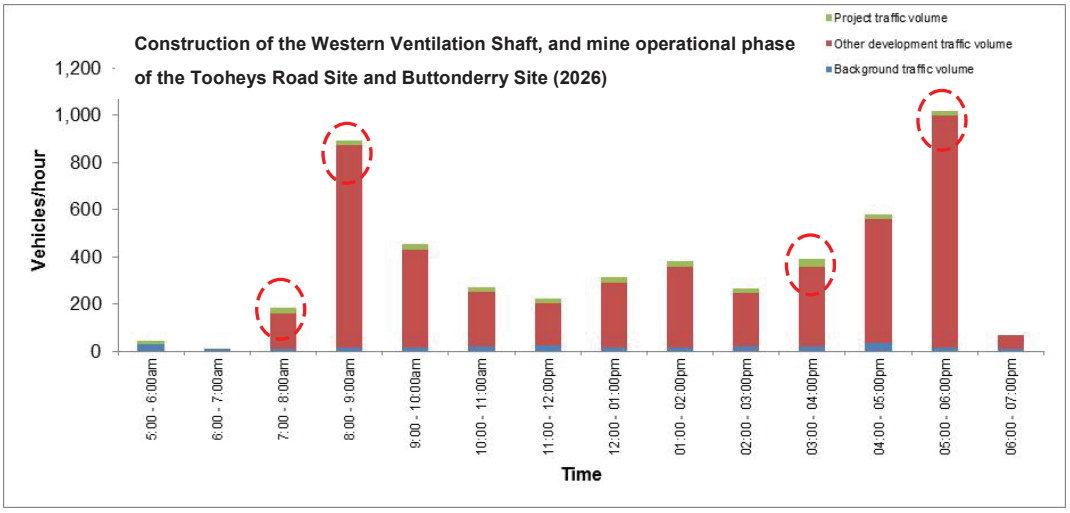


Figure 5.11 Example of selecting peak hours

The modelled traffic volumes are based on the sum of all traffic at the intersection in one-hour intervals - between 5.00 am and 7.00 pm. The modelling considers the following hourly traffic trips:

- Traffic associated with background traffic growth (shown as blue in the columns/bars).
- Traffic associated with operation and inclusion of the additional surrounding developments (shown as red in the columns/bars).
- Project traffic - associated with construction activities of the Western Ventilation Shaft and the operational activities to/from the Buttonderry Site and the Tooheys Road Site (shown as green in the columns/bars).

From Figure 5.11 above, it can be seen in this 2026 scenario that the total traffic peak hours (combination of all three coloured columns in relation to traffic associated with traffic growth, surrounding developments and the Project) would occur between 8.00 am and 9.00 am, and between 3.00 pm and 4.00 pm; the Project traffic generation peak hours (green) would occur between 7.00 am and 8.00 am, and between 3.00 pm and 4.00 pm, at the Motorway Link Road/Tooheys Road intersection (northern side).

This method has been applied to individual key intersections for each future year scenario.

5.6 Forecast traffic demand

The peak hour traffic volumes for each future year scenario are shown in the following sections. Traffic impacts at key intersections between the no-Project cases and with-Project cases were assessed for the future years during the background traffic peak hours and the Project traffic generation peak hours.

It should be noted that intersection turning volumes may not sum (equate) at mid-block locations in the following figures due to the fact that the peak hours and traffic growth rates may be different at each intersection.

5.6.1 Scenario 1: No-Project (2015) with background traffic growth and the inclusion of other surrounding developments

Future 2015 no-Project traffic volumes were calculated as the sum of the 2011 surveyed traffic and growth in the background traffic (ranging from 1.0% to 2.7% p.a. depending on location), plus operation of the following surrounding new developments:

- Tooheys Road 18 Lot Subdivision.
- Warnervale Airport Industrial Subdivision.

This scenario reflects a forecast scenario under the assumed future conditions if the Project did not proceed.

Figures 5.12 and 5.13 show the forecast future total traffic volumes at the key intersections for the ‘total traffic’ peak hours.

Figures 5.14 and 5.15 show the forecast future total traffic volumes at the key intersections during the ‘Project traffic generation’ peak hours. It should be noted that whilst the Project is assumed to **not** occur in this Scenario, the traffic volumes in these peak hours are still estimated in order to provide a comparison for those in Scenario 2, enabling traffic impacts to be assessed for the same hours.

It should be noted that at some intersections, the ‘total traffic peak’ hours and the ‘Project traffic peak’ hours coincide. Thus the results are identical.

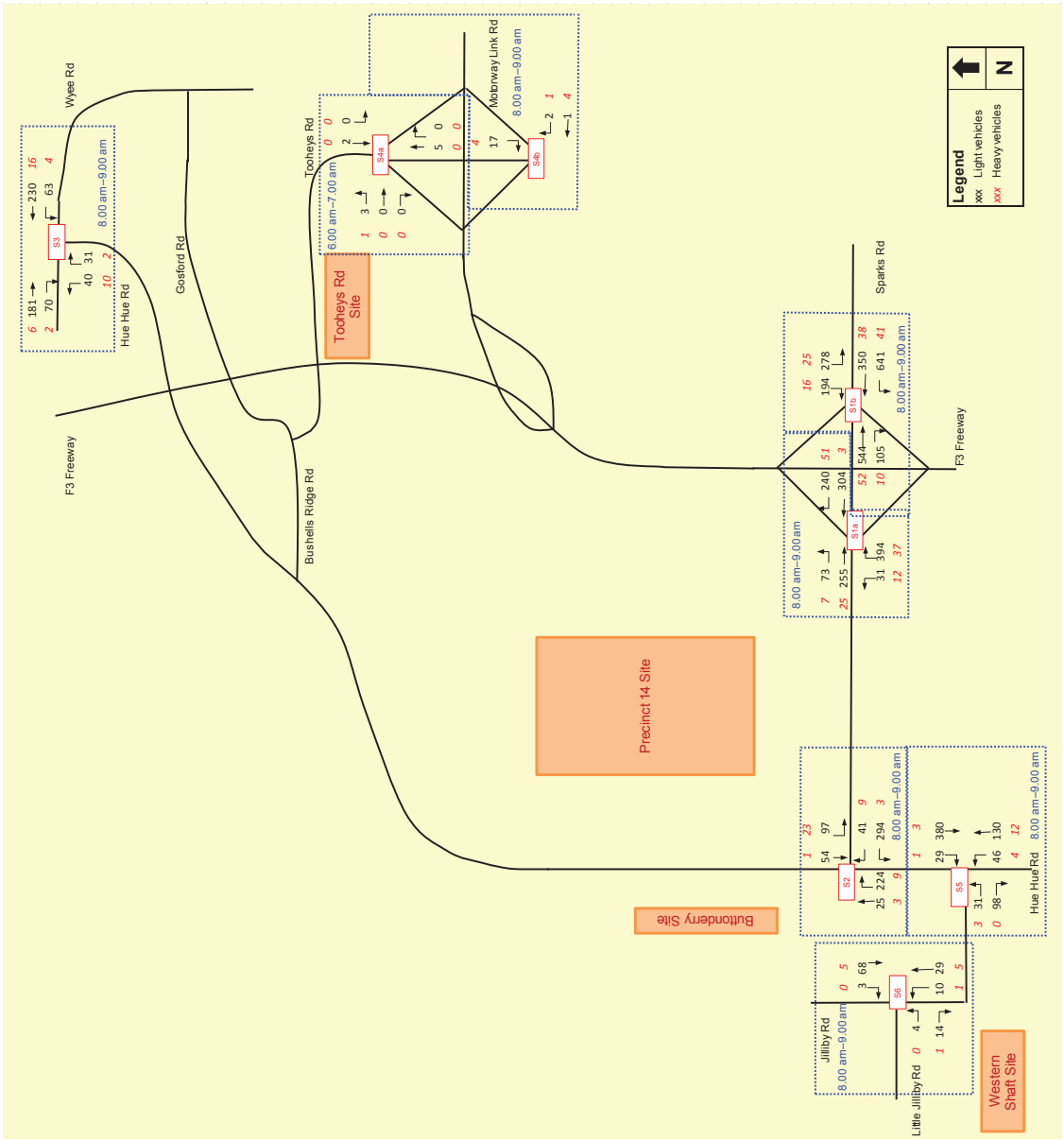


Figure 5.12 2015 No-Project AM peak hour traffic volumes at the key intersections – total traffic peak hour

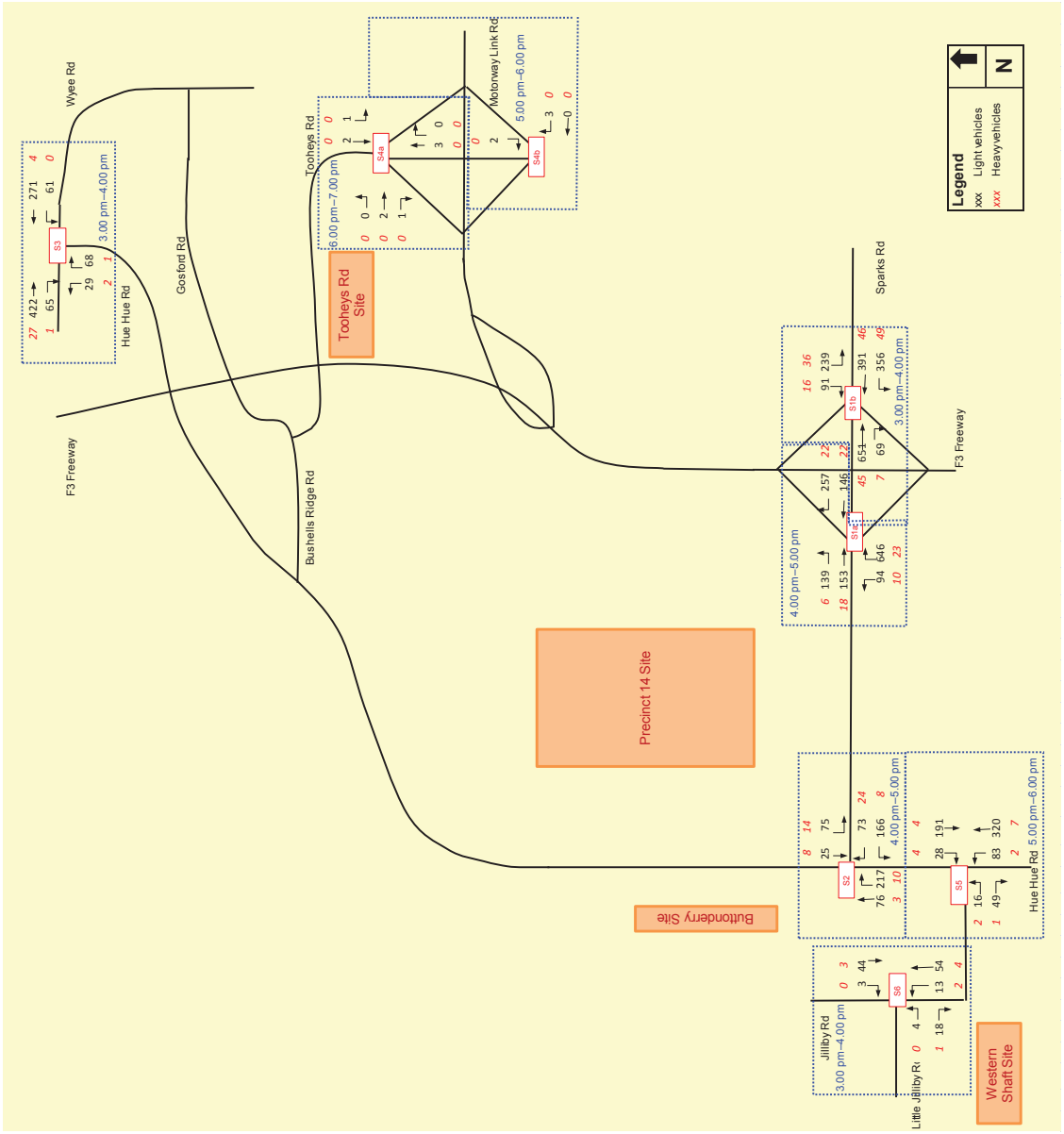


Figure 5.13 2015 No-Project PM peak hour traffic volumes at the key intersections – total traffic peak hour

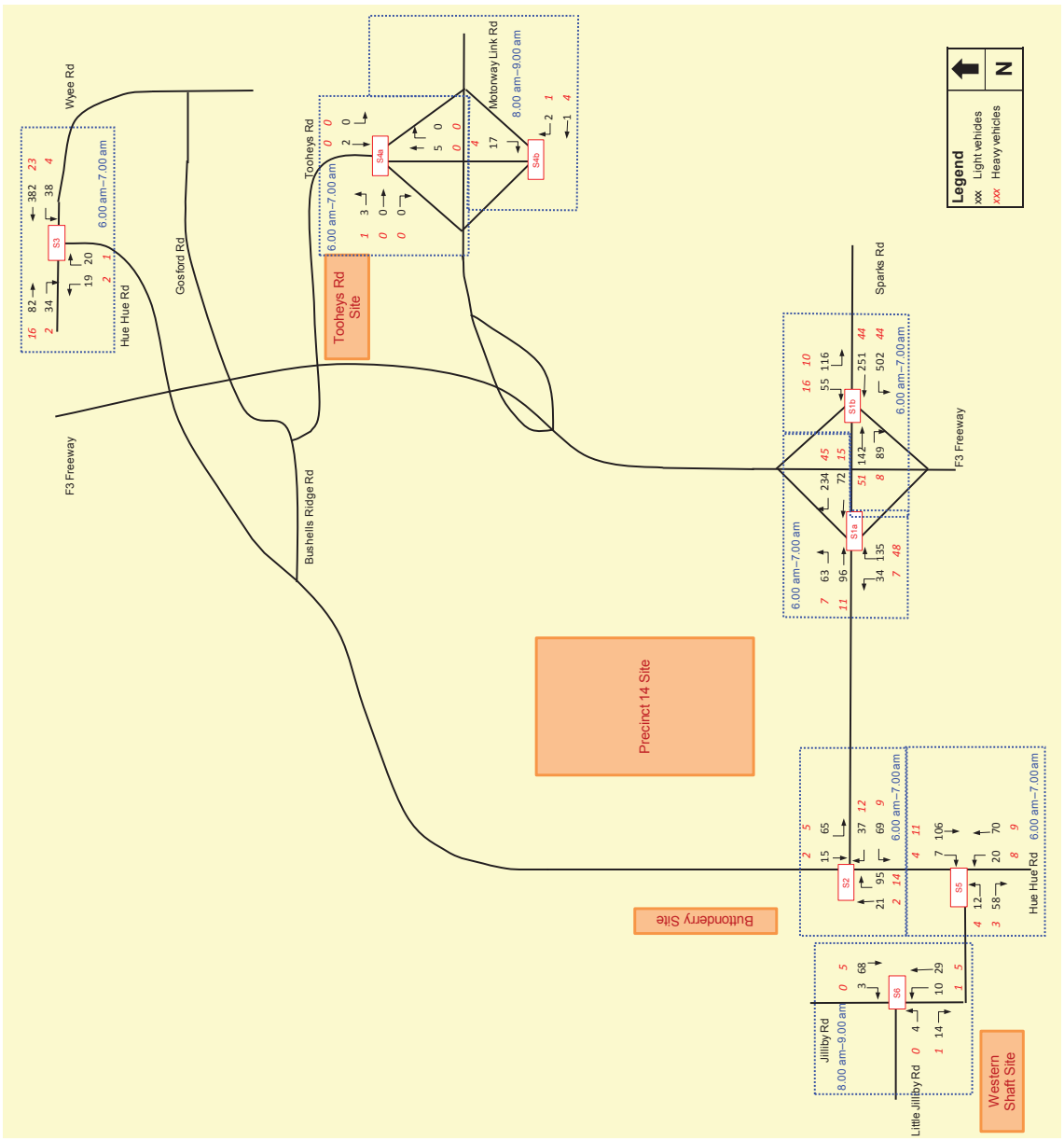


Figure 5.14 2015 No-Project AM peak hour traffic volumes at the key intersections – Project traffic generation peak hour

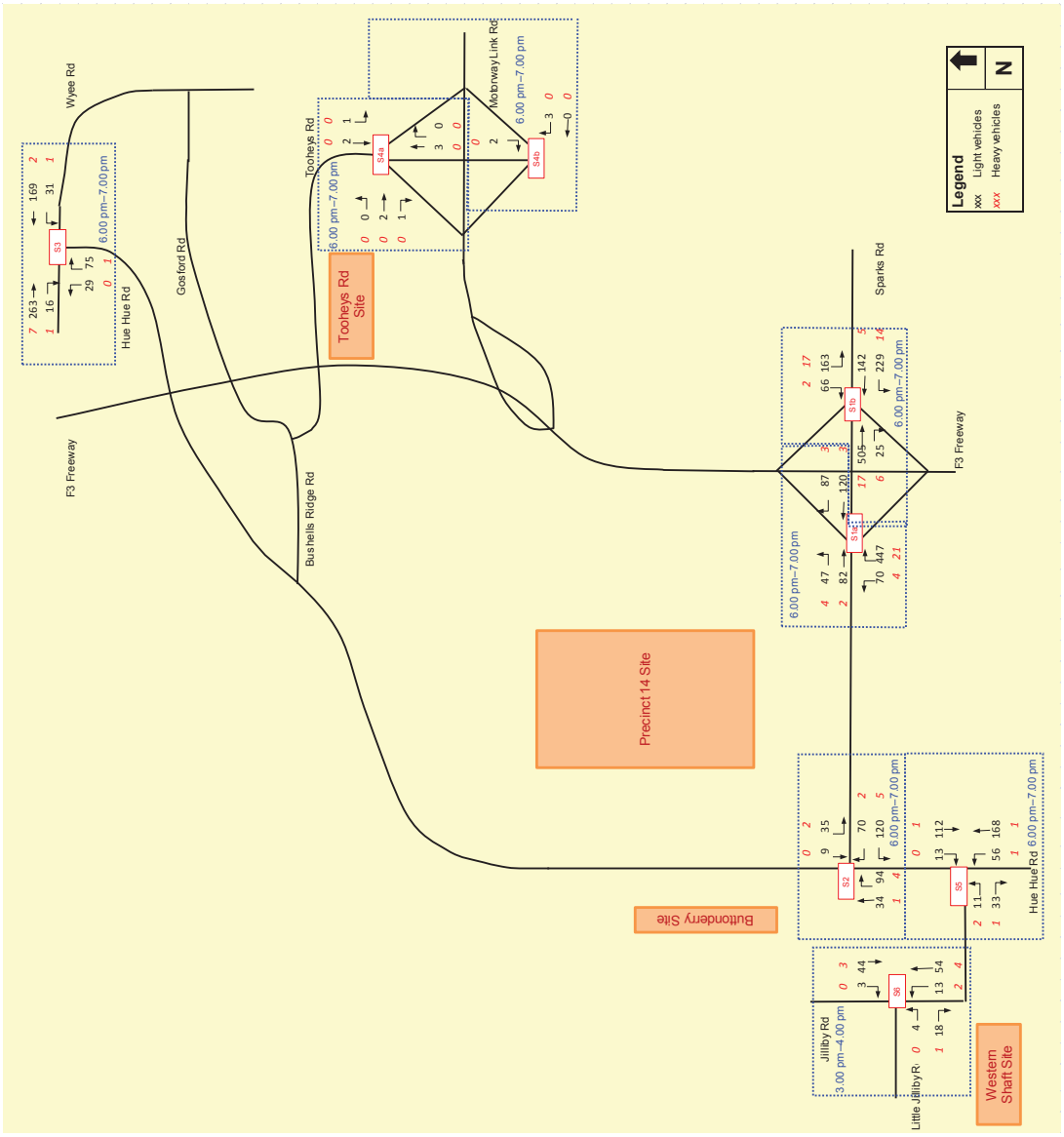


Figure 5.15 2015 No-Project PM peak hour traffic volumes at the key intersections – Project traffic generation peak hour

5.6.2 Scenario 2: construction phase for the Tooheys Road and Buttonderry Sites (2015), with background traffic growth and the inclusion of other surrounding developments

Future traffic volumes were calculated as the sum of the 2011 surveyed traffic, growth in the background traffic (ranging from 1.0% to 2.7% p.a. depending on location), the operation of the following surrounding new developments and the traffic generation associated with the construction of the Tooheys Road Site and Buttonderry Site (refer to Tables 5.3 and 5.4):

- Tooheys Road 18 Lot Subdivision.
- Warnervale Airport Industrial Subdivision.

Figures 5.16 and 5.17 show the forecast future traffic assigned to the key intersections in the 'total traffic peak' hours.

Figures 5.18 and 5.19 show the forecast future traffic assigned to the key intersections during the identified 'Project traffic generation' peak hours.

It should be noted that at some intersections, the 'total traffic peak' hours and the 'Project traffic peak' hours coincide. Thus the results are identical.

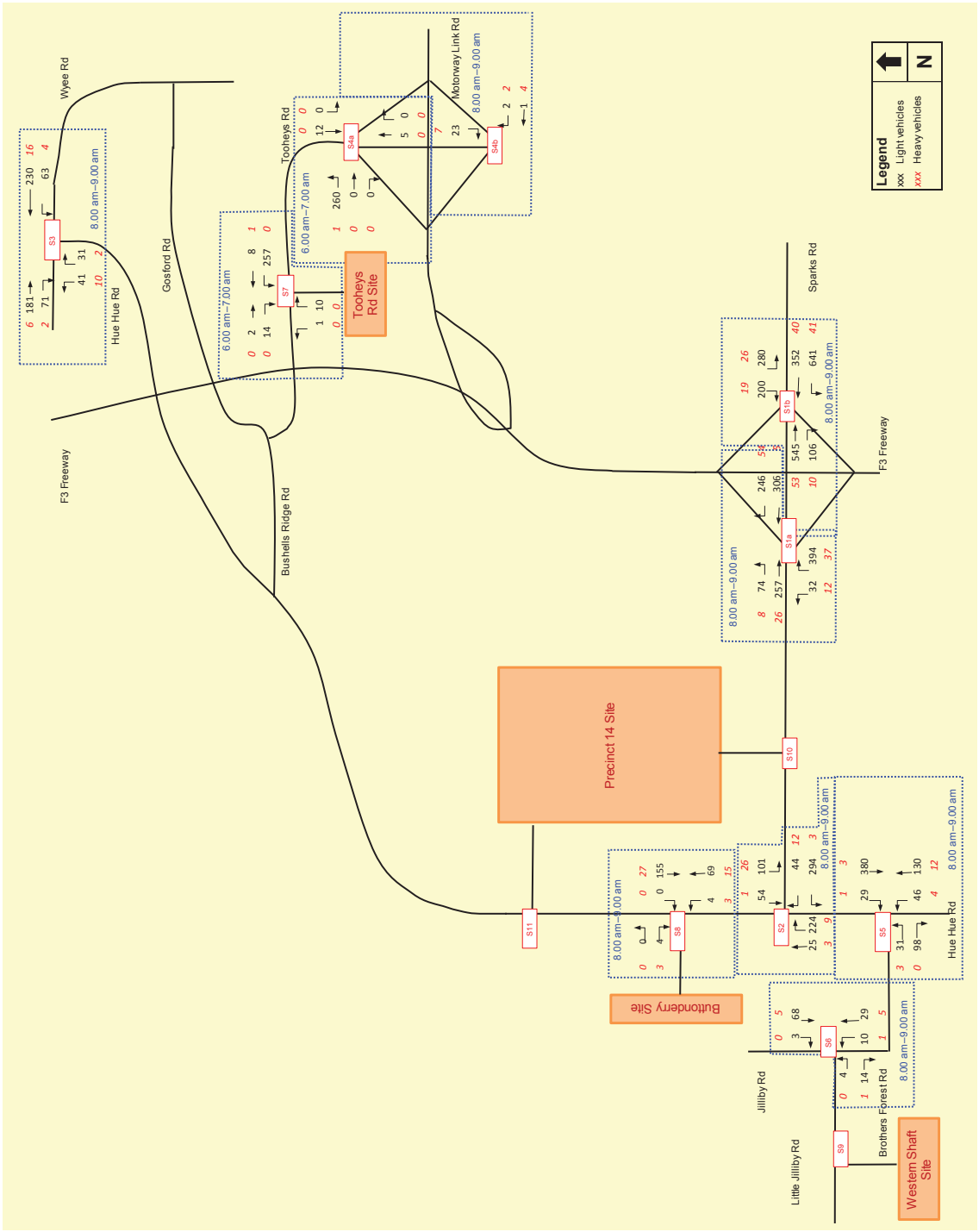


Figure 5.16 2015 with mine construction AM peak hour traffic volumes at the key intersections – total traffic peak hour

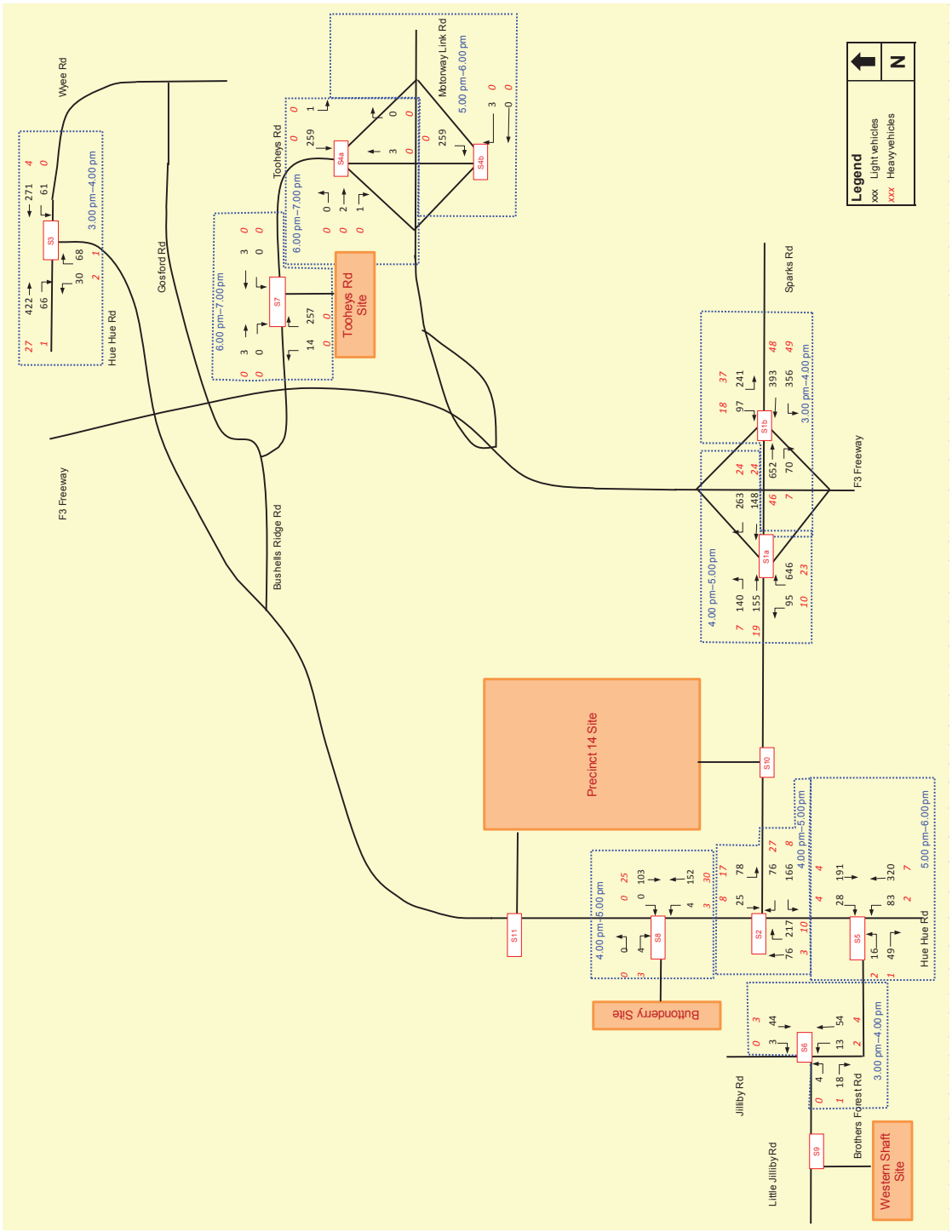


Figure 5.17 2015 with mine construction PM peak hour traffic volumes at the key intersections – total traffic peak hour

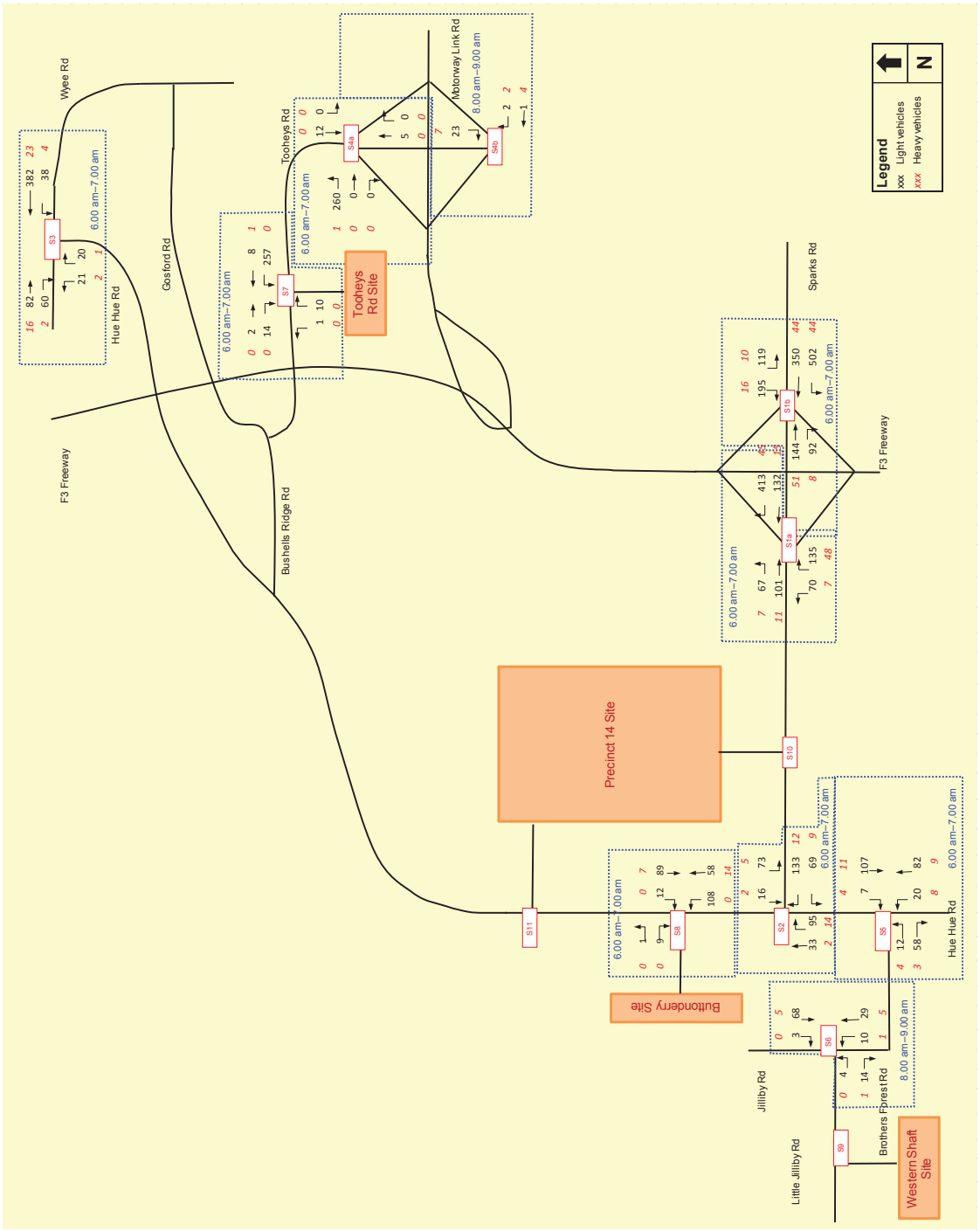


Figure 5.18 2015 with mine construction AM peak hour traffic volumes at the key intersections – Project traffic generation peak hour

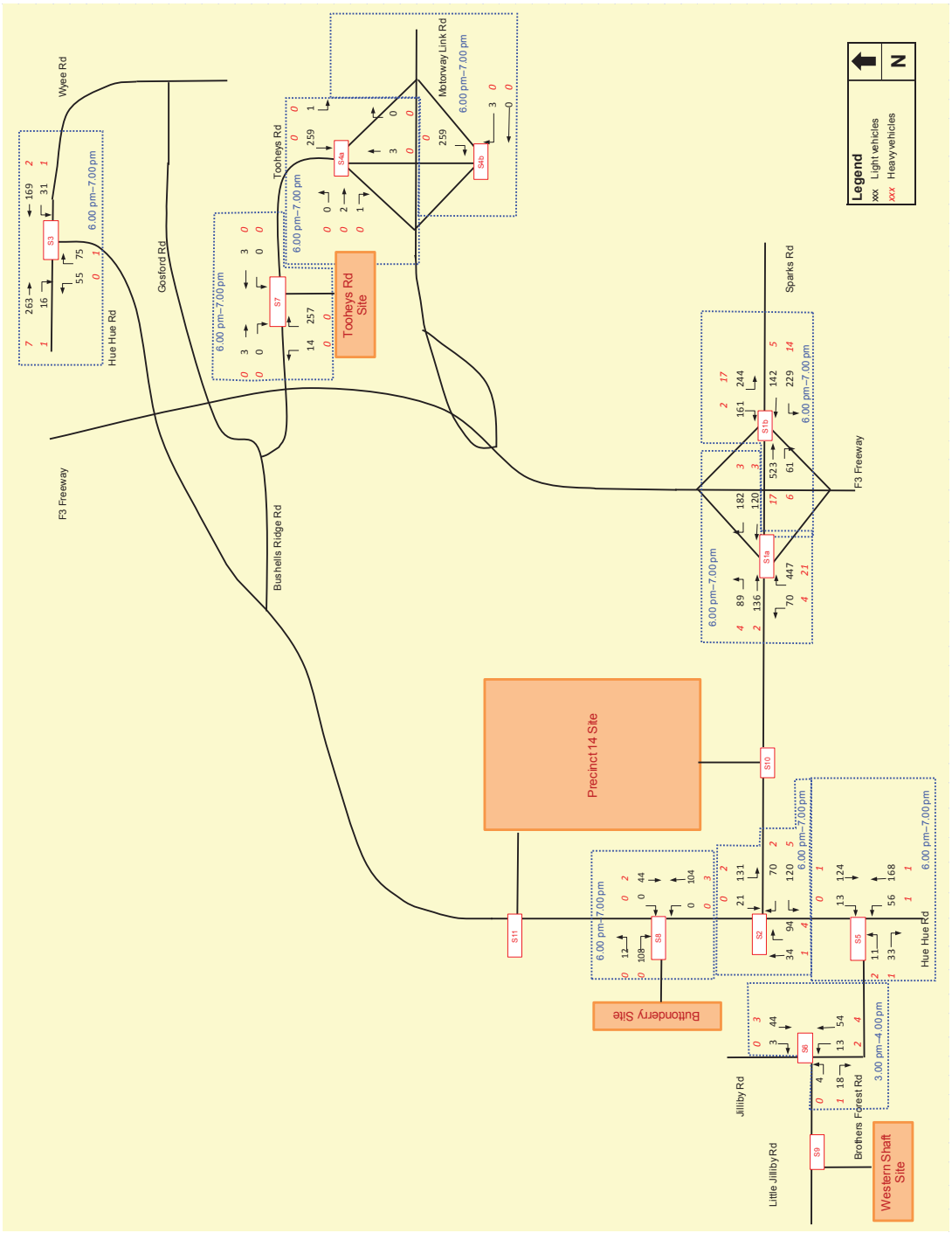


Figure 5.19 2015 with mine construction PM peak hour traffic volumes at the key intersections – Project traffic generation peak hour

5.6.3 Scenario 3: No-Project (2025) with background traffic growth and the inclusion of other surrounding developments

Future 2025 no-Project traffic volumes were calculated as the sum of the 2011 surveyed traffic and growth in the background traffic (ranging from 1.0% to 2.7% p.a. depending on location), plus the operation/inclusion of the following surrounding new developments:

- Woolworths Retail Facility.
- Wyong Employment Zone.
- Warner Industrial Park.
- Bushells Ridge Employment Estate.
- Tooheys Road 18 Lot Subdivision.
- Warnervale Airport Industrial Subdivision.

This scenario forecasts the conditions that would exist if the Project did not proceed.

Figures 5.20 and 5.21 show the forecast future traffic assigned to the key intersections in the 'total traffic peak' hours.

Figures 5.22 and 5.23 show the forecast future traffic assigned to the key intersections in the 'Project traffic generation peak' hours. Note: Whilst the Project is assumed to **not** occur in this Scenario, the traffic volumes in these peak hours are still estimated in order to provide a comparison for those in Scenario 4, enabling traffic impacts to be assessed for the same hours.

It should be noted that at some intersections, the 'total traffic peak' hours and the 'Project traffic peak' hours coincide. Thus the results are identical.

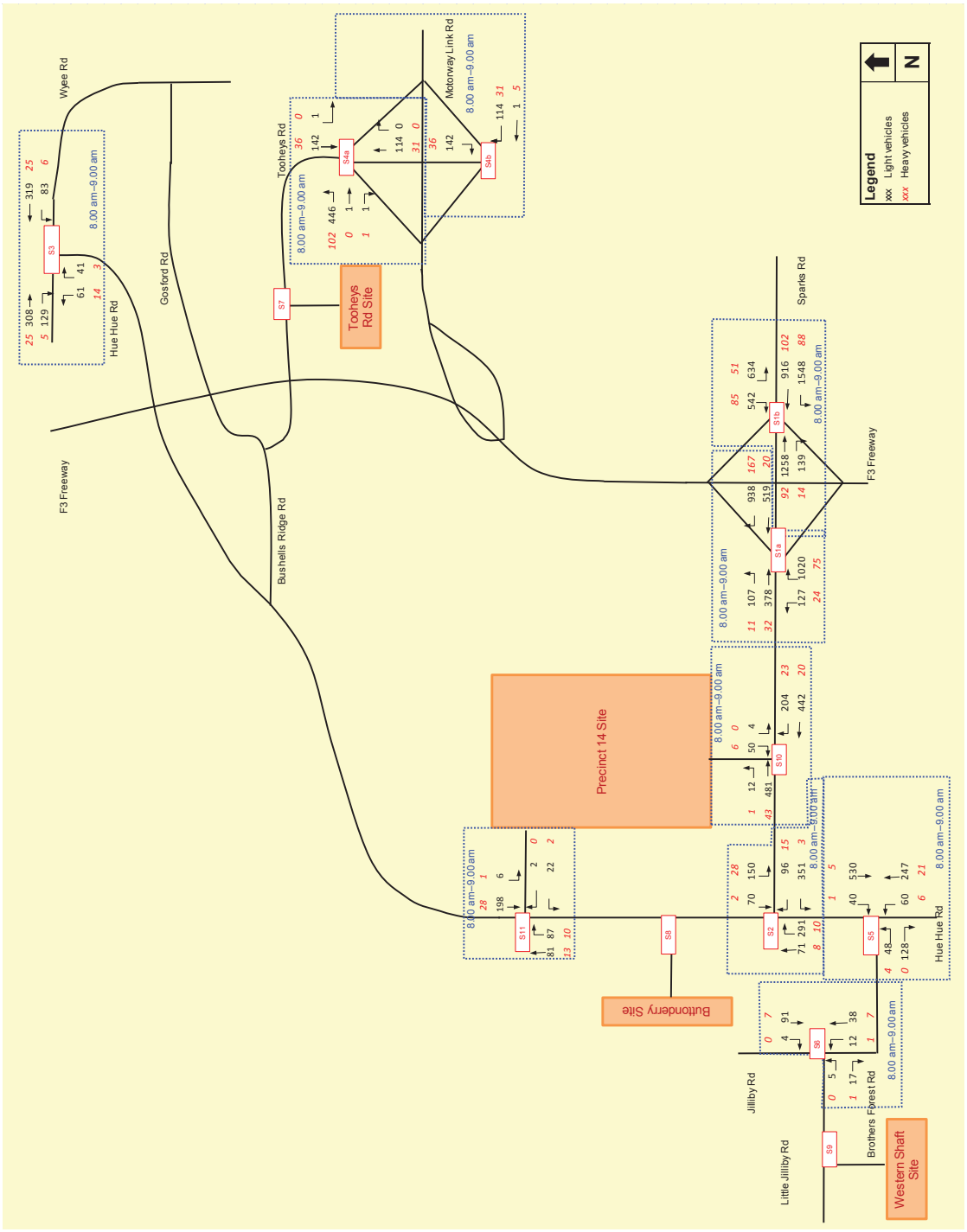


Figure 5.20 2025 No-Project AM peak hour traffic volumes at the key intersections – total traffic peak hour

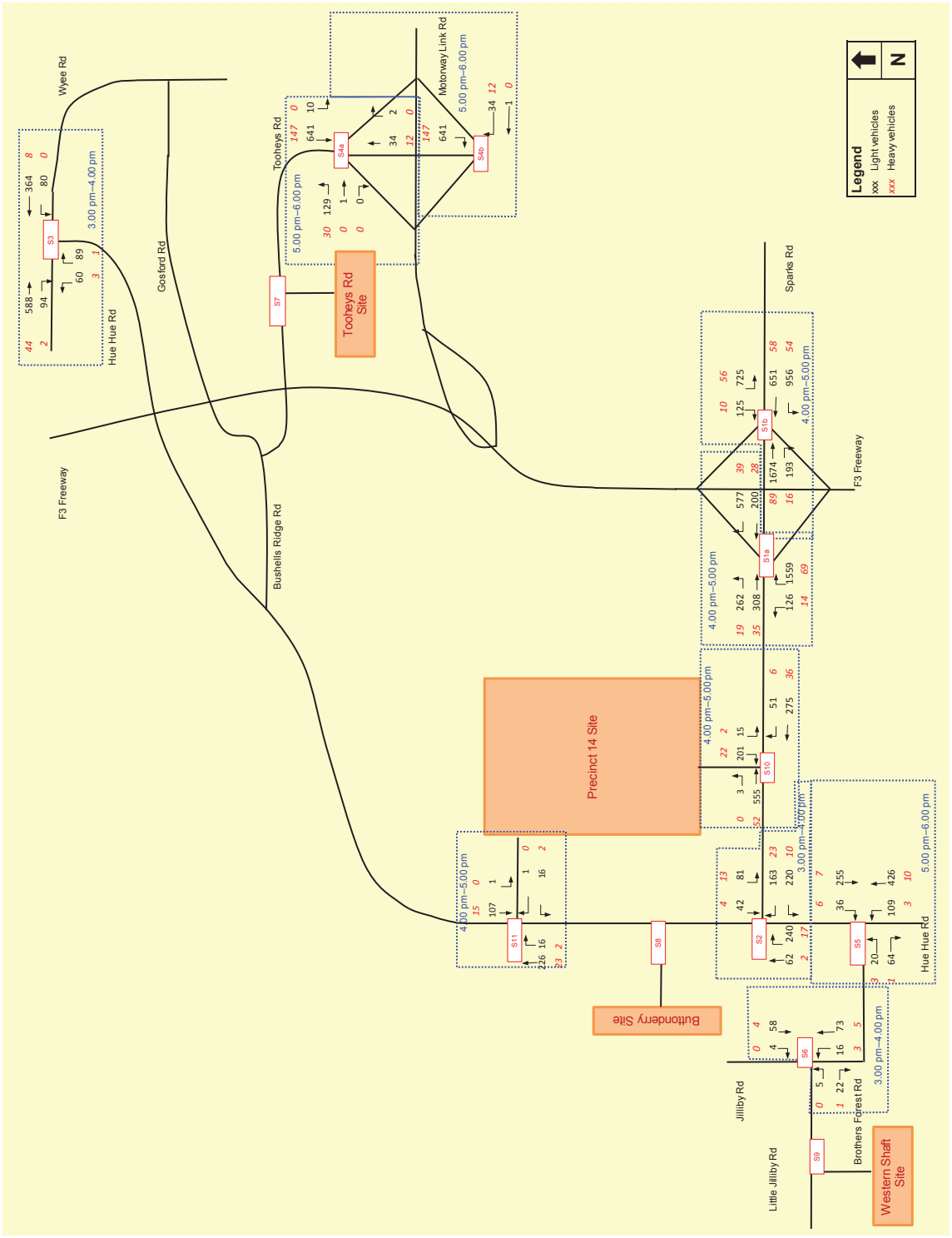


Figure 5.21 2025 No-Project PM peak hour traffic volumes at the key intersections – total traffic peak hour

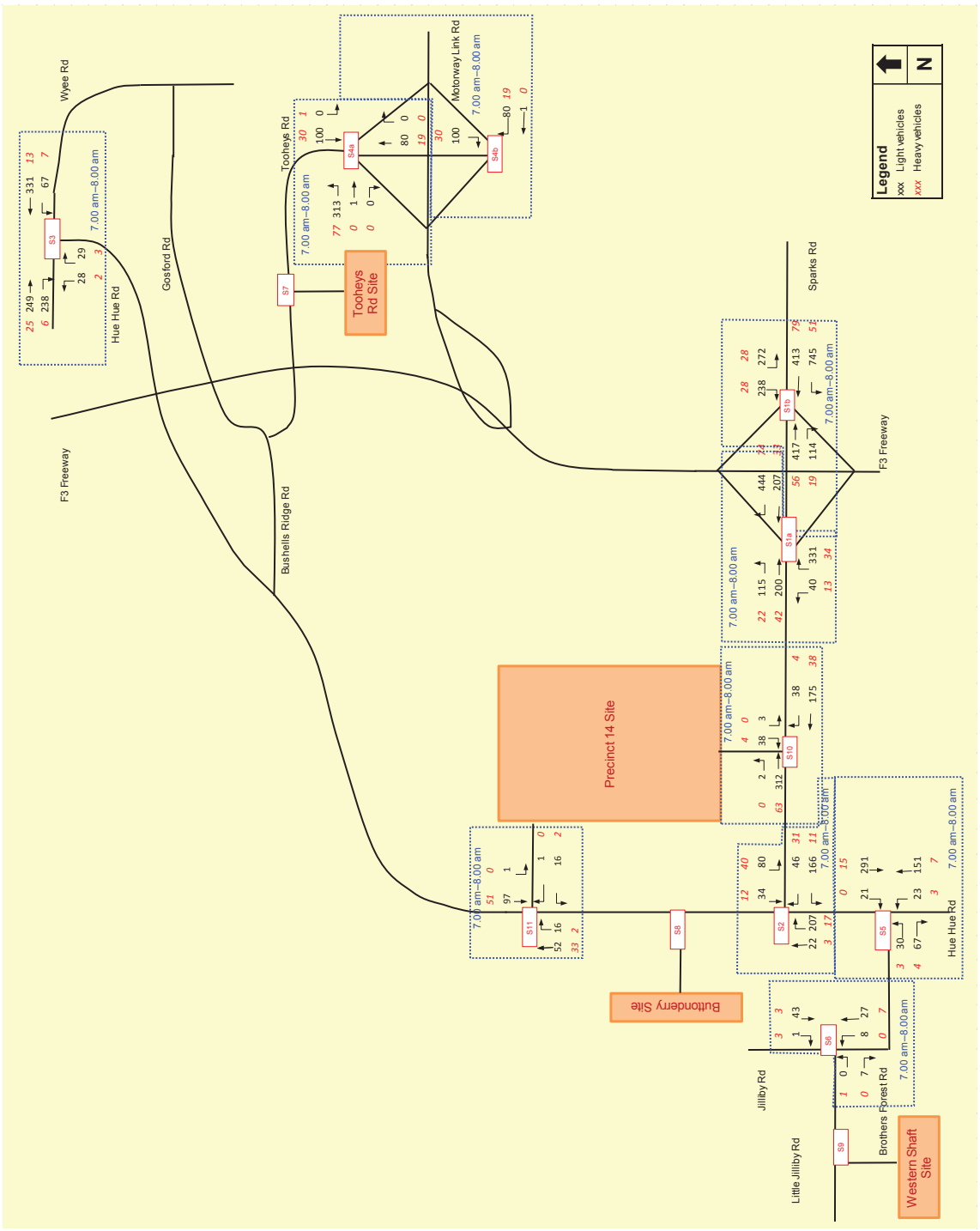


Figure 5.22 2025 No-Project AM peak hour traffic volumes at the key intersections – Project traffic generation peak hour

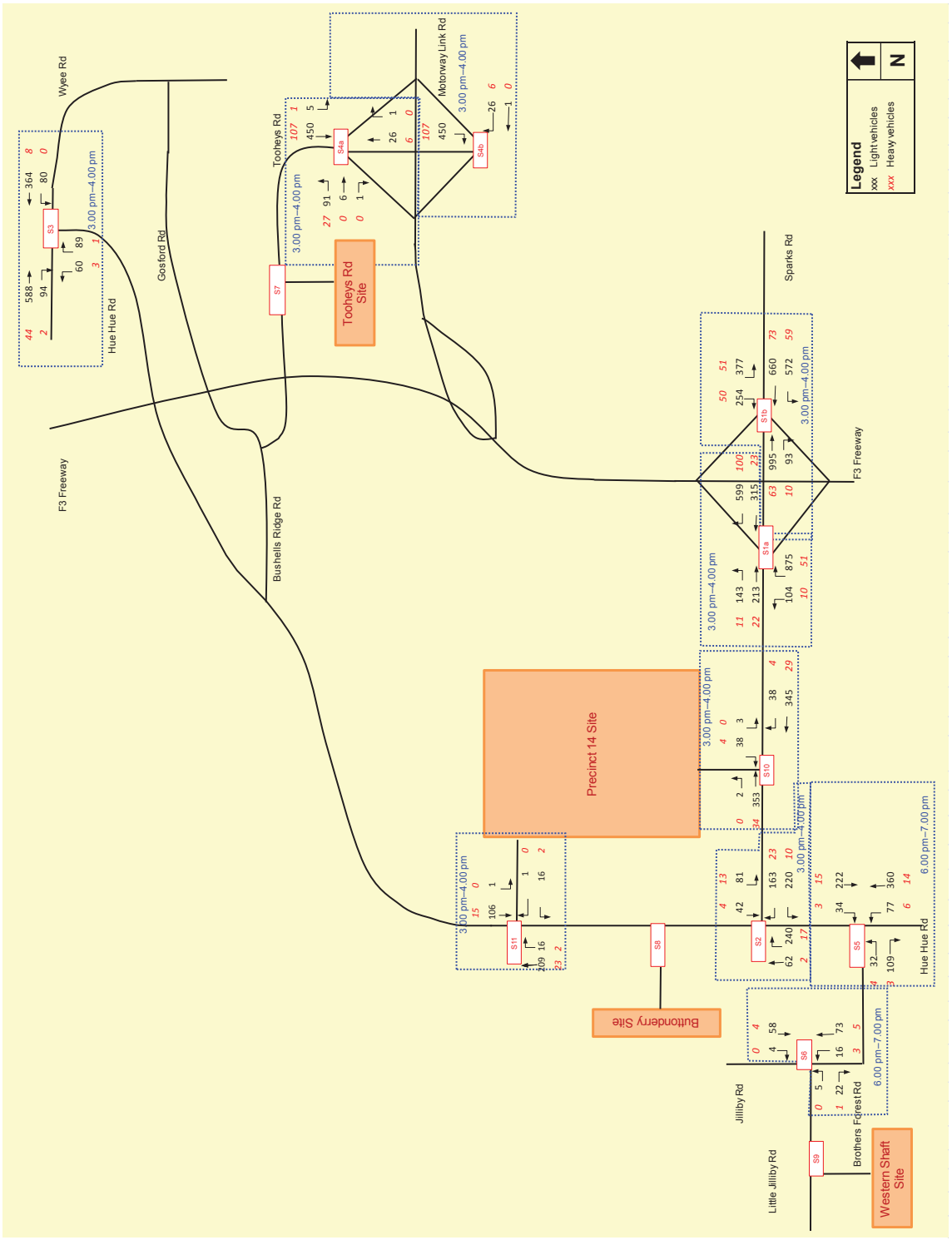


Figure 5.23 2025 No-Project PM peak hour traffic volumes at the key intersections – Project traffic generation peak hour

5.6.4 Scenario 4: mine operational phase of the Tooheys Road Site and Buttonderry Site (2025) with background traffic growth and the inclusion of other surrounding developments

Future traffic volumes were calculated as the sum of the 2011 surveyed traffic, growth in the background traffic (ranging from 1.0% to 2.7% p.a. depending on location), operation of the following surrounding developments and the traffic generation associated with the operation of the Tooheys Road Site and Buttonderry Site (refer to Tables 5.7 and 5.8):

- Woolworths Retail Facility.
- Wyong Employment Zone.
- Warner Industrial Park.
- Bushells Ridge Employment Estate.
- Tooheys Road 18 Lot Subdivision.
- Warnervale Airport Industrial Subdivision.

Figures 5.24 and 5.25 show the forecast future traffic assigned to the key intersections in the 'total traffic peak' hours.

Figures 5.26 and 5.27 show the forecast future traffic assigned to the key intersections in the 'Project traffic generation peak' hours.

It should be noted that at some intersections, the 'total traffic peak' hours and the 'Project traffic peak' hours coincide. Thus the results are identical.

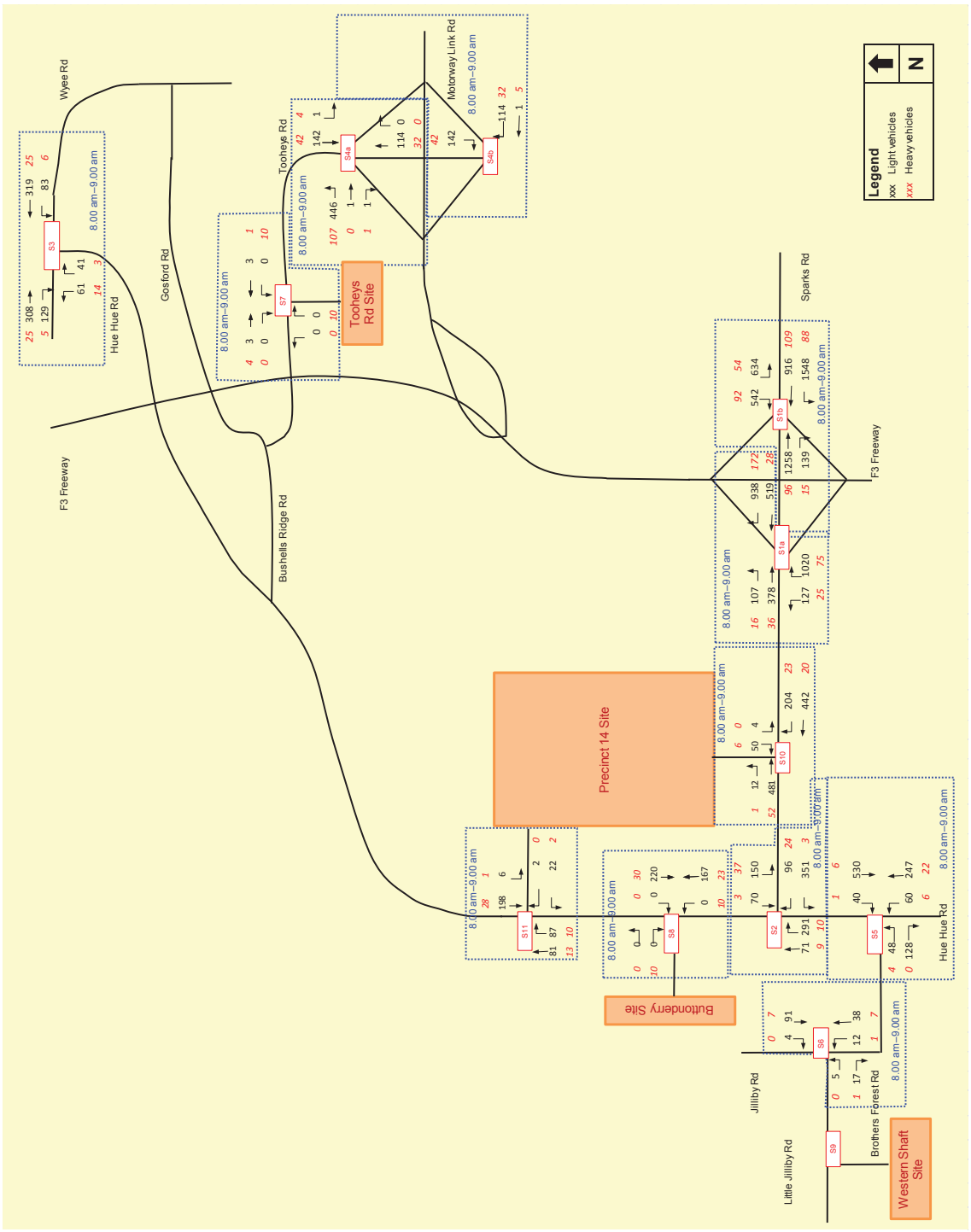


Figure 5.24 2025 with mine operation AM peak hour traffic volumes at the key intersections – total traffic peak hour

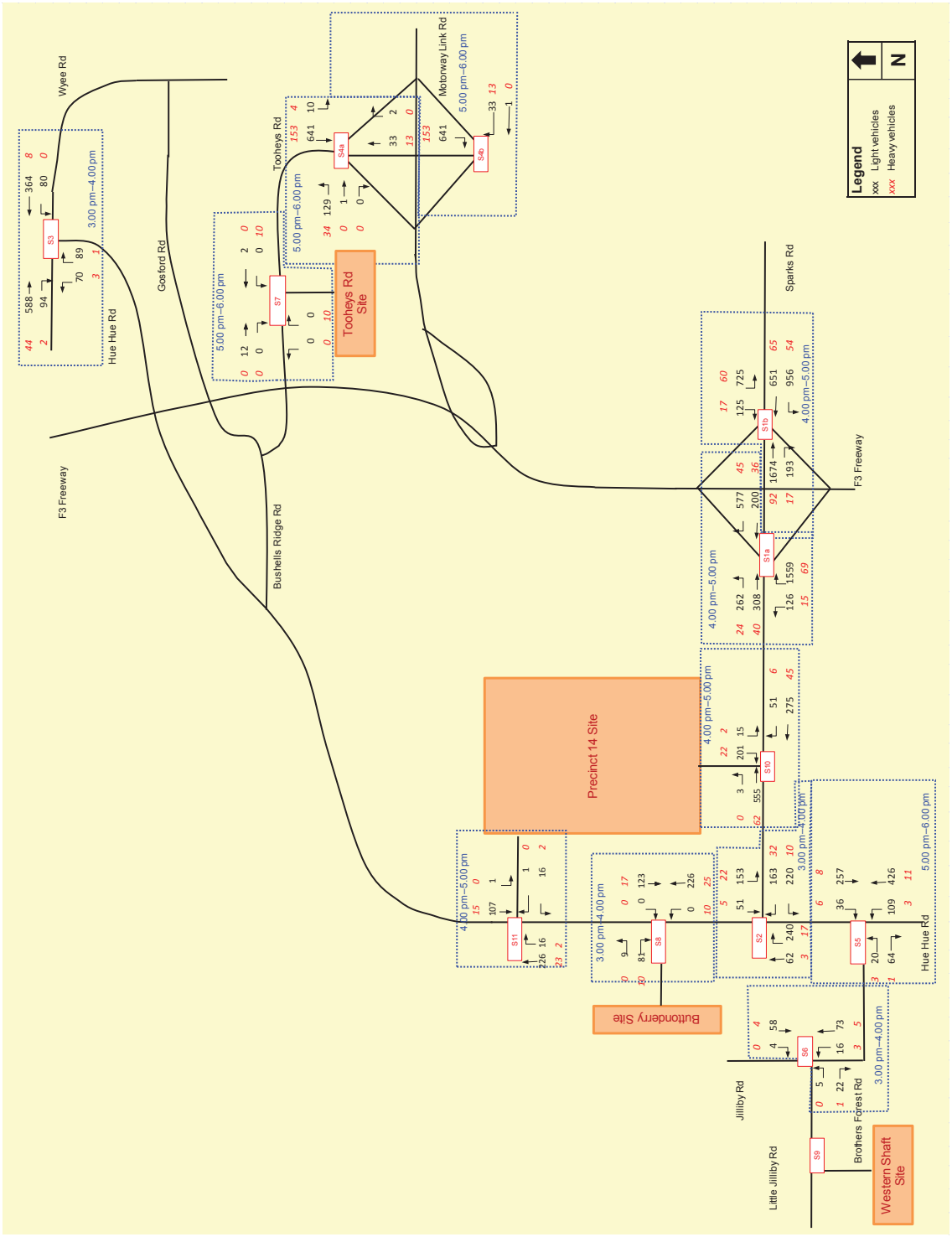


Figure 5.25 2025 with mine operation PM peak hour traffic volumes at the key intersections – total peak hour

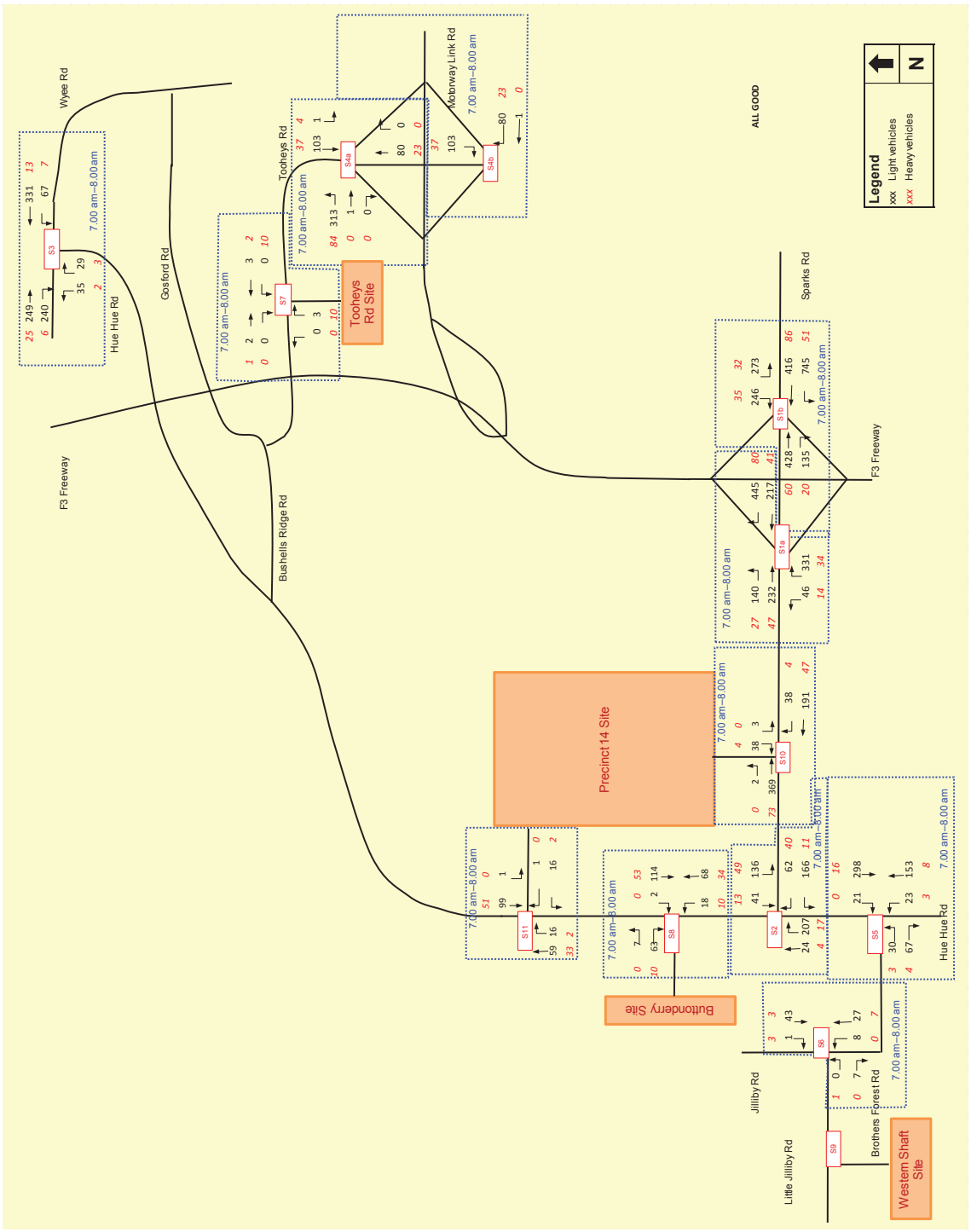


Figure 5.26 2025 with mine operation AM peak hour traffic volumes at the key intersections – Project traffic generation peak hour

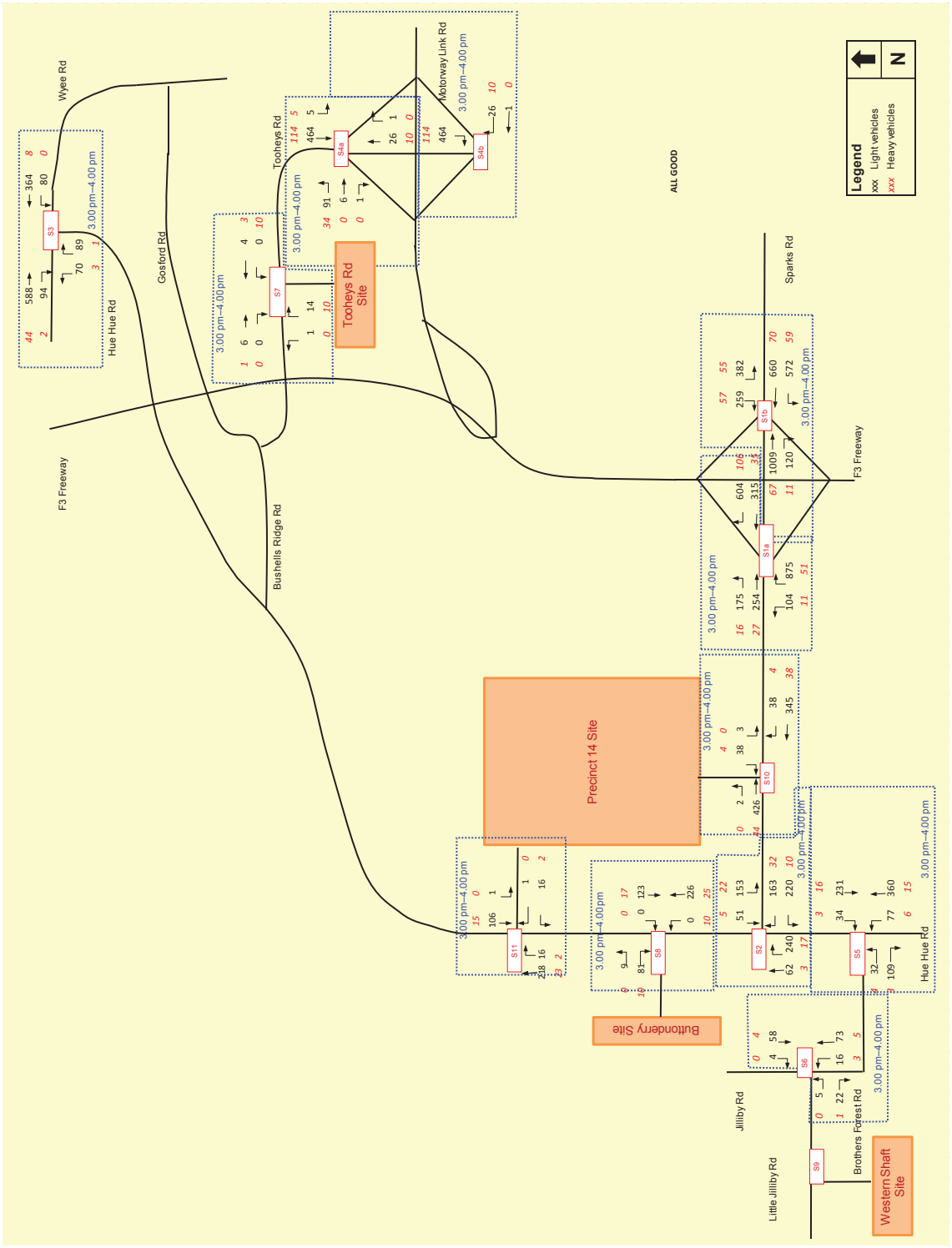


Figure 5.27 2025 with mine operation PM peak hour traffic volumes at the key intersections – Project traffic generation peak hour

5.6.5 Scenario 5: No-Project (2026) with background traffic growth and the inclusion of other surrounding developments

Future 2026 no-Project traffic volumes were calculated as the sum of the 2011 surveyed traffic and growth in the background traffic (ranging from 1.0% to 2.7% p.a. depending on location), plus the operation of the following surrounding new developments:

- Woolworths Retail Facility.
- Wyong Employment Zone.
- Warner Industrial Park.
- Bushells Ridge Employment Estate.
- Tooheys Road 18 Lot Subdivision.
- Warnervale Airport Industrial Subdivision.

This scenario forecasts the conditions that would exist if the Project did not proceed.

Figures 5.28 and 5.29 show the forecast future traffic assigned to the key intersections in the 'total traffic peak' hours.

Figures 5.30 and 5.31 show the forecast future traffic assigned to the key intersections in the 'Project traffic generation traffic' hours. Note: Whilst the Project is assumed to **not** occur in this Scenario, the traffic volumes in these peak hours are still estimated in order to provide a comparison for those in Scenario 6, enabling traffic impacts to be assessed for the same hours.

It should be noted that at some intersections, the 'total traffic peak' hours and the 'Project traffic peak' hours coincide. Thus the results are identical.

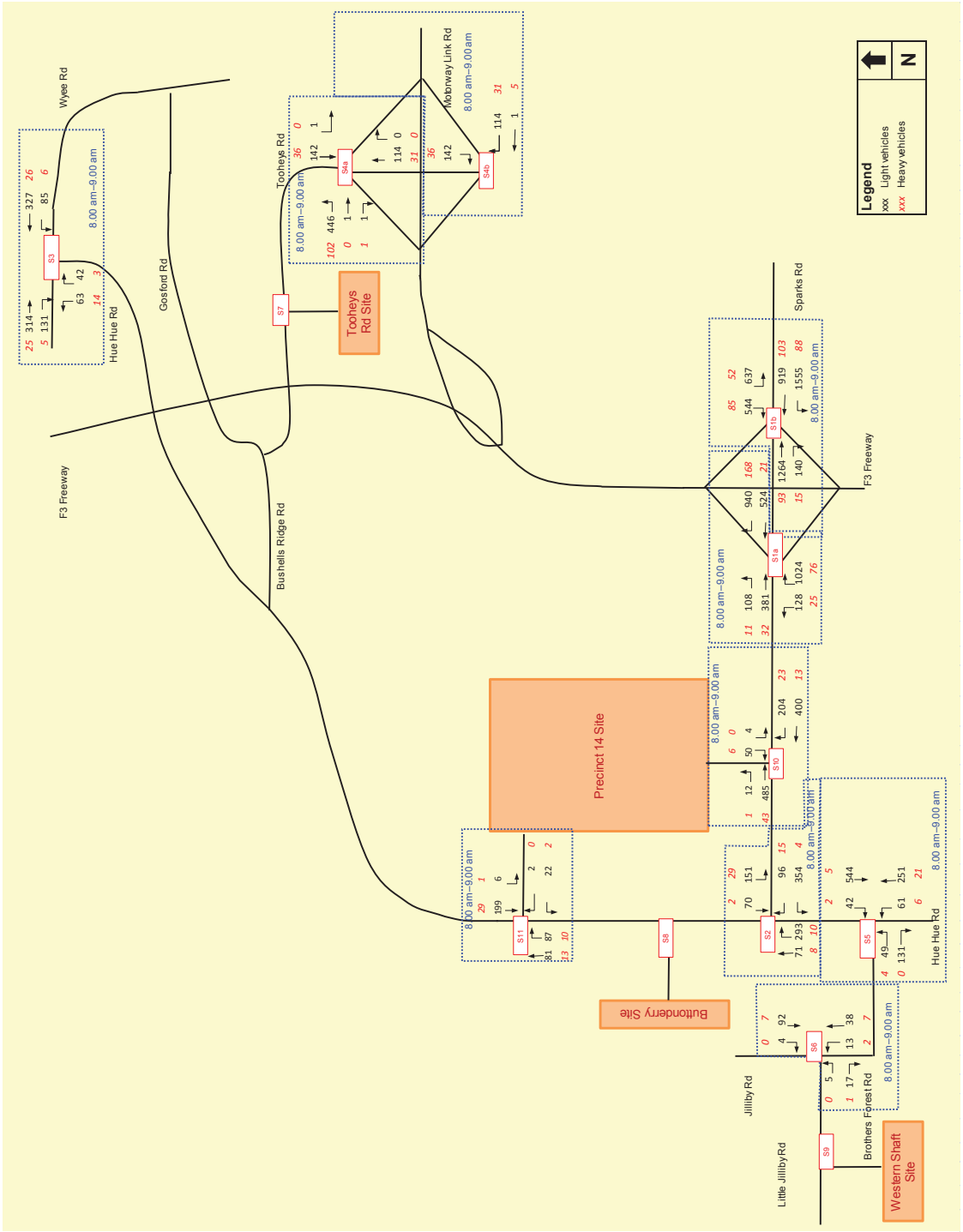


Figure 5.28 2026 No-Project AM peak hour traffic volumes at the key intersections – total traffic peak hour

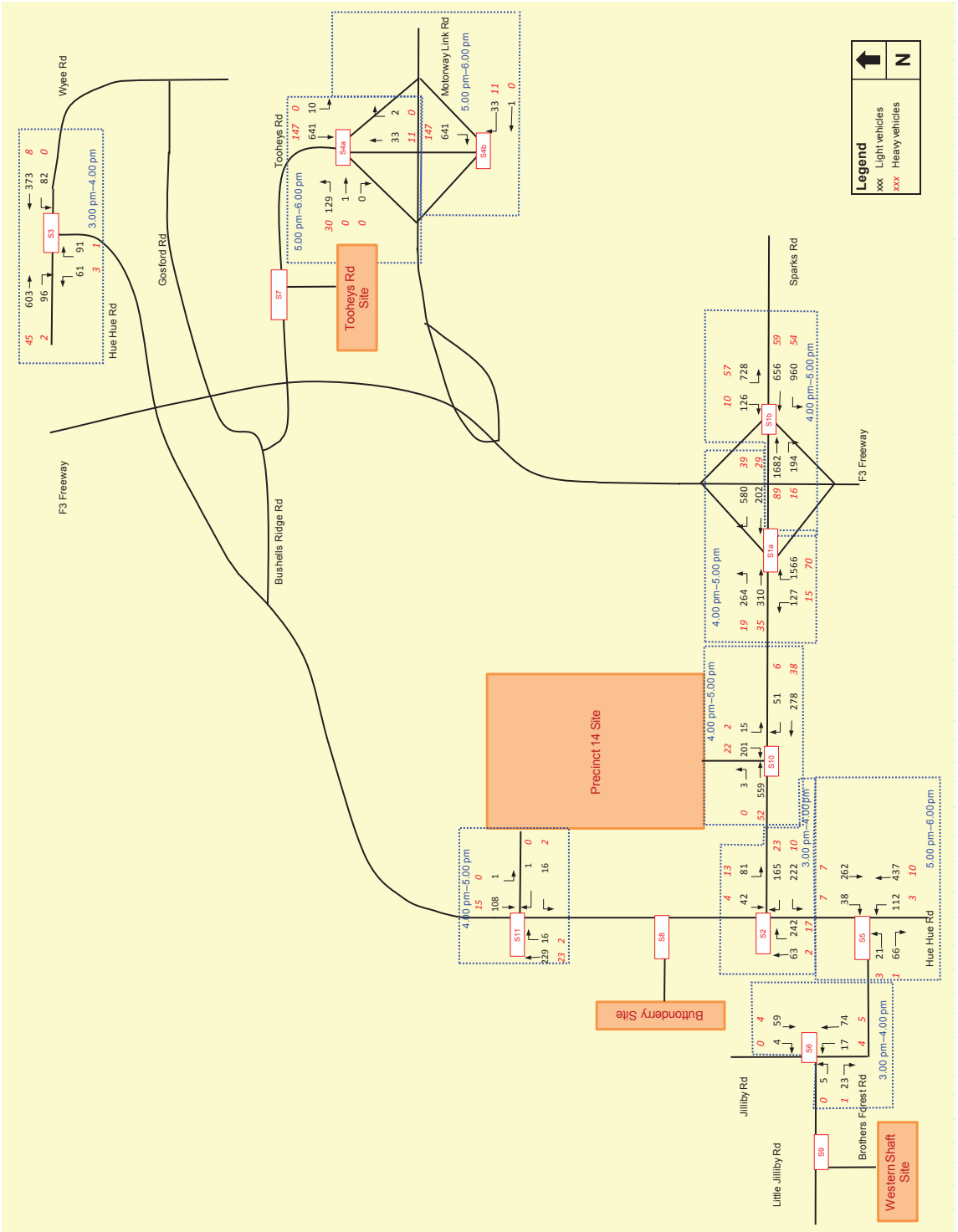


Figure 5.29 2026 No-Project PM peak hour traffic volumes at the key intersections – total traffic peak hour

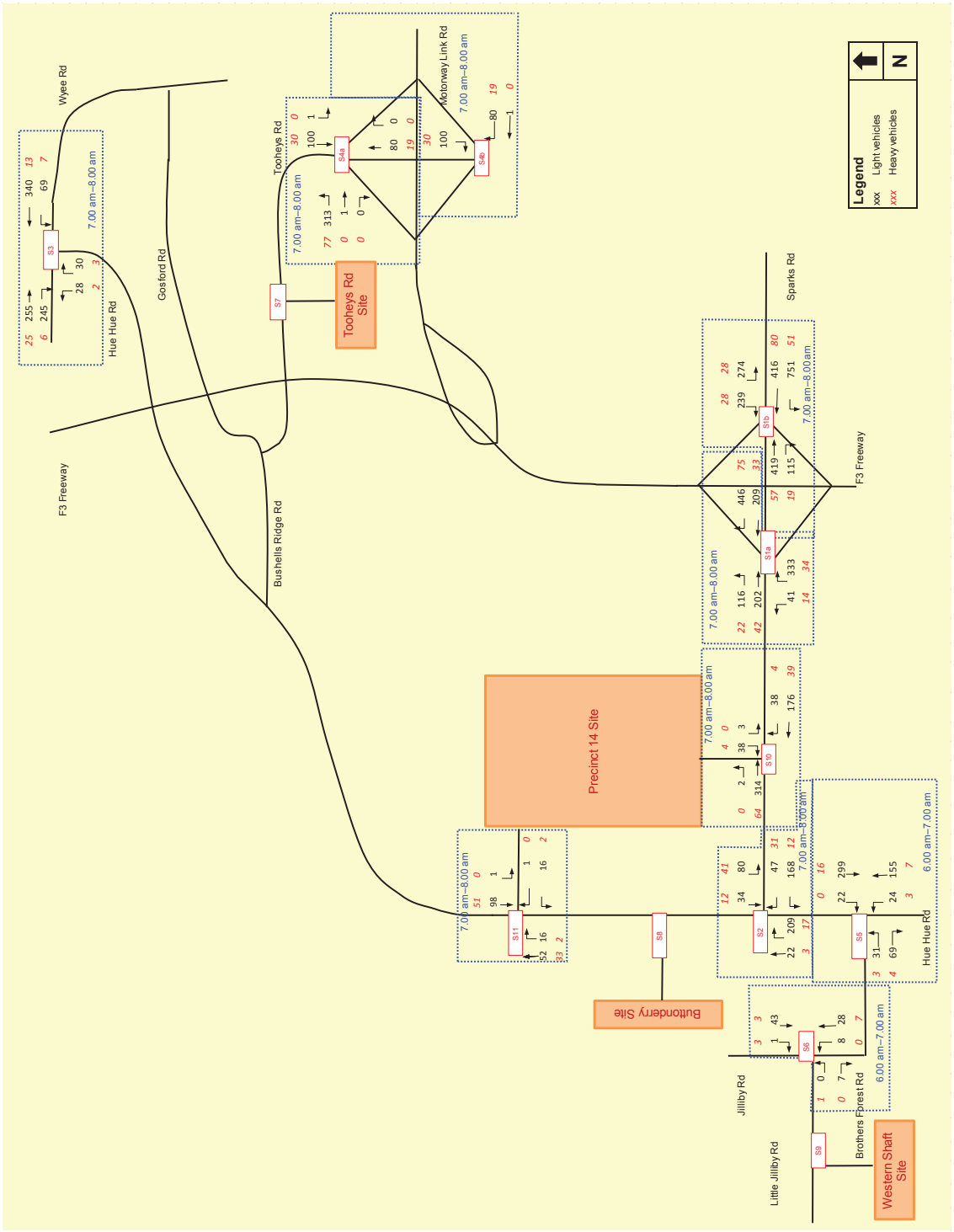


Figure 5.30 2026 No-Project AM peak hour traffic volumes at the key intersections – Project traffic generation peak hour

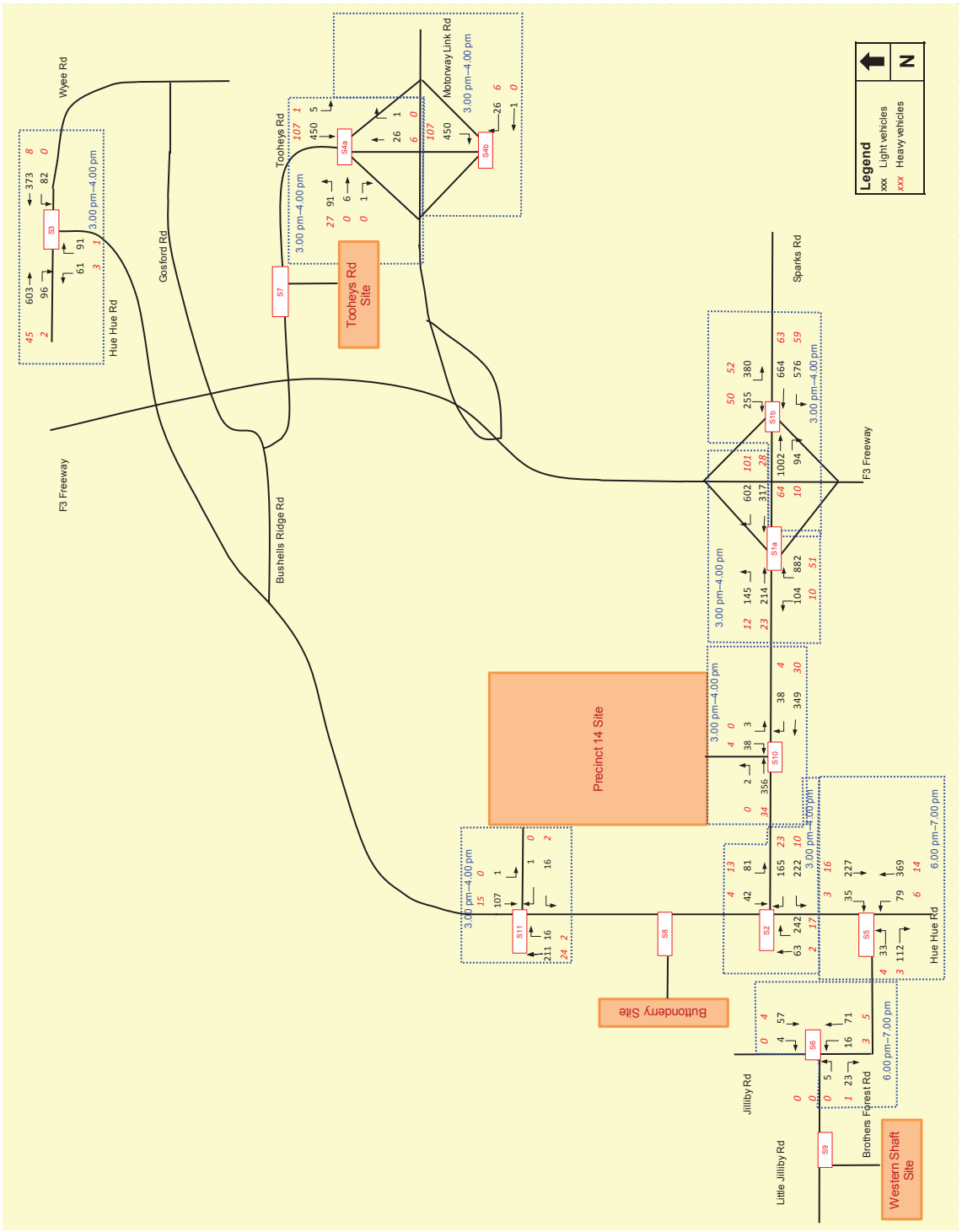


Figure 5.31 2026 No-Project PM peak hour traffic volumes at the key intersections – Project traffic generation peak hour

5.6.6 Scenario 6: construction of the Western Ventilation Shaft, and mine operational phase of the Tooheys Road Site and Buttonderry Site (2026) with background traffic growth and the inclusion of other surrounding developments

Future traffic volumes were calculated as the sum of the 2011 surveyed traffic, growth in the background traffic (ranging from 1.0% to 2.7% p.a. depending on location), the operation of the following surrounding developments and the traffic generation associated with the operation of the Tooheys Road site and Buttonderry site (refer to Tables 5.7 and 5.8), as well as the construction of Western Ventilation Shaft site (refer to Table 5.5):

- Woolworths Retail Facility.
- Wyong Employment Zone.
- Warner Industrial Park.
- Bushells Ridge Employment Estate.
- Tooheys Road 18 Lot Subdivision.
- Warnervale Airport Industrial Subdivision.

Figures 5.32 and 5.33 show the forecast future traffic assigned to the key intersections in the 'total traffic peak' hours.

Figures 5.34 and 5.35 show the forecast future traffic assigned to the key intersections in the 'Project traffic generation peak' hours.

It should be noted that at some intersections, the 'total traffic peak' hours and the 'Project traffic peak' hours coincide. Thus the results are identical.

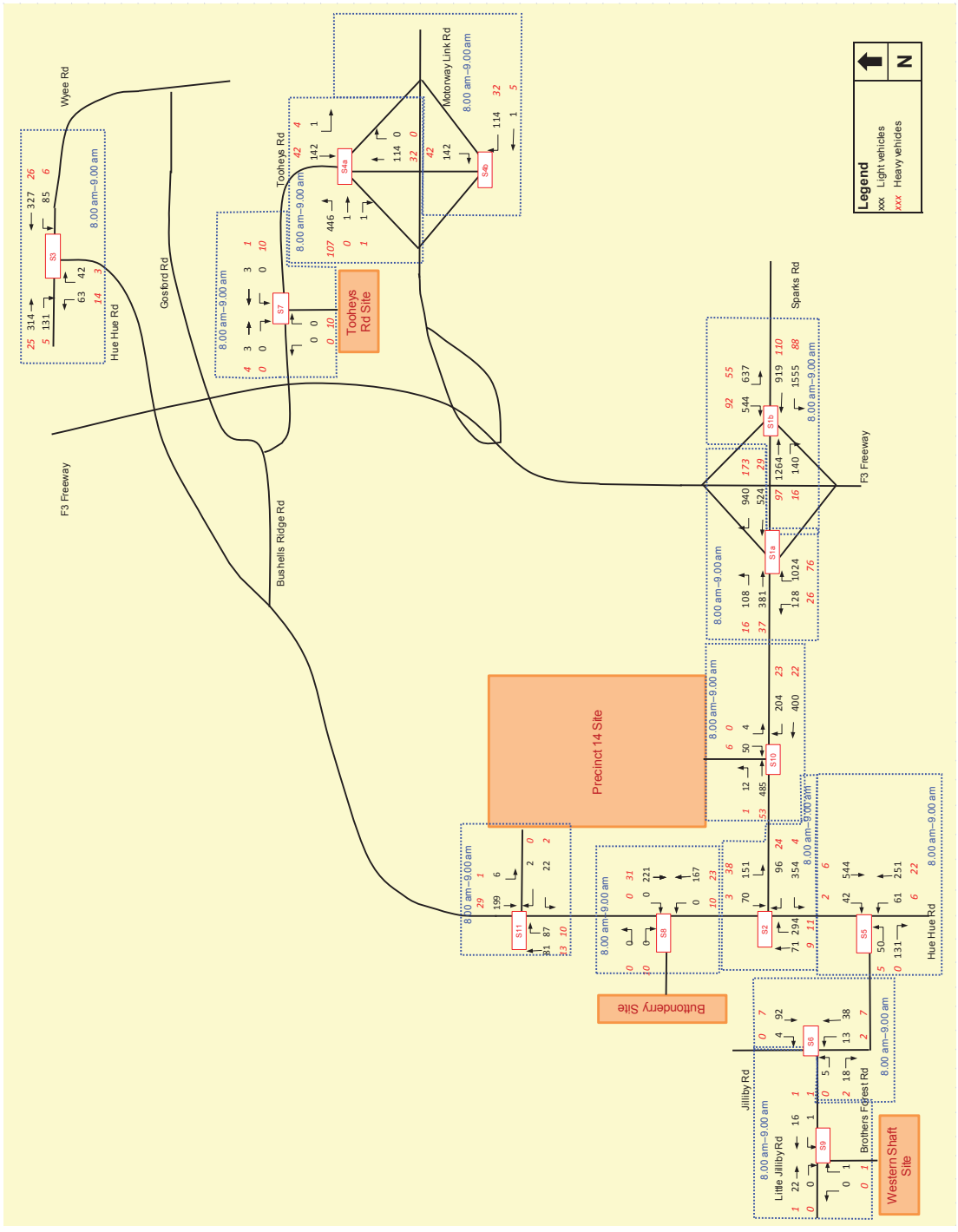


Figure 5.32 2026 with Western Ventilation Shaft construction and mine operation AM peak hour traffic volumes at the key intersections – total traffic peak hour

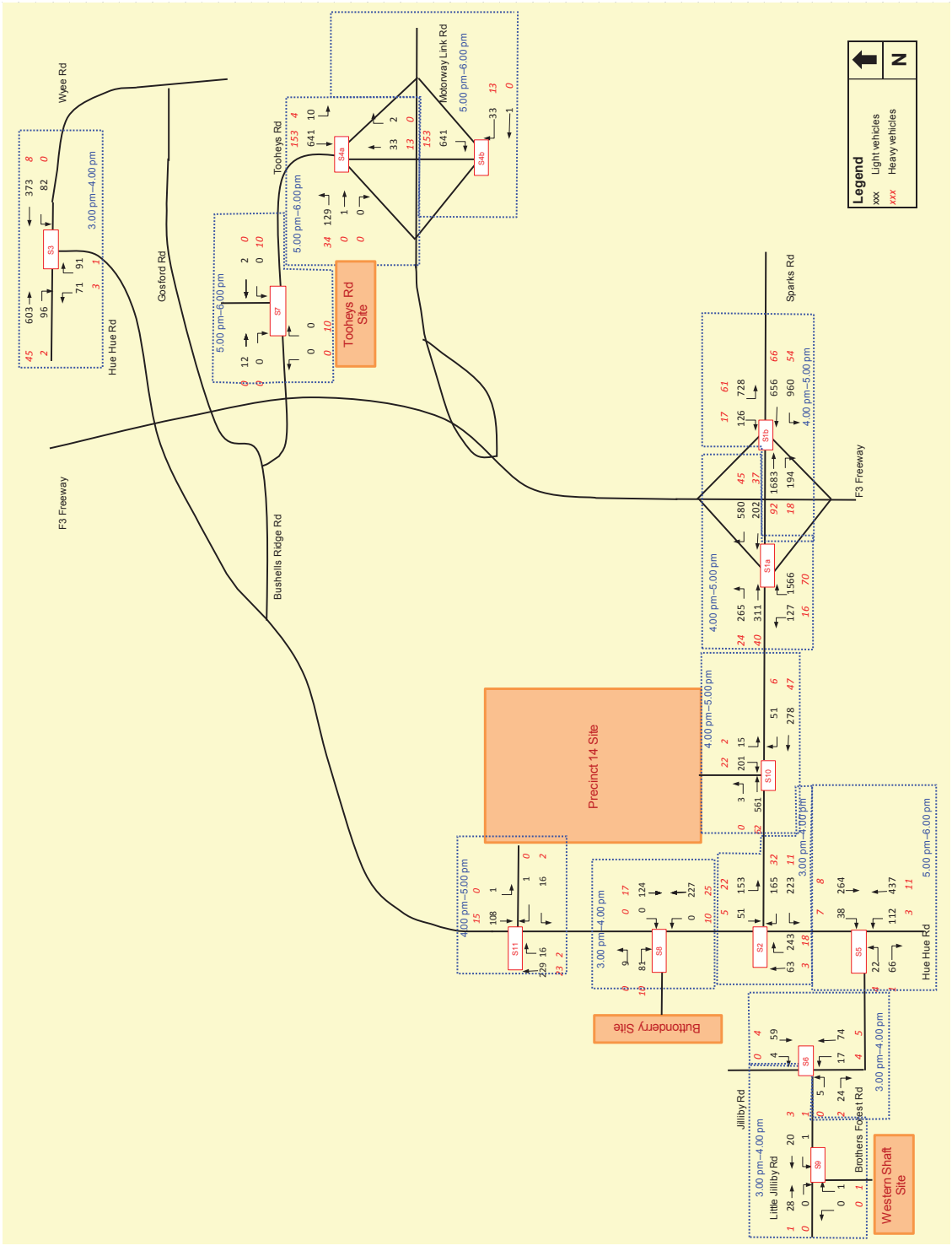


Figure 5.33 2026 with Western Ventilation Shaft construction and mine operation PM peak hour traffic volumes at the key intersections – total traffic peak hour

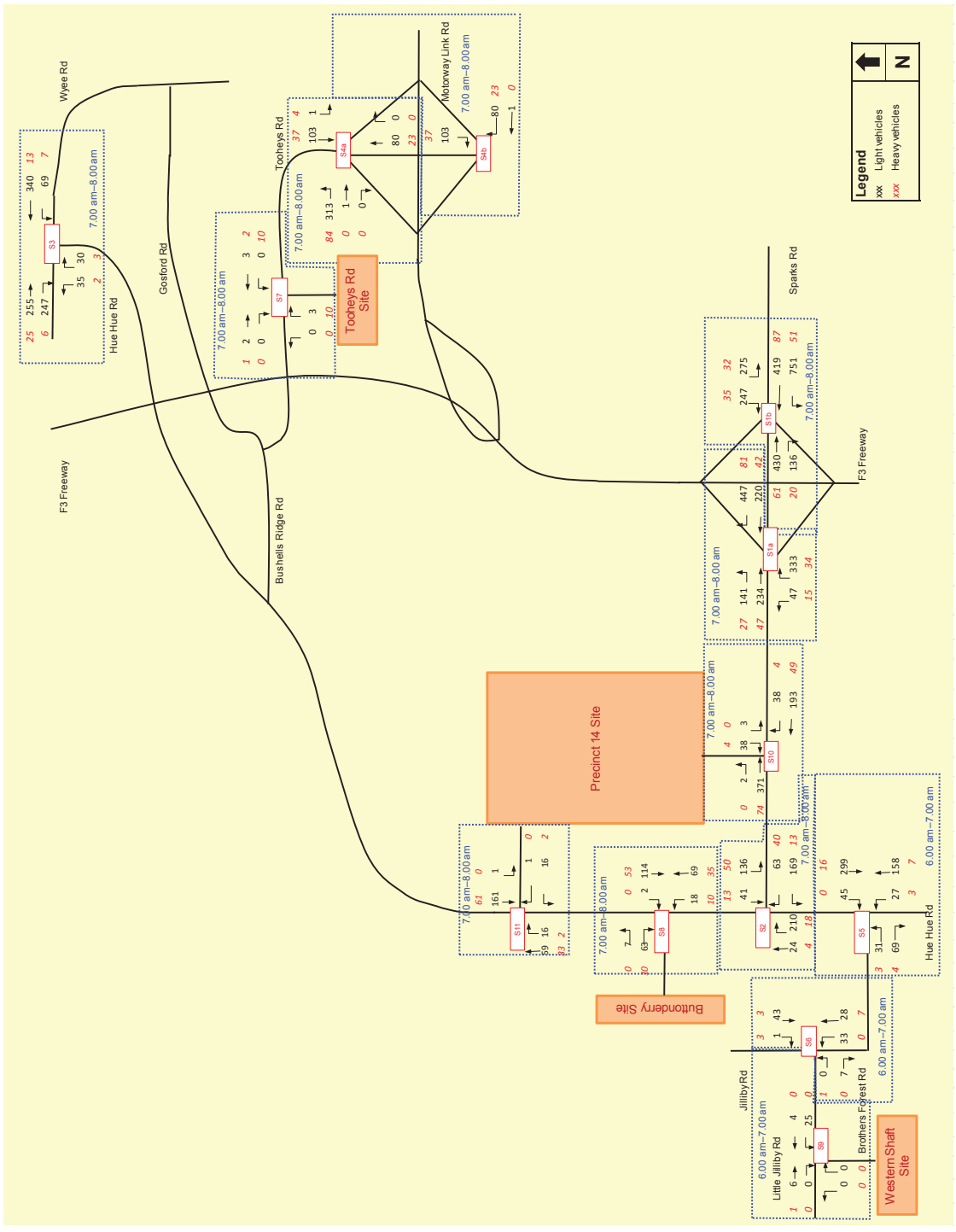


Figure 5.34 2026 with Western Ventilation Shaft construction and mine operation AM peak hour traffic volumes at the key intersections – Project traffic generation peak hour

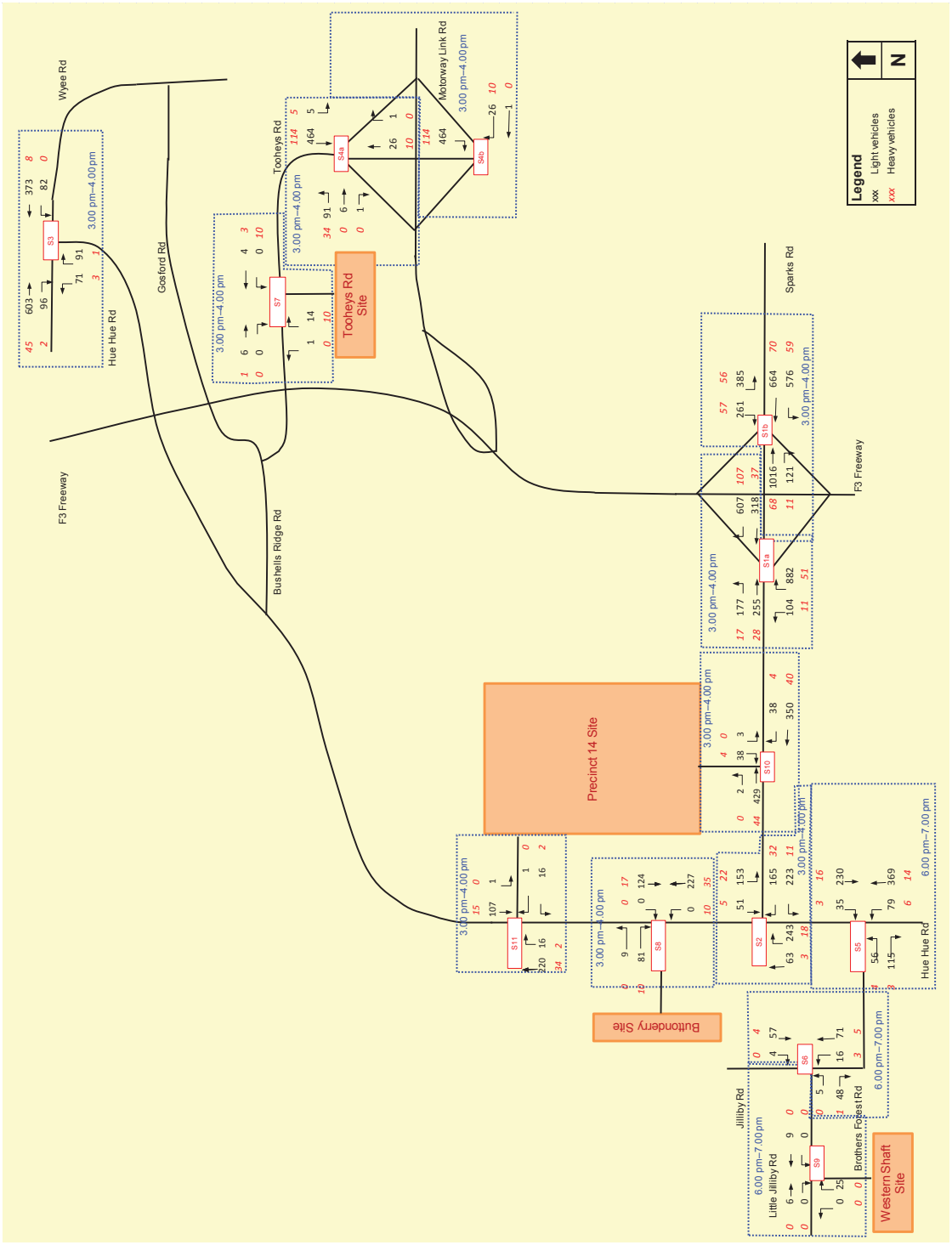


Figure 5.35 2026 with Western Ventilation Shaft construction and mine operation PM peak hour traffic volumes at the key intersections – Project traffic generation peak hour

6. Traffic impacts

6.1 Intersection performance

6.1.1 Scenario 1: No-Project (2015) with background traffic growth and the inclusion of other surrounding developments

Table 6.1 shows a summary of the forecast intersection performance (based on SIDRA modelling) during both the total traffic and Project traffic generation peak hours in 2015, including consideration of the operation of the surrounding new developments. Despite a number incidences where the of total traffic peak hour periods coincide with the Project traffic generation peak hours, the intersection performance for both sets of peak hours are presented, in Table 6.1, for clarity purposes.

Despite the fact that the Project does not occur in this Scenario, the forecast traffic conditions for the Project traffic generation peak hour periods are provided for comparison with those in Scenario 2, enabling traffic impacts to be evaluated over the same time period (hours).

The results depicted in red indicate intersection performance exceeding the acceptable level (refer to section 3.2).

Table 6.1 Year 2015 No-Project traffic conditions

Intersection	Intersection control type	Peak hour	Peak hour time	DoS	Delay	LoS	Queue (m)
F3/Sparks Road interchange (western side of the interchange)	Signals	Total traffic peak	8.00 am–9.00 am	**1.02**	**57**	**E**	**171**
		Total traffic peak	4.00 pm–5.00 pm	**0.93**	**47**	**D**	**136**
		Project traffic generation peak	6.00 am–7.00 am	**1.02**	**57**	**E**	**169**
		Project traffic generation peak	6.00 pm–7.00 pm	0.65	38	C	65
F3/Sparks Road interchange (eastern side of the interchange)	Priority (seagull)	Total traffic peak	8.00 am–9.00 am	0.54	23	B	26
		Total traffic peak	3.00 pm–4.00 pm	0.39	24	B	13
		Project traffic generation peak	6.00 am–7.00 am	0.33	17	B	6
		Project traffic generation peak	6.00 pm–7.00 pm	0.29	16	B	3
Sparks Road/ Hue Hue Road	Priority	Total traffic peak	8.00 am–9.00 am	0.48	15	B	11
		Total traffic peak	4.00 pm–5.00 pm	0.34	24	B	13
		Project traffic generation peak	6.00 am–7.00 am	0.14	14	A	3
		Project traffic generation peak	6.00 pm–7.00 pm	0.20	12	A	3
Hue Hue Road/ Wyee Road	Priority	Total traffic peak	8.00 am–9.00 am	0.14	16	B	3
		Total traffic peak	3.00 pm–4.00 pm	0.34	28	B	10
		Project traffic generation peak	6.00 am–7.00 am	0.23	16	B	2
		Project traffic generation peak	6.00 pm–7.00 pm	0.19	15	B	5

Intersection	Intersection control type	Peak hour	Peak hour time	DoS	Delay	LoS	Queue (m)
Motorway Link Road/Tooheys Road interchange (northern side of the interchange)	Priority	Total traffic peak	6.00 am–7.00 am	0.01	9	A	1
		Total traffic peak	6.00 pm–7.00 pm	0.01	9	A	1
		Project traffic generation peak	6.00 am–7.00 am	0.01	9	A	1
		Project traffic generation peak	6.00 pm–7.00 pm	0.01	9	A	1
Motorway Link Road/Tooheys Road interchange (southern side of the interchange)	Priority	Total traffic peak	8.00 am–9.00 am	0.01	11	A	1
		Total traffic peak	5.00 pm–6.00 pm	0.01	9	A	1
		Project traffic generation peak	8.00 am–9.00 am	0.01	11	A	1
		Project traffic generation peak	6.00 pm–7.00 pm	0.01	9	A	1
Hue Hue Road/ Jilliby Road	Priority	Total traffic peak	8.00 am–9.00 am	0.46	30	C	17
		Total traffic peak	5.00 pm–6.00 pm	0.25	27	B	11
		Project traffic generation peak	6.00 am–7.00 am	0.14	20	B	5
		Project traffic generation peak	6.00 pm–7.00 pm	0.12	20	B	4
Jilliby Road/ Little Jilliby Road	Priority	Total traffic peak	8.00 am–9.00 am	0.05	11	A	2
		Total traffic peak	3.00 pm–4.00 pm	0.04	11	A	1
		Project traffic generation peak	8.00 am–9.00 am	0.05	12	A	2
		Project traffic generation peak	3.00 pm–4.00 pm	0.04	11	A	1

Note: Intersection delays and LOS for signalised intersections are based on average intersection delays, whilst priority controlled intersections and roundabouts are based on the highest average delay.

The analysis indicates the performance F3/Sparks Road interchange (western side) would reduce from an acceptable LoS C to an unacceptable E during the AM peak hour, as a result of the increasing traffic volume associated with the background traffic growth and the operation of the surrounding new developments. The intersection would operate above its practical capacity during the AM peak hour and near its practical capacity during the PM peak hour.

With the exception of the F3/Sparks Road interchange (western side), in 2015 all other intersections would operate within their practical capacity, indicating the road network would still have plenty of spare capacity in the peak hours to accommodate the Project related construction trips.

6.1.2 Scenario 2: construction phase for the Tooheys Road and Buttonderry Sites (2015), with background traffic growth and the inclusion of other surrounding developments

Table 6.2 shows a summary of the forecast intersection performance (based on SIDRA modelling) during both the total traffic and Project traffic generation peak hours when construction is at its peak in 2015, with the consideration of the operation of the surrounding new developments. Despite a number of total traffic peak hours coincide with the Project traffic generation peak hours, the intersection performance for both peak hours are shown in Table 6.2 for clarity purposes.

The number of key intersections is increased to 10, including the new access points to the surface facilities on Hue Hue Road and Tooheys Road. These two newly created intersections would operate as priority controlled T-junctions.

The results depicted in red indicate intersection performance exceeding the acceptable level (refer to section 3.2).

Table 6.2 Traffic conditions for the construction phase in 2015

Intersection	Intersection control type	Peak hour	Peak hour time	DoS	Delay	LoS	Queue (m)
F3/Sparks Road interchange (western side of the interchange)	Signals	Total traffic peak	8.00 am–9.00 am	**1.02**	**57**	**E**	178
		Total traffic peak	4.00 pm–5.00 pm	**0.93**	49	D	143
		Project traffic generation peak	6.00 am–7.00 am	**1.02**	46	D	177
		Project traffic generation peak	6.00 pm–7.00 pm	0.65	33	C	78
F3/Sparks Road interchange (eastern side of the interchange)	Priority (seagull)	Total traffic peak	8.00 am–9.00 am	0.58	24	B	36
		Total traffic peak	3.00 pm–4.00 pm	0.39	25	B	19
		Project traffic generation peak	6.00 am–7.00 am	0.55	22	B	33
		Project traffic generation peak	6.00 pm–7.00 pm	0.30	17	B	11
Sparks Road/ Hue Hue Road	Priority	Total traffic peak	8.00 am–9.00 am	0.48	15	B	13
		Total traffic peak	4.00 pm–5.00 pm	0.37	25	B	19
		Project traffic generation peak	6.00 am–7.00 am	0.19	13	A	6
		Project traffic generation peak	6.00 pm–7.00 pm	0.20	13	A	5
Hue Hue Road/ Wyee Road	Priority	Total traffic peak	8.00 am–9.00 am	0.14	16	B	4
		Total traffic peak	3.00 pm–4.00 pm	0.34	28	B	12
		Project traffic generation peak	6.00 am–7.00 am	0.23	17	B	3
		Project traffic generation peak	6.00 pm–7.00 pm	0.19	14	A	7
Motorway Link Road/Tooheys Road interchange (northern side of the interchange)	Priority	Total traffic peak	6.00 am–7.00 am	0.35	9	A	8
		Total traffic peak	6.00 pm–7.00 pm	0.14	11	A	1
		Project traffic generation peak	6.00 am–7.00 am	0.35	9	A	8
		Project traffic generation peak	6.00 pm–7.00 pm	0.14	11	A	1
Motorway Link Road/Tooheys Road interchange (southern side of the interchange)	Priority	Total traffic peak	8.00 am–9.00 am	0.02	12	A	1
		Total traffic peak	5.00 pm–6.00 pm	0.15	11	A	1
		Project traffic generation peak	6.00 am–7.00 am	0.02	12	A	1
		Project traffic generation peak	6.00 pm–7.00 pm	0.15	11	A	1
Hue Hue Road/ Jilliby Road	Priority	Total traffic peak	8.00 am–9.00 am	0.46	30	C	21
		Total traffic peak	5.00 pm–6.00 pm	0.25	27	B	13
		Project traffic generation peak	6.00 am–7.00 am	0.15	20	B	7
		Project traffic generation peak	6.00 pm–7.00 pm	0.12	20	B	5

Intersection	Intersection control type	Peak hour	Peak hour time	DoS	Delay	LoS	Queue (m)
Jilliby Road/ Little Jilliby Road	Priority	Total traffic peak	8.00 am–9.00 am	0.05	12	A	2
		Total traffic peak	3.00 pm–4.00 pm	0.04	12	A	2
		Project traffic generation peak	8.00 am–9.00 am	0.05	12	A	2
		Project traffic generation peak	3.00 pm–4.00 pm	0.04	12	A	2
Tooheys Road Site access	Priority	Total traffic peak	6.00 am–7.00 am	0.15	10	A	1
		Total traffic peak	6.00 pm–7.00 pm	0.24	9	A	8
		Project traffic generation peak	6.00 am–7.00 am	0.15	10	A	1
		Project traffic generation peak	6.00 pm–7.00 pm	0.24	9	A	8
Buttonderry Site access	Priority	Total traffic peak	8.00 am–9.00 am	0.11	15	B	5
		Total traffic peak	4.00 pm–5.00 pm	0.11	16	B	4
		Project traffic generation peak	6.00 am–7.00 am	0.11	11	A	3
		Project traffic generation peak	6.00 pm–7.00 pm	0.12	11	A	3

Note: Intersection delays and LOS for signalised intersections are based on average intersection delays, whilst priority controlled intersections and roundabouts are based on the highest average delay.

When compared to the no-Project results in Table 6.1, it is apparent that there is only a marginal worsening in intersection performance as a result of the increased traffic on the network due to the construction activities. The F3/Sparks Road interchange (western side) would continue to operate at an unacceptable LoS E during the AM peak hour.

The analysis indicates that the construction activities would not impact on the performance of any of the intersections on the road network. The only intersection facing capacity constraints is the F3/Sparks Road interchange (western side). However, this congestion is not caused by the incremental inclusion of the Project over the other new developments.

The proposed Tooheys Road Site and Buttonderry Site access points would operate satisfactorily at LoS B or better, within the design capacities, with virtually no queue based on the proposed intersection layouts.

6.1.3 Scenario 3: No-Project (2025) with background traffic growth and the inclusion of other surrounding developments

Table 6.3 shows a summary of the forecast intersection performance (based on SIDRA modelling) during both the total traffic and Project traffic generation peak hours in 2025, with the consideration of the operation of the surrounding developments. Despite a number of total traffic peak hours coincide with the Project traffic generation peak hours, the intersection performance for both peak hours are shown in Table 6.3 for clarity purposes.

Despite the fact that the Project does not occur in this Scenario, the forecast traffic conditions for the Project traffic generation peak hour periods are provided for comparison with those in Scenario 4, enabling traffic impacts to be evaluated over the same time period (hours).

This scenario has considered the upgrade of the Sparks Road/Hue Hue Road intersection as a CHR type, as it is scheduled to be upgraded as part of the WEZ project (refer to section 2.12).

The number of key intersections is increased to 10, including the new access points to the Precinct 14 developments on Hue Hue Road and Sparks Road.

The results depicted in red indicate intersection performance exceeding the acceptable level (refer to section 3.2).

Table 6.3 Year 2025 No-Project traffic conditions

Intersection	Intersection control type	Peak hour	Peak hour time	DoS	Delay	LoS	Queue (m)
F3/Sparks Road interchange (western side of the interchange)	Signals	Total traffic peak	8.00 am–9.00 am	**3.70**	**891**	**F**	**2,299**
		Total traffic peak	4.00 pm–5.00 pm	**3.38**	**933**	**F**	**3,181**
		Project traffic generation peak	7.00 am–8.00 am	**1.02**	42	C	**171**
		Project traffic generation peak	3.00 pm–4.00 pm	**1.51**	**193**	**F**	**795**
F3/Sparks Road interchange (eastern side of the interchange)	Priority (seagull)	Total traffic peak	8.00 am–9.00 am	**11.0**	**9,074**	**F**	**3,149**
		Total traffic peak	4.00 pm–5.00 pm	**1.18**	**232**	**F**	**133**
		Project traffic generation peak	7.00 am–8.00 am	**1.02**	**99**	**F**	**152**
		Project traffic generation peak	3.00 pm–4.00 pm	**2.82**	**1,701**	**F**	**1,113**
Sparks Road/ Hue Hue Road	Priority (seagull)	Total traffic peak	8.00 am–9.00 am	0.58	15	B	20
		Total traffic peak	3.00 pm–4.00 pm	0.38	15	A	9
		Project traffic generation peak	7.00 am–8.00 am	0.30	18	B	8
		Project traffic generation peak	3.00 pm–4.00 pm	0.38	15	A	9
Hue Hue Road/ Wyee Road	Priority	Total traffic peak	8.00 am–9.00 am	0.25	29	C	9
		Total traffic peak	3.00 pm–4.00 pm	**0.89**	**108**	**F**	38
		Project traffic generation peak	7.00 am–8.00 am	0.35	32	C	12
		Project traffic generation peak	3.00 pm–4.00 pm	**0.89**	**108**	**F**	38
Motorway Link Road/Tooheys Road interchange (northern side of the interchange)	Priority	Total traffic peak	8.00 am–9.00 am	**0.96**	16	B	37
		Total traffic peak	5.00 pm–6.00 pm	0.48	23	B	6
		Project traffic generation peak	7.00 am–8.00 am	0.68	14	A	35
		Project traffic generation peak	3.00 pm–4.00 pm	0.34	18	B	4
Motorway Link Road/Tooheys Road interchange (southern side of the interchange)	Priority	Total traffic peak	8.00 am–9.00 am	0.21	13	A	7
		Total traffic peak	5.00 pm–6.00 pm	0.51	37	C	9
		Project traffic generation peak	7.00 am–8.00 am	0.12	11	A	4
		Project traffic generation peak	3.00 pm–4.00 pm	0.36	18	B	3
Hue Hue Road/ Jilliby Road	Priority	Total traffic peak	8.00 am–9.00 am	**1.27**	**327**	**F**	251
		Total traffic peak	5.00 pm–6.00 pm	0.53	46	D	24
		Project traffic generation peak	7.00 am–8.00 am	0.29	24	B	11
		Project traffic generation peak	3.00 pm–4.00 pm	0.69	46	D	31

Intersection	Intersection control type	Peak hour	Peak hour time	DoS	Delay	LoS	Queue (m)
Jilliby Road/ Little Jilliby Road	Priority	Total traffic peak	8.00 am–9.00 am	0.06	12	A	3
		Total traffic peak	3.00 pm–4.00 pm	0.06	12	A	2
		Project traffic generation peak	7.00 am–8.00 am	0.03	15	B	1
		Project traffic generation peak	3.00 pm–4.00 pm	0.06	12	A	2
Sparks Road/ Precinct 14 Access	Roundabout	Total traffic peak	8.00 am–9.00 am	0.55	17	B	37
		Total traffic peak	4.00 pm–5.00 pm	0.48	18	B	31
		Project traffic generation peak	7.00 am–8.00 am	0.32	15	B	16
		Project traffic generation peak	3.00 pm–4.00 pm	0.32	15	B	17
Hue Hue Road/ Precinct 14 Access	Priority (seagull)	Total traffic peak	8.00 am–9.00 am	0.13	12	A	4
		Total traffic peak	4.00 pm–5.00 pm	0.14	11	A	1
		Project traffic generation peak	7.00 am–8.00 am	0.10	12	A	1
		Project traffic generation peak	3.00 pm–4.00 pm	0.13	11	A	1

Note: Intersection delays and LoS for signalised intersections are based on average intersection delays, whilst priority controlled intersections and roundabouts are based on the highest average delay.

The analysis indicates the following are expected to perform poorly:

- F3/Sparks Road interchange (western side).
- F3/Sparks Road interchange (eastern side).
- Hue Hue Road/Wyee Road intersection.
- Motorway Link Road/Tooheys Road interchange (northern side).
- Hue Hue Road/Jilliby Road intersection.

The above listed intersections are estimated to operate at or above their practical capacities during the peak hours. Most of these intersections would operate at unacceptable LoS F.

This poor performance is a result of the background traffic growth and the inclusion of the surrounding developments, even without the Project proceeding. The main contributor to the future traffic problem is the additional traffic accessing the Wyong Employment Zone, when it is scheduled to be in operation in 2018.

The above listed intersections will require additional capacity to accommodate the traffic associated with the background traffic growth and the operation of the surrounding additional developments.

6.1.4 Scenario 4: mine operational phase of the Tooheys Road Site and Buttonderry Site (2025) with background traffic growth and the inclusion of other surrounding developments

Table 6.4 shows a summary of the forecast intersection performance (based on SIDRA modelling) during both the total traffic and Project traffic generation peak hours when mine production is at its peak in 2025, with the consideration of the operation of surrounding developments. Despite a number of total traffic peak hours coincide with the Project traffic generation peak hours, the intersection performance for both peak hours are shown in Table 6.4 for clarity purposes.

The results depicted in red indicate intersection performance exceeding the acceptable level (refer to section 3.2).

Table 6.4 Traffic conditions for the mine operation phase in 2025

Intersection	Intersection control type	Peak hour	Peak hour time	DoS	Delay	LoS	Queue (m)
F3/Sparks Road interchange (western side of the interchange)	Signals	Total traffic peak	8.00 am–9.00 am	**3.70**	**897**	**F**	**2,375**
		Total traffic peak	4.00 pm–5.00 pm	**3.38**	**934**	**F**	**3,181**
		Project traffic generation peak	7.00 am–8.00 am	**1.02**	42	C	**171**
		Project traffic generation peak	3.00 pm–4.00 pm	**1.51**	**200**	**F**	**795**
F3/Sparks Road interchange (eastern side of the interchange)	Priority (seagull)	Total traffic peak	8.00 am–9.00 am	**11.1**	**9,184**	**F**	**3,207**
		Total traffic peak	4.00 pm–5.00 pm	**1.25**	**281**	**F**	**194**
		Project traffic generation peak	7.00 am–8.00 am	**1.18**	**214**	**F**	**301**
		Project traffic generation peak	3.00 pm–4.00 pm	**3.00**	**1,861**	**F**	**1,207**
Sparks Road/ Hue Hue Road	Priority (seagull)	Total traffic peak	8.00 am–9.00 am	0.59	17	B	20
		Total traffic peak	3.00 pm–4.00 pm	0.38	16	B	12
		Project traffic generation peak	7.00 am–8.00 am	0.32	19	B	9
		Project traffic generation peak	3.00 pm–4.00 pm	0.38	16	B	12
Hue Hue Road/ Wyee Road	Priority	Total traffic peak	8.00 am–9.00 am	0.25	29	C	7
		Total traffic peak	3.00 pm–4.00 pm	**0.89**	**108**	**F**	38
		Project traffic generation peak	7.00 am–8.00 am	0.35	32	C	13
		Project traffic generation peak	3.00 pm–4.00 pm	**0.89**	**108**	**F**	38
Motorway Link Road/Tooheys Road interchange (northern side of the interchange)	Priority	Total traffic peak	8.00 am–9.00 am	**0.99**	16	B	37
		Total traffic peak	5.00 pm–6.00 pm	0.49	24	B	6
		Project traffic generation peak	7.00 am–8.00 am	0.71	12	A	37
		Project traffic generation peak	3.00 pm–4.00 pm	0.36	19	B	5

Intersection	Intersection control type	Peak hour	Peak hour time	DoS	Delay	LoS	Queue (m)
Motorway Link Road/Tooheys Road interchange (southern side of the interchange)	Priority	Total traffic peak	8.00 am–9.00 am	0.22	13	A	8
		Total traffic peak	5.00 pm–6.00 pm	0.51	40	C	10
		Project traffic generation peak	7.00 am–8.00 am	0.13	11	A	4
		Project traffic generation peak	3.00 pm–4.00 pm	0.37	21	B	4
Hue Hue Road/ Jilliby Road	Priority	Total traffic peak	8.00 am–9.00 am	1.27	333	F	251
		Total traffic peak	5.00 pm–6.00 pm	0.53	47	D	24
		Project traffic generation peak	7.00 am–8.00 am	0.30	24	B	11
		Project traffic generation peak	3.00 pm–4.00 pm	0.71	48	D	33
Jilliby Road/Little Jilliby Road	Priority	Total traffic peak	8.00 am–9.00 am	0.06	12	A	3
		Total traffic peak	3.00 pm–4.00 pm	0.06	12	A	2
		Project traffic generation peak	7.00 am–8.00 am	0.03	15	B	1
		Project traffic generation peak	3.00 pm–4.00 pm	0.06	12	A	2
Tooheys Road Site access	Priority	Total traffic peak	8.00 am–9.00 am	0.02	14	A	1
		Total traffic peak	5.00 pm–6.00 pm	0.02	14	A	1
		Project traffic generation peak	7.00 am–8.00 am	0.02	13	A	1
		Project traffic generation peak	3.00 pm–4.00 pm	0.03	13	A	1
Buttonderry Site access	Priority	Total traffic peak	8.00 am–9.00 am	0.15	31	C	8
		Total traffic peak	3.00 pm–4.00 pm	0.16	15	B	5
		Project traffic generation peak	7.00 am–8.00 am	0.12	13	A	6
		Project traffic generation peak	3.00 pm–4.00 pm	0.15	15	B	4
Sparks Road/ Precinct 14 Access	Priority	Total traffic peak	8.00 am–9.00 am	0.57	17	B	37
		Total traffic peak	4.00 pm–5.00 pm	0.50	18	B	33
		Project traffic generation peak	7.00 am–8.00 am	0.37	15	B	20
		Project traffic generation peak	3.00 pm–4.00 pm	0.37	15	B	19
Hue Hue Road/ Precinct 14 Access	Priority	Total traffic peak	8.00 am–9.00 am	0.13	12	A	4
		Total traffic peak	4.00 pm–5.00 pm	0.14	11	A	1
		Project traffic generation peak	7.00 am–8.00 am	0.10	12	A	1
		Project traffic generation peak	3.00 pm–4.00 pm	0.14	11	A	1

Note: Intersection delays and LOS for signalised intersections are based on average intersection delays, whilst priority controlled intersections and roundabouts are based on the highest average delay.

When compared to the no-Project results in Table 6.3, there is a slight decrease in performance at all intersections during both AM and PM peak hours, as a result of the increased traffic on the network associated with the operational activities of the Project.

The intersections that are expected to perform poorly in the 2025 no-Project case would continue to operate at or above their practical capacities during both peak hours. The traffic queues would exceed the available turning bay lengths and interrupt the operation of their adjacent intersections.

The analysis indicates that the operational activities would not adversely impact on the performance of any of the intersections on the road network. The intersections that would be facing capacity constraints are not caused by the Project.

The proposed Tooheys Road Site and Buttonderry Site access points would operate at a satisfactory LoS C or better, within the design capacities, with virtually no queue based on the proposed intersection layouts. The Precinct 14 access points would also operate at a satisfactory LoS B or better, within the design capacities, with virtually no queue based on the proposed intersection layouts.

6.1.5 Scenario 5: No-Project (2026) with background traffic growth and the inclusion of other surrounding developments

Table 6.5 shows a summary of the forecast intersection performance (based on SIDRA modelling) during both the total traffic and site generation peak hours in 2026, with the consideration of the operation of the surrounding developments. Despite a number of total traffic peak hours coincide with the Project traffic generation peak hours, the intersection performance for both peak hours are shown in Table 6.5 for clarity purposes.

Despite the fact that the Project does not occur in this Scenario, the forecast traffic conditions for the Project traffic generation peak hour periods are provided for comparison with those in Scenario 6, enabling traffic impacts to be evaluated over the same time period (hours).

The results depicted in red indicate intersection performance exceeding the acceptable level (refer to section 3.2).

Table 6.5 Year 2026 No-Project traffic conditions

Intersection	Intersection control type	Peak hour	Peak hour time	DoS	Delay	LoS	Queue (m)
F3/Sparks Road interchange (western side of the interchange)	Signals	Total traffic peak	8.00 am–9.00 am	**3.73**	**901**	**F**	**2,334**
		Total traffic peak	4.00 pm–5.00 pm	**3.40**	**943**	**F**	**3,210**
		Project traffic generation peak	7.00 am–8.00 am	**1.02**	43	D	**171**
		Project traffic generation peak	3.00 pm–4.00 pm	**1.53**	**201**	**F**	**818**
F3/Sparks Road interchange (eastern side of the interchange)	Priority (seagull)	Total traffic peak	8.00 am–9.00 am	**11.0**	**9,106**	**F**	**3,158**
		Total traffic peak	4.00 pm–5.00 pm	**1.19**	**239**	**F**	**183**
		Project traffic generation peak	7.00 am–8.00 am	**1.04**	**109**	**F**	**165**
		Project traffic generation peak	3.00 pm–4.00 pm	**2.66**	**1,554**	**F**	**1,079**
Sparks Road/ Hue Hue Road	Priority (seagull)	Total traffic peak	8.00 am–9.00 am	0.59	15	B	20
		Total traffic peak	3.00 pm–4.00 pm	0.38	14	A	9
		Project traffic generation peak	7.00 am–8.00 am	0.31	18	B	8
		Project traffic generation peak	3.00 pm–4.00 pm	0.38	14	A	9

Intersection	Intersection control type	Peak hour	Peak hour time	DoS	Delay	LoS	Queue (m)
Hue Hue Road/ Wyee Road	Priority	Total traffic peak	8.00 am–9.00 am	0.27	31	C	9
		Total traffic peak	3.00 pm–4.00 pm	**0.97**	**143**	**F**	52
		Project traffic generation peak	7.00 am–8.00 am	0.36	33	C	13
		Project traffic generation peak	3.00 pm–4.00 pm	**0.97**	**143**	**F**	52
Motorway Link Road/Tooheys Road interchange (northern side of the interchange)	Priority	Total traffic peak	8.00 am–9.00 am	**0.96**	16	B	37
		Total traffic peak	5.00 pm–6.00 pm	0.48	23	B	6
		Project traffic generation peak	7.00 am–8.00 am	0.68	14	A	35
		Project traffic generation peak	3.00 pm–4.00 pm	0.34	18	B	4
Motorway Link Road/Tooheys Road interchange (southern side of the interchange)	Priority	Total traffic peak	8.00 am–9.00 am	0.21	11	A	7
		Total traffic peak	5.00 pm–6.00 pm	0.51	35	C	8
		Project traffic generation peak	7.00 am–8.00 am	0.12	11	A	4
		Project traffic generation peak	3.00 pm–4.00 pm	0.36	18	B	3
Hue Hue Road/ Jilliby Road	Priority	Total traffic peak	8.00 am–9.00 am	**1.38**	**421**	**F**	304
		Total traffic peak	5.00 pm–6.00 pm	0.58	50	D	26
		Project traffic generation peak	6.00 am–7.00 am	0.31	25	B	10
		Project traffic generation peak	6.00 pm–7.00 pm	0.74	51	D	36
Jilliby Road/ Little Jilliby Road	Priority	Total traffic peak	8.00 am–9.00 am	0.07	12	A	3
		Total traffic peak	3.00 pm–4.00 pm	0.06	12	A	2
		Project traffic generation peak	6.00 am–7.00 am	0.03	15	B	1
		Project traffic generation peak	6.00 pm–7.00 pm	0.06	12	A	1
Sparks Road/ Precinct 14 Access	Roundabout	Total traffic peak	8.00 am–9.00 am	0.55	17	B	37
		Total traffic peak	4.00 pm–5.00 pm	0.48	18	B	31
		Project traffic generation peak	7.00 am–8.00 am	0.32	15	B	16
		Project traffic generation peak	3.00 pm–4.00 pm	0.33	15	B	17
Hue Hue Road/ Precinct 14 Access	Priority (seagull)	Total traffic peak	8.00 am–9.00 am	0.13	12	A	4
		Total traffic peak	4.00 pm–5.00 pm	0.14	13	A	1
		Project traffic generation peak	7.00 am–8.00 am	0.10	12	A	1
		Project traffic generation peak	3.00 pm–4.00 pm	0.14	11	A	1

Note: Intersection delays and LOS for signalised intersections are based on average intersection delays, whilst priority controlled intersections and roundabouts are based on the highest average delay.

Similar to the no-Project results in Table 6.3, the analysis indicates the following are expected to perform poorly:

- F3/Sparks Road interchange (western side).
- F3/Sparks Road interchange (eastern side).

- Hue Hue Road/Wyee Road intersection.
- Motorway Link Road/Tooheys Road interchange (northern side).
- Hue Hue Road/Jilliby Road intersection.

The above listed intersections are estimated to operate at or above their practical capacities during the peak hours. Most of these intersections would operate at unacceptable LoS F.

This poor performance is as a result of the background traffic growth and the operation of the surrounding developments, even without the Project proceeding. The main contributor to future traffic problem would be the additional traffic accessing the Wyong Employment Zone, when it is scheduled to be in operation in 2018.

The above listed intersections will require additional capacity to accommodate the traffic associated with the background traffic growth and the operation of the surrounding developments.

The Precinct 14 access points would operate at a satisfactory LoS B or better, within the design capacities, with virtually no queue based on the proposed intersection layouts.

6.1.6 Scenario 6: construction of the Western Ventilation Shaft, and mine operational phase of the Tooheys Road Site and Buttonderry Site (2026) with background traffic growth and the inclusion of other surrounding developments

Table 6.6 shows a summary of the forecast intersection performance (based on SIDRA modelling) during both the total traffic and Project traffic generation peak hours in 2026, considering the operation of the surrounding developments and the Project, as well as the construction of the Western Ventilation Shaft. Despite a number of total traffic peak hours coincide with the Project traffic generation peak hours, the intersection performance for both peak hours are shown in Table 6.6 for clarity purposes.

The results depicted in red indicate intersection performance exceeding the acceptable level (refer to section 3.2).

The number of key intersections is increased to 13, including the new access point to the Western Ventilation shaft site on Little Jilliby Road. This newly created intersection would operate as priority controlled T-junctions.

Table 6.6 Traffic conditions for the construction of Western Ventilation shaft, mine operation phase in 2026

Intersection	Intersection control type	Peak hour	Peak hour time	DoS	Delay	LoS	Queue (m)
F3/Sparks Road interchange (western side of the interchange)	Signals	Total traffic peak	8.00 am–9.00 am	**3.73**	**906**	**F**	**2,411**
		Total traffic peak	4.00 pm–5.00 pm	**3.40**	**944**	**F**	**3,210**
		Project traffic generation peak	7.00 am–8.00 am	**1.02**	41	C	**171**
		Project traffic generation peak	3.00 pm–4.00 pm	**1.53**	**208**	**F**	**818**
F3/Sparks Road interchange (eastern side of the interchange)	Priority (seagull)	Total traffic peak	8.00 am–9.00 am	**11.2**	**9,215**	**F**	**3,216**
		Total traffic peak	4.00 pm–5.00 pm	**1.25**	**288**	**F**	**271**
		Project traffic generation peak	7.00 am–8.00 am	**1.20**	**231**	**F**	**319**
		Project traffic generation peak	3.00 pm–4.00 pm	**3.06**	**1,911**	**F**	**1,224**
Sparks Road/ Hue Hue Road	Priority (seagull)	Total traffic peak	8.00 am–9.00 am	0.59	17	B	21
		Total traffic peak	3.00 pm–4.00 pm	0.39	16	B	13
		Project traffic generation peak	7.00 am–8.00 am	0.33	19	B	10
		Project traffic generation peak	3.00 pm–4.00 pm	0.39	16	B	13
Hue Hue Road/ Wyee Road	Priority	Total traffic peak	8.00 am–9.00 am	0.27	31	C	9
		Total traffic peak	3.00 pm–4.00 pm	**0.97**	**143**	**F**	52
		Project traffic generation peak	7.00 am–8.00 am	0.37	33	C	13
		Project traffic generation peak	3.00 pm–4.00 pm	**0.97**	**143**	**F**	52
Motorway Link Road/Tooheys Road interchange (northern side of the interchange)	Priority	Total traffic peak	8.00 am–9.00 am	**0.98**	16	B	37
		Total traffic peak	5.00 pm–6.00 pm	0.49	24	B	6
		Project traffic generation peak	7.00 am–8.00 am	0.71	14	A	37
		Project traffic generation peak	3.00 pm–4.00 pm	0.36	17	B	5
Motorway Link Road/Tooheys Road interchange (southern side of the interchange)	Priority	Total traffic peak	8.00 am–9.00 am	0.22	13	A	8
		Total traffic peak	5.00 pm–6.00 pm	0.51	40	C	10
		Project traffic generation peak	7.00 am–8.00 am	0.13	11	A	4
		Project traffic generation peak	3.00 pm–4.00 pm	0.37	21	B	4
Hue Hue Road/ Jilliby Road	Priority	Total traffic peak	8.00 am–9.00 am	**1.39**	**432**	**F**	313
		Total traffic peak	5.00 pm–6.00 pm	0.59	48	D	22
		Project traffic generation peak	6.00 am–7.00 am	0.33	26	B	13
		Project traffic generation peak	6.00 pm–7.00 pm	0.79	53	D	45
Jilliby Road/ Little Jilliby Road	Priority	Total traffic peak	8.00 am–9.00 am	0.07	12	A	3
		Total traffic peak	3.00 pm–4.00 pm	0.06	12	A	2
		Project traffic generation peak	6.00 am–7.00 am	0.04	15	B	1
		Project traffic generation peak	6.00 pm–7.00 pm	0.06	12	A	2

Intersection	Intersection control type	Peak hour	Peak hour time	DoS	Delay	LoS	Queue (m)
Tooheys Road Site access	Priority	Total traffic peak	8.00 am–9.00 am	0.02	14	A	1
		Total traffic peak	5.00 pm–6.00 pm	0.02	14	A	1
		Project traffic generation peak	7.00 am–8.00 am	0.02	13	A	1
		Project traffic generation peak	3.00 pm–4.00 pm	0.03	13	A	1
Buttonderry Site access	Priority	Total traffic peak	8.00 am–9.00 am	0.15	31	C	8
		Total traffic peak	3.00 pm–4.00 pm	0.16	15	B	6
		Project traffic generation peak	7.00 am–8.00 am	0.12	13	A	6
		Project traffic generation peak	3.00 pm–4.00 pm	0.16	15	B	5
Western Ventilation Shaft Site access	Priority	Total traffic peak	8.00 am–9.00 am	0.01	9	A	1
		Total traffic peak	3.00 pm–4.00 pm	0.02	9	A	1
		Project traffic generation peak	6.00 am–7.00 am	0.02	7	A	1
		Project traffic generation peak	6.00 pm–7.00 pm	0.02	7	A	1
Sparks Road/ Precinct 14 Access	Priority	Total traffic peak	8.00 am–9.00 am	0.57	17	B	36
		Total traffic peak	4.00 pm–5.00 pm	0.50	18	B	33
		Project traffic generation peak	7.00 am–8.00 am	0.37	11	A	20
		Project traffic generation peak	3.00 pm–4.00 pm	0.37	11	A	19
Hue Hue Road/ Precinct 14 Access	Priority	Total traffic peak	8.00 am–9.00 am	0.13	12	A	4
		Total traffic peak	4.00 pm–5.00 pm	0.14	12	A	3
		Project traffic generation peak	7.00 am–8.00 am	0.14	12	A	1
		Project traffic generation peak	3.00 pm–4.00 pm	0.15	11	A	1

Note: Intersection delays and LOS for signalised intersections are based on average intersection delays, whilst priority controlled intersections and roundabouts are based on the highest average delay.

When compared to the 2026 no-Project results in Table 6.5, there is only a slight decrease in performance at all intersections during both AM and PM peak hours, as a result of the increased traffic on the network associated with the Project's mine construction and operational activities.

The intersections that are expected to perform poorly in the 2026 No-Project case would continue to operate above their practical capacities during both peak hours. The traffic queues would exceed the available turning bay lengths and interrupt the operation of their adjacent intersections.

The proposed Tooheys Road Site and Buttonderry Site access points would operate satisfactorily at LoS C or better, within the design capacities, with virtually no queue based on the proposed intersection layouts. The Precinct 14 access points would operate at a satisfactory LoS B or better, within the design capacities, with virtually no queue based on the proposed intersection layouts.

6.2 Impacts on Tooheys Road

Tooheys Road is expected to carry approximately 900 vehicles (two-way) during the total peak hour by year 2026 on its section between the Bushells Ridge Employment Estate and the Motorway Link Road Interchange. This is as a result of the background traffic growth and the operation of the surrounding additional developments, irrespective of the Project.

The road in its current condition is unlikely to efficiently and safely accommodate the additional traffic, which includes a significant proportion of heavy vehicles (20%), associated with the surrounding new developments.

With the additional traffic associated with the operational activities of the Tooheys Road Site, the road is expected to carry only 20 additional vehicles per peak hour – which equates to approximately 3% of the total traffic volume during the peak hour. Consequently, the additional forecast traffic associated the Project would not impose any adverse impact on Tooheys Road.

6.3 Impacts on Hue Hue Road

Hue Hue Road is expected to carry approximately 1,000 vehicles (two-way) during the total traffic peak hour by year 2026 on its section between Hue Hue Road and Alison Road. This is as a result of the background traffic growth supplemented with the operation of the surrounding new developments - irrespective of the Project. The additional traffic associated with the Project is estimated as being approximately 4% of the total traffic volume during the peak hours, and thus would not impose adversely on Hue Hue Road.

6.4 Impacts on road safety

The following road safety impacts may occur as a direct result of creating new intersections for accessing the surface facilities which would alter traffic patterns on the roads:

- Buttonderry Site access:
  - Rear end crashes may be introduced on Hue Hue Road, as a result of turning traffic slowing down abruptly while approaching the site access and the subsequent traffic not responding in time.
- Tooheys Road Site access:
  - Rear end crashes may be introduced on Tooheys Road, as a result of turning traffic slowing down abruptly while approaching the site access and the subsequent traffic not responding in time. This problem is exacerbated by the limited sight distance in the southern approach on Tooheys Road.
  - Crossing/turning crashes may be introduced, as a result of the limited sight distance in the southern approach on Tooheys Road.
- Western Ventilation Shaft Site access:
  - Rear end crashes may be introduced on Jilliby Road, as a result of turning traffic slowing down abruptly while approaching the site access and the subsequent traffic not responding in time.

The following road safety impacts may occur as a direct result of the additional Project related traffic changing the future traffic patterns at intersections where the crash record is poor:

- Hue Hue Road/Sparks Road intersection – the number of right-through crashes may increase due to additional Project related traffic involving both the right turn and crossing movements.
- F3/Sparks Road interchange – the number of right-through crashes may increase due to additional Project related traffic involving both the right turn and crossing movements.

6.5 Impacts on public transport activities and services

During the Project's construction and operational periods, the demand of mining employees for public transport is not anticipated to be significant since bus stops are not located in close proximity to the proposed surface facilities, and evening and night shifts' working hours are often outside public transport service hours.

A review of the Environmental Assessment that was prepared for the Warner Industrial Park Concept Plan and Project Application (Precinct 14 Wyong Employment Zone) identified a number of public transport improvements along the Sparks Road corridor. The Sparks Road Corridor would become a major bus route feeding the new Warnervale Town Centre and its transport interchange, with extended services throughout the Wyong Employment Zone. This may benefit the mining employees at the Buttonderry Site, providing the option of using public buses as a mode of transport.

6.6 Impacts on school bus route safety

During school start and end times, the low additional traffic volumes would not impose adverse impact on school bus route safety when Project employees travel to/from the Project sites. The only shift changeover time which would correspond with the school start and end times occurs between 2.00 pm and 3.00 pm – when the Project employees departing from the Tooheys Road and Buttonderry Road Sites.

Although the volume of heavy vehicles is anticipated to be low and spread throughout the day, the additional heavy vehicles that occur during the school start and end times may impact on pedestrian safety along school bus routes in the vicinity of the Project's access routes with particular reference to Jilliby Road, where parents and school children jaywalking across the road outside the public school.

6.7 Impacts on pedestrian and cyclist activities and facilities

The Project is unlikely to generate pedestrian and cyclist activities, therefore, no additional facilities are considered.

The Concept Plan prepared for the Warner Industrial Park (Precinct 14 Wyong Employment Zone) identifies a proposed cycleway for the Precinct 14 which would link with the existing on-road cycle lane on Sparks Road.

The RMS has developed a strategic plan for an off-road cycleway on the southern side of Sparks Road. However, the timing and implementation of this plan has not been determined.

7. Mitigation measures

Section 2.11 outlined the existing deficiencies along the potential access routes, and Section 6 discusses the potential traffic impacts – with the impacts being as a result of the background traffic growth in conjunction with traffic associated with surrounding developments, and the Project's construction and operational activities.

The recommended major road and intersection upgrades to resolve the future capacity problems as a result of the increasing traffic volume associated with the background traffic growth and the operation of the surrounding new developments, regardless of the Project proceeding, are addressed in Appendix E.

This Section discusses the recommended measures to mitigate road safety impacts associated with road system around the Project. These road safety deficiencies are currently in existence and occur irrespective of whether the Project does or does not proceed. In many instances the issues highlighted are on routes that will only be lightly trafficked by Project related vehicles.

It is recommended that WACJV undertake consultation with RMS and WSC to develop an agreement for determining mitigation priorities/responsibilities and providing an appropriate contribution towards addressing the relevant road safety deficiencies; and ensure that adequate levels of safety are maintained during construction and operation.

7.1 Provision of shuttle bus

Consideration should be given to providing shuttle bus service between the mine site and major localities, where the majority of the workforce would reside. As a consequence, the number of employee vehicle trips would be significantly reduced, resulting in reduced traffic impacts on the surrounding road network.

7.2 Road safety improvements

The local road network comprises major roads administered by RMS and minor local roads managed by WSC. A number of current design features and maintenance standards are noted to result in safety, operational and service standards that fall short of preferred/best practice conditions. Details of improvements that would be currently desirable on the surrounding road network are identified in the following sections, however it is noted that these improvements are recommended irrespective of the Project.

7.2.1 Motorway Link Road/Tooheys Road interchange

- Repair the 'NO LEFT TURN' sign.
- Repair the directional sign.
- Provide a stop line at the eastbound off ramp.
- Consider proper and timely pavement maintenance on the eastbound off ramp.
- Replace the guardrail and provide sufficient reflectors along the guardrail on Tooheys Road.
- Re-paint the centreline marking along Tooheys Road.

7.2.2 Tooheys Road

- Upgrade Tooheys Road – to a sealed road.
- Consider the installation of posted speed limit signs on Tooheys Road to enforce a safe legal speed.
- Trim the tree branches to provide a sufficient vertical clearance.
- Consider position of the trees within the clear zone and develop roadside management strategy to improve safety beside the road.
- Replace CAM signs.
- Consider proper and timely pavement maintenance.
- Provide sufficient delineation along the horizontal curve to the north of the tunnel, as well as at the Tooheys Road/private access road intersection.
- Provide priority control at the Tooheys Road intersection with the side road.
- Replace the 'NARROW TUNNEL' warning sign.
- Relocate the curve warning sign in advance of the curve.
- Clear the vegetation to the south of the Tooheys Road Site access to provide sufficient SISD.

7.2.3 Hue Hue Road/Wyee Road intersection

- Provide a sight board at the termination of Hue Hue Road.
- Provide a hold line and 'GIVE WAY' sign on Hue Hue Road's approach to the intersection.
- Replace the 'KEEP LEFT' signs.

7.2.4 Hue Hue Road/Bushells Ridge Road intersection

- Provide sufficient delineation along the curve by means of chevron alignment markers in accordance with AS1742.2
- Provide priority control on Bushells Ridge Road on approach to the intersection.
- Consider position of the tree and develop roadside management strategy to improve road safety regarding the sight distance obstruction.

7.2.5 Bushells Ridge Road

- Provide sufficient delineation along the road – including the provision of edgeline and re-painting of the centreline marking.
- Repair the damaged pavement.

7.2.6 Sparks Road/Hue Hue Road intersection

- Re-paint the hold line on Sparks Road.

7.2.7 Hue Hue Road (between Wyee Road and Jilliby Road)

- Consider the provision of 1 m wide sealed and 1–2 m wide unsealed road shoulders on both sides of the road.
- Re-paint the edgeline and trim back the grass on the roadside.
- Provide sufficient delineation along the road – including the provision of guideposts and re-painting of the edgeline and centreline markings.
- Re-paint the centreline marking.
- Re-install retro-reflective pavement markers (RRPMs) along Hue Hue Road.
- Replace the guardrail terminal.
- Consider proper and timely pavement maintenance.
- Clean up the debris trapped in the culverts, and ensure regular and timely maintenance and cleaning.
- Consider making the culverts traversable.
- Consider position of the tree within the clear zone and develop roadside management strategy to improve road safety regarding the tree near the road.

7.2.8 Hue Hue Road/Jilliby Road intersection

- Install a sight board at the termination of Jilliby Road.
- Repaint the stop line on Jilliby Road.
- Relocate the direction and detour signs closer to Hue Hue Road.

7.2.9 Jilliby Road

- Consider the provision of 1 m wide sealed and 1–2 m wide unsealed road shoulders on both sides of the road.
- Provide sufficient delineation along the road – including the provision of guideposts and edgeline marking.
- Assess the need for the installation of CAM signs and provide these signs if deemed necessary for improved curve delineation.
- Provide adequate transition section between the approach guardrail and bridge rail.
- Remove the sandstones and extend the culvert head walls making the culverts traversable.
- Replace the ‘END SCHOOL ZONE’ and ’60 km/h’ signs.

- Consider proper and timely pavement maintenance.
- Refer to Section 7.4 regarding the recommended mitigation measures associated with the school zone on Jilliby Road.

7.2.10 Jilliby Road/Little Jilliby Road intersection

- Provide a hold line on Little Jilliby Road's approach to the intersection.
- Install a sight board at the termination of Little Jilliby Road.
- Consider making the culvert traversable.

7.2.11 Little Jilliby Road/Brothers Road intersection

- Consider widening Brothers Road to accommodate safe manoeuvring for all vehicles at the intersection and along the Brothers Road.

7.2.12 Tooheys Road Site access

- Provide an exclusive left turn lane on Hue Hue Road to facilitate the left turn movement onto the site.
- Provide an exclusive right turn lane on Hue Hue Road to facilitate the right turn movement onto the site.
- Provide suitable truck warning signs on both approaches to the site access.

7.2.13 Buttonderry Site access

- Provide an exclusive left turn lane on Hue Hue Road to facilitate the left turn movement onto the site.
- Provide an exclusive right turn lane on Hue Hue Road to facilitate the right turn movement onto the site.
- Provide suitable truck warning signs on both approaches to the site access.

7.2.14 Western Ventilation Shaft Site access

- Provide an exclusive left turn lane on Little Jilliby Road to facilitate the left turn movement onto the site.

7.3 Project site accesses

WACJV will seek the relevant Section 138 permit for any works to be undertaken in or over any public road corridor.

Figures 7.1 to 7.3 show the recommended access layout of the Tooheys Road Site, Buttonderry Site and the Western Ventilation Shaft Site.

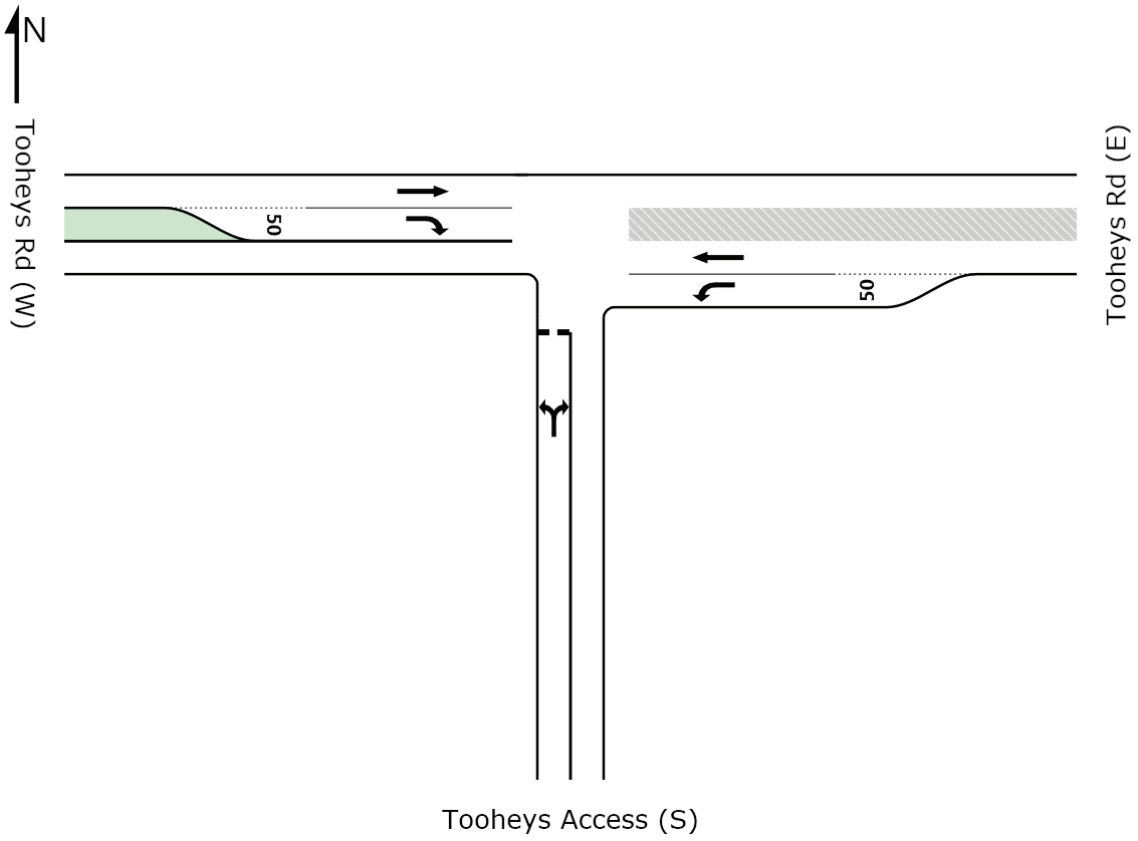


Figure 7.1 Recommended layout of the Tooheys Road Site access

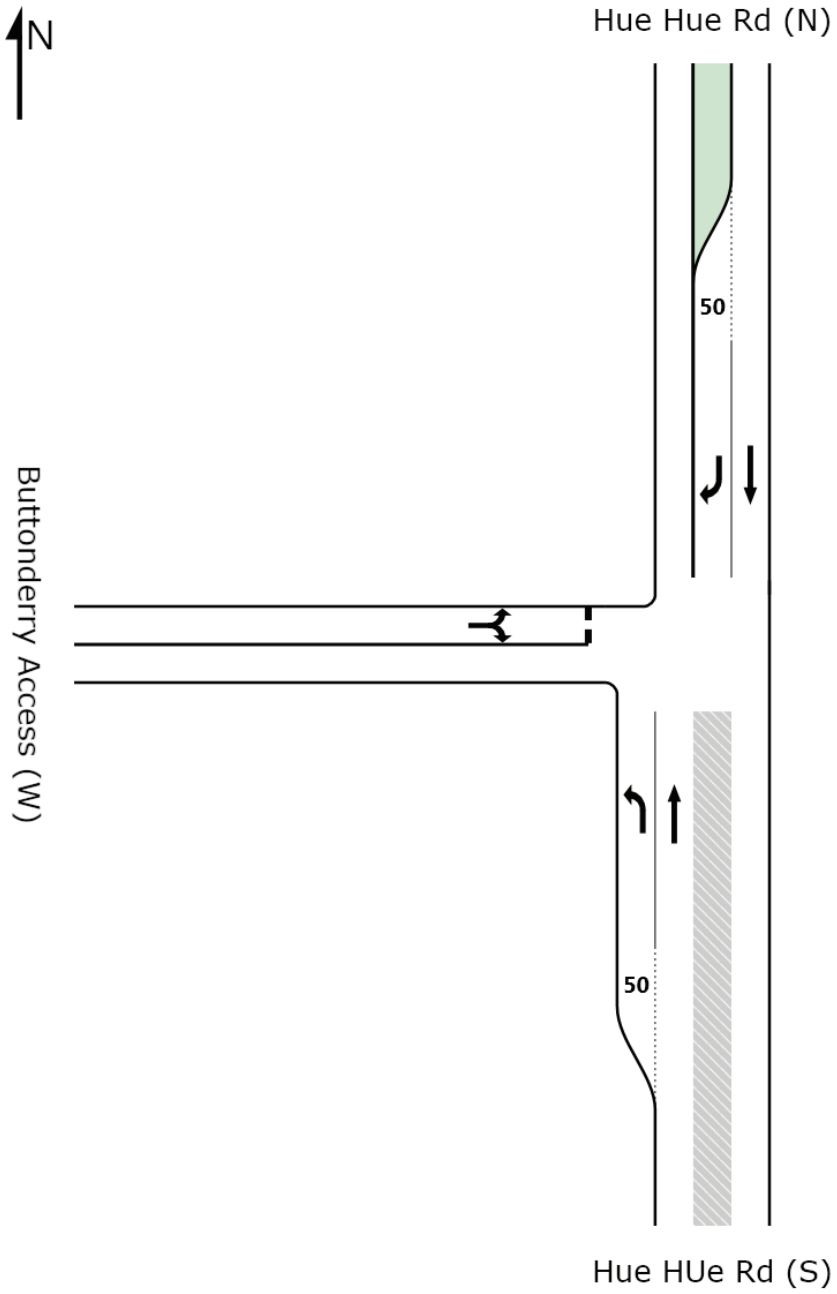


Figure 7.2 Recommended layout of the Buttonderry Site access

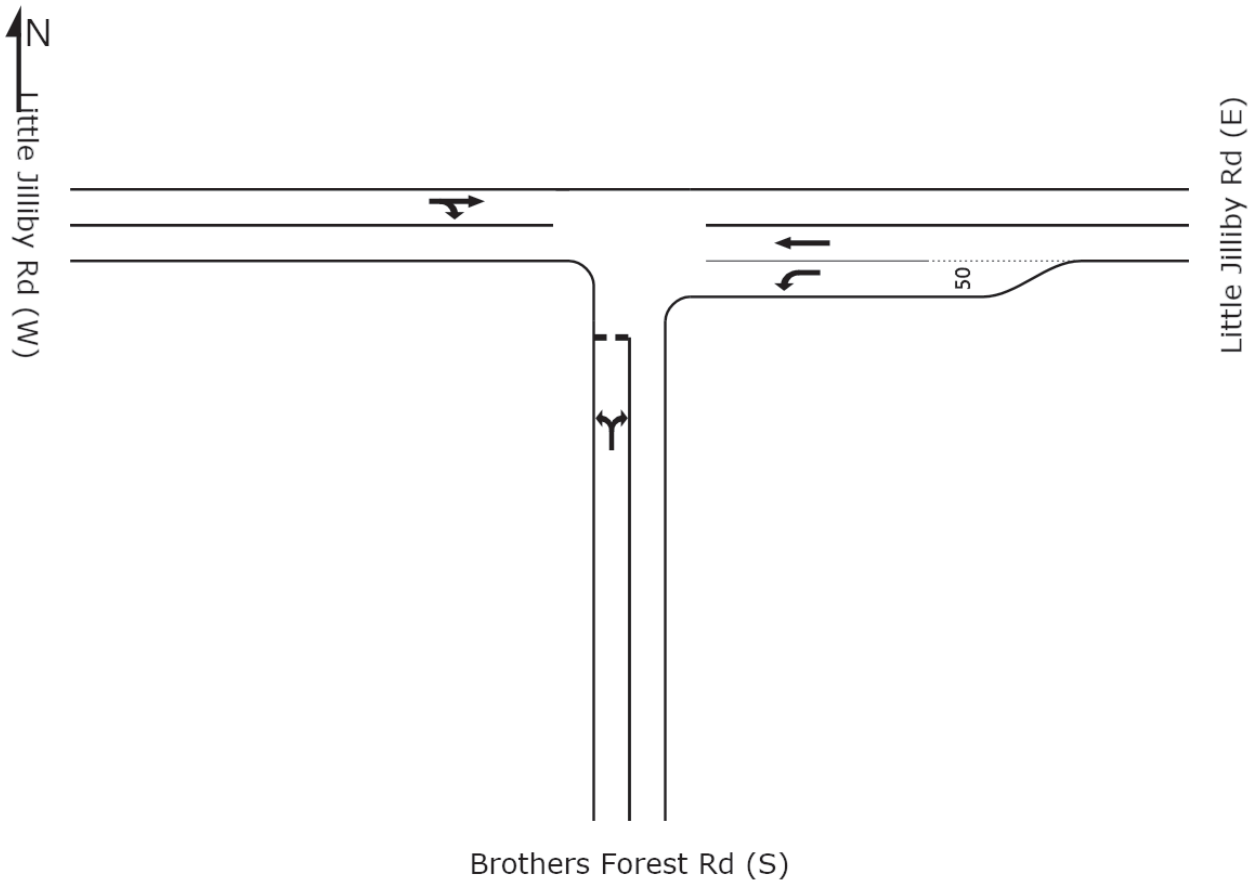


Figure 7.3 Recommended layout of the Western Ventilation Shaft Site access

7.4 School bus route safety

- Arrange the movement of heavy vehicles as to minimise disruption to traffic during the before and after school periods.
- Provide 'SCHOOL CHILDREN' warning signs on both approaches to the road section outside Jilliby Public School.

8. Road dilapidation

Road dilapidation inspections should be undertaken where the Project is likely to result in additional heavy vehicle traffic usage of the WSC's maintained road network on a sustained basis. The inspections should consider the pavement and drainage structure in consultation with the RMS and WSC prior to the commencement of construction and after construction is complete. Any damage resulting from construction of the Project, beyond normal wear and tear, should be repaired unless alternative arrangements are made with the relevant road authority.

9. Subsidence assessment

The subsidence effects associated with the underground mining operations for the Project are anticipated to result in impacts to local road network in the vicinity of the Extraction Area. Subsidence effects will likely result in modified drainage characteristics on the road surface and surrounds (including additional ponding) and will also cause road surfaces to crack and experience heaving effects. Some bridges may be affected by valley closure subsidence effects, though are not anticipated to be significant.

WACJV is committed to ensuring that any impacts on the local road network due directly to subsidence are remediated to ensure the ongoing safety of the road network. Ongoing visual inspections of the public road network and any bridges within the Extraction Area will be undertaken during the active subsidence period to identify any areas on the network requiring immediate attention by WACJV.

10. Construction traffic management

Prior to any construction commencing, a construction traffic management plan should be prepared as part of the pre-construction planning. The plan should detail how the traffic associated with the construction should be managed in accordance with the Roads and Traffic Authority 2010, *Traffic Control at Work Sites*, as well as relevant Australian Standards including AS1742.

Traffic Management Plans should be developed for the construction of rail bridges for the new rail spur line crossing over Tooheys Road as well as the temporary closure of Tooheys Road and Brothers Road during the construction period.

The construction traffic management plan should also be used to develop site-specific traffic management measures once the construction methods and haulage routes are finalised. These measures should be developed as part of the site-specific management plans to indicate how traffic should be controlled and managed during each stage of the construction.

The construction traffic management plan should contain the following information:

- The proposed works and construction traffic impacts:
  - Proposed construction activities.
  - Estimated duration of the works.
  - Increased traffic volume by vehicle type.
  - Anticipated or designated routes for the delivery of materials and equipment.
  - Summary of the potential construction impacts on the road network and any feasible measures to reduce the forecast impacts.
- Considerations:
  - Retention of local property and emergency access where practicable.
  - Provide a swept path analysis to ascertain that sufficient manoeuvring space is provided for all vehicles at intersections along the haulage routes.
  - Warning signs to advise road users in advance of work zones and surrounding intersections.
  - Safety signage to be installed to warn construction vehicle drivers of the presence of cyclists and pedestrians.
  - U-turn facilities for construction vehicles where necessary.
  - Emphasis on the school bus route particularly along Jilliby Road, near Jilliby Public School.
  - Repair damaged road pavement and pavement shoulder.
- Stakeholders:
  - The main stakeholders in the construction traffic management plan.

- Roles and responsibilities of all stakeholders.
- Contact details for all stakeholders.
- The person responsible for developing, updating and implementing the plan.
- Any required approvals and licenses.

- Community consultation:
  - Letterbox drops to local residents advising of potential property access restrictions (if required).
  - Signposting and advertising to warn motorists of proposed road closures and traffic diversions and other temporary traffic arrangements.
  - Advertisements in local newspapers.

Traffic control plans should be prepared as part of the construction traffic management plan for specific stages of work or locations as required. A review of temporary road work traffic control measures, signage and speed limits in areas of potential risk will also be undertaken.

The construction traffic management plan should also outline procedures to audit implementation of the plan and particularly to ensure safety aspects are being observed.

11. Conclusions

11.1 Intersection performance analysis

The Project would not impose any adverse impacts on the surrounding road network, as a result of the increased traffic associated with construction and operational activities.

Five intersections would face capacity constraints in future years due to the forecast growth in background traffic and the operation of the surrounding new developments. However this congestion is not a result of the Project. In order to maintain satisfactory intersection performance in the forecast years, irrespective of the Project proceeding, it is recommended that RMS and the WSC proceed with planned upgrades which should involve the widening of Sparks Road, signalisation of the F3/Sparks Road interchange (eastern side), as well as the upgrades of the F3/Sparks Road interchange (western side), Hue Hue Road/Wyee Road intersection, Hue Hue Road/Jilliby Road intersection as well as the Motorway Link Road/Tooheys Road interchange (northern side).

The proposed layout at the newly created intersections, including the Tooheys Road Site, Buttonderry Site and the Western Ventilation Shaft Site accesses is adequate to accommodate the estimated future traffic.

11.2 Road safety

The crash record at the F3/Sparks Road interchange as well as the Hue Hue Road/Sparks Road intersection is poor and includes a significant number of 'right turning/crossing' crashes. Project related traffic would marginally increase the risk exposure at this intersection.

Consultation with WSC indicated that the Hue Hue Road/Sparks Road intersection would be upgraded to provide an auxiliary right turn lane (Type CHR) for the right turning movement from Sparks Road onto Hue Hue Road. This would significantly improve the road safety outcome at this intersection.

The design of the access points at the Tooheys Road Site, Buttonderry Site and Western Ventilation Shaft has taken road safety into consideration. The proposed turning lanes reduce the potential rear end crashes on the frontage roads, resulting from the separation of the through traffic and the left turning traffic travelling at different speeds toward the site accesses.

The recommended roundabout at the Hue Hue Road/Wyee Road intersection would reduce the potential safety risks by simplifying conflicts, reducing vehicle speed and by simplifying a driver's decision by providing by a clearer indication of the driver's right of way.

A number of road safety issues were identified in relation to deficiencies in signs and linemarking, delineation, pavement, guardrail and drainage, and a number of mitigation measures could be implemented to improve road safety irrespective of whether the project does or does not proceed.

11.3 Public transport, pedestrian and cyclist considerations

Public transport, pedestrian and cyclist facilities would be improved along the Sparks Road corridor as a result of the Wyong Employee Zone project. However, the anticipated demand for mining employees to use public transport is not anticipated to be significant, and therefore would not impact on the public transport services.

11.4 School bus route considerations

The Project related traffic may potentially impact on the school bus operation and pedestrian safety on Jilliby Road in the vicinity of Jilliby Public School. It is recommended that the movement of heavy vehicles is arranged so as to minimise disruption to traffic during the before and after school periods.

11.5 Conclusions

- The Project would not impose any adverse impacts on the surrounding road network as a result of the increased traffic associated with construction and operational activities.
- The main contributor to the future traffic volumes is the Wyong Employment Zone - scheduled to be in operation in 2018.
- Model forecasts identify five intersections which would perform at unacceptable level in 2025, due to the growth of background traffic and the inclusion of other surrounding new developments, irrespective of whether or not the Project proceeds. It is recommended that the RMS and Wyong Shire Council consider increasing the intersections' capacity with the following upgrades:
  - Widening of Sparks Road.
  - Provision of additional through and turn lanes at the F3/Sparks interchange (western side).
  - Signalisation of the F3/Sparks interchange (eastern side).
  - Provision of a two-lane roundabout at the Hue Hue Road/Wyee Road intersection.
  - Provision of a short left turn lane on the eastbound on-ramp at the Motorway Link Road/Tooheys Road interchange (northern side).
  - Provision of a single lane roundabout at the Hue Hue Road/Jilliby Road intersection.
- Tooheys Road is unlikely to efficiently and safely accommodate the future traffic volume as a result of the growth of background traffic and the inclusion of other surrounding new developments, irrespective of whether or not the Project proceeds. It is recommended that Tooheys Road be sealed and upgraded to provide four lanes in its section between the Bushells Ridge Employment Estate access and the Motorway Link Road Interchange.

- Consideration should be given to providing shuttle bus service between the mine site and major towns during construction phase. This would reduce the number of employee vehicle trips, resulting in lower traffic impacts on the surrounding road network.
- The Project's construction and operation activities should be undertaken in compliance with accepted traffic engineering practices, along with mitigation measures as recommended in this report.

12. References

ADW Johnson (2010) *Statement of Environmental Effect for a Proposed 18 lot Industrial Subdivision.*

ARUP (2005) *Wyong Employment Zone Sparks Road Intersection Analysis.*

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Roads and Traffic Authority (2002) *Guide to Traffic Generating Developments.*

Roads and Traffic Authority (2004) *Traffic Volume Data for Hunter and Northern Regions.*

Statement of Environmental Effects for the Master Plan for the Upgrade to the Buttonderry Waste Management Facility.

TAR Technologies (2008) *Traffic Assessment for Warner Industrial Park – Concept Plan and Project Application.*

Trehy, Ingold and Neate Land Development (2011) *Section 96(1) Application to Modify Development Consent DA/3130/2004/A Proposing Subdivision of Land 150–190 Sparks Road, Warnervale.*

Wyong Shire Council (2006) *Wyong Employment Zone Traffic Study.*

Wyong Shire Council (2006) *Wyong Employment Zone Sparks Road Traffic Generation Report.*

Appendix A

Traffic generation and distribution of surrounding developments

Warner Industrial Park and Wyong Employment Zone – Precinct 14

Warner Industrial Park is 90 lot subdivision of a parcel of land used for industrial and ancillary uses, as a part of Precinct 14 of the Wyong Employment Zone. Precinct 14 is a private commercial area, part of the Wyong Employment Zone development.

Based on the available information the cumulative traffic impact assessment included the traffic generation associated with the development's operational activities.

A consultation with WSC has confirmed the following traffic assumptions:

- Peak hour and off-peak traffic generation.
- Intersection layout at the proposed access points.
- Heavy vehicle percentage of the total traffic generated by the development.

The site is located on the eastern side of Hue Hue Road between Sparks Road and Kiar Ridge Road. There would be two proposed access points:

- A roundabout on Sparks Road.
- A channelised intersection on Hue Hue Road.

Traffic generation

When the development is fully developed, it is expected to generate about 430 vehicles during the AM peak hour between 8.00 am and 9.00 am, and during the PM peak hour between 4.00 pm and 5.00 pm. Although the *Wyong Employment Zone Sparks Road Intersection Analysis 2005* assumed it would be operational by 2018, Council indicates the timeframe of this development is uncertain at this stage. This assessment assumed the development would be fully occupied in the future assessment years (i.e. 2025 and 2026).

The development is expected to generate traffic outside the morning and afternoon peak hours. For the purposes of this cumulative traffic impact assessment, it was assumed that 15% of the peak traffic would be travelling into and out of the development during the off-peak hours (between 7.00 am and 8.00 am, between 9.00 and to 4.00 pm, and between 5.00 pm and 7.00 pm). The traffic distribution by time of day was considered in selecting future traffic peak hours (refer to section 5.5).

During the AM peak hour, the traffic generated by the site is expected to be 80% inbound and 20% outbound. A reverse pattern in the PM peak hour is expected: 80% of the trips would be inbound and 20% would be outbound. During the off-peak hours, the generated traffic is expected to be 50% inbound and 50% outbound.

It was assumed that 10% of traffic generated by the development consists of heavy vehicles.

Traffic distribution

Parsons Brinckerhoff was provided with traffic distribution information that 70% of trips would use the Sparks Road access, while 30% would use the Hue Hue Road access.

The traffic distribution is based on the *Wyong Employment Zone Sparks Road Intersection Analysis 2005* into and out of the development, and Parsons Brinckerhoff's additional assumptions made for the trips to/from the external road network. WSC has confirmed these assumptions.

The traffic distribution adopted in the analysis includes:

- Inbound trips: 30% from F3 (south), 35% from F3 (north), 15% from Sparks Road (east), 6% from Hue Hue Road (north), and 14% from Hue Hue Road (south).
- Outbound trips: 30% to F3 (south), 35% to F3 (north), 15% to Sparks Road (east), 7% to Hue Hue Road (north), and 13% to Hue Hue Road (south).

This assessment assumed the development would be fully occupied in the future assessment years (i.e. 2025 and 2026).

Wyong Employment Zone – Precincts 11 and 13

Based on Wyong Shire Council (2006) *Wyong Employment Zone Sparks Road Traffic Generation Report*, Table 3 in Part A indicated that the Precincts 11 and 13 would generate 2,040 vehicles between 8.00 am and 9.00 am and approximately 2,378 vehicles between 4.00 pm and 5.00 pm on a weekday. This is based on the increased traffic volume in 2018, on the Sparks Road section to the east of the F3/Sparks Road interchange.

The Council report provides information on the Precincts 11 and 13 related traffic volumes at the F3/Sparks Road interchange. These peak hour traffic volumes were adopted in the cumulative traffic impact assessment. Traffic generation during other hours was also considered.

This assessment assumed the WEZ would be fully occupied in the future assessment years (i.e. 2025 and 2026).

Bushells Ridge Employment Estate

Parsons Brinckerhoff adopted the following assumptions in the assessment:

- 28 employees per hectares.
- 0.318 vehicular trip per employee during the AM peak hour.
- 0.365 vehicular trip per employee during the PM peak hour.
- 60% of total land size is developable based on the draft concept plan of subdivision (a significant proportion of land would not be developable which is to be used as green corridor).
- 80% of traffic would be arriving and 20% departing from the development during the AM peak period, and 20% arriving and 80% departing from the development during the PM peak period.
- 70% of traffic would be distributed to/from the northern access via the Bushells Ridge Road and 30% to/from the southern access via Tooheys Road.

To the developable land of 130 hectares, the development would result in a total of 1,389 vehicle trips (two way) during the AM peak hour and 1,594 vehicle trips (two way) during the PM Peak hour. Traffic generation during other hours was considered in the assessment.

This assessment assumed the development would be fully occupied in the future assessment years (i.e. 2025 and 2026).

Tooheys Road 18 Lot Industrial Subdivision

The RTA's Traffic Generating Development Guide outlines that 28 employees per developed hectare is an appropriate assumption for industrial estates containing mainly factories. Based on this, a total of 273 employment opportunities will be created once the development becomes fully operational. The Guide also provides an indication of traffic generation distribution of an industrial estate of 1,000 employees during each working day between 7.00 am and 7.00 pm. Due to the lack of project specific information, the traffic generation distribution as recommended in the RTA guide has been adopted in this assessment. As it has been estimated 273 employees will work within the subdivision, a factor of 0.27 has been used to the RTA hourly distribution and has been provided in Table A1.

Table A1 Traffic generation of the Tooheys Road 18 lot subdivision

Time	Light vehicles/ hr/1000 staff	Heavy vehicles/ hr/1000 staff	Total vehicles
7.00 am–8.00 am	27	0	28
8.00 am–9.00 am	84	3	87
9.00 am–10.00 am	56	8	64
10.00 am–11.00 am	29	9	39
11.00 am–12.00 pm	23	9	32
12.00 pm–1.00 pm	36	8	45
1.00 pm–2.00 pm	44	9	54
2.00 pm–3.00 pm	31	7	38
3.00 pm–4.00 pm	45	8	53
4.00 pm–5.00 pm	72	7	79
5.00 pm–6.00 pm	96	4	100
6.00 pm–7.00 pm	12	0	12
Total	**555**	**73**	**628**

It is estimated a total of 628 vehicle trips (two-way) would be generated from the industrial subdivision between 7.00 am and 7.00 pm. The peak hours are estimated to occur between 8.00 am and 9.00 am and between 5.00 pm and 6.00 pm. Heavy vehicles made up approximately 14%–16% of the total traffic volumes. Parsons Brinckerhoff adopted the following assumptions in the assessment:

- 90% of traffic would be distributed to/from the east and 10% to/from the west via Tooheys Road.
- 80% of traffic would be arriving and 20% departing from the development during the AM peak period, and 20% arriving and 80% departing from the development during the PM peak period. During other hours, 50% of traffic would be arriving and 50% departing from the development.

This assessment assumed the development would be fully occupied in the future assessment years (i.e. 2015, 2025 and 2026).

Warnervale Airport Industrial Subdivision

The RTA's Traffic Generating Development Guide outlines that 28 employees per developed hectare is an appropriate assumption for industrial estates containing mainly factories. Based on this, a total of 222 employment opportunities will be created once the development becomes fully operational. The Guide also provides an indication of traffic generation distribution of an industrial estate of 1,000 employees during each working day between 7.00 am and 7.00 pm. As it has been estimated 222 employees will work within the subdivision, a factor of 0.22 has been used to the RTA hourly distribution and has been provided in Table A2.

Table A2 Traffic generation of the Warnervale Airport Industrial subdivision

Time	Light vehicles/ hr/1000 staff	Heavy vehicles/ hr/1000 staff	Total vehicles
7.00 am–8.00 am	22	0	22
8.00 am–9.00 am	68	2	70
9.00 am–10.00 am	46	6	52
10.00 am–11.00 am	24	7	31
11.00 am–12.00 pm	18	7	26
12.00 pm–1.00 pm	29	7	36
1.00 pm–2.00 pm	36	8	43
2.00 pm–3.00 pm	25	6	31
3.00 pm–4.00 pm	36	7	43
4.00 pm–5.00 pm	59	5	64
5.00 pm–6.00 pm	78	3	81
6.00 pm–7.00 pm	10	0	10
Total	**450**	**59**	**509**

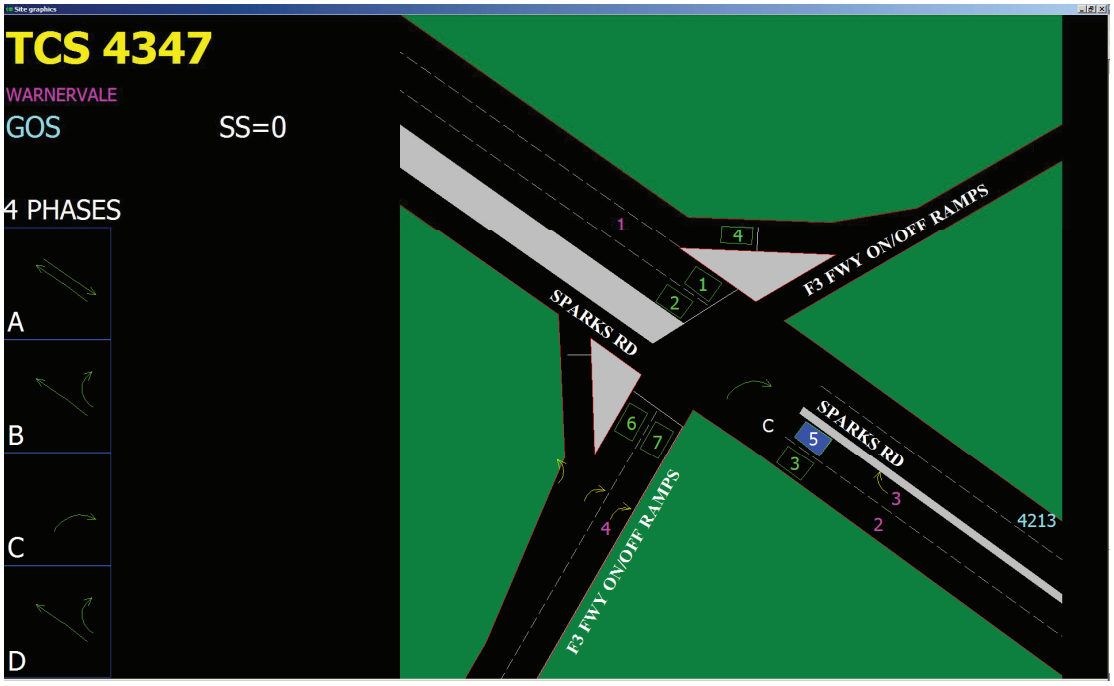
It is estimated a total of 509 vehicle trips (two-way) would be generated from the industrial subdivision between 7.00 am and 7.00 pm. The peak hours are estimated to occur between 8.00 am and 9.00 am and between 5.00 pm and 6.00 pm. Heavy vehicles made up approximately 14%–16% of the total traffic volumes. Parsons Brinckerhoff adopted the following assumptions in the assessment:

- 30% of traffic would be distributed to/from the east and 70% to/from the west via Sparks Road.
- 80% of traffic would be arriving and 20% departing from the development during the AM peak period, and 20% arriving and 80% departing from the development during the PM peak period. During other hours, 50% of traffic would be arriving and 50% departing from the development.

This assessment assumed the development would be fully occupied in the future assessment years (i.e. 2015, 2025 and 2026).

Appendix B

Intersection Diagnostic Monitor (IDM) data



Statistics

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Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	19	15	24	16	33	320					
B	17	15	32	22	40	380					
C	14	15	27	18	27	261					
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F											
G											
Act. Cycle	19	30	69	50							
Nom. Cycle											

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Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time

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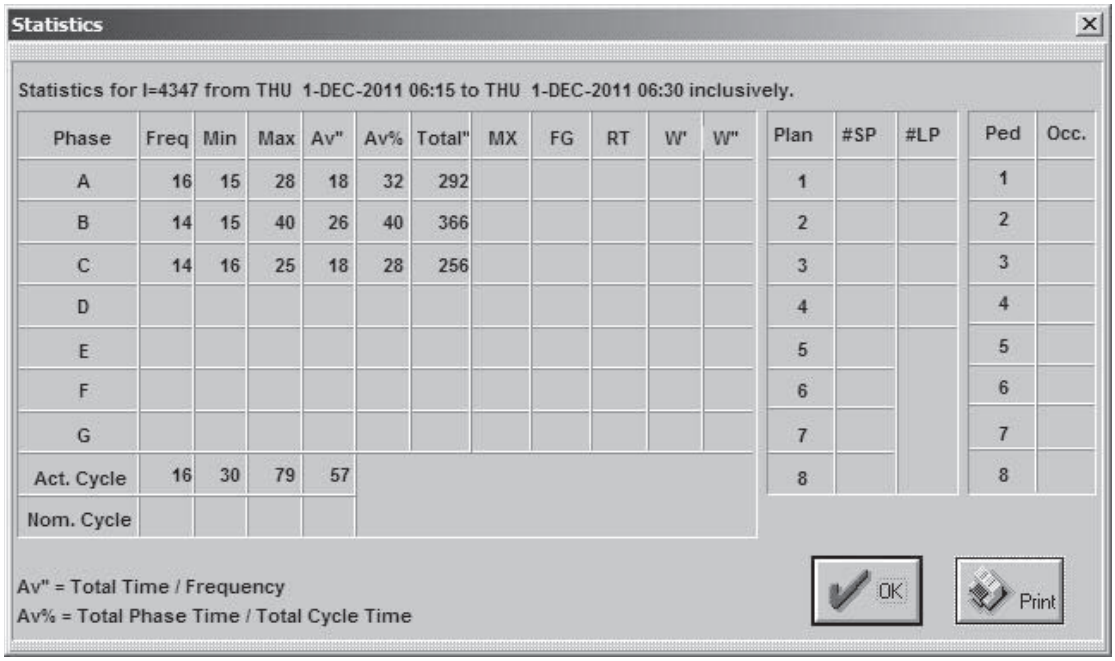

Statistics

Statistics for I=4347 from THU 1-DEC-2011 06:15 to THU 1-DEC-2011 06:30 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	16	15	28	18	32	292					
B	14	15	40	26	40	366					
C	14	16	25	18	28	256					
D											
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Act. Cycle	16	30	79	57							
Nom. Cycle											

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Av" = Total Time / Frequency
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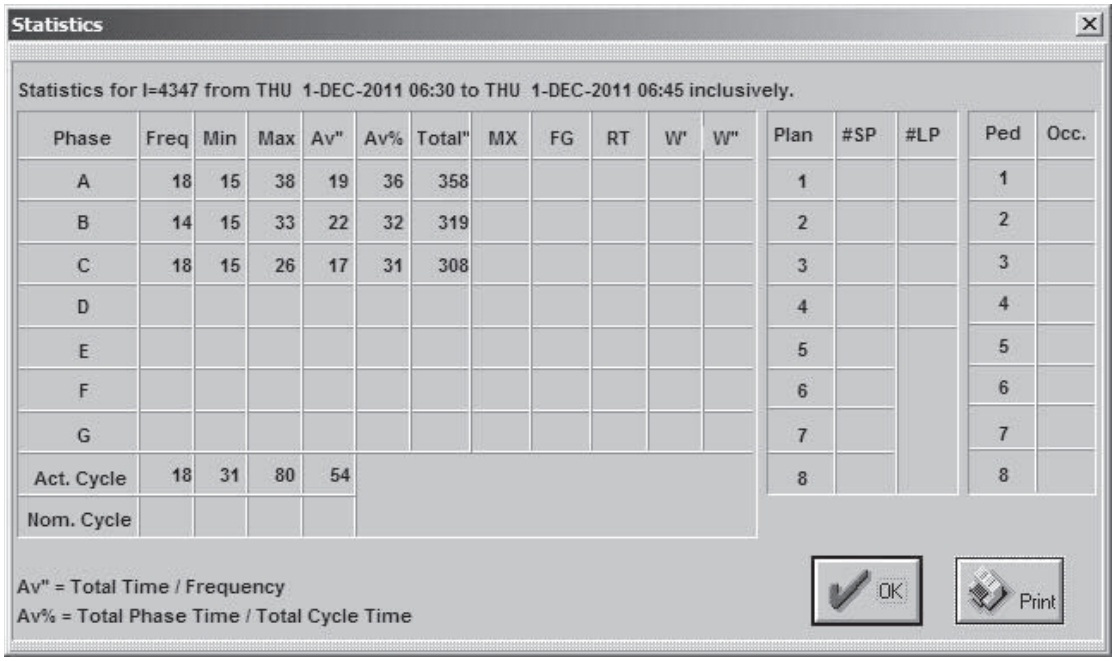

Statistics

Statistics for I=4347 from THU 1-DEC-2011 06:30 to THU 1-DEC-2011 06:45 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	18	15	38	19	36	358					
B	14	15	33	22	32	319					
C	18	15	26	17	31	308					
D											
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Act. Cycle	18	31	80	54							
Nom. Cycle											

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Av" = Total Time / Frequency
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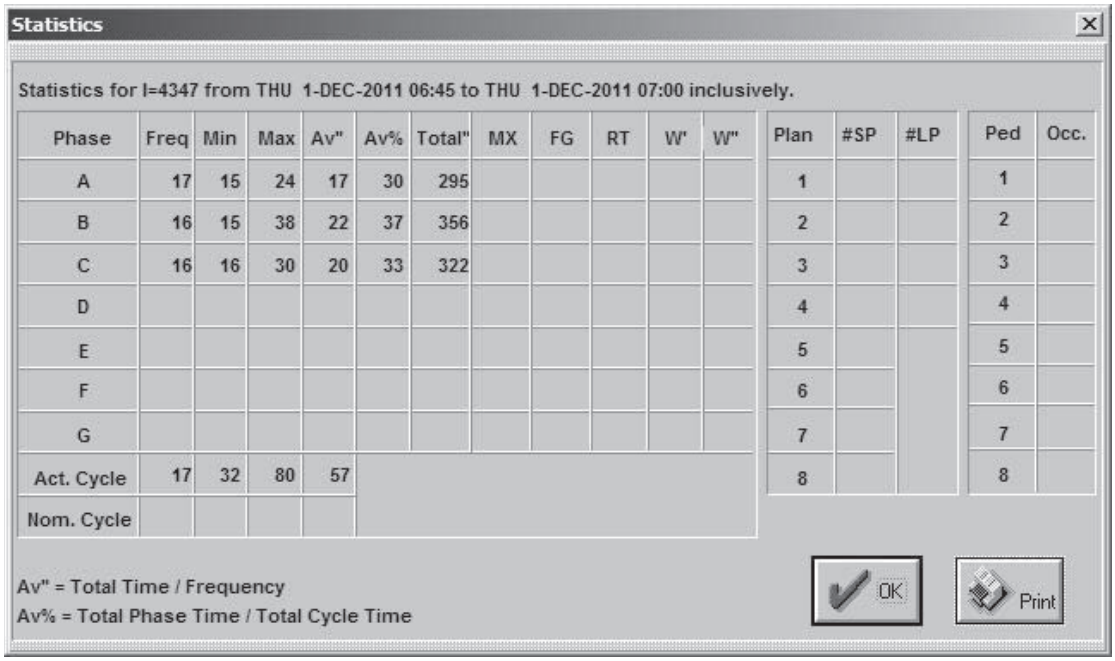

Statistics

Statistics for I=4347 from THU 1-DEC-2011 06:45 to THU 1-DEC-2011 07:00 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	17	15	24	17	30	295					
B	16	15	38	22	37	356					
C	16	16	30	20	33	322					
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Act. Cycle	17	32	80	57							
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Av" = Total Time / Frequency
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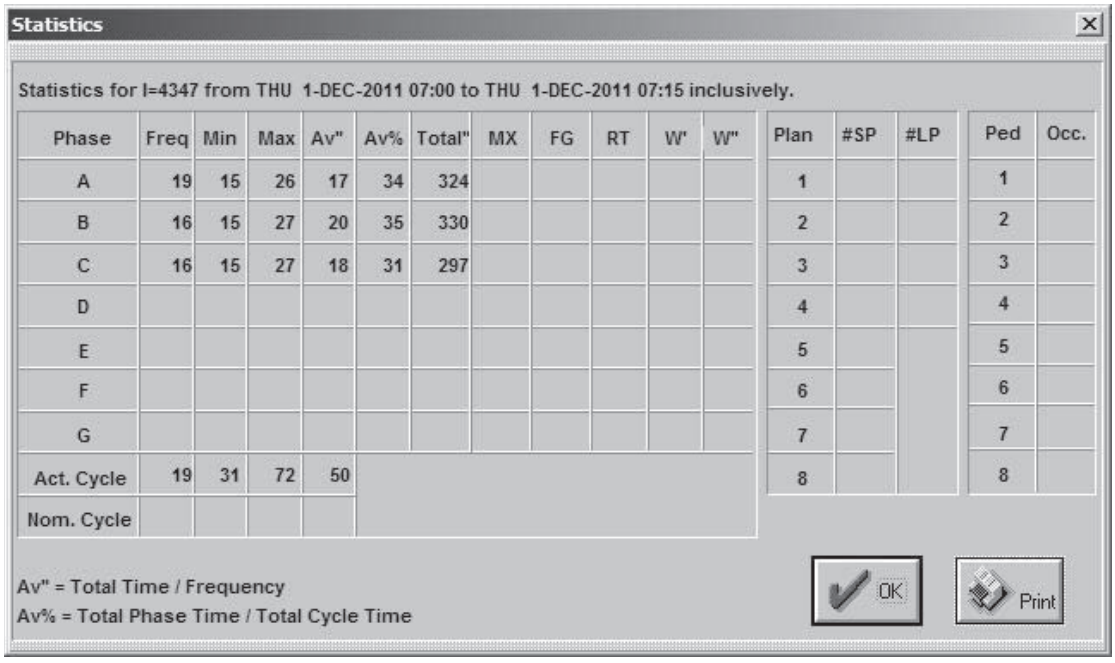

Statistics

Statistics for I=4347 from THU 1-DEC-2011 07:00 to THU 1-DEC-2011 07:15 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	19	15	26	17	34	324					
B	16	15	27	20	35	330					
C	16	15	27	18	31	297					
D											
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Act. Cycle	19	31	72	50							
Nom. Cycle											

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Av" = Total Time / Frequency
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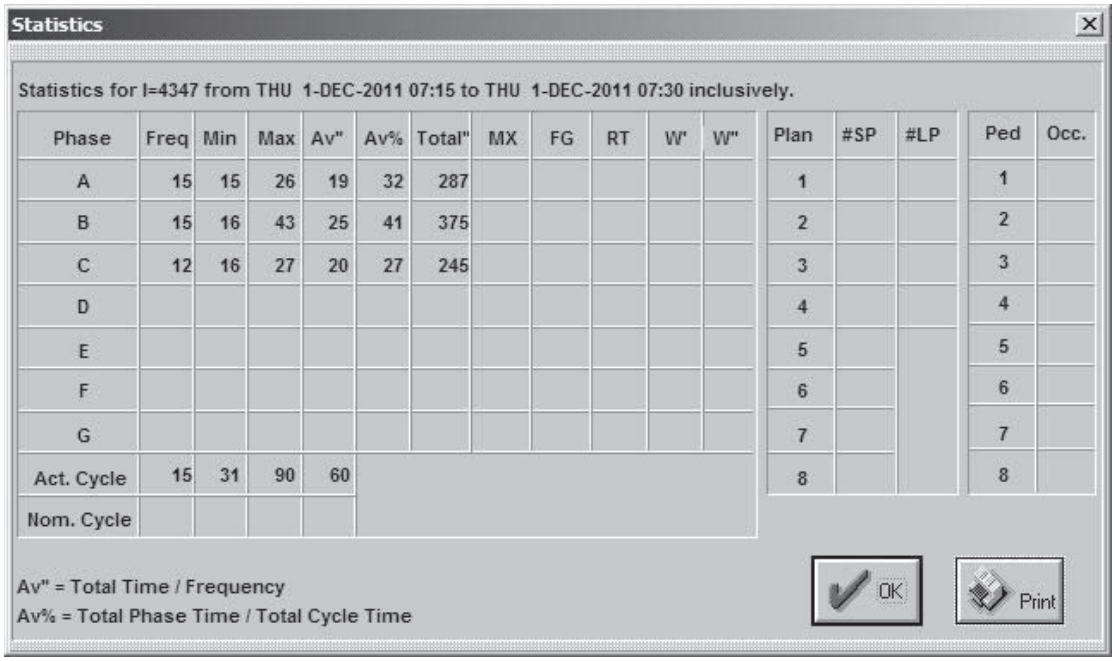

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Statistics for I=4347 from THU 1-DEC-2011 07:15 to THU 1-DEC-2011 07:30 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	15	15	26	19	32	287					
B	15	16	43	25	41	375					
C	12	16	27	20	27	245					
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Act. Cycle	15	31	90	60							
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Av" = Total Time / Frequency
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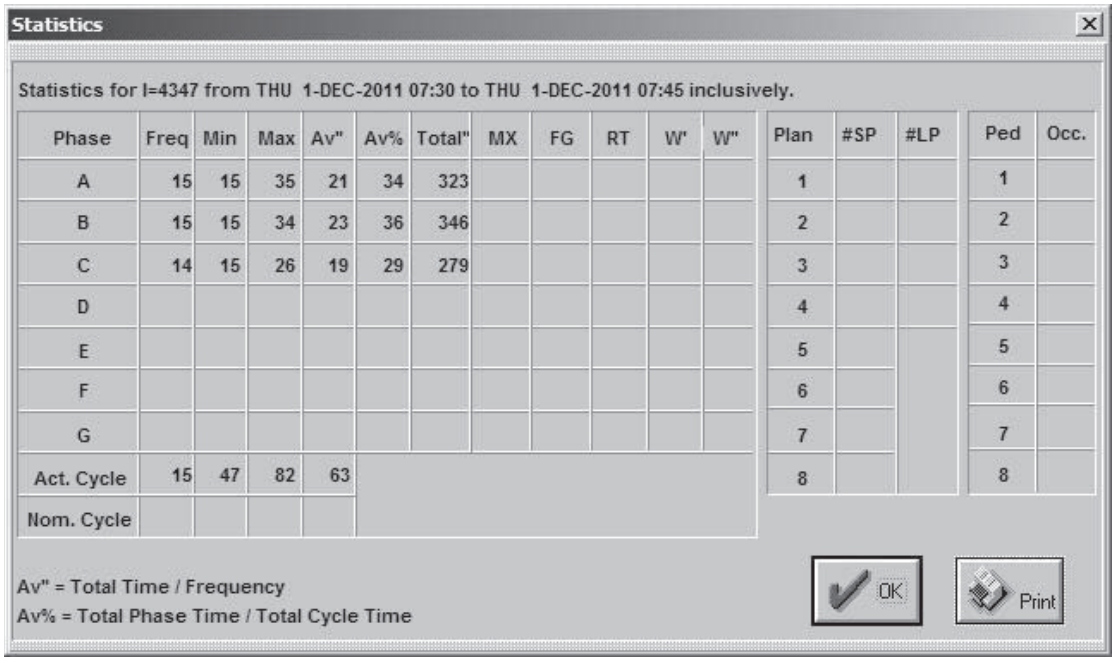

Statistics

Statistics for I=4347 from THU 1-DEC-2011 07:30 to THU 1-DEC-2011 07:45 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	15	15	35	21	34	323					
B	15	15	34	23	36	346					
C	14	15	26	19	29	279					
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Act. Cycle	15	47	82	63							
Nom. Cycle											

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Av" = Total Time / Frequency
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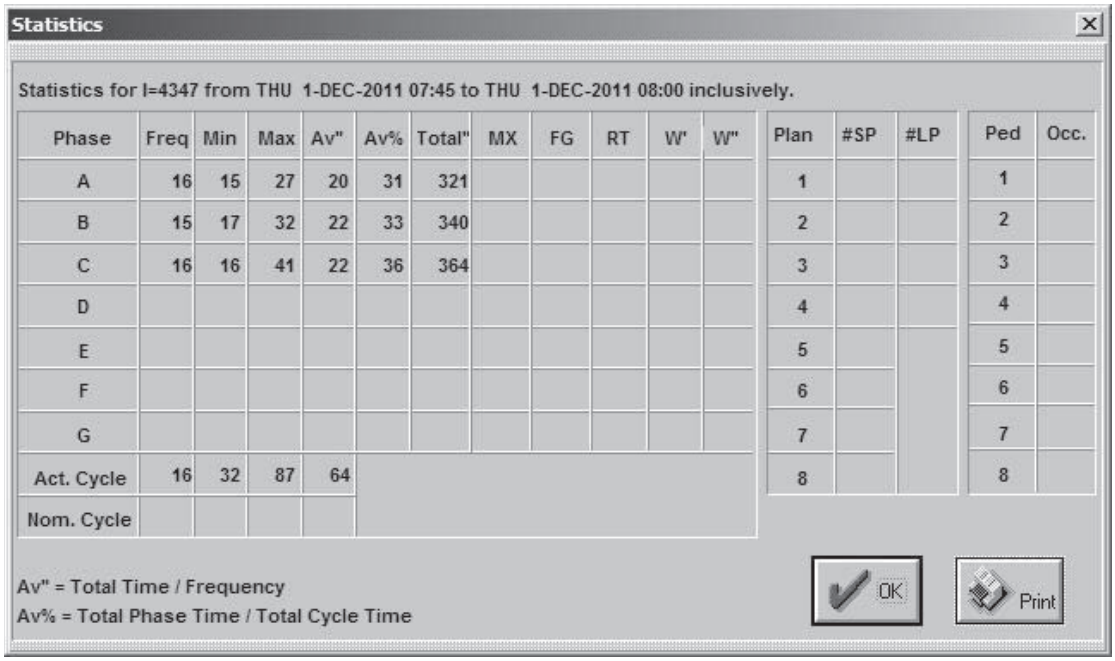

Statistics

Statistics for I=4347 from THU 1-DEC-2011 07:45 to THU 1-DEC-2011 08:00 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	16	15	27	20	31	321					
B	15	17	32	22	33	340					
C	16	16	41	22	36	364					
D											
E											
F											
G											
Act. Cycle	16	32	87	64							
Nom. Cycle											

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Av" = Total Time / Frequency
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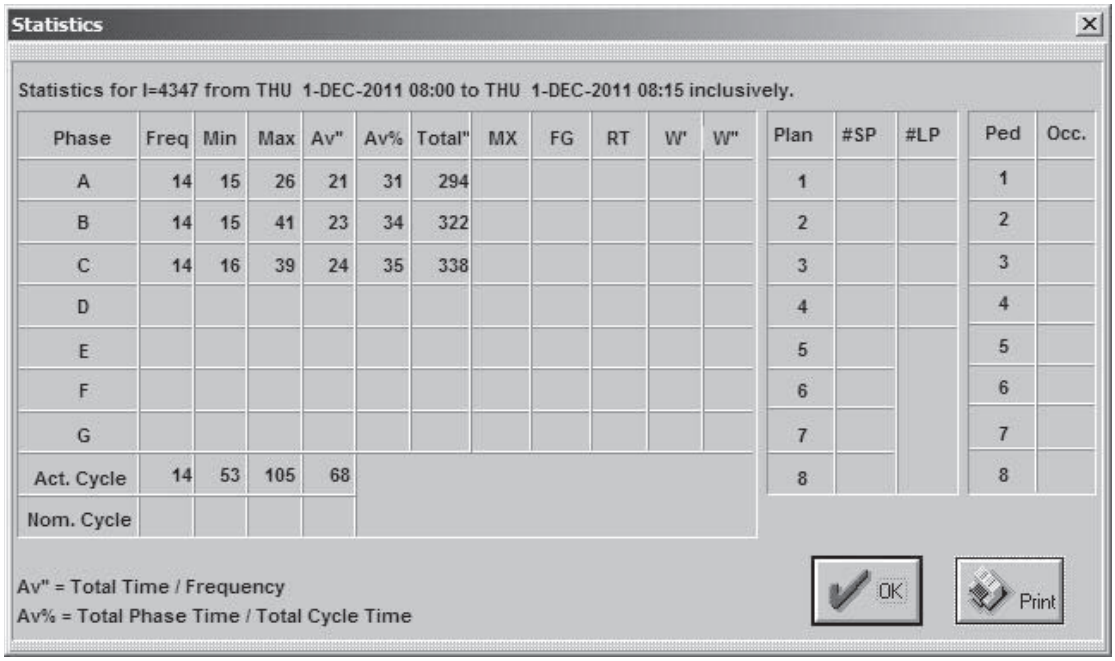

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Statistics for I=4347 from THU 1-DEC-2011 08:00 to THU 1-DEC-2011 08:15 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	14	15	26	21	31	294					
B	14	15	41	23	34	322					
C	14	16	39	24	35	338					
D											
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F											
G											
Act. Cycle	14	53	105	68							
Nom. Cycle											

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Av" = Total Time / Frequency
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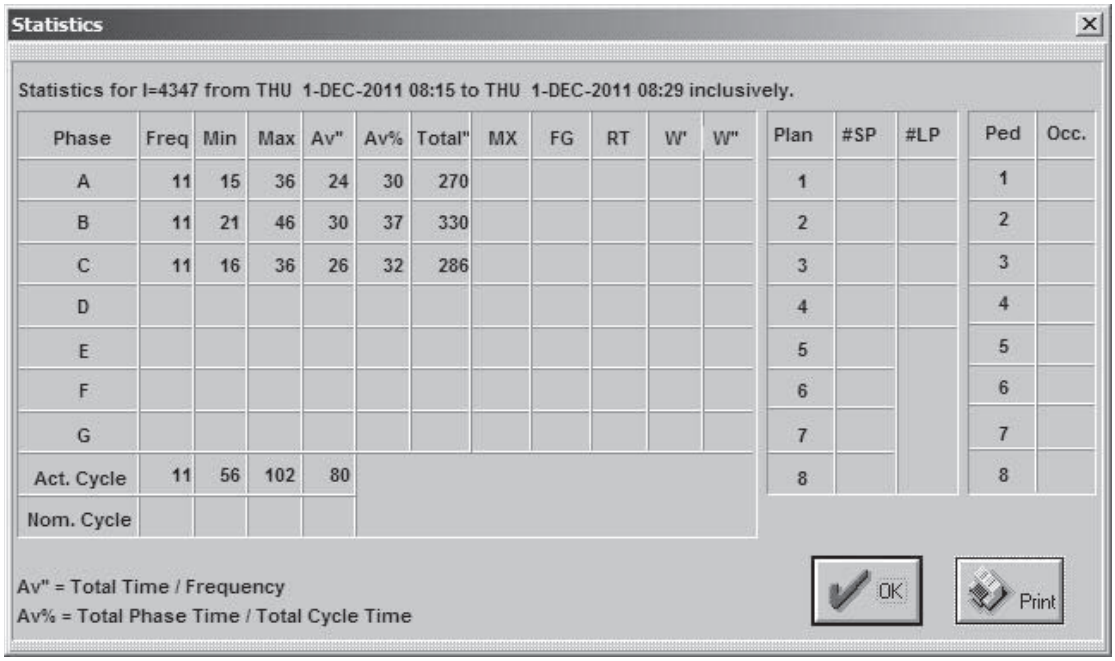

Statistics

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Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	11	15	36	24	30	270					
B	11	21	46	30	37	330					
C	11	16	36	26	32	286					
D											
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F											
G											
Act. Cycle	11	56	102	80							
Nom. Cycle											

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Av" = Total Time / Frequency
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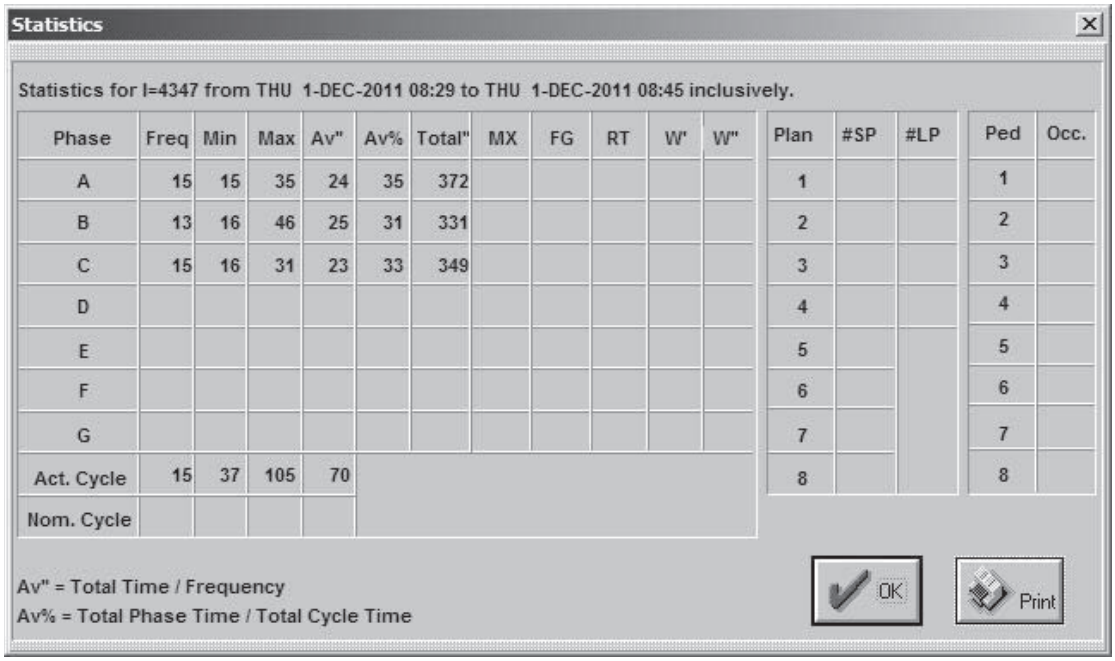

Statistics

Statistics for I=4347 from THU 1-DEC-2011 08:29 to THU 1-DEC-2011 08:45 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	15	15	35	24	35	372					
B	13	16	46	25	31	331					
C	15	16	31	23	33	349					
D											
E											
F											
G											
Act. Cycle	15	37	105	70							
Nom. Cycle											

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Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time

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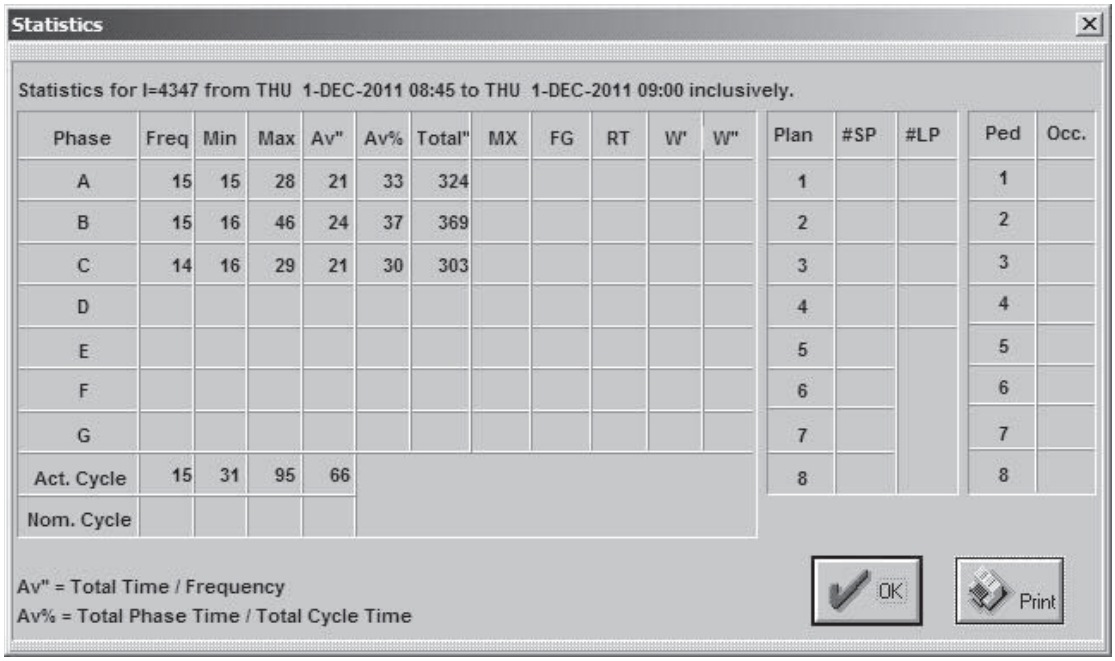

Statistics

Statistics for I=4347 from THU 1-DEC-2011 08:45 to THU 1-DEC-2011 09:00 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	15	15	28	21	33	324					
B	15	16	46	24	37	369					
C	14	16	29	21	30	303					
D											
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G											
Act. Cycle	15	31	95	66							
Nom. Cycle											

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Av" = Total Time / Frequency
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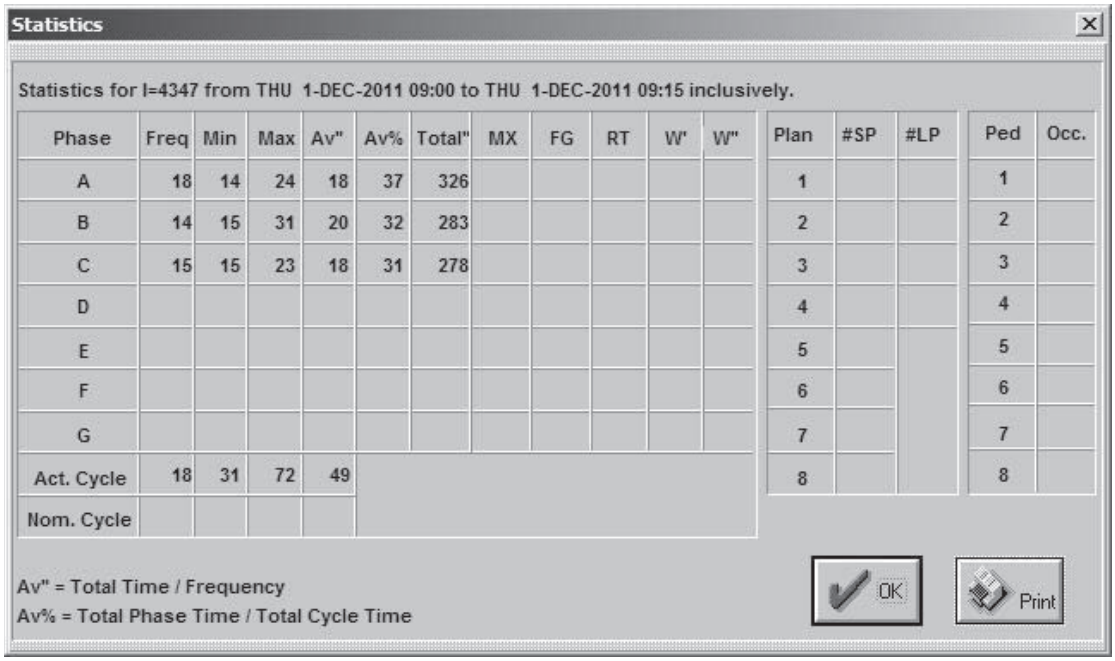

Statistics

Statistics for I=4347 from THU 1-DEC-2011 09:00 to THU 1-DEC-2011 09:15 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	18	14	24	18	37	326					
B	14	15	31	20	32	283					
C	15	15	23	18	31	278					
D											
E											
F											
G											
Act. Cycle	18	31	72	49							
Nom. Cycle											

Plan	#SP	#LP
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Ped	Occ.
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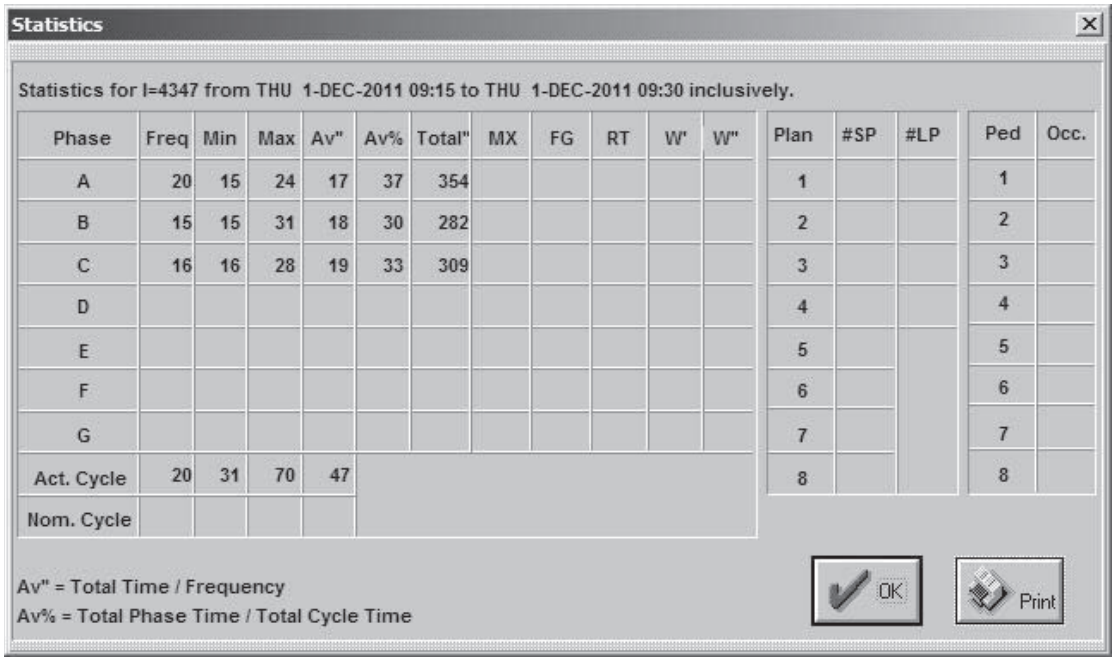
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time

OK Print



Statistics

Statistics for I=4347 from THU 1-DEC-2011 09:15 to THU 1-DEC-2011 09:30 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	20	15	24	17	37	354					
B	15	15	31	18	30	282					
C	16	16	28	19	33	309					
D											
E											
F											
G											
Act. Cycle	20	31	70	47							
Nom. Cycle											

Plan	#SP	#LP
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Ped	Occ.
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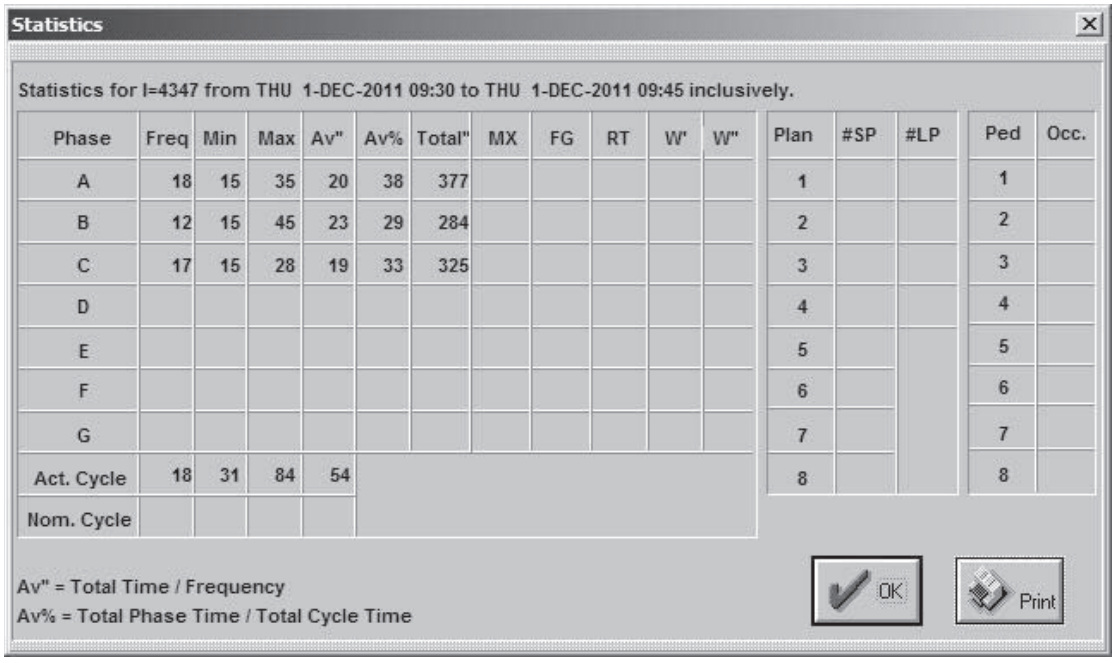
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time

OK Print



Statistics

Statistics for I=4347 from THU 1-DEC-2011 09:30 to THU 1-DEC-2011 09:45 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	18	15	35	20	38	377					
B	12	15	45	23	29	284					
C	17	15	28	19	33	325					
D											
E											
F											
G											
Act. Cycle	18	31	84	54							
Nom. Cycle											

Plan	#SP	#LP
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Ped	Occ.
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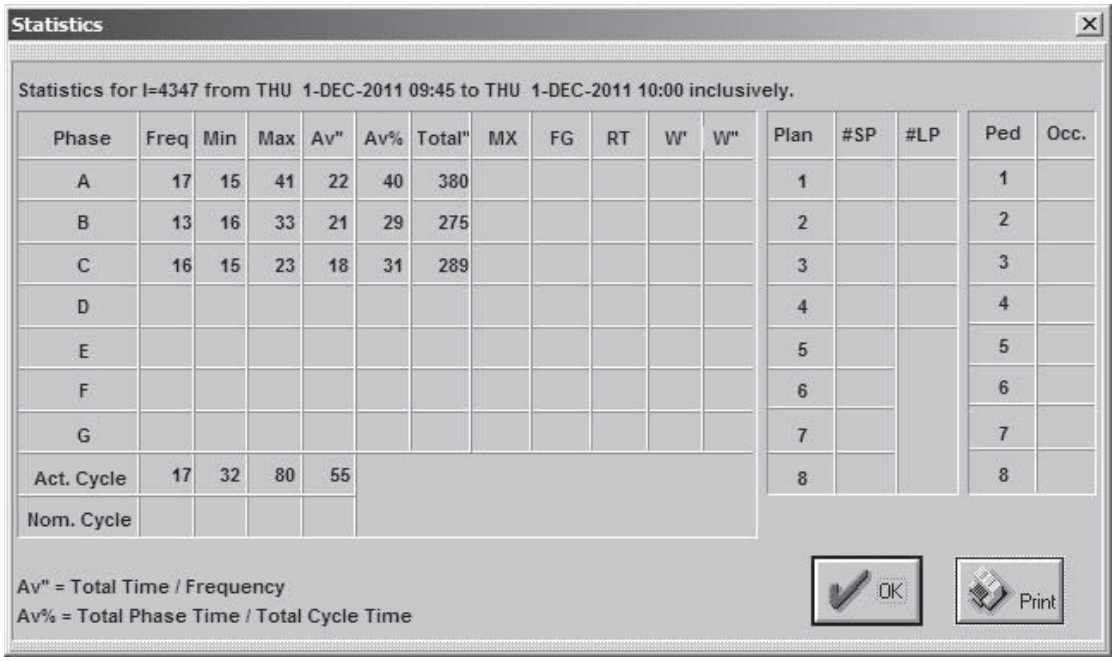
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time

OK Print



Statistics

Statistics for I=4347 from THU 1-DEC-2011 09:45 to THU 1-DEC-2011 10:00 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	17	15	41	22	40	380					
B	13	16	33	21	29	275					
C	16	15	23	18	31	289					
D											
E											
F											
G											
Act. Cycle	17	32	80	55							
Nom. Cycle											

Plan	#SP	#LP
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Ped	Occ.
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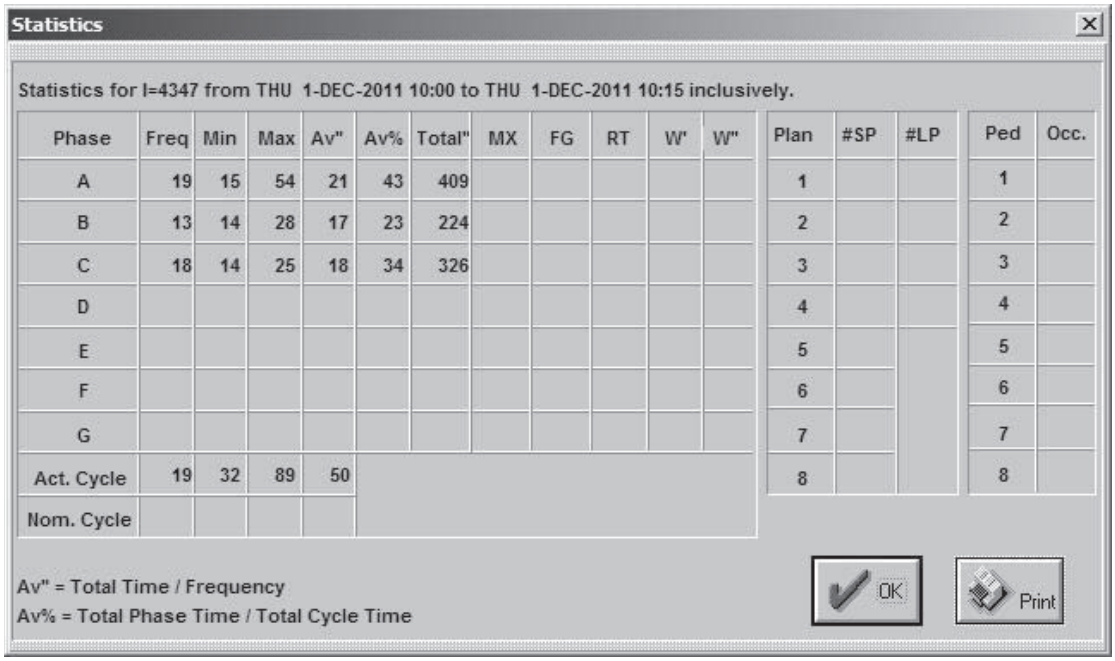
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time

OK Print



Statistics

Statistics for I=4347 from THU 1-DEC-2011 10:00 to THU 1-DEC-2011 10:15 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	19	15	54	21	43	409					
B	13	14	28	17	23	224					
C	18	14	25	18	34	326					
D											
E											
F											
G											
Act. Cycle	19	32	89	50							
Nom. Cycle											

Plan	#SP	#LP
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Ped	Occ.
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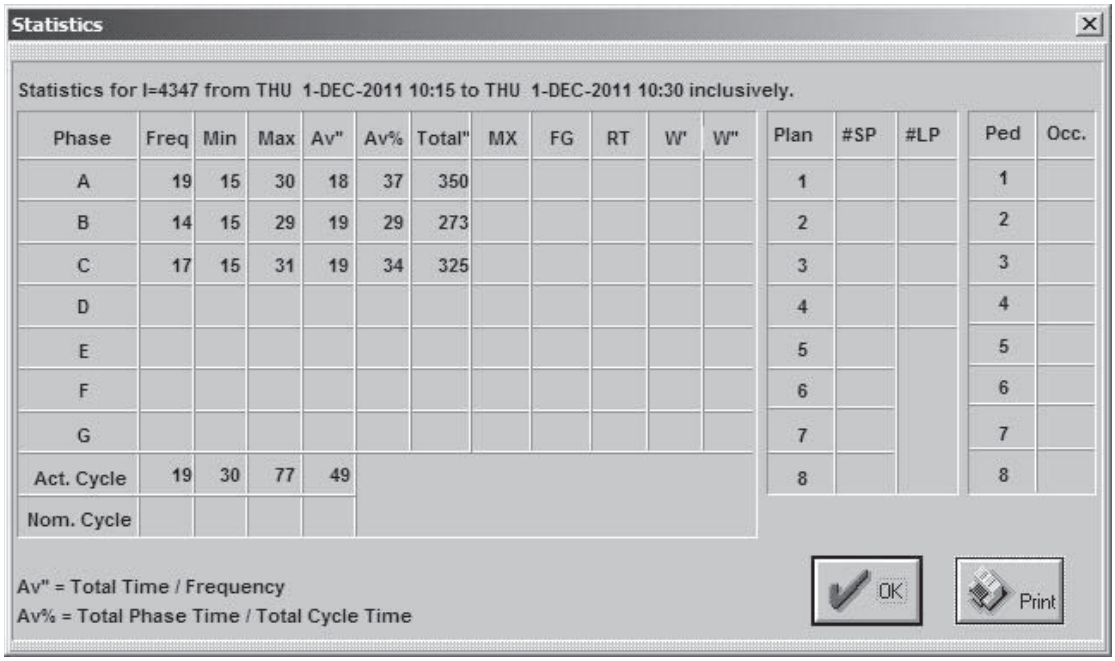
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time

OK Print



Statistics

Statistics for I=4347 from THU 1-DEC-2011 10:15 to THU 1-DEC-2011 10:30 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	19	15	30	18	37	350					
B	14	15	29	19	29	273					
C	17	15	31	19	34	325					
D											
E											
F											
G											
Act. Cycle	19	30	77	49							
Nom. Cycle											

Plan	#SP	#LP
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Ped	Occ.
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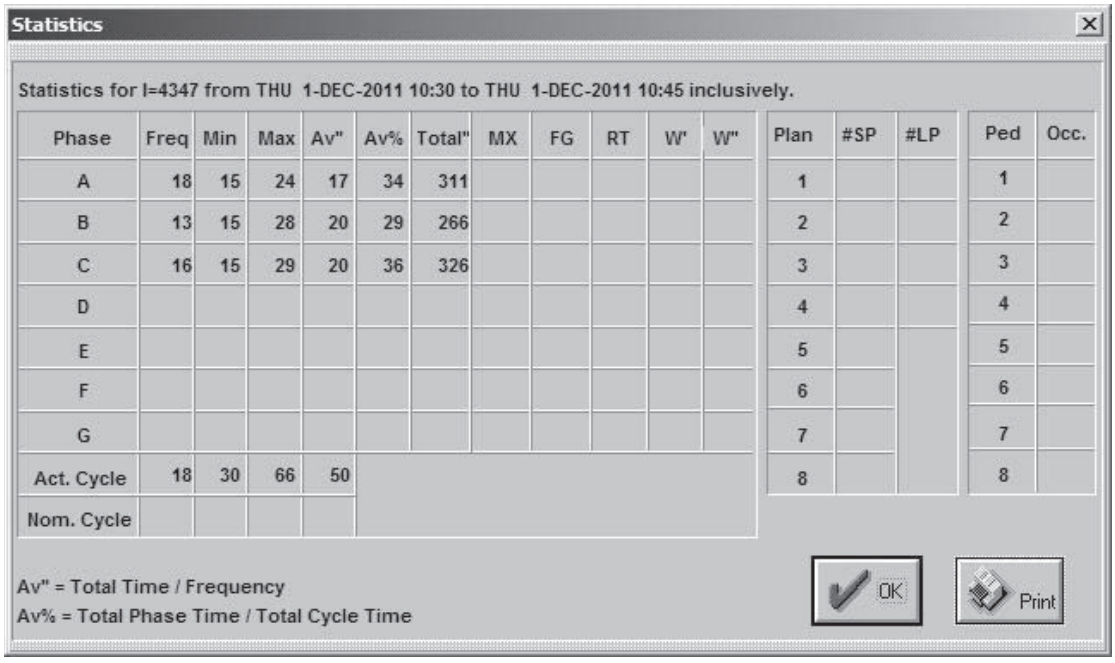
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time

OK Print



Statistics

Statistics for I=4347 from THU 1-DEC-2011 10:30 to THU 1-DEC-2011 10:45 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	18	15	24	17	34	311					
B	13	15	28	20	29	266					
C	16	15	29	20	36	326					
D											
E											
F											
G											
Act. Cycle	18	30	66	50							
Nom. Cycle											

Plan	#SP	#LP
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Ped	Occ.
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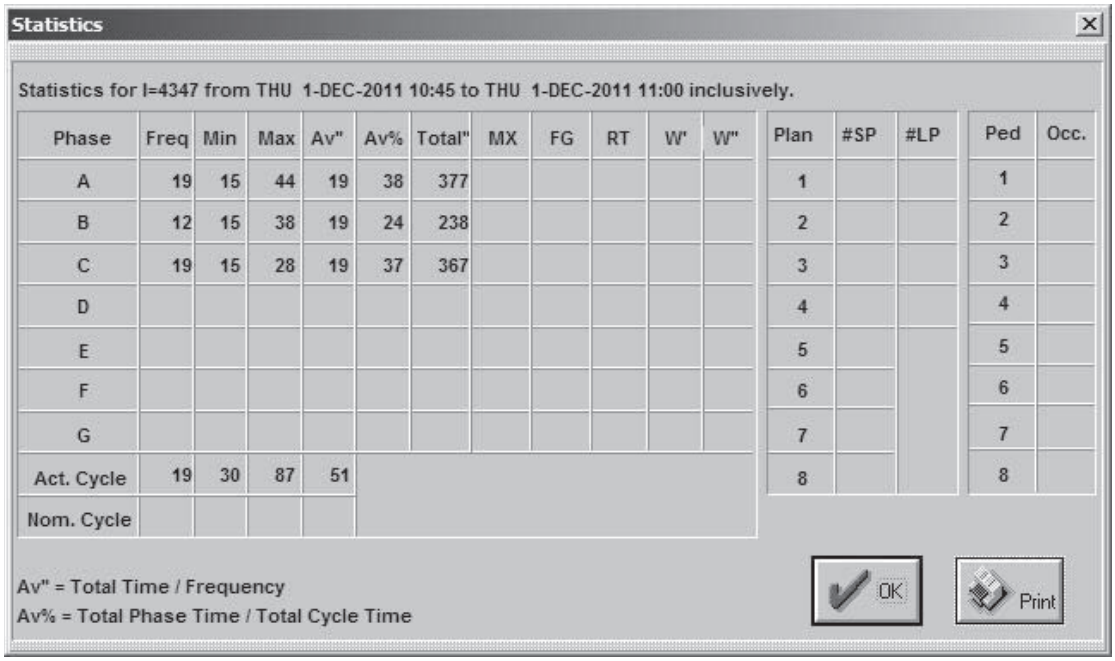
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time

OK Print



Statistics

Statistics for I=4347 from THU 1-DEC-2011 10:45 to THU 1-DEC-2011 11:00 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	19	15	44	19	38	377					
B	12	15	38	19	24	238					
C	19	15	28	19	37	367					
D											
E											
F											
G											
Act. Cycle	19	30	87	51							
Nom. Cycle											

Plan	#SP	#LP
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Ped	Occ.
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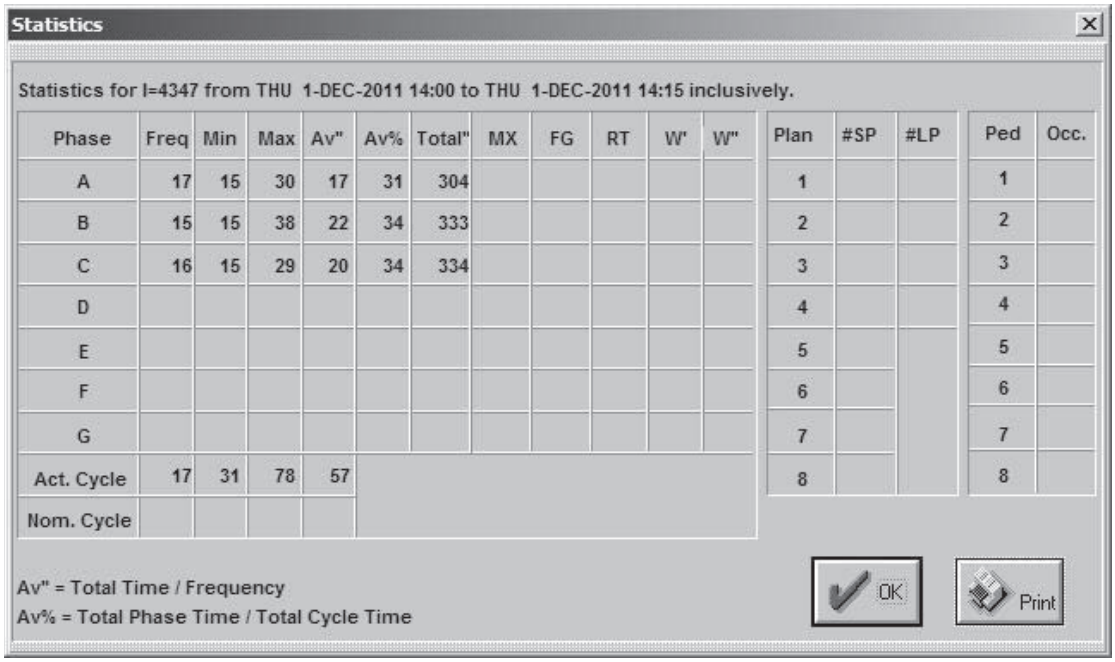
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time

OK Print



Statistics

Statistics for I=4347 from THU 1-DEC-2011 14:00 to THU 1-DEC-2011 14:15 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	17	15	30	17	31	304					
B	15	15	38	22	34	333					
C	16	15	29	20	34	334					
D											
E											
F											
G											
Act. Cycle	17	31	78	57							
Nom. Cycle											

Plan	#SP	#LP
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Ped	Occ.
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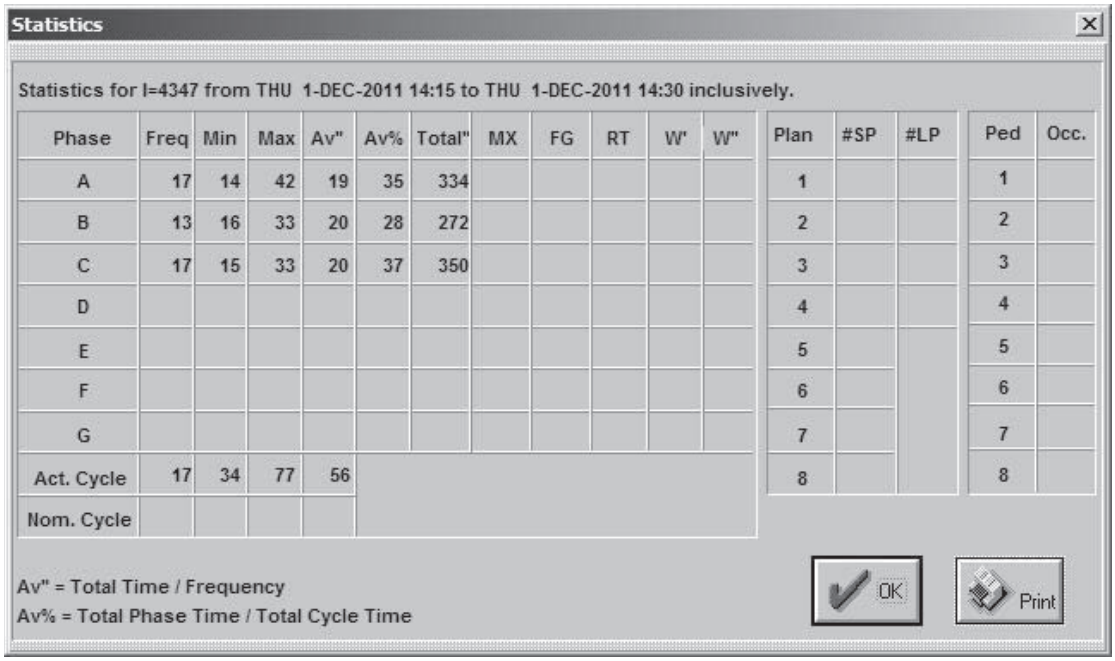
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time

OK Print



Statistics

Statistics for I=4347 from THU 1-DEC-2011 14:15 to THU 1-DEC-2011 14:30 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	17	14	42	19	35	334					
B	13	16	33	20	28	272					
C	17	15	33	20	37	350					
D											
E											
F											
G											
Act. Cycle	17	34	77	56							
Nom. Cycle											

Plan	#SP	#LP
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Ped	Occ.
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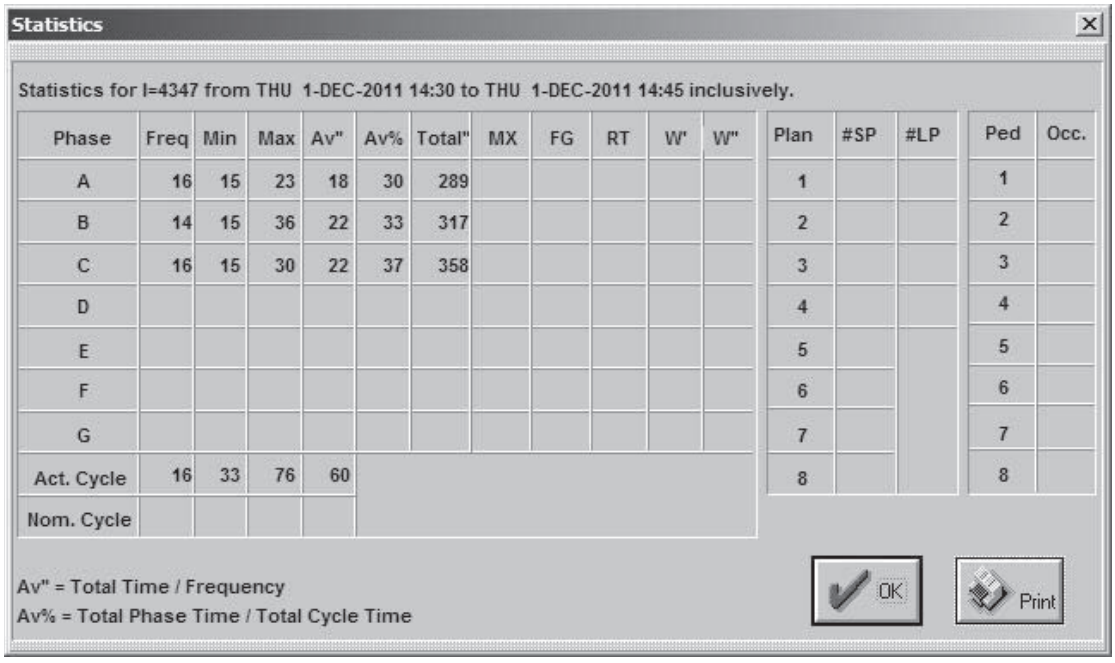
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time

OK Print



Statistics

Statistics for I=4347 from THU 1-DEC-2011 14:30 to THU 1-DEC-2011 14:45 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	16	15	23	18	30	289					
B	14	15	36	22	33	317					
C	16	15	30	22	37	358					
D											
E											
F											
G											
Act. Cycle	16	33	76	60							
Nom. Cycle											

Plan	#SP	#LP
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Ped	Occ.
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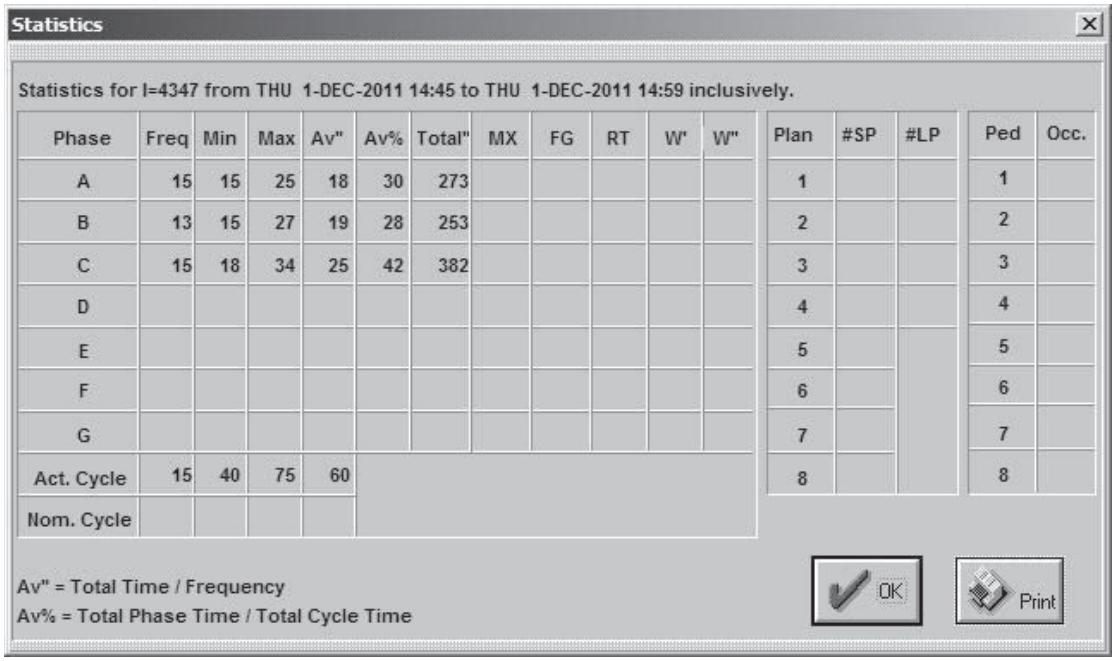
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time

OK Print



Statistics

Statistics for I=4347 from THU 1-DEC-2011 14:45 to THU 1-DEC-2011 14:59 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	15	15	25	18	30	273					
B	13	15	27	19	28	253					
C	15	18	34	25	42	382					
D											
E											
F											
G											
Act. Cycle	15	40	75	60							
Nom. Cycle											

Plan	#SP	#LP
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Ped	Occ.
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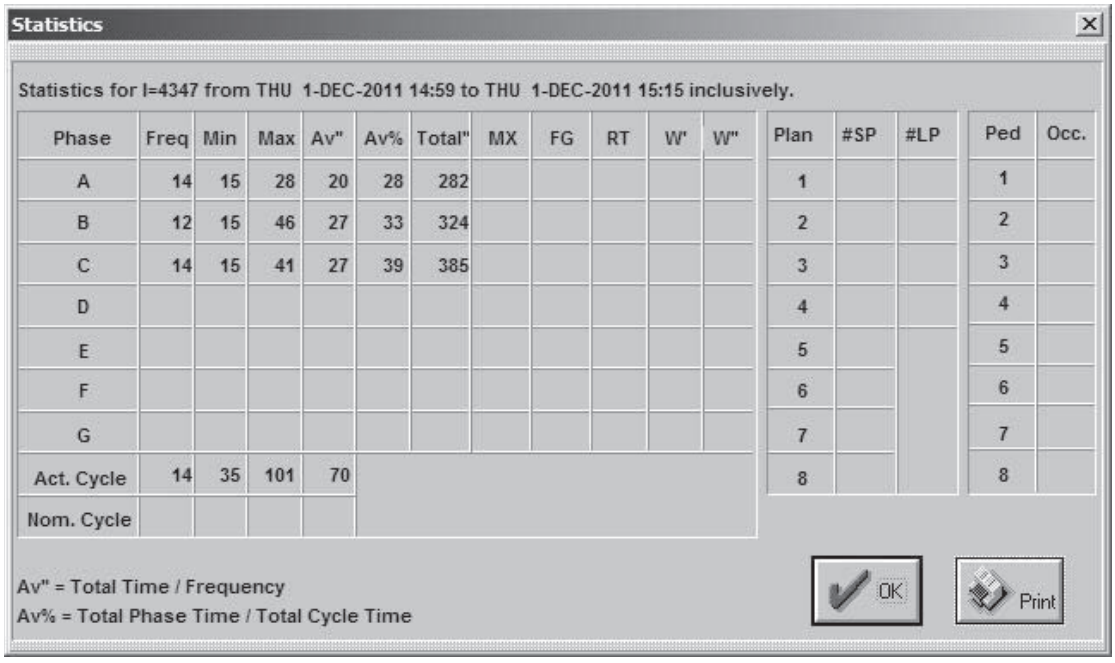
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time

OK Print



Statistics

Statistics for I=4347 from THU 1-DEC-2011 14:59 to THU 1-DEC-2011 15:15 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	14	15	28	20	28	282					
B	12	15	46	27	33	324					
C	14	15	41	27	39	385					
D											
E											
F											
G											
Act. Cycle	14	35	101	70							
Nom. Cycle											

Plan	#SP	#LP
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Ped	Occ.
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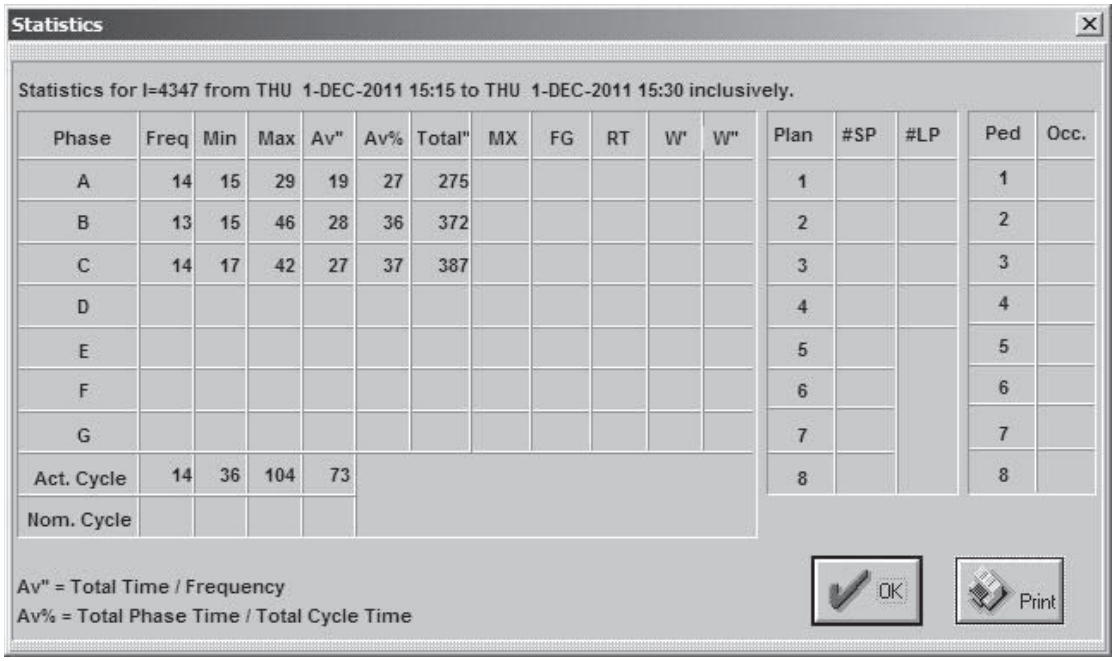
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time

OK Print



Statistics

Statistics for I=4347 from THU 1-DEC-2011 15:15 to THU 1-DEC-2011 15:30 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	14	15	29	19	27	275					
B	13	15	46	28	36	372					
C	14	17	42	27	37	387					
D											
E											
F											
G											
Act. Cycle	14	36	104	73							
Nom. Cycle											

Plan	#SP	#LP
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Ped	Occ.
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Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time

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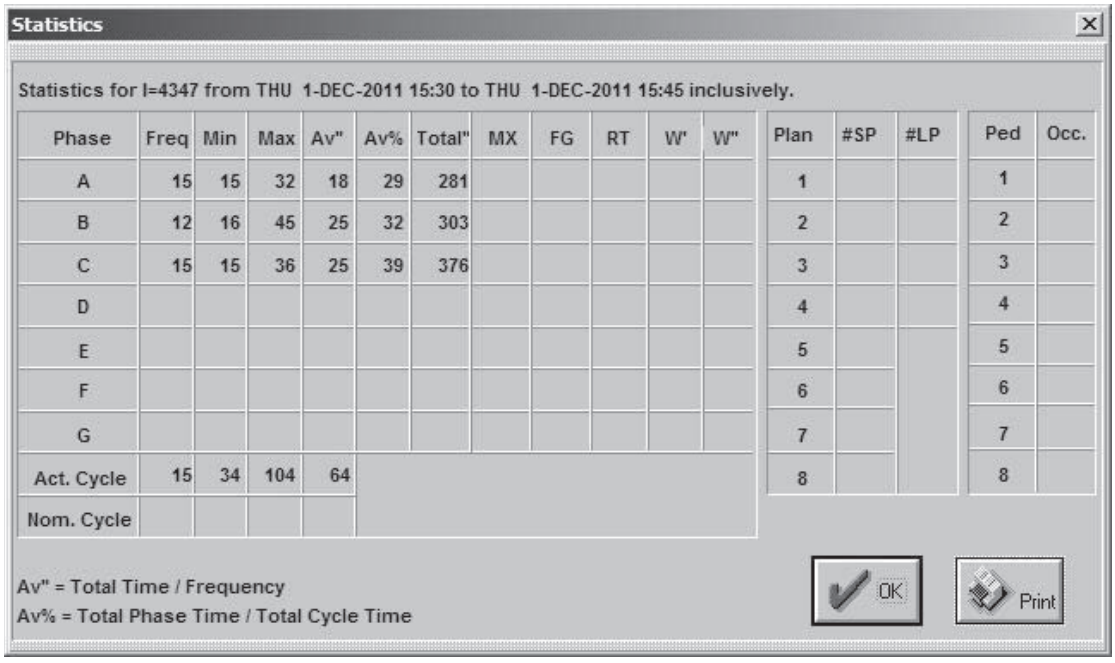

Statistics

Statistics for I=4347 from THU 1-DEC-2011 15:30 to THU 1-DEC-2011 15:45 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	15	15	32	18	29	281					
B	12	16	45	25	32	303					
C	15	15	36	25	39	376					
D											
E											
F											
G											
Act. Cycle	15	34	104	64							
Nom. Cycle											

Plan	#SP	#LP
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Ped	Occ.
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Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time

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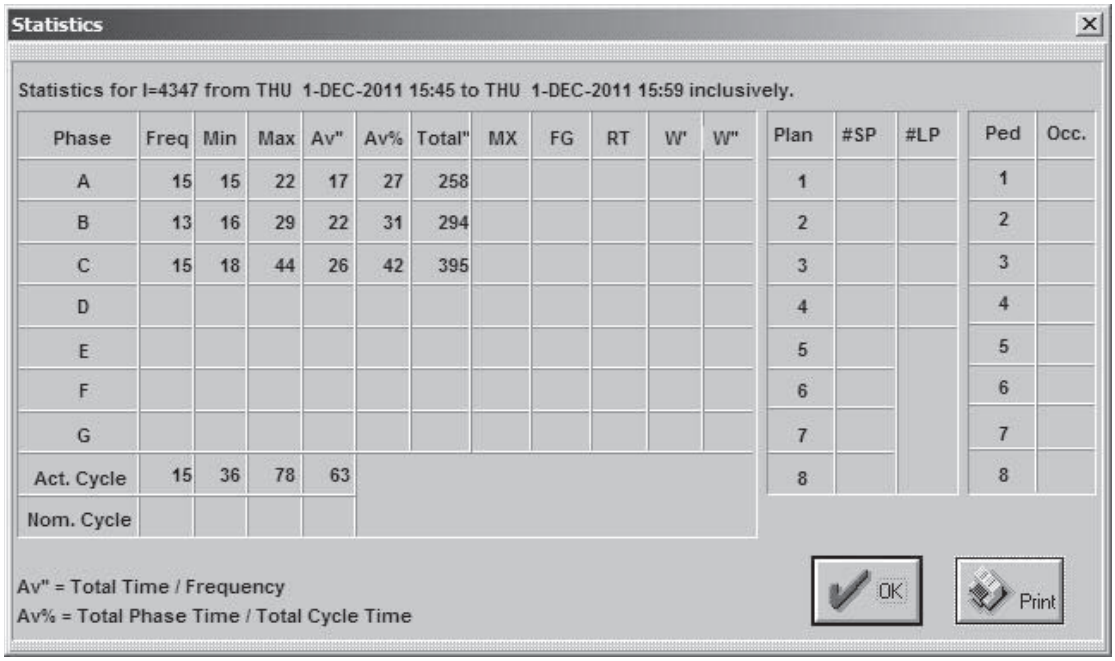

Statistics

Statistics for I=4347 from THU 1-DEC-2011 15:45 to THU 1-DEC-2011 15:59 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	15	15	22	17	27	258					
B	13	16	29	22	31	294					
C	15	18	44	26	42	395					
D											
E											
F											
G											
Act. Cycle	15	36	78	63							
Nom. Cycle											

Plan	#SP	#LP
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Ped	Occ.
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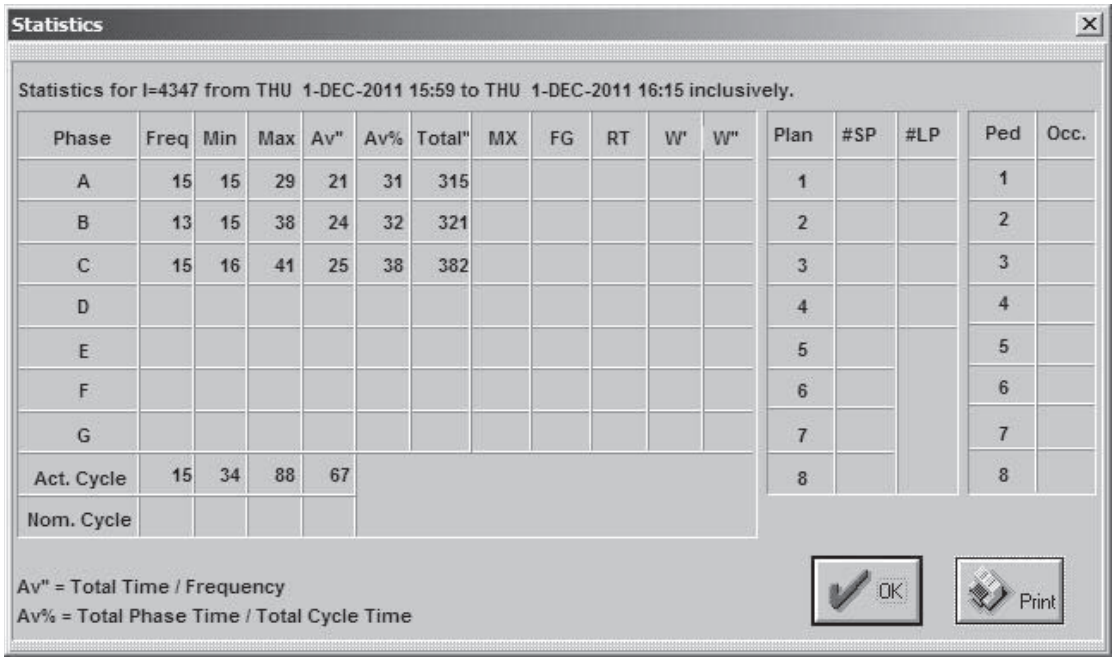
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time

OK Print



Statistics

Statistics for I=4347 from THU 1-DEC-2011 15:59 to THU 1-DEC-2011 16:15 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	15	15	29	21	31	315					
B	13	15	38	24	32	321					
C	15	16	41	25	38	382					
D											
E											
F											
G											
Act. Cycle	15	34	88	67							
Nom. Cycle											

Plan	#SP	#LP
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Ped	Occ.
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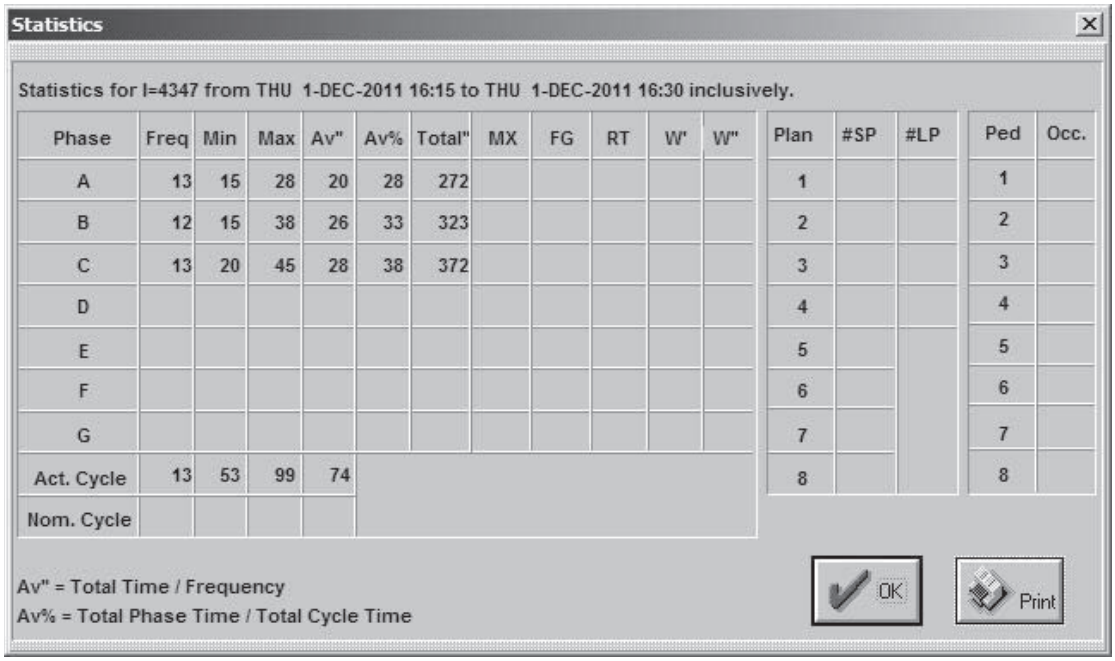
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time

OK Print



Statistics

Statistics for I=4347 from THU 1-DEC-2011 16:15 to THU 1-DEC-2011 16:30 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	13	15	28	20	28	272					
B	12	15	38	26	33	323					
C	13	20	45	28	38	372					
D											
E											
F											
G											
Act. Cycle	13	53	99	74							
Nom. Cycle											

Plan	#SP	#LP
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Ped	Occ.
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Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time

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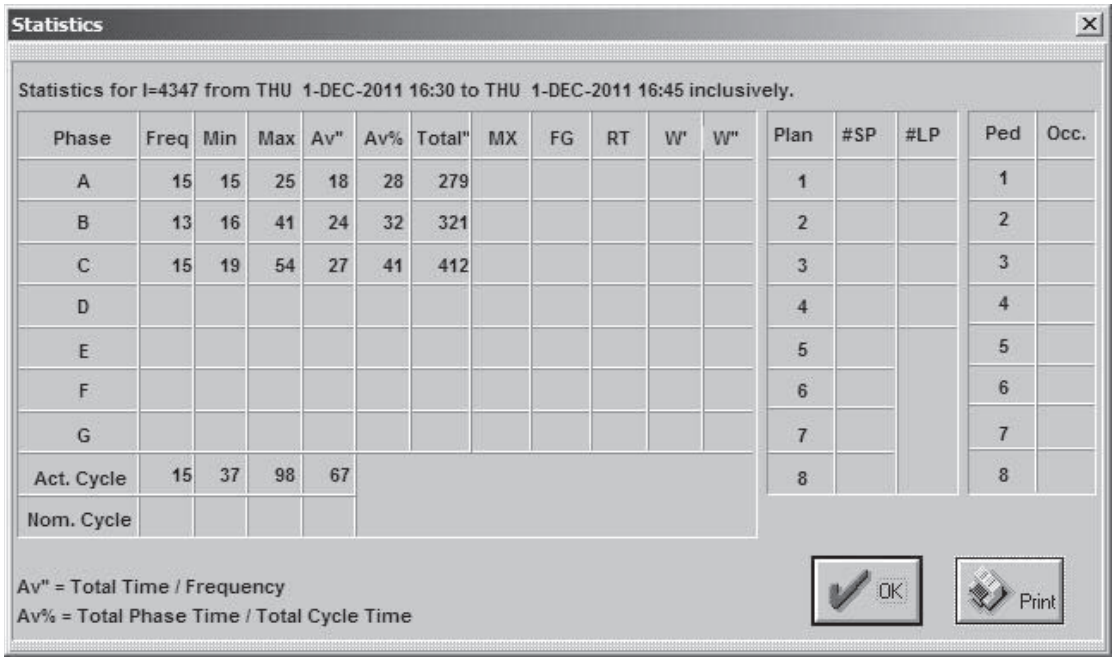

Statistics

Statistics for I=4347 from THU 1-DEC-2011 16:30 to THU 1-DEC-2011 16:45 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	15	15	25	18	28	279					
B	13	16	41	24	32	321					
C	15	19	54	27	41	412					
D											
E											
F											
G											
Act. Cycle	15	37	98	67							
Nom. Cycle											

Plan	#SP	#LP
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Ped	Occ.
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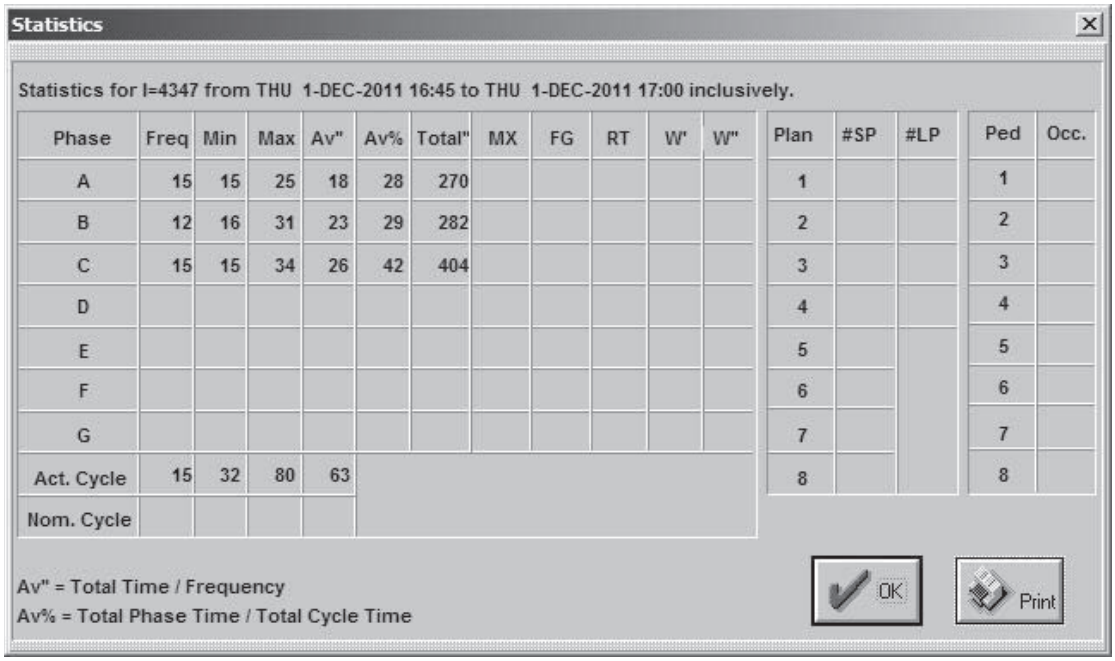
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time

OK Print



Statistics

Statistics for I=4347 from THU 1-DEC-2011 16:45 to THU 1-DEC-2011 17:00 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	15	15	25	18	28	270					
B	12	16	31	23	29	282					
C	15	15	34	26	42	404					
D											
E											
F											
G											
Act. Cycle	15	32	80	63							
Nom. Cycle											

Plan	#SP	#LP
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Ped	Occ.
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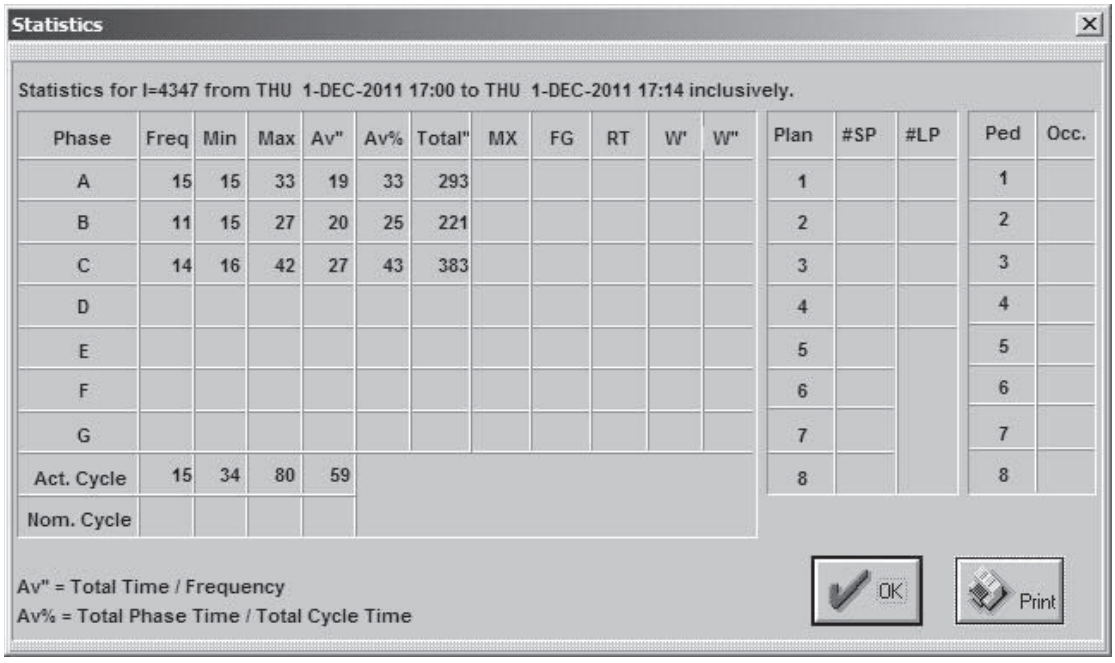
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time

OK Print



Statistics

Statistics for I=4347 from THU 1-DEC-2011 17:00 to THU 1-DEC-2011 17:14 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	15	15	33	19	33	293					
B	11	15	27	20	25	221					
C	14	16	42	27	43	383					
D											
E											
F											
G											
Act. Cycle	15	34	80	59							
Nom. Cycle											

Plan	#SP	#LP
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Ped	Occ.
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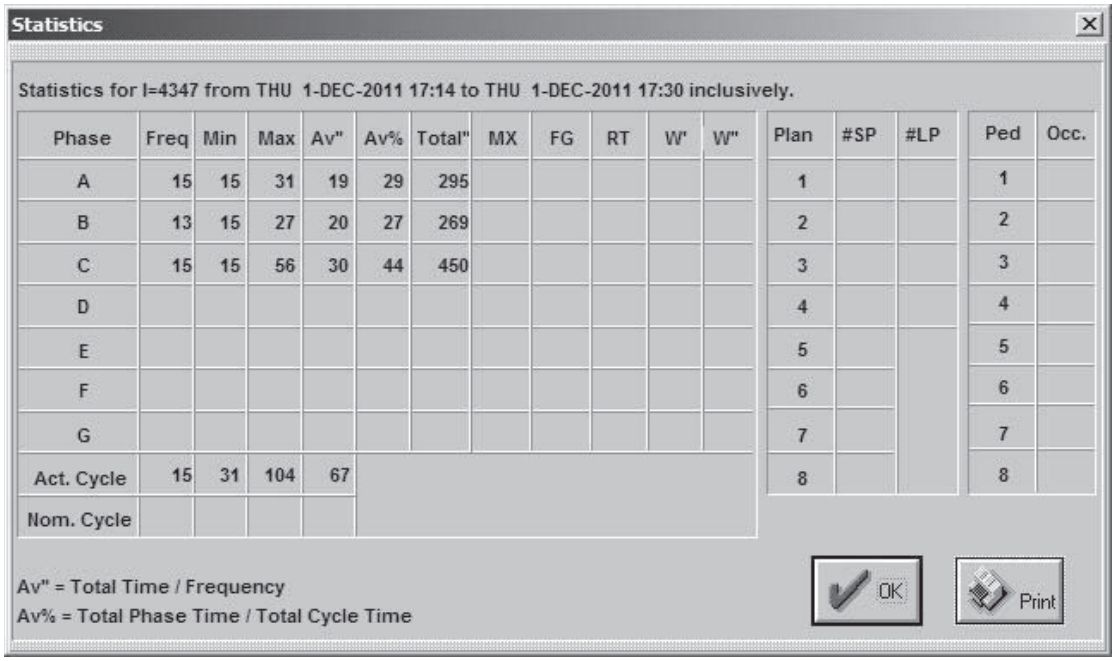
Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time

OK Print



Statistics

Statistics for I=4347 from THU 1-DEC-2011 17:14 to THU 1-DEC-2011 17:30 inclusively.

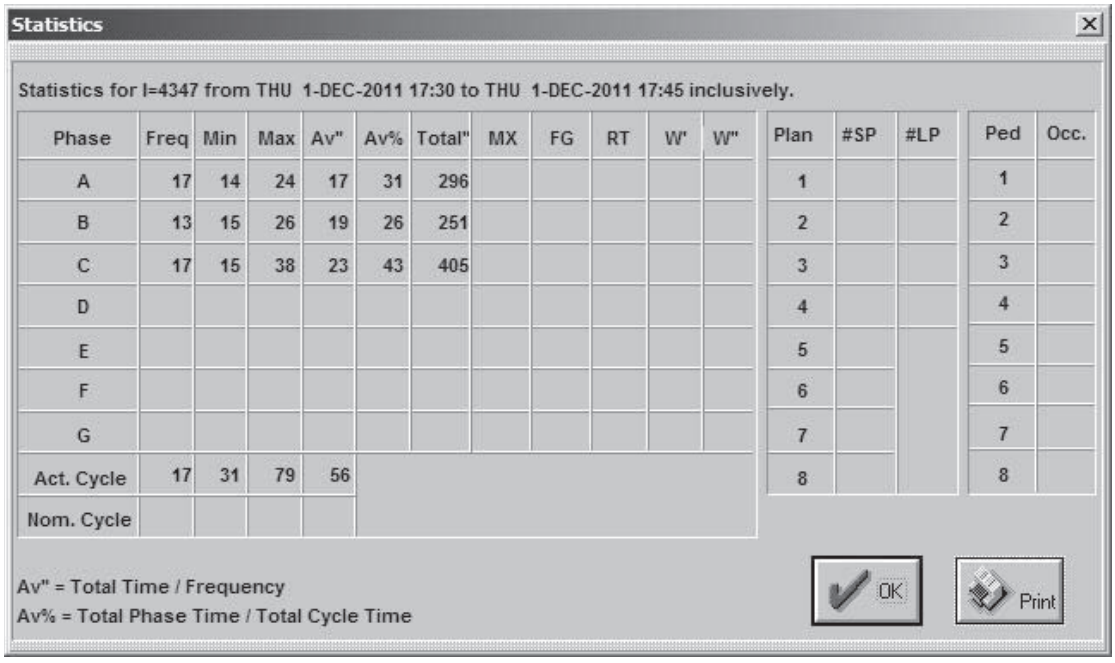
Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	15	15	31	19	29	295					
B	13	15	27	20	27	269					
C	15	15	56	30	44	450					
D											
E											
F											
G											
Act. Cycle	15	31	104	67							
Nom. Cycle											

Plan	#SP	#LP
1		
2		
3		
4		
5		
6		
7		
8		

Ped	Occ.
1	
2	
3	
4	
5	
6	
7	
8	

Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time

OK Print



Statistics

Statistics for I=4347 from THU 1-DEC-2011 17:30 to THU 1-DEC-2011 17:45 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	17	14	24	17	31	296					
B	13	15	26	19	26	251					
C	17	15	38	23	43	405					
D											
E											
F											
G											
Act. Cycle	17	31	79	56							
Nom. Cycle											

Plan	#SP	#LP
1		
2		
3		
4		
5		
6		
7		
8		

Ped	Occ.
1	
2	
3	
4	
5	
6	
7	
8	

Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time

OK Print

Statistics

Statistics for I=4347 from THU 1-DEC-2011 17:45 to THU 1-DEC-2011 18:00 inclusively.

Phase	Freq	Min	Max	Av"	Av%	Total"	MX	FG	RT	W'	W"
A	15	15	36	20	33	302					
B	12	15	29	17	23	214					
C	15	17	37	27	44	410					
D											
E											
F											
G											
Act. Cycle	15	36	76	61							
Nom. Cycle											

Plan	#SP	#LP
1		
2		
3		
4		
5		
6		
7		
8		

Ped	Occ.
1	
2	
3	
4	
5	
6	
7	
8	

Av" = Total Time / Frequency
Av% = Total Phase Time / Total Cycle Time

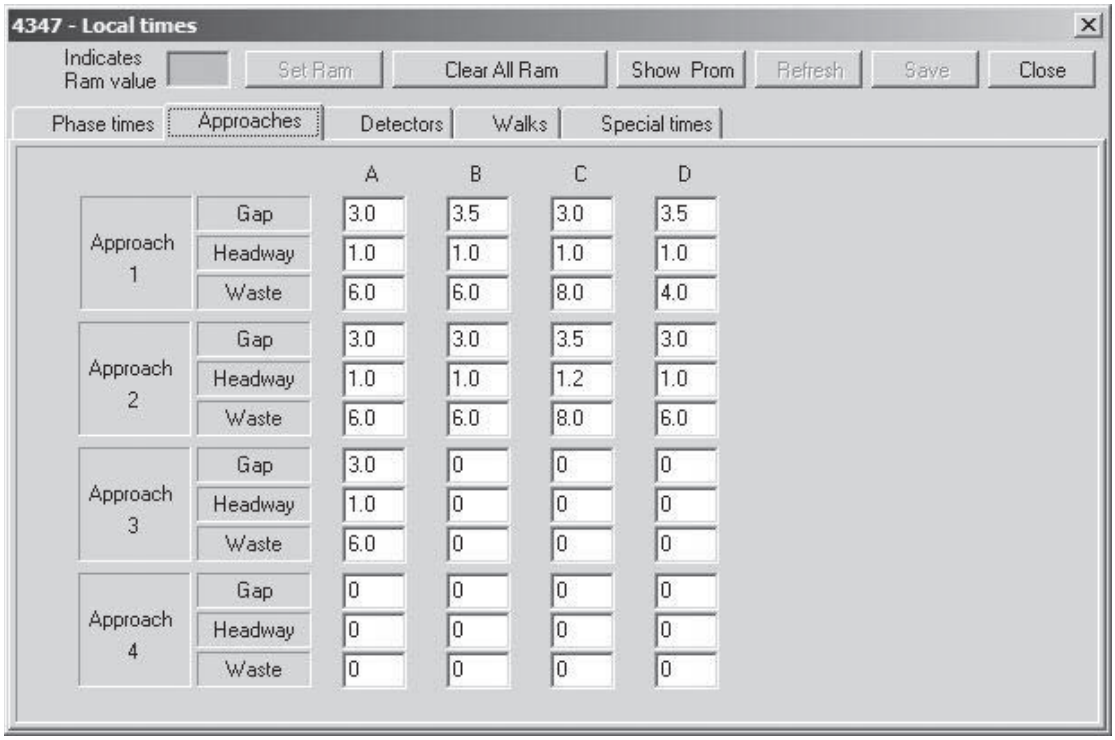
OK Print

4347 - Local times

Indicates Ram value | Set Ram | Clear All Ram | Show Prom | Refresh | Save | Close

Phase times | Approaches | Detectors | Walks | Special times

	A	B	C	D
Late start	0	0	0	0
Minimum green	8.0	8.0	8.0	8.0
Early cutoff green	0	0	0	0
Yellow	5.0	5.0	5.0	5.0
Red	2.0	2.0	2.0	2.0
Maximum green	30	30	40	20
Variable green increment	0	0	0	0
Maximum initial green	0	0	0	0
Special red	0	0	0	0
Special time	0	0	0	0



		A	B	C	D
Approach 1	Gap	3.0	3.5	3.0	3.5
	Headway	1.0	1.0	1.0	1.0
	Waste	6.0	6.0	8.0	4.0
Approach 2	Gap	3.0	3.0	3.5	3.0
	Headway	1.0	1.0	1.2	1.0
	Waste	6.0	6.0	8.0	6.0
Approach 3	Gap	3.0	0	0	0
	Headway	1.0	0	0	0
	Waste	6.0	0	0	0
Approach 4	Gap	0	0	0	0
	Headway	0	0	0	0
	Waste	0	0	0	0

MF, KP data

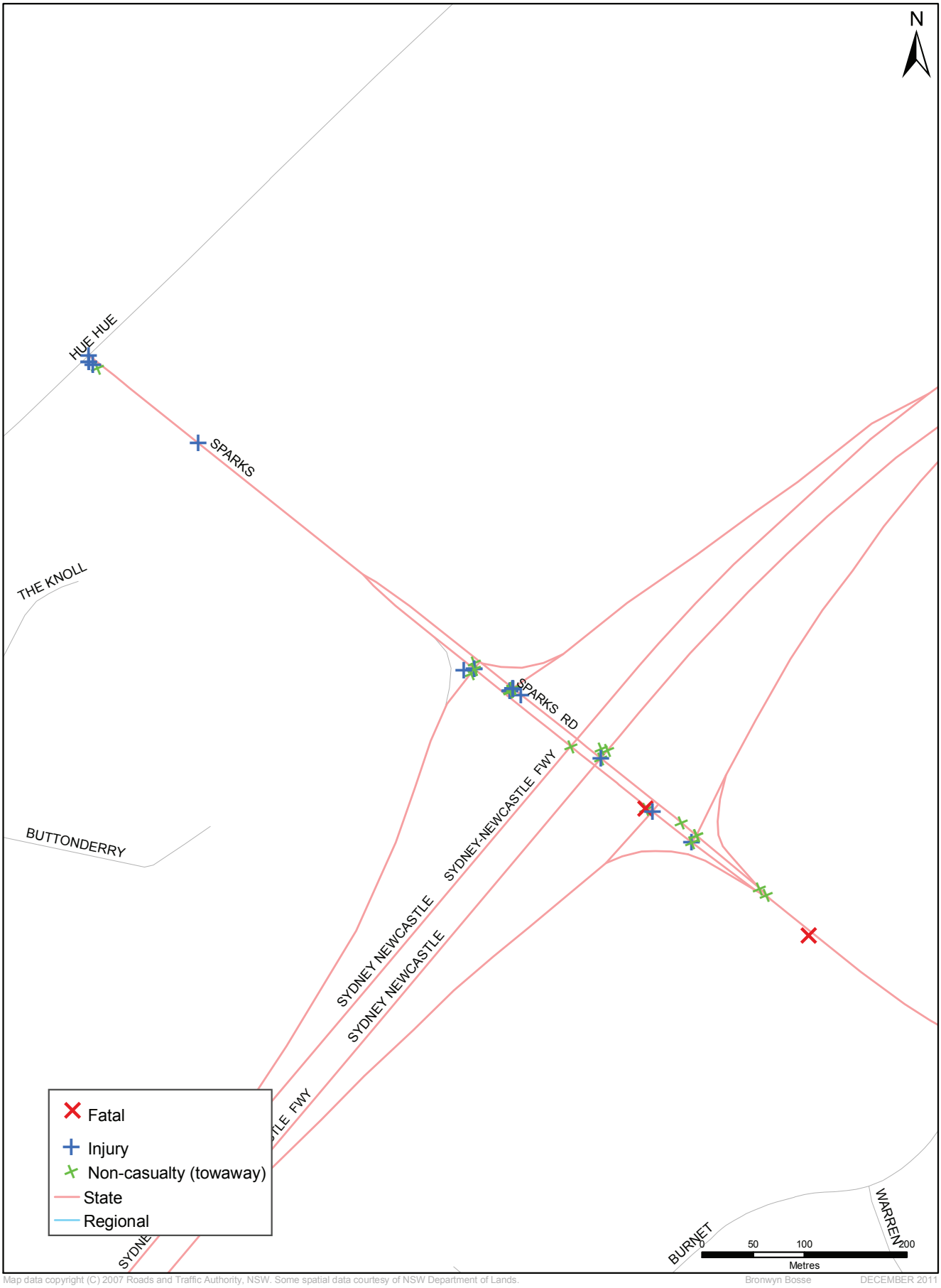
Detector 1 MF=1406, KP=1.01
Detector 2 MF=1895, KP=0.61
Detector 3 MF=1659, KP=0.93
Detector 5 MF=1324, KP=1.25
Detector 6 MF=1434, KP=1.1
Detector 7 MF=1364, KP=1.08

Appendix C

RMS Crash data

Sparkes Rd btw Hue Hue Rd & 100m E of F3 Interchange, Warnervale.

Crash Period from 01/01/2006 to 31/12/2010 (Finalised Data)



Bronwyn Bosse DECEMBER 2011

Detailed Crash Report - sorted

Crash No.	Date	Day of Week	Time	Distance	ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash	Killed	Injured	Factors
																				A S F
Hunter Region				**Wyong LGA**		**Warnervale**			**Sparks Rd**											
566356	17/03/2007	Sat	10:15	200 m W	BURNET RD	2WY	STR	Fine	Dry	80	2	M/C	M42	E in SPARKS RD	120	Proceeding in lane	F	1	0	S
E30117629						DCA : 704	Right off cway into obj					TRK	M37	W in SPARKS RD	75	Proceeding in lane				
												Traffic island etc								
Hunter Region				**Wyong LGA**		**Warnervale**			**Sparks Rd**											
559056	23/02/2007	Fri	08:20	5 m E	HUE HUE RD	TJN	STR	Fine	Dry	70	2	VAN	F37	W in SPARKS RD	10	Proceeding in lane	I	0	1	
E57494701						DCA : 301	Same - Rear end					CAR	F46	W in SPARKS RD	0	Stationary				
Hunter Region				**Wyong LGA**		**Jilliby**			**Sparks Rd**											
532802	18/08/2006	Fri	09:30	10 m E	HUE HUE RD	TJN	STR	Fine	Dry	80	3	CAR	F43	W in SPARKS RD	10	Proceeding in lane	N	0	0	
E28958308						DCA : 301	Same - Rear end					TRK	M49	W in SPARKS RD	0	Stationary				
												CAR	M61	W in SPARKS RD	0	Stationary				
Hunter Region				**Wyong LGA**		**Warnervale**			**Sparks Rd**											
671143	15/06/2009	Mon	12:53	137 m E	HUE HUE RD	2WY	STR	Fine	Dry	80	1	CAR	F33	W in SPARKS RD	Unk	Proceeding in lane	I	0	3	
E37206560						DCA : 704	Right off cway into obj					Tree/bush								
Hunter Region				**Wyong LGA**		**Warnervale**			**Sparks Rd**											
522664	31/05/2006	Wed	06:45	at	NEWCASTLE EXP	TJN	STR	Fine	Dry	80	2	4WD	M44	W in SPARKS RD	15	Turning right	N	0	0	
E27294206						DCA : 202	Opp - Right-thru					CAR	F23	E in SPARKS RD	60	Proceeding in lane				
Hunter Region				**Wyong LGA**		**Warnervale**			**Sparks Rd**											
523572	06/06/2006	Tue	17:20	at	NEWCASTLE EXP	TJN	STR	Overcast	Wet	60	2	CAR	F23	W in SPARKS RD	10	Turning right	N	0	0	
E29391888						DCA : 202	Opp - Right-thru					CAR	M19	E in SPARKS RD	45	Proceeding in lane				
Hunter Region				**Wyong LGA**		**Warnervale**			**Sparks Rd**											
526905	23/06/2006	Fri	15:05	at	NEWCASTLE EXP	TJN	STR	Fine	Dry	80	2	CAR	F55	W in SPARKS RD	10	Turning right	I	0	2	
E27427545						DCA : 202	Opp - Right-thru					TRK	M36	E in SPARKS RD	60	Proceeding in lane				
Hunter Region				**Wyong LGA**		**Warnervale**			**Sparks Rd**											
531208	03/08/2006	Thu	17:05	at	NEWCASTLE EXP	TJN	STR	Overcast	Dry	80	2	WAG	M50	W in SPARKS RD	15	Turning right	I	0	2	
E241627191						DCA : 202	Opp - Right-thru					CAR	M24	E in SPARKS RD	60	Proceeding in lane				
Hunter Region				**Wyong LGA**		**Warnervale**			**Sparks Rd**											
537742	28/09/2006	Thu	08:30	at	NEWCASTLE EXP	TJN	STR	Fine	Dry	80	2	CAR	F61	E in SPARKS RD	10	Turning right	N	0	0	
E28401831						DCA : 202	Opp - Right-thru					4WD	U U	W in SPARKS RD	80	Proceeding in lane				

Detailed Crash Report - sorted

Crash No.	Date	Day of Week	Time	Distance		ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash	Killed	Injured	Factors
																					ASF
Hunter Region				**Wyong LGA**			**Warnervale**			**Sparks Rd**											
546196	23/11/2006	Thu	13:02	at	NEWCASTLE EXP		TJN	STR	Fine	Dry	80	2	CAR	M75	E in SPARKS RD	20 Turning right		F	1	1	
E28545176							DCA : 202	Opp - Right-thru					LOR	M57	W in SPARKS RD	65 Proceeding in lane					
Hunter Region				**Wyong LGA**			**Warnervale**			**Sparks Rd**											
549452	20/12/2006	Wed	11:00	at	NEWCASTLE EXP		TJN	STR	Overcast	Dry	80	2	TRK	M45	W in SPARKS RD	10 Turning right		N	0	0	
E29308974							DCA : 202	Opp - Right-thru					4WD	M U	E in SPARKS RD	60 Proceeding in lane					
Hunter Region				**Wyong LGA**			**Warnervale**			**Sparks Rd**											
557876	18/02/2007	Sun	17:32	at	NEWCASTLE EXP		TJN	STR	Fine	Dry	80	2	CAR	M76	N in NEWCASTLE EXP	10 Turning right		N	0	0	
E29482511							DCA : 102	Adj - Right-thru from left					CAR	M28	E in SPARKS RD	70 Proceeding in lane					
Hunter Region				**Wyong LGA**			**Warnervale**			**Sparks Rd**											
582360	10/07/2007	Tue	16:10	at	NEWCASTLE EXP		TJN	STR	Fine	Dry	70	2	4WD	M76	W in SPARKS RD	30 Turning right		N	0	0	
E32093155							DCA : 202	Opp - Right-thru					CAR	M50	E in SPARKS RD	70 Proceeding in lane					
Hunter Region				**Wyong LGA**			**Warnervale**			**Sparks Rd**											
595617	28/09/2007	Fri	08:25	at	NEWCASTLE EXP		TJN	STR	Fine	Dry	70	2	CAR	F70	W in SPARKS RD	20 Turning right		I	0	3	
E32646608							DCA : 202	Opp - Right-thru					CAR	F18	E in SPARKS RD	60 Proceeding in lane					
Hunter Region				**Wyong LGA**			**Jilliby**			**Sparks Rd**											
596923	01/11/2007	Thu	15:49	at	NEWCASTLE EXP		TJN	STR	Fine	Dry	80	3	CAR	F62	W in SPARKS RD	30 Turning right		N	0	0	
E33826184							DCA : 202	Opp - Right-thru					CAR	F48	E in SPARKS RD	50 Proceeding in lane					
													CAR	F25	E in SPARKS RD	50 Proceeding in lane					
Hunter Region				**Wyong LGA**			**Warnervale**			**Sparks Rd**											
603414	17/12/2007	Mon	16:50	at	NEWCASTLE EXP		TJN	STR	Overcast	Dry	80	2	CAR	M84	W in SPARKS RD	80 Turning right		N	0	0	
E122272595							DCA : 202	Opp - Right-thru					WAG	F20	E in SPARKS RD	60 Proceeding in lane					
Hunter Region				**Wyong LGA**			**Warnervale**			**Sparks Rd**											
616323	28/02/2008	Thu	12:20	at	NEWCASTLE EXP		TJN	STR	Raining	Wet	80	2	SEM	M29	W in SPARKS RD	20 Turning right		N	0	0	
E32672220							DCA : 202	Opp - Right-thru					UTE	M39	E in SPARKS RD	60 Proceeding in lane					
Hunter Region				**Wyong LGA**			**Warnervale**			**Sparks Rd**											
627072	23/04/2008	Wed	17:10	at	NEWCASTLE EXP		TJN	STR	Overcast	Wet	80	2	CAR	F49	W in SPARKS RD	10 Turning right		I	0	2	
E33543513							DCA : 202	Opp - Right-thru					CAR	M19	E in SPARKS RD	75 Proceeding in lane					

Detailed Crash Report - sorted

Crash No.	Date	Day of Week	Time	Distance		ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash	Killed	Injured	Factors
																					ASF
Hunter Region				**Wyong LGA**			**Warnervale**			**Sparks Rd**											
631596	17/07/2008	Thu	14:00	at	NEWCASTLE EXP		TJN	STR	Fine	Dry	80	2	CAR	F57	N in NEWCASTLE EXP	Unk	Proceeding in lane	N	0	0	
E34850663							DCA : 101	Adj - Cross traffic					TRK	M41	W in SPARKS RD	Unk	Proceeding in lane				
Hunter Region				**Wyong LGA**			**Warnervale**			**Sparks Rd**											
634858	02/08/2008	Sat	13:50	at	NEWCASTLE EXP		TJN	STR	Fine	Dry	80	2	CAR	F73	W in SPARKS RD	Unk	Turning right	N	0	0	
E35595616							DCA : 202	Opp - Right-thru					WAG	M47	E in SPARKS RD	70	Proceeding in lane				
Hunter Region				**Wyong LGA**			**Jilliby**			**Sparks Rd**											
645399	11/11/2008	Tue	15:40	at	NEWCASTLE EXP		TJN	STR	Fine	Dry	70	2	CAR	F36	W in SPARKS RD	20	Turning right	N	0	0	
E37715383							DCA : 202	Opp - Right-thru					CAR	M45	E in SPARKS RD	60	Proceeding in lane				
Hunter Region				**Wyong LGA**			**Warnervale**			**Sparks Rd**											
646170	18/11/2008	Tue	15:45	at	NEWCASTLE EXP		TJN	STR	Raining	Wet	60	2	CAR	F51	N in NEWCASTLE EXP	Unk	Turning right	N	0	0	
E209430592							DCA : 104	Adj - Right-thru from right					CAR	F34	W in SPARKS RD	Unk	Proceeding in lane				
Hunter Region				**Wyong LGA**			**Jilliby**			**Sparks Rd**											
648419	02/12/2008	Tue	14:00	at	NEWCASTLE EXP		TJN	STR	Fine	Dry	60	2	CAR	F29	N in NEWCASTLE EXP	Unk	Turning left	I	0	1	
E125546696							DCA : 107	Adj - Left-thru from right					4WD	F33	W in SPARKS RD	Unk	Proceeding in lane				
Hunter Region				**Wyong LGA**			**Warnervale**			**Sparks Rd**											
655203	19/01/2009	Mon	09:17	at	NEWCASTLE EXP		TJN	STR	Fine	Dry	70	2	TRK	M70	W in SPARKS RD	Unk	Turning right	I	0	2	
E35830109							DCA : 202	Opp - Right-thru					CAR	F68	E in SPARKS RD	Unk	Proceeding in lane				
Hunter Region				**Wyong LGA**			**Warnervale**			**Sparks Rd**											
655548	07/02/2009	Sat	13:30	at	NEWCASTLE EXP		TJN	STR	Fine	Dry	80	2	CAR	M18	S in NEWCASTLE EXP	40	Proceeding in lane	N	0	0	
E36114935							DCA : 101	Adj - Cross traffic					SEM	M50	E in SPARKS RD	50	Proceeding in lane				
Hunter Region				**Wyong LGA**			**Warnervale**			**Sparks Rd**											
674423	16/04/2009	Thu	14:50	at	NEWCASTLE EXP		TJN	STR	Fine	Dry	80	2	CAR	F37	W in SPARKS RD	Unk	Turning right	I	0	3	
E37168005							DCA : 202	Opp - Right-thru					CAR	F56	E in SPARKS RD	Unk	Proceeding in lane				
Hunter Region				**Wyong LGA**			**Warnervale**			**Sparks Rd**											
667794	29/04/2009	Wed	15:35	at	NEWCASTLE EXP		TJN	STR	Fine	Dry	80	2	CAR	M34	W in SPARKS RD	10	Turning right	I	0	1	
E37963741							DCA : 202	Opp - Right-thru					CAR	M26	E in SPARKS RD	70	Proceeding in lane				
Hunter Region				**Wyong LGA**			**Jilliby**			**Sparks Rd**											
669547	19/05/2009	Tue	14:45	at	NEWCASTLE EXP		TJN	STR	Overcast	Dry	80	2	CAR	F42	N in NEWCASTLE EXP	2	Turning right	N	0	0	
E38157341							DCA : 104	Adj - Right-thru from right					CAR	F31	W in SPARKS RD	60	Proceeding in lane				

Detailed Crash Report - sorted

Crash No.	Date	Day of Week	Time	Distance		ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash	Killed	Injured	Factors
																					ASF
Hunter Region				**Wyong LGA**			**Warnervale**			**Sparks Rd**											
671518	03/06/2009	Wed	08:00		at	NEWCASTLE EXP	TJN	STR	Raining	Wet	70	2	CAR	F58	W in SPARKS RD	Unk	Turning right	I	0	2	
E37466747							DCA :	202	Opp - Right-thru				CAR	F47	E in SPARKS RD	70	Proceeding in lane				
Hunter Region				**Wyong LGA**			**Jilliby**			**Sparks Rd**											
683982	20/06/2009	Sat	23:40		at	NEWCASTLE EXP	TJN	STR	Overcast	Wet	70	1	CAR	M35	S in SPARKS RD	Unk	Proceeding in lane	I	0	2	A
E37677259							DCA :	703	Left off cway into object				Traffic island etc								
Hunter Region				**Wyong LGA**			**Jilliby**			**Sparks Rd**											
676499	15/07/2009	Wed	18:45		at	NEWCASTLE EXP	TJN	STR	Fine	Dry	70	2	UTE	M45	W in SPARKS RD	1	Turning right	N	0	0	
E39673687							DCA :	202	Opp - Right-thru				CAR	M17	E in SPARKS RD	70	Proceeding in lane				
Hunter Region				**Wyong LGA**			**Warnervale**			**Sparks Rd**											
675663	24/07/2009	Fri	05:50		at	NEWCASTLE EXP	TJN	STR	Fine	Dry	70	2	CAR	F21	W in SPARKS RD	10	Turning right	I	0	4	
E38183557							DCA :	202	Opp - Right-thru				CAR	F21	E in SPARKS RD	60	Proceeding in lane				
Hunter Region				**Wyong LGA**			**Warnervale**			**Sparks Rd**											
681391	18/08/2009	Tue	17:50		at	NEWCASTLE EXP	TJN	STR	Fine	Dry	70	2	CAR	M26	W in SPARKS RD	60	Turning right	I	0	2	
E38425638							DCA :	202	Opp - Right-thru				CAR	M37	E in SPARKS RD	70	Proceeding in lane				
Hunter Region				**Wyong LGA**			**Warnervale**			**Sparks Rd**											
688295	04/11/2009	Wed	07:00		at	NEWCASTLE EXP	TJN	STR	Overcast	Dry	40	2	TRK	M55	W in SPARKS RD	10	Turning right	N	0	0	
E39381669							DCA :	202	Opp - Right-thru				TRK	M45	E in SPARKS RD	40	Proceeding in lane				
Hunter Region				**Wyong LGA**			**Warnervale**			**Sparks Rd**											
691490	19/11/2009	Thu	14:29		at	NEWCASTLE EXP	TJN	STR	Fine	Dry	40	2	CAR	F51	N in NEWCASTLE EXP	20	Turning right	I	0	1	
E39924839							DCA :	104	Adj - Right-thru from right				TRK	M51	W in SPARKS RD	40	Proceeding in lane				
Hunter Region				**Wyong LGA**			**Jilliby**			**Sparks Rd**											
704346	09/03/2010	Tue	14:20		at	NEWCASTLE EXP	TJN	STR	Fine	Dry	70	2	WAG	F27	E in SPARKS RD	15	Turning right	I	0	1	
E239369192							DCA :	202	Opp - Right-thru				4WD	M53	W in SPARKS RD	70	Proceeding in lane				
Hunter Region				**Wyong LGA**			**Jilliby**			**Sparks Rd**											
715675	13/06/2010	Sun	17:52		at	NEWCASTLE EXP	TJN	STR	Fine	Dry	70	2	CAR	M23	S in NEWCASTLE EXP	5	Turning right	N	0	0	
E41078827							DCA :	104	Adj - Right-thru from right				CAR	F20	E in SPARKS RD	60	Proceeding in lane				
Hunter Region				**Wyong LGA**			**Warnervale**			**Sparks Rd**											
719358	26/07/2010	Mon	11:20		at	NEWCASTLE EXP	TJN	STR	Fine	Dry	80	2	CAR	F37	W in SPARKS RD	20	Proceeding in lane	N	0	0	
E41863162							DCA :	301	Same - Rear end				LOR	M56	W in SPARKS RD	20	Proceeding in lane				

Detailed Crash Report - sorted

Crash No.	Date	Day of Week	Time	Distance	ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash	Killed	Injured	Factors
																				ASF
Hunter Region				**Wyong LGA**		**Jilliby**				**Sparks Rd**										
654109	21/01/2009	Wed	13:10	10 m E	NEWCASTLE EXP	TJN	STR	Fine	Dry	80	2	TRK	M36	W in SPARKS RD	20 Turning right		I	0	1	
E36376804						DCA : 202	Opp - Right-thru					CAR	M18	E in SPARKS RD	60 Proceeding in lane					
Hunter Region				**Wyong LGA**		**Jilliby**				**Sparks Rd**										
728267	14/10/2010	Thu	07:30	80 m E	NEWCASTLE EXP	DIV	STR	Overcast	Wet	70	1	CAR	M18	E in SPARKS RD	70 Proceeding in lane		N	0	0	
E42631149						DCA : 703	Left off cway into object					Utility pole								
Hunter Region				**Wyong LGA**		**Warnervale**				**Sparks Rd**										
698656	08/02/2010	Mon	17:30	100 m E	NEWCASTLE EXPR OP	DIV	STR	Fine	Dry	70	3	CAR	M25	E in SPARKS RD	50 Proceeding in lane		N	0	0	
E40067821						DCA : 301	Same - Rear end					CAR	F24	E in SPARKS RD	0 Stationary					
												CAR	F21	E in SPARKS RD	5 Proceeding in lane					
Hunter Region				**Wyong LGA**		**Warnervale**				**Sparks Rd**										
692486	14/12/2009	Mon	17:20	200 m E	NEWCASTLE EXPR OP	2WY	STR	Overcast	Wet	70	3	CAR	M18	E in SPARKS RD	80 Proceeding in lane		N	0	0	S
E39511521						DCA : 601	On path - Parked					CAR	M42	E in SPARKS RD	0 Parked					
												4WD		E in SPARKS RD	0 Parked					
Hunter Region				**Wyong LGA**		**Jilliby**				**Hue Hue Rd**										
506660	17/01/2006	Tue	07:20	at SPARKS RD		TJN	STR	Overcast	Wet	90	2	LOR	M45	W in SPARKS RD	15 Turning right		I	0	1	
E366023890						DCA : 104	Adj - Right-thru from right					CAR	M18	S in HUE HUE RD	80 Proceeding in lane					
Hunter Region				**Wyong LGA**		**Jilliby**				**Hue Hue Rd**										
547781	01/11/2006	Wed	17:10	at SPARKS RD		TJN	STR	Fine	Dry	80	2	TRK	F30	W in SPARKS RD	20 Turning right		I	0	1	
E28807450						DCA : 104	Adj - Right-thru from right					LOR	M52	S in HUE HUE RD	75 Proceeding in lane					
Hunter Region				**Wyong LGA**		**Jilliby**				**Hue Hue Rd**										
669185	28/05/2009	Thu	12:54	at SPARKS RD		TJN	STR	Overcast	Wet	80	2	WAG	M17	W in SPARKS RD	15 Turning right		I	0	2	
E72486001						DCA : 104	Adj - Right-thru from right					TRK	M54	S in HUE HUE RD	75 Proceeding in lane					
Hunter Region				**Wyong LGA**		**Warnervale**				**Newcastle Exp**										
587930	22/08/2007	Wed	15:30	5 m S	SPARKS RD	TJN	STR	Fine	Dry	70	2	CAR	F22	N in NEWCASTLE EXP	Unk Proceeding in lane		I	0	1	
E31575943						DCA : 303	Same - Rear right					CAR	F57	N in NEWCASTLE EXP	0 Wait turn right					
Hunter Region				**Wyong LGA**		**Jilliby**				**Newcastle Exp**										
730620	10/09/2010	Fri	17:40	5 m S	SPARKS RD	TJN	STR	Fine	Dry	70	2	4WD	M41	N in NEWCASTLE EXP	Unk Proceeding in lane		N	0	0	
E42023556						DCA : 301	Same - Rear end					CAR	M42	N in NEWCASTLE EXP	0 Stationary					

Detailed Crash Report - sorted

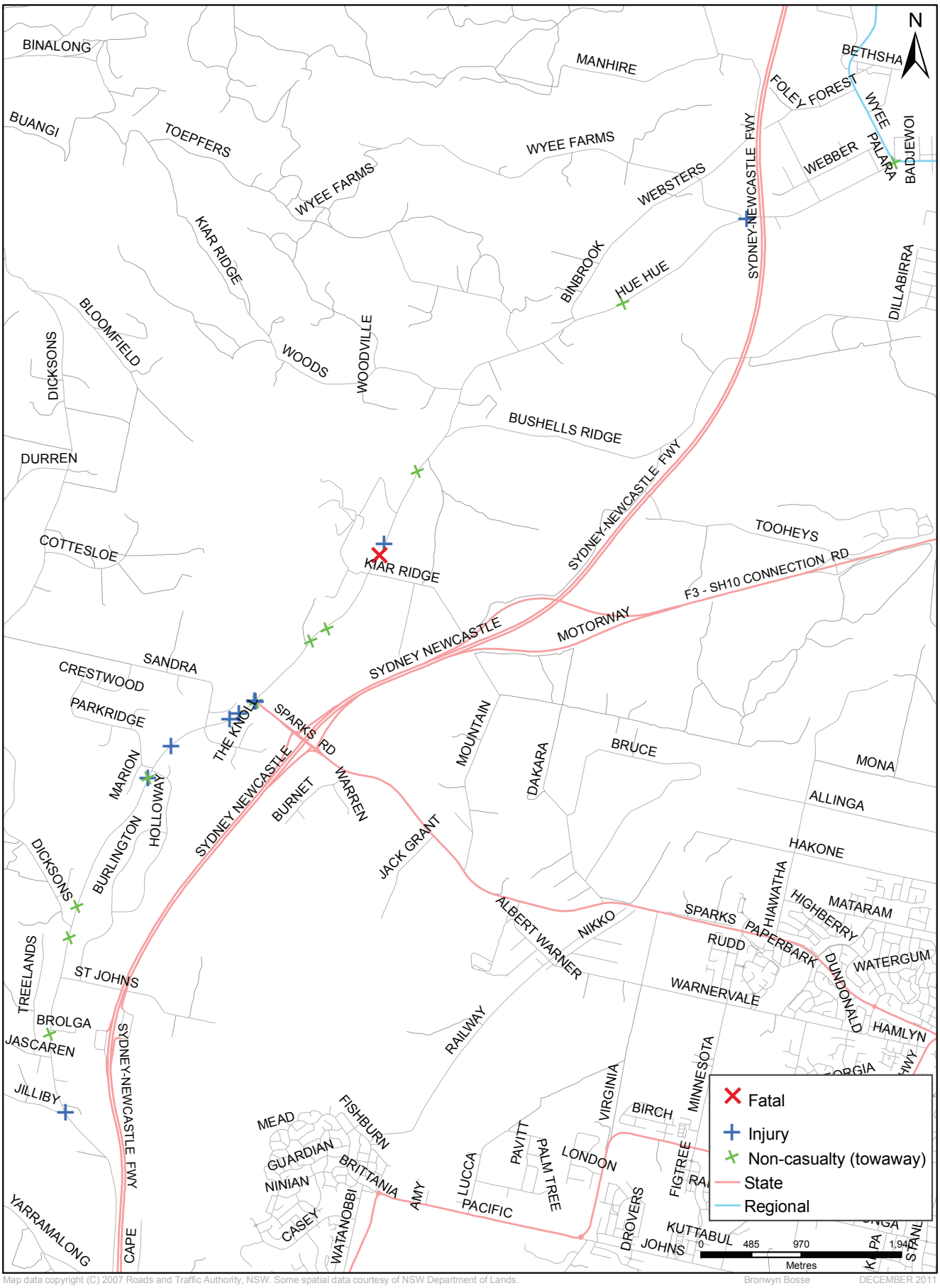
Crash No.	Date	Day of Week	Time	Distance	ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash	Killed	Injured	Factors
																				ASF
Hunter Region				**Wyong LGA**		**Warnervale**				**Newcastle Exp**										
687231	28/10/2009	Wed	19:45	at	SPARKS ROAD OP	D F	STR	Fine	Dry	110	1	CAR	M60	S in NEWCASTLE EXP	55	Proceeding in lane	N	0	0	
E38972934						DCA : 702		Off carriageway to right												
Hunter Region				**Wyong LGA**		**Jilliby**				**Newcastle Exp**										
709506	07/05/2010	Fri	17:45	at	SPARKS ROAD OP	D F	STR	Fine	Dry	110	2	CAR	M42	N in NEWCASTLE EXP	60	Proceeding in lane	N	0	0	A
E40985657						DCA : 301		Same - Rear end				CAR	M35	N in NEWCASTLE EXP	40	Proceeding in lane				
Hunter Region				**Wyong LGA**		**Jilliby**				**Newcastle Exp**										
741417	08/11/2010	Mon	07:58	at	SPARKS ROAD OP	D F	STR	Fine	Dry	110	1	LOR	M45	S in NEWCASTLE EXP	100	Proceeding in lane	I	0	1	
E43509708						DCA : 703		Left off cway into object				Fence								
Hunter Region				**Wyong LGA**		**Warnervale**				**Newcastle Exp**										
542555	01/11/2006	Wed	15:40	10 m N	SPARKS ROAD OP	D F	STR	Fine	Dry	110	1	CAR	F72	S in NEWCASTLE EXP	110	Proceeding in lane	N	0	0	F
E28813669						DCA : 703		Left off cway into object				Fence								
Hunter Region				**Wyong LGA**		**Jilliby**				**Newcastle Exp**										
662210	15/03/2009	Sun	17:00	10 m N	SPARKS ROAD OP	D F	STR	Raining	Wet	110	2	UTE	M20	S in NEWCASTLE EXP	30	Proceeding in lane	N	0	0	
E37125762						DCA : 301		Same - Rear end				CAR	M58	S in NEWCASTLE EXP	0	Stationary				

Report Totals: Total Crashes: 52 Fatal Crashes: 2 Injury Crashes: 22 Killed: 2 Injured: 40

Crashid dataset Sparkes Rd btw Hue Hue Rd and 100m East of the F3 Interchange, Warnervale. Crash Period 01/01/2006 to 31/12/2010.

Hue Hue Rd btw Wyee Rd and 100m S of Jilliby Rd.

Crash Period from 01/01/2006 to 31/12/2010 (Finalised Data)



Map data copyright (C) 2007 Roads and Traffic Authority, NSW. Some spatial data courtesy of NSW Department of Lands. Bronwyn Bosse DECEMBER 2011

Detailed Crash Report - sorted

Crash No.	Date	Day of Week	Time	Distance		ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash	Killed	Injured	Factors
Natural Lighting																					**A S F**
Hunter Region				**Lake Macquarie City LGA**		**Wyee**				**Hue Hue Rd**											
704753	30/03/2010	Tue	09:00	500 m	N	BINBROOK RD	2WY	STR	Raining	Wet	90	1	VAN	F29	S in HUE HUE RD	75 Proceeding in lane		N	0	0	
E41115878						Daylight	DCA : 701		Off carriageway to left												
Hunter Region				**Wyong LGA**		**Jilliby**				**Hue Hue Rd**											
550920	28/12/2006	Thu	12:45	50 m	S	BROLGA WAY	2WY	STR	Fine	Dry	80	1	CAR	F17	N in HUE HUE RD	80 Proceeding in lane		N	0	0	
E29320377						Daylight	DCA : 704		Right off cway into obj				Fence								
Hunter Region				**Wyong LGA**		**Jilliby**				**Hue Hue Rd**											
662706	25/03/2009	Wed	00:12	415 m	S	BUSHELLS RIDGE RD	2WY	CRV	Fine	Dry	90	1	CAR	F41	N in HUE HUE RD	Unk Proceeding in lane		N	0	0	
E36560844						Darkness	DCA : 805		Out of control on bend												
Hunter Region				**Wyong LGA**		**Jilliby**				**Hue Hue Rd**											
664461	14/03/2009	Sat	15:20	370 m	S	BUTTONDERRY WAY	2WY	CRV	Overcast	Dry	90	2	CAR	F24	N in HUE HUE RD	90 Incorrect side		I	0	5	S
E36779006						Daylight	DCA : 201		Opp - Head on				4WD	M38	S in HUE HUE RD	80 Proceeding in lane					
Hunter Region				**Wyong LGA**		**Jilliby**				**Hue Hue Rd**											
609392	17/02/2008	Sun	17:05	200 m	N	DICKSONS RD	2WY	STR	Overcast	Dry	80	1	WAG	M19	N in HUE HUE RD	80 Proceeding in lane		N	0	0	F
E34584282						Daylight	DCA : 704		Right off cway into obj				Tree/bush								
Hunter Region				**Wyong LGA**		**Jilliby**				**Hue Hue Rd**											
641863	14/10/2008	Tue	10:15	100 m	S	DICKSONS RD	2WY	STR	Raining	Wet	80	1	CAR	M32	S in HUE HUE RD	100 Proceeding in lane		N	0	0	S
E35267306						Daylight	DCA : 703		Left off cway into object				Drain/culvert								
Hunter Region				**Wyong LGA**		**Jilliby**				**Hue Hue Rd**											
581465	09/06/2007	Sat	02:10	100 m	S	HOLLOWAY DR	2WY	STR	Raining	Wet	90	1	CAR	M56	S in HUE HUE RD	70 Proceeding in lane		N	0	0	
E30276025						Darkness	DCA : 607		On path - Hit temp object				Other non fixed object								
Hunter Region				**Wyong LGA**		**Jilliby**				**Hue Hue Rd**											
581467	09/06/2007	Sat	05:30	100 m	S	HOLLOWAY DR	2WY	STR	Raining	Wet	90	1	CAR	M55	S in HUE HUE RD	70 Proceeding in lane		I	0	1	
E30939428						Darkness	DCA : 607		On path - Hit temp object				Other non fixed object								
Hunter Region				**Wyong LGA**		**Warnervale**				**Sparks Rd**											
559056	23/02/2007	Fri	08:20	5 m	E	HUE HUE RD	TJN	STR	Fine	Dry	70	2	VAN	F37	W in SPARKS RD	10 Proceeding in lane		I	0	1	
E57494701						Daylight	DCA : 301		Same - Rear end				CAR	F46	W in SPARKS RD	0 Stationary					

Detailed Crash Report - sorted

Crash No.	Date	Day of Week	Time	Distance	ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash	Killed	Injured	Factors
Natural Lighting																				**A S F**
Hunter Region				**Wyong LGA**		**Jilliby**				**Sparks Rd**										
532802	18/08/2006	Fri	09:30	10 m E	HUE HUE RD	TJN	STR	Fine	Dry	80	3	CAR	F43	W in SPARKS RD	10 Proceeding in lane		N	0	0	
E28958308				Daylight		DCA : 301	Same - Rear end					TRK	M49	W in SPARKS RD	0 Stationary					
												CAR	M61	W in SPARKS RD	0 Stationary					
Hunter Region				**Wyong LGA**		**Jilliby**				**Hue Hue Rd**										
628638	23/06/2008	Mon	16:27	5 m N	JILLIBY RD	TJN	STR	Fine	Dry	80	2	VAN	M58	S in HUE HUE RD	80 Proceeding in lane		I	0	3	
E34259918				Daylight		DCA : 303	Same - Rear right					TRK	F16	S in HUE HUE RD	0 Wait turn right					
Hunter Region				**Wyong LGA**		**Jilliby**				**Hue Hue Rd**										
649168	12/02/2009	Thu	23:05	200 m N	KIAR RIDGE RD	2WY	CRV	Raining	Wet	90	2	CAR	M27	S in HUE HUE RD	Unk Incorrect side		F	1	1	
E523568990				Darkness		DCA : 201	Opp - Head on					CAR	M62	N in HUE HUE RD	Unk Proceeding in lane					
Hunter Region				**Wyong LGA**		**Jilliby**				**Hue Hue Rd**										
506660	17/01/2006	Tue	07:20	at	SPARKS RD	TJN	STR	Overcast	Wet	90	2	LOR	M45	W in SPARKS RD	15 Turning right		I	0	1	
E366023890				Dawn		DCA : 104	Adj - Right-thru from right					CAR	M18	S in HUE HUE RD	80 Proceeding in lane					
Hunter Region				**Wyong LGA**		**Jilliby**				**Hue Hue Rd**										
547781	01/11/2006	Wed	17:10	at	SPARKS RD	TJN	STR	Fine	Dry	80	2	TRK	F30	W in SPARKS RD	20 Turning right		I	0	1	
E28807450				Daylight		DCA : 104	Adj - Right-thru from right					LOR	M52	S in HUE HUE RD	75 Proceeding in lane					
Hunter Region				**Wyong LGA**		**Jilliby**				**Hue Hue Rd**										
669185	28/05/2009	Thu	12:54	at	SPARKS RD	TJN	STR	Overcast	Wet	80	2	WAG	M17	W in SPARKS RD	15 Turning right		I	0	2	
E72486001				Daylight		DCA : 104	Adj - Right-thru from right					TRK	M54	S in HUE HUE RD	75 Proceeding in lane					
Hunter Region				**Wyong LGA**		**Jilliby**				**Hue Hue Rd**										
724269	12/09/2010	Sun	18:10	800 m N	SPARKS RD	2WY	STR	Fine	Dry	80	1	CAR	M34	S in HUE HUE RD	55 Proceeding in lane		N	0	0	
E41988647				Dusk		DCA : 703	Left off cway into object					Tree/bush								
Hunter Region				**Wyong LGA**		**Jilliby**				**Hue Hue Rd**										
528441	07/07/2006	Fri	16:30	1 km N	SPARKS RD	2WY	CRV	Fine	Dry	80	1	TRK	F59	S in HUE HUE RD	80 Proceeding in lane		N	0	0	
E27766377				Dusk		DCA : 609	On path - Hit animal					Kangaroo								
Hunter Region				**Wyong LGA**		**Jilliby**				**Hue Hue Rd**										
671471	10/03/2009	Tue	23:59	2 km N	SPARKS RD	2WY	STR	Fine	Dry	70	1	CAR	F22	N in HUE HUE RD	70 Proceeding in lane		I	0	1	
E40341386				Darkness		DCA : 609	On path - Hit animal					Kangaroo								

Detailed Crash Report - sorted

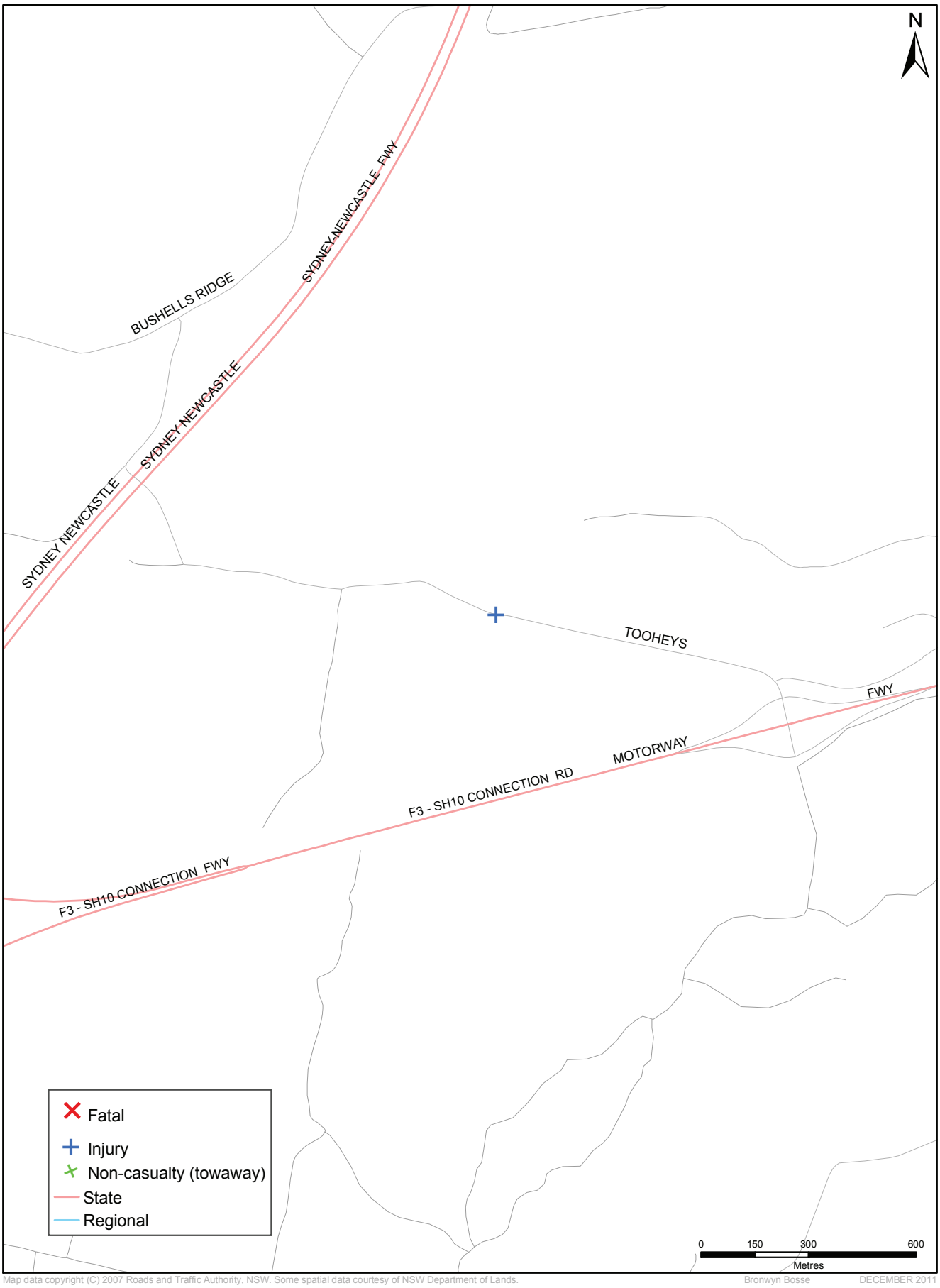
Crash No.	Date	Day of Week	Time	Distance	ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash	Killed	Injured	Factors
Natural Lighting																				**A S F**
Hunter Region				**Lake Macquarie City LGA**		**Wyee**								**Hue Hue Rd**						
694672	05/10/2009	Mon	19:30	50 m E	WYEE FARMS RD	2WY	STR	Fine	Dry	90	1	CAR	M18	W in HUE HUE RD	80 Proceeding in lane		I	0	1	
E39915419				Darkness		DCA : 609		On path - Hit animal				Kangaroo								
Hunter Region				**Lake Macquarie City LGA**		**Wyee**								**Hue Hue Rd**						
586048	31/07/2007	Tue	07:00	30 m S	WYEE RD	2WY	CRV	Fine	Dry	90	1	CAR	M29	N in HUE HUE RD	70 Proceeding in lane		N	0	0	
E32929880				Daylight		DCA : 802 R		Off cway left bend												
Hunter Region				**Wyong LGA**		**Jilliby**								**Hue Hue Rd**						
552169	27/10/2006	Fri	12:15	8.876 km S	WYEE RD	2WY	STR	Fine	Dry	80	1	LOR	M46	S in HUE HUE RD	80 Proceeding in lane		I	0	1	
E164931592				Daylight		DCA : 704		Right off cway into obj				Tree/bush								
Hunter Region				**Wyong LGA**		**Jilliby**								**Hue Hue Rd**						
551689	04/01/2007	Thu	07:30	8.93 km S	WYEE RD	2WY	CRV	Fine	Dry	90	1	CAR	M19	N in HUE HUE RD	Unk Proceeding in lane		I	0	1	S
E31176883				Daylight		DCA : 803 R		Off right bend into obj				Tree/bush								

Report Totals: Total Crashes: 22 Fatal Crashes: 1 Injury Crashes: 11 Killed: 1 Injured: 19

Crashid dataset Hue Hue Rd btw Wyee Rd and 100m S of Jilliby Rd. Crash Period 01/01/2006 to 31/12/2010.

Tooheys Rd btw Bushells Ridge Rd and Motorway Link Interchange

Crash Period from 01/01/2006 to 31/12/2010 (Finalised Data)



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RTA

Detailed Crash Report - sorted

Crash No.	Date	Day of Week	Time	Distance	ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash	Killed	Injured	Factors
																				A S F
Natural Lighting																				
Hunter Region				**Wyong LGA**				**Bushells Ridge**						**Tooheys Rd**						
521121	20/05/2006	Sat	16:40	850 m W	MOTORWAY LINK MS	2WY	CRV	Raining	Wet	60	1	CAR	F34	E in TOOHEYS RD	60	Proceeding in lane	I	0	2	A S
E26833115				Daylight		DCA : 804 R		Off left bend into obj				Utility pole								

Report Totals: Total Crashes: 1 Fatal Crashes: 0 Injury Crashes: 1 Killed: 0 Injured: 2

Crashid dataset Tooheys Rd btw Bushells Ridge Rd and Motorway Link Interchange, Bushells Ridge. Crash Period 01/01/2006 to 31/12/2010.

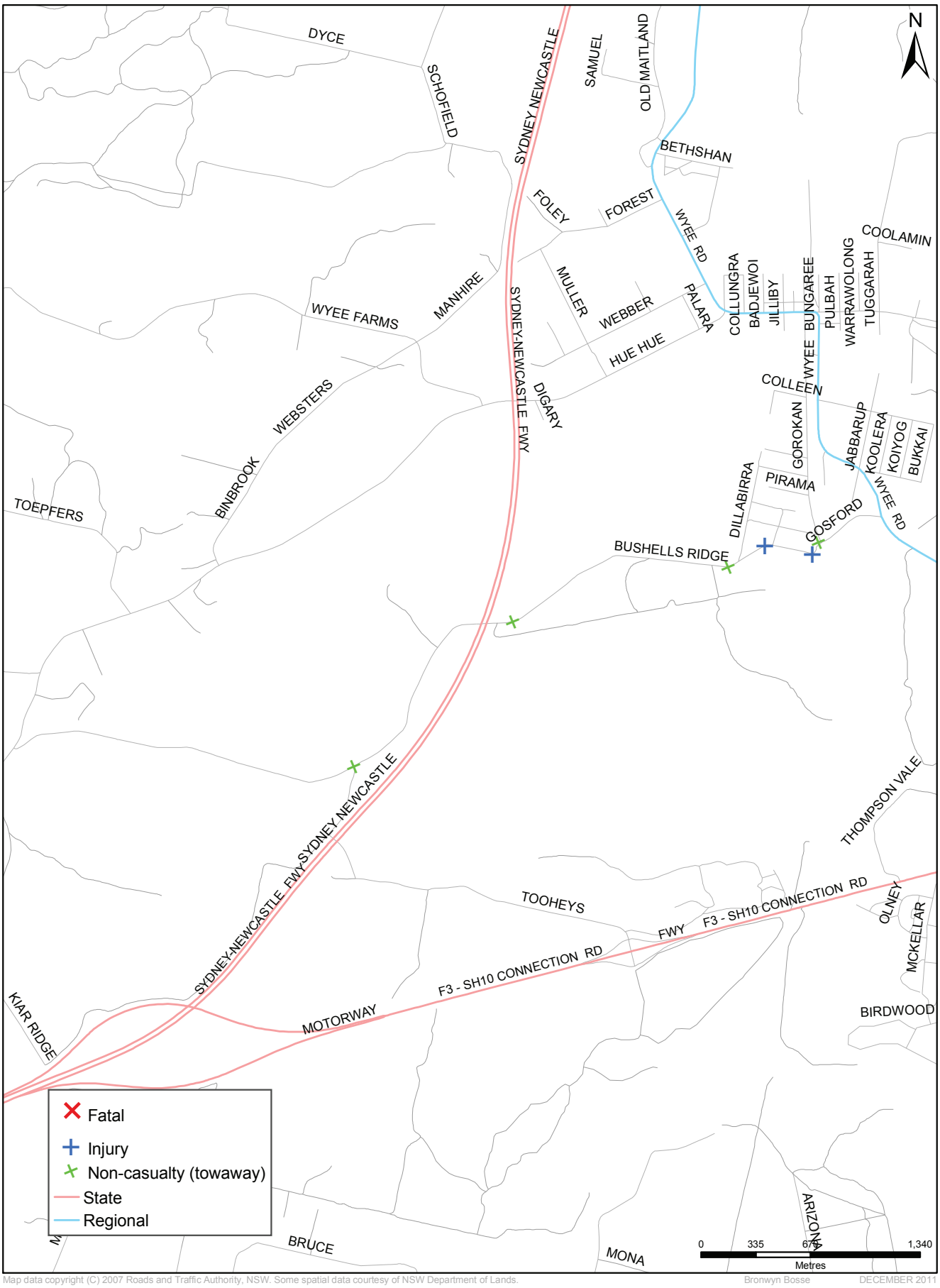
Rep ID: DCR02 **Office:** Hunter **User ID:** bosseb

Generated: 12/12/2011 09:51

Bushells Ridge Rd btw Hue Hue Rd and Wyee Rd, Wyee

Crash Period from 01/01/2006 to 31/12/2010 (Finalised Data)

RTA



Bronwyn Bosse DECEMBER 2011

RTA

PARSONS BRINCKERHOFF

Detailed Crash Report - sorted

Crash No.	Date	Day of Week	Time	Distance	ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash	Killed	Injured	Factors
																				ASF
Hunter Region				**Wyong LGA**		**Wyee**			**Bushells Ridge Rd**											
665861	01/05/2009	Fri	08:20	70 m W	DILLABIRRA RD	2WY	CRV	Fine	Dry	60	2	STA	M61	E in BUSHELLS RIDGE RD	60 Incorrect side		N	0	0	
E39728586						DCA : 201	Opp - Head on					CAR	F29	W in BUSHELLS RIDGE RD	60 Proceeding in lane					
Hunter Region				**Lake Macquarie City LGA**		**Wyee**			**Bushells Ridge Rd**											
686600	08/09/2009	Tue	18:50	390 m W	GOROKAN RD	2WY	CRV	Fine	Dry	80	1	CAR	F22	E in BUSHELLS RIDGE RD	60 Proceeding in lane		I	0	1	
E38644579						DCA : 609	On path - Hit animal					Kangaroo								
Hunter Region				**Lake Macquarie City LGA**		**Wyee**			**Bushells Ridge Rd**											
513416	19/03/2006	Sun	02:00	at	GOSFORD RD	TJN	CRV	Overcast	Dry	50	1	CAR	U U	N in BUSHELLS RIDGE RD	30 Turning right		N	0	0	S
E26376356						DCA : 707 L	Right turn					Fence								
Hunter Region				**Wyong LGA**		**Wyee**			**Bushells Ridge Rd**											
621090	12/03/2008	Wed	10:40	90 m W	GOSFORD RD	2WY	CRV	Fine	Dry	60	1	TRK	M43	E in BUSHELLS RIDGE RD	60 Proceeding in lane		I	0	1	S
E33046733						DCA : 804 R	Off left bend into obj					Embankment								
Hunter Region				**Wyong LGA**		**Bushells Ridge**			**Bushells Ridge Rd**											
678098	03/12/2008	Wed	22:30	at	NTH TOOHEYS RD	TJN	STR	Fine	Dry	50	1	WAG	U U	N in NTH TOOHEYS RD	Unk Turning right		N	0	0	S
E35922638						DCA : 707 L	Right turn					Fence								
Hunter Region				**Wyong LGA**		**Bushells Ridge**			**Bushells Ridge Rd**											
654838	16/12/2008	Tue	15:11	2.5 km W	WYEE RD	2WY	CRV	Fine	Dry	80	1	CAR	M U	W in BUSHELLS RIDGE RD	65 Proceeding in lane		N	0	0	S
E35932418						DCA : 803 L	Off right bend into obj					Tree/bush								

Report Totals: Total Crashes: 6 Fatal Crashes: 0 Injury Crashes: 2 Killed: 0 Injured: 2

Crashid dataset Bushells Ridge Rd btw Hue Hue Rd and Wyee Rd, Wyee. Crash Period 01/01/2006 to 31/12/2010.

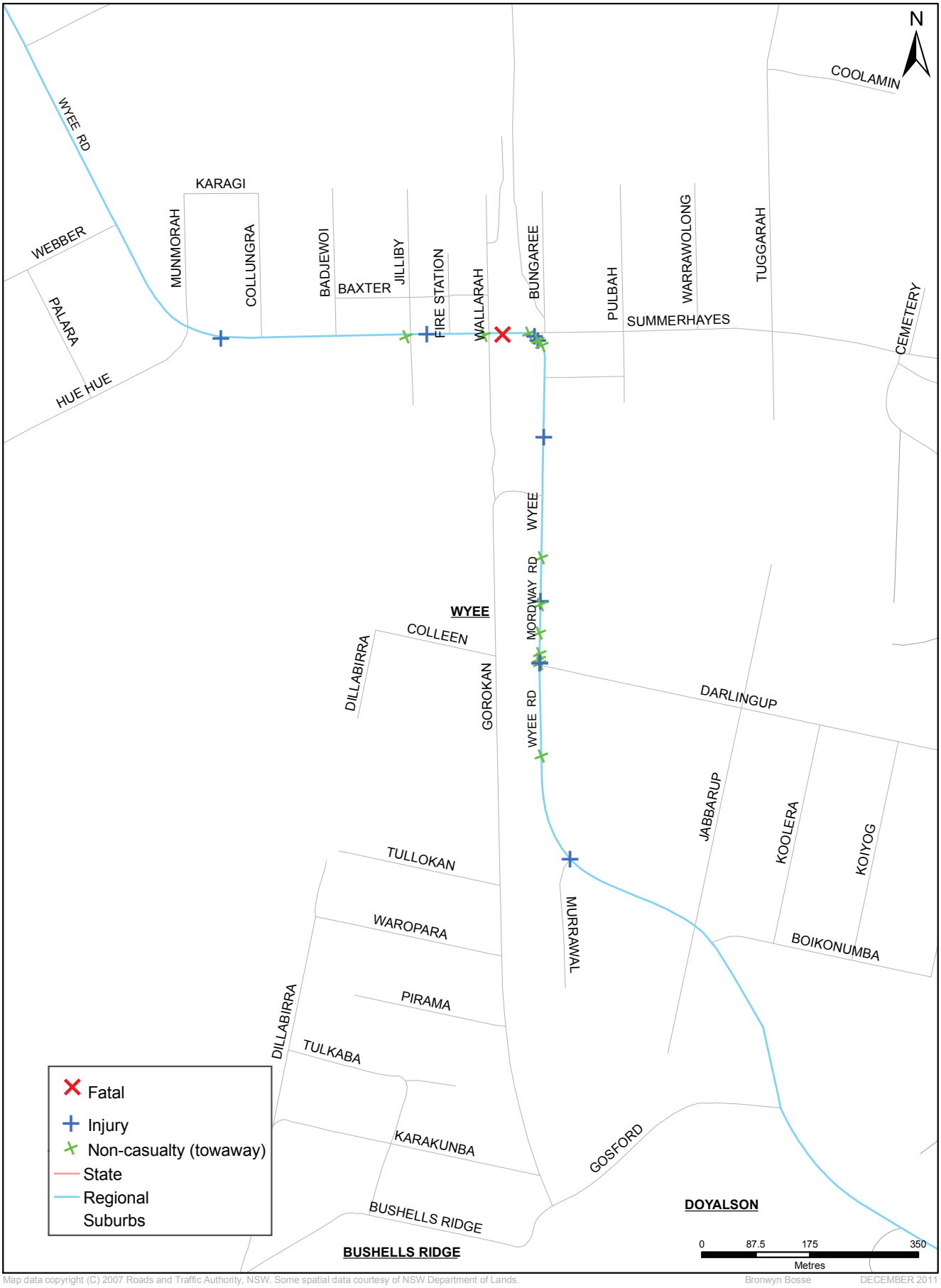
Rep ID: DCR02 **Office:** Hunter **User ID:** bosseb

Generated: 12/12/2011 09:48

Wyee Rd btw 100m N of Hue Hue Rd &100m S of Gosford Rd, Wyee

Crash Period from 01/01/2006 to 31/12/2010

RTA



Bronwyn Bosse DECEMBER 2011

Detailed Crash Report - sorted

Crash No.	Date	Day of Week	Time	Distance	ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash	Killed	Injured	Factors
Natural Lighting																				**A S F**
Hunter Region				**Lake Macquarie City LGA**	**Wyee**				**Wyee Rd**											
694835	12/12/2009	Sat	13:00	20 m N	DARLINGUO RD	2WY	STR	Fine	Dry	60	2	CAR	M21	N in WYEE RD	Unk	Proceeding in lane	N	0	0	
E39523926				Daylight		DCA : 301		Same - Rear end				4WD	M54	N in WYEE RD	0	Stationary				
Hunter Region				**Lake Macquarie City LGA**	**Wyee**				**Wyee Rd**											
511452	17/02/2006	Fri	06:10	at	DARLINGUP RD	TJN	STR	Fine	Dry	60	2	CAR	M20	W in DARLINGUP RD	Unk	Turning right	N	0	0	
E28036089				Dawn		DCA : 104		Adj - Right-thru from right				CAR	M18	S in WYEE RD	Unk	Proceeding in lane				
Hunter Region				**Lake Macquarie City LGA**	**Wyee**				**Wyee St**											
578206	25/05/2007	Fri	18:30	at	DARLINGUP RD	TJN	STR	Fine	Dry	60	2	OMV	U U	W in DARLINGUP RD	5	Turning left	I	0	1	
E30452446				Darkness		DCA : 107		Adj - Left-thru from right				WAG	F33	S in WYEE ST	60	Proceeding in lane				
Hunter Region				**Lake Macquarie City LGA**	**Wyee**				**Wyee Rd**											
604948	22/11/2007	Thu	17:25	at	DARLINGUP RD	TJN	STR	Fine	Dry	60	2	CAR	F17	W in DARLINGUP RD	20	Proceeding in lane	I	0	1	
E32392777				Daylight		DCA : 101		Adj - Cross traffic				CAR	M44	S in WYEE RD	50	Proceeding in lane				
Hunter Region				**Lake Macquarie City LGA**	**Wyee**				**Wyee Rd**											
680692	28/08/2009	Fri	19:20	10 m N	DARLINGUP RD	TJN	STR	Fine	Dry	60	1	CAR	U U	E in WYEE RD	Unk	Forward from drive	N	0	0	S F
E38432505				Darkness		DCA : 804 R		Off left bend into obj				Signpost								
Hunter Region				**Lake Macquarie City LGA**	**Wyee**				**Murrawah Rd**											
616461	10/03/2008	Mon	08:00	50 m N	DARLINGUP RD	2WY	STR	Fine	Dry	60	2	CAR	F18	N in MURRAWAH RD	30	Pulling out	N	0	0	
E32804044				Daylight		DCA : 401		Manov - Leaving parking				CAR	F45	N in MURRAWAH RD	60	Proceeding in lane				
Hunter Region				**Lake Macquarie City LGA**	**Wyee**				**Wyee Rd**											
735256	16/10/2010	Sat	10:50	100 m N	DARLINGUP RD	2WY	STR	Fine	Dry	60	2	CAR	F28	N in WYEE RD	5	Perform U-turn	N	0	0	
E81743402				Daylight		DCA : 401		Manov - Leaving parking				WAG	F44	N in WYEE RD	40	Proceeding in lane				
Hunter Region				**Lake Macquarie City LGA**	**Wyee**				**Wyee St**											
583450	24/06/2007	Sun	15:15	145 m S	DARLINGUP RD	2WY	STR	Fine	Dry	60	2	CAR	M17	N in WYEE ST	60	Proceeding in lane	N	0	0	
E30877505				Daylight		DCA : 704		Right off cway into obj				CAR		N in WYEE ST	0	Parked				
Hunter Region				**Lake Macquarie City LGA**	**Wyee**				**Bungaree St**											
530667	02/08/2006	Wed	15:00	100 m N	GOROKAN RD	2WY	STR	Fine	Dry	60	2	CAR	F18	N in BUNGAREE ST	Unk	Perform U-turn	I	0	1	
E30079986				Daylight		DCA : 304		Same - U-turn				VAN	F36	N in BUNGAREE ST	50	Proceeding in lane				
Hunter Region				**Lake Macquarie City LGA**	**Wyee**				**Wyee Rd**											
671113	14/06/2009	Sun	09:45	100 m S	GOROKAN RD	2WY	STR	Fine	Dry	60	2	CAR	M65	S in WYEE RD	50	Pull out opposite	N	0	0	
E37530372				Daylight		DCA : 506		Ovtak - Overtaking right turn				CAR	F42	S in WYEE RD	20	Turning right				

Rep ID: DCR02 **Office:** Hunter **User ID:** bosseb

Generated: 12/12/2011 09:35

Detailed Crash Report - sorted

Crash No.	Date	Day of Week	Time	Distance	ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash	Killed	Injured	Factors
Natural Lighting																				**A S F**
Hunter Region				**Lake Macquarie City LGA**	**Wyee**				**Wyee Rd**											
575166	30/05/2007	Wed	19:20	10 m W GOROKAN RD		XJN	STR	Fine	Dry	60	3	CAR	M67	E in WYEE RD	40 Proceeding in lane		N	0	0	
E30212624				Darkness		DCA : 301		Same - Rear end				CAR	F19	E in WYEE RD	0 Stationary					
												CAR	M42	E in WYEE RD	0 Wait turn right					
Hunter Region				**Lake Macquarie City LGA**	**Wyee**				**Wyee Rd**											
658403	26/01/2009	Mon	19:00	100 m W GOROKAN RD		2WY	STR	Fine	Wet	60	1	CAR	F52	WYEE RD	Unk Proceeding in lane		I	0	1	A F
E149916394				Dusk		DCA : 703		Left off cway into object				Utility pole								
Hunter Region				**Lake Macquarie City LGA**	**Wyee**				**Wyee Rd**											
544497	03/11/2006	Fri	13:00	50 m E HUE HUE RD		2WY	CRV	Fine	Dry	60	2	CAR	F21	W in WYEE RD	60 Proceeding in lane		I	0	2	
E28402723				Daylight		DCA : 301		Same - Rear end				WAG	M54	W in WYEE RD	40 Proceeding in lane					
Hunter Region				**Lake Macquarie City LGA**	**Wyee**				**Wyee Rd**											
524495	15/06/2006	Thu	09:45	at JILLIBY ST		XJN	STR	Fine	Dry	50	2	CAR	F53	W in WYEE RD	10 Turning right		N	0	0	
E28391908				Daylight		DCA : 202		Opp - Right-thru				CAR	F40	E in WYEE RD	20 Proceeding in lane					
Hunter Region				**Lake Macquarie City LGA**	**Wyee**				**Wyee Rd**											
648393	29/11/2008	Sat	16:00	at MURRAWAL RD		TJN	CRV	Overcast	Wet	80	2	4WD	F55	S in WYEE RD	Unk Proceeding in lane		I	0	4	
E35328337				Daylight		DCA : 303		Same - Rear right				VAN	F57	S in WYEE RD	0 Wait turn right					
Hunter Region				**Lake Macquarie City LGA**	**Wyee**				**Wyee Rd**											
616742	20/03/2008	Thu	08:30	at SUMMERHAYES RD		TJN	CRV	Fine	Dry	60	1	CAR	F17	E in WYEE RD	60 Proceeding in lane		N	0	0	S
E33571429				Daylight		DCA : 803 L		Off right bend into obj				Other fixed object								
Hunter Region				**Lake Macquarie City LGA**	**Wyee**				**Wyee Rd**											
646346	16/11/2008	Sun	06:15	at SUMMERHAYES RD		TJN	CRV	Fine	Dry	60	1	CAR	M25	N in WYEE RD	60 Turning left		N	0	0	S
E35498011				Dawn		DCA : 706 R		Left turn				Utility pole								
Hunter Region				**Lake Macquarie City LGA**	**Wyee**				**Wyee Rd**											
703847	26/02/2010	Fri	18:15	10 m S SUMMERHAYES RD		TJN	CRV	Fine	Dry	50	2	UTE	M40	N in WYEE RD	Unk Incorrect side		I	0	1	
E40898741				Daylight		DCA : 201		Opp - Head on				LOR	M30	S in WYEE RD	Unk Proceeding in lane					
Hunter Region				**Lake Macquarie City LGA**	**Wyee**				**Wyee Rd**											
527928	06/04/2006	Thu	15:13	20 m E WALLARAH ST		2WY	CRV	Fine	Dry	60	2	CAR	F84	W in WYEE RD	40 Incorrect side		F	1	4	S
E27444765				Daylight		DCA : 201		Opp - Head on				CAR	F31	E in WYEE RD	30 Proceeding in lane					

Detailed Crash Report - sorted

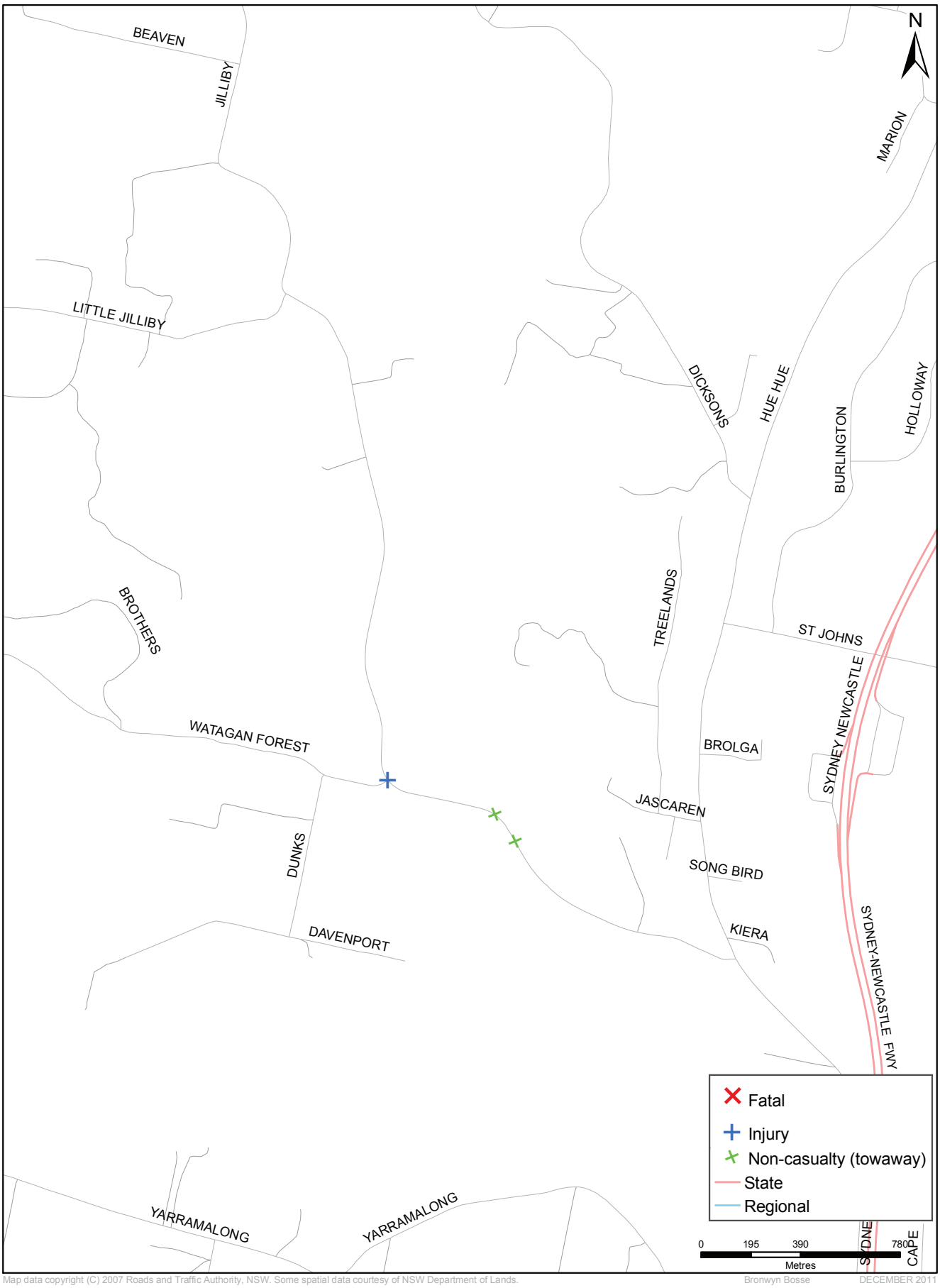
Crash No.	Date	Day of Week	Time	Distance	ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash	Killed	Injured	Factors
Natural Lighting																				**A S F**
Hunter Region		**Lake Macquarie City LGA**			**Wyee**				**Wyee Rd**											
655779	20/01/2009	Tue	05:15	at WYEE RAILWAY SN		2WY	STR	Fine	Dry	60	2	CAR	M21	S in WYEE RD	10	Pull out opposite	I	0	1	
E38221084			Dawn			DCA : 506		Ovtak - Overtaking right turn				CAR	F40	S in WYEE RD	Unk	Turning right				
Hunter Region		**Lake Macquarie City LGA**			**Wyee**				**Bungaree St**											
592120	28/09/2007	Fri	16:40	at WYEE ST		XJN	STR	Fine	Dry	60	1	M/C	M24	E in WYEE ST	20	Turning right	I	0	2	S
E31940951			Dusk			DCA : 707		Right turn												
Hunter Region		**Lake Macquarie City LGA**			**Wyee**				**Bungaree St**											
527433	24/06/2006	Sat	09:15	10 m S WYEE ST		TJN	CRV	Fine	Dry	60	2	VAN	M39	N in WYEE ST	60	Incorrect side	N	0	0	
E27507071			Daylight			DCA : 201		Opp - Head on				TRK	M63	S in WYEE ST	60	Proceeding in lane				

Report Totals: Total Crashes: 22 Fatal Crashes: 1 Injury Crashes: 9 Killed: 1 Injured: 18

Crashid dataset Wyee Rd btw 100m N of Hue Hue Rd and 100m S of Gosford Rd, Wyee. Crash Period 01/01/2006 to 31/12/2010.

Jilliby Rd btw 100m north of Little Jilliby Rd and Hue Hue Rd, Jilliby.

Crash Period from 01/01/2006 to 31/12/2010 (Finalised Data)



Bronwyn Bosse DECEMBER 2011

RTA

Detailed Crash Report - sorted

Crash No.	Date	Day of Week	Time	Distance	ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash	Killed	Injured	Factors
Natural Lighting																				**A S F**
Hunter Region		**Wyong LGA**			**Jilliby**				**Jilliby Rd**											
620250	19/04/2008	Sat	00:01	1 km W	HUE HUE RD	2WY	STR	Raining	Wet	60	1	CAR	M33	E in JILLIBY RD	60	Proceeding in lane	N	0	0	F
E33185537				Darkness		DCA : 704		Right off cway into obj				Fence								
Hunter Region		**Wyong LGA**			**Jilliby**				**Jilliby Rd**											
717646	04/07/2010	Sun	07:20	1.16 km W	HUE HUE RD	2WY	CRV	Overcast	Wet	80	1	CAR	F20	E in JILLIBY RD	65	Proceeding in lane	N	0	0	S
E596659090				Dawn		DCA : 803 L		Off right bend into obj				Fence								
Hunter Region		**Wyong LGA**			**Jilliby**				**Jilliby Rd**											
657391	05/01/2009	Mon	21:00	at	WATAGAN FOREST DR	TJN	CRV	Fine	Dry	60	1	CAR	M37	S in JILLIBY RD	80	Proceeding in lane	I	0	1	S
E36272768				Darkness		DCA : 804 R		Off left bend into obj				Fence								

Report Totals: Total Crashes: 3 Fatal Crashes: 0 Injury Crashes: 1 Killed: 0 Injured: 1

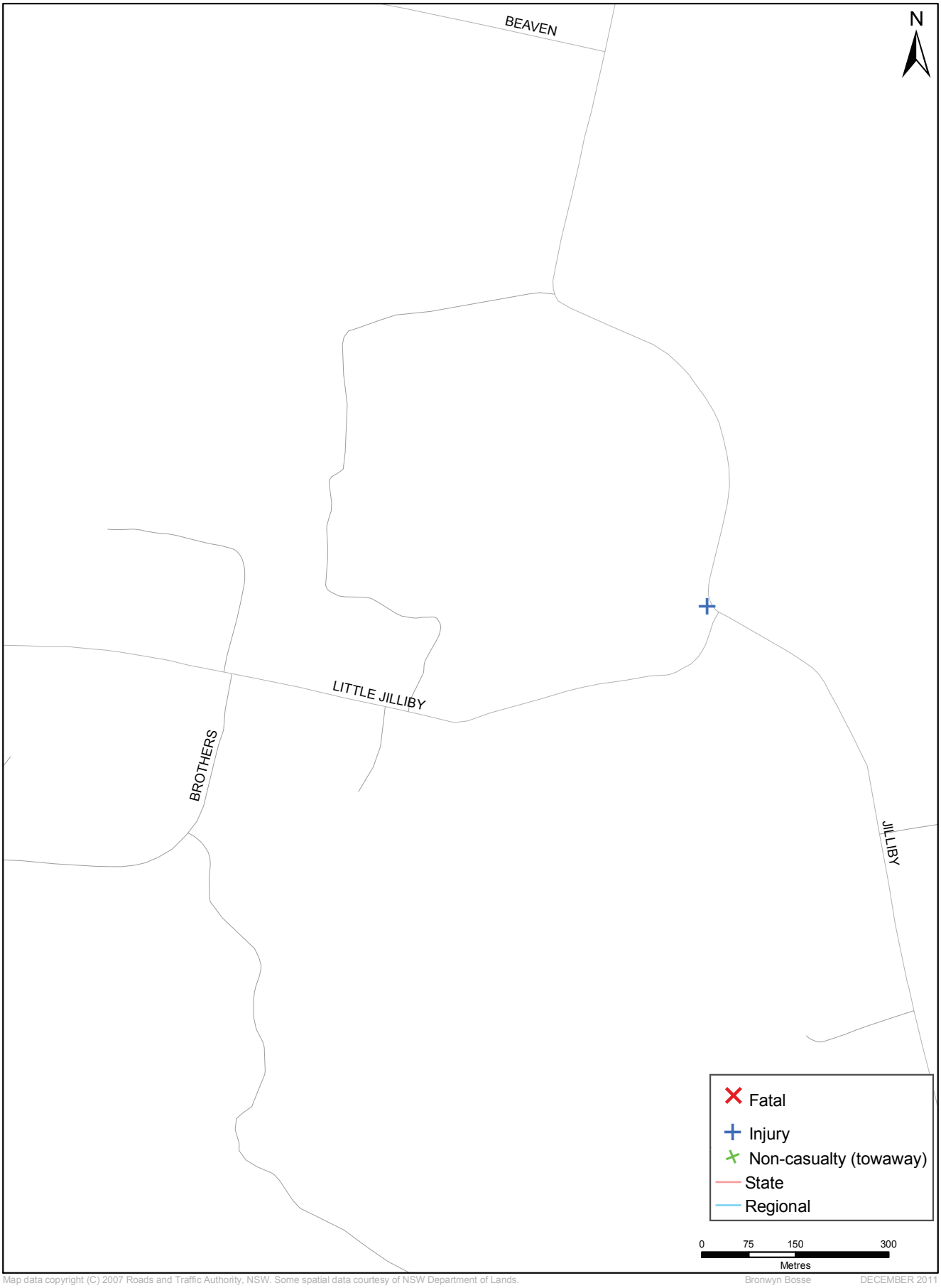
Crashid dataset Jilliby Rd btw 100m north of Little Jilliby Rd and Hue Hue Rd, Jilliby. Crash Period 01/01/2006 to 31/12/2010.

Rep ID: DCR02 **Office:** Hunter **User ID:** bosseb

Generated: 12/12/2011 10:19

Little Jilliby Rd btw 100m west of Brothers Forest Rd and Jilliby Rd

Crash Period from 01/01/2006 to 31/12/2010 (Finalised Data)



Map data copyright (C) 2007 Roads and Traffic Authority, NSW. Some spatial data courtesy of NSW Department of Lands. Bronwyn Bosse DECEMBER 2011

RTA

PARSONS BRINCKERHOFF

Detailed Crash Report - sorted

Crash No.	Date	Day of Week	Time	Distance	ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash	Killed	Injured	Factors
Natural Lighting																				**A S F**
Hunter Region		**Wyong LGA**			**Jilliby**				**Little Jilliby Rd**											
560813	20/02/2007	Tue	11:20	10 m S JILLIBY RD		TJN	CRV	Fine	Dry	60	1	CAR	F60	E in LITTLE JILLIBY RD	50	Proceeding in lane	I	0	1	
E29232370				Daylight		DCA :	803	L	Off right bend into obj			Fence								

Report Totals: Total Crashes: 1 Fatal Crashes: 0 Injury Crashes: 1 Killed: 0 Injured: 1

Crashid dataset Little Jilliby Rd btw 100m west of Brothers Forest Rd and Jilliby Rd. Crash Period 01/01/2006 to 31/12/2010.

Rep ID: DCR02 **Office:** Hunter **User ID:** bosseb

Generated: 12/12/2011 10:24

Appendix D

Site photos

Motorway Link Road/Tooheys Road interchange

Photo 1 Tooheys Road, looking east from the Tooheys Road/Motorway Link Road interchange

Photo 2 Tooheys Road, looking west toward the eastbound on-ramp of the Tooheys Road/Motorway Link Road interchange

Photo 3 Tooheys Road/Motorway Link Road interchange eastbound off ramp, looking east toward Tooheys Road

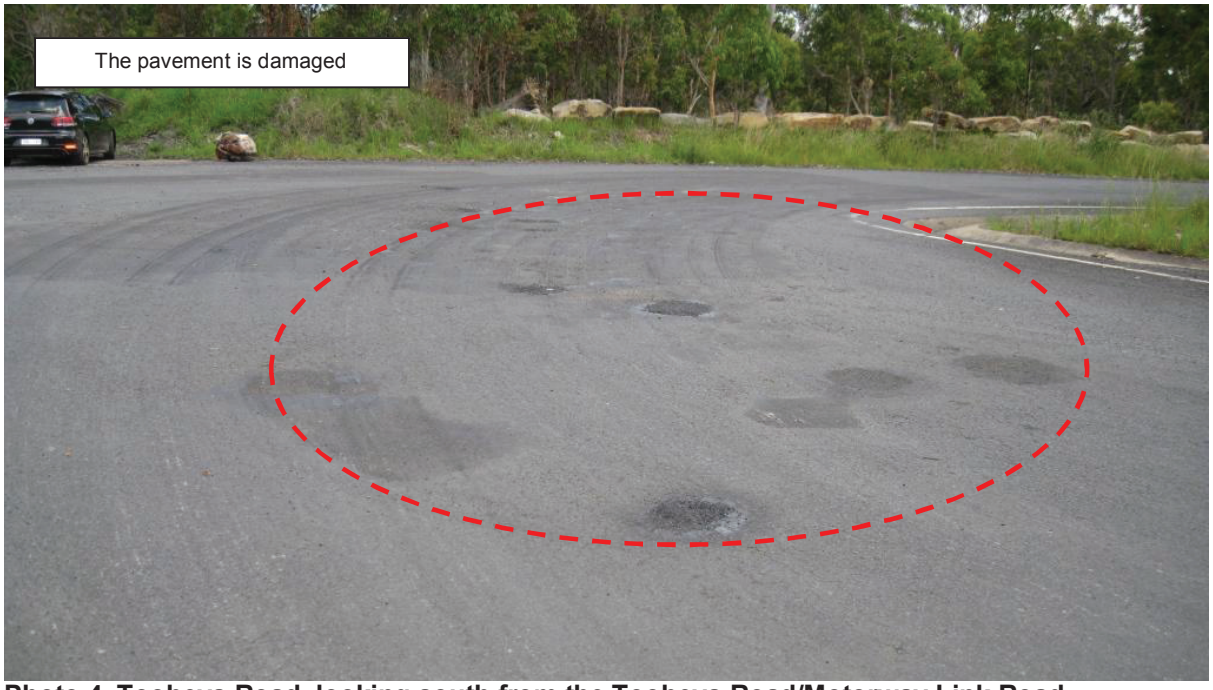


Photo 4 Tooheys Road, looking south from the Tooheys Road/Motorway Link Road interchange

Photo 5 Tooheys Road, looking north from the Tooheys Road/Motorway Link Road interchange

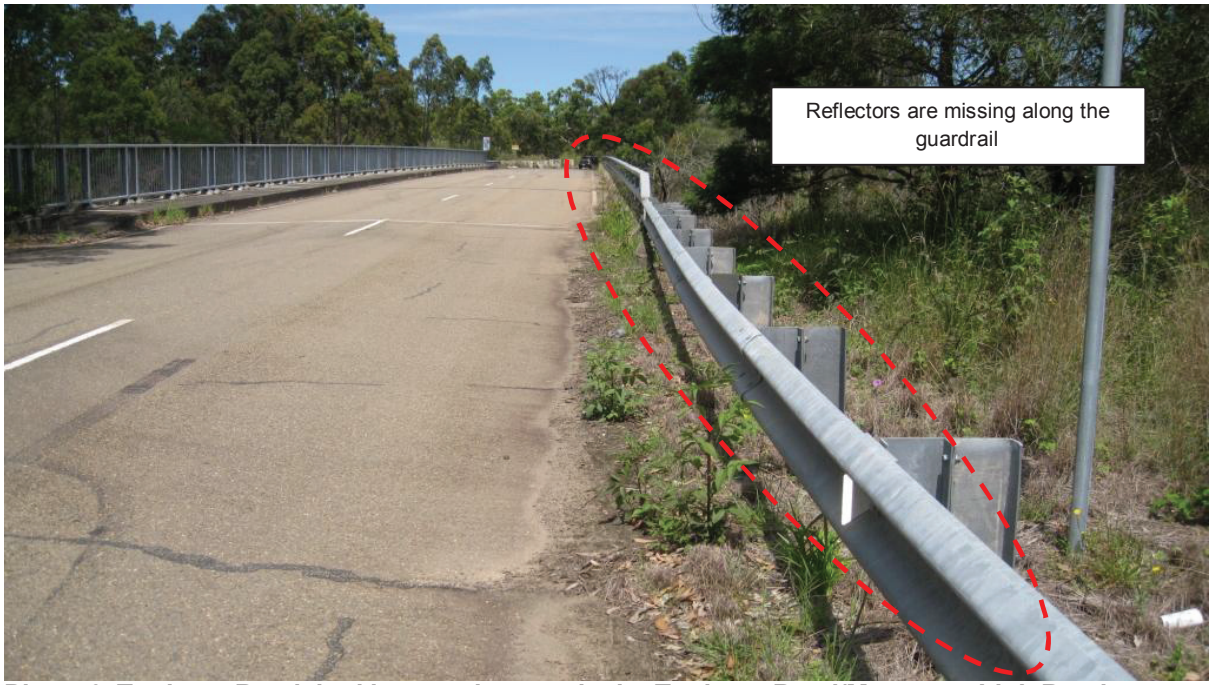


Photo 6 Tooheys Road, looking south towards the Tooheys Road/Motorway Link Road interchange

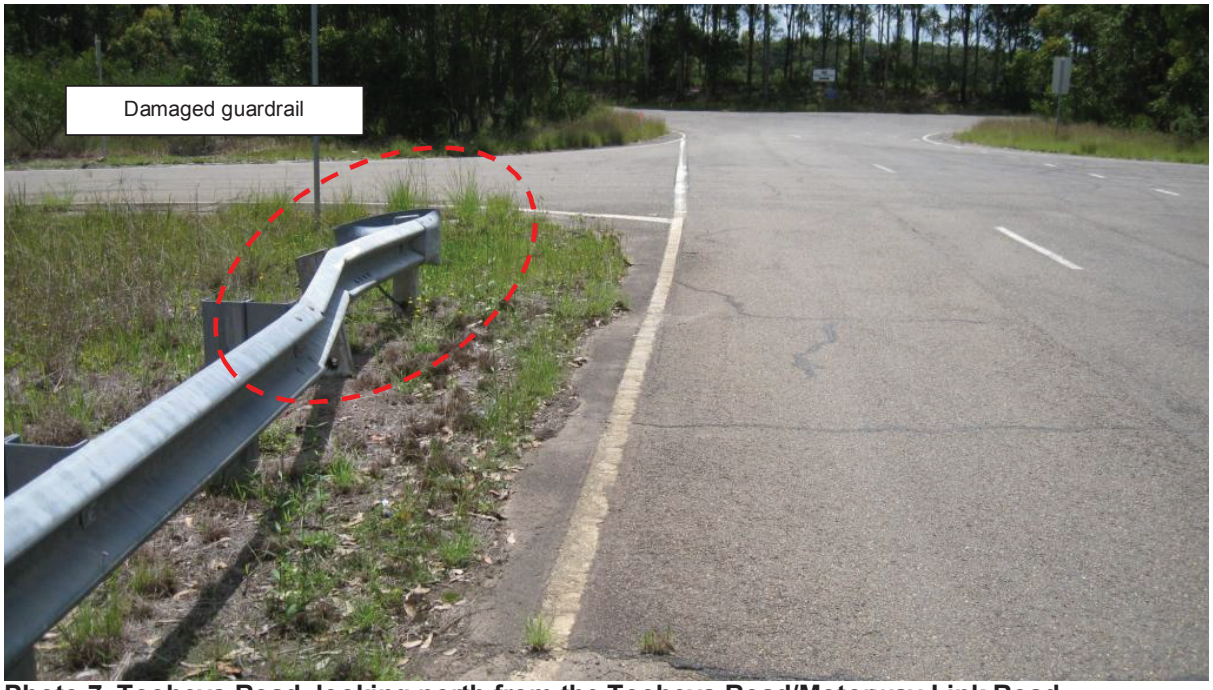


Photo 7 Tooheys Road, looking north from the Tooheys Road/Motorway Link Road interchange

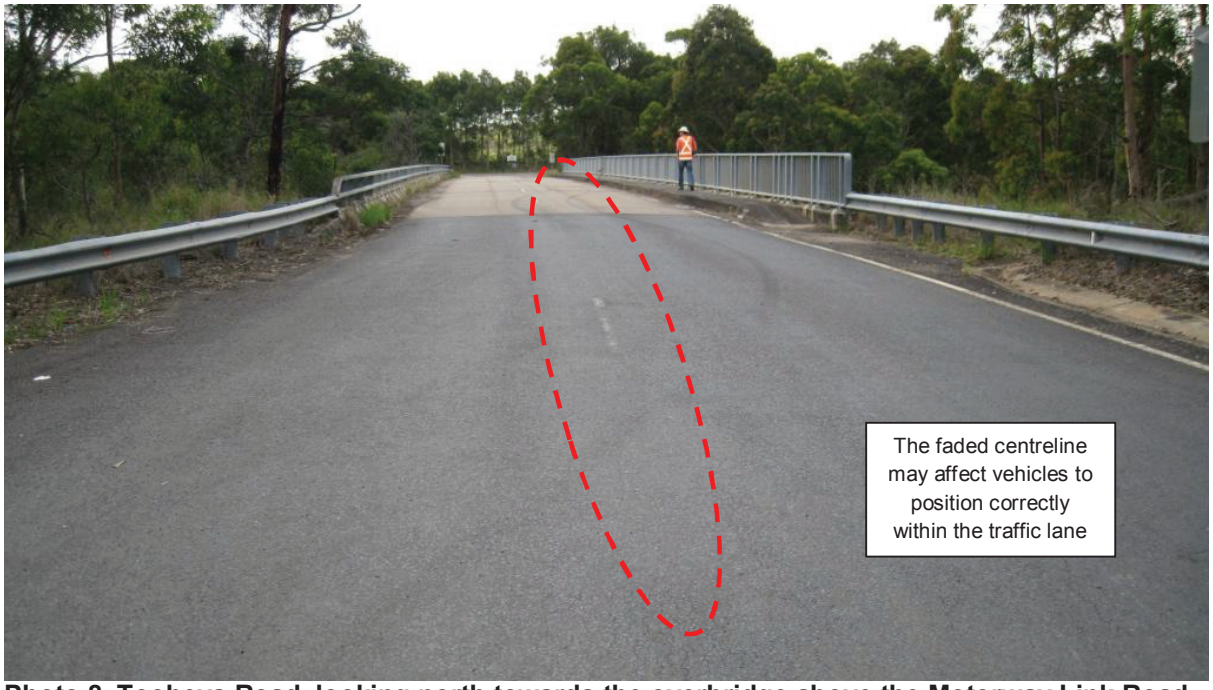


Photo 8 Tooheys Road, looking north towards the overbridge above the Motorway Link Road

Tooheys Road

Photo 9 Tooheys Road, looking east from the east of a private access road

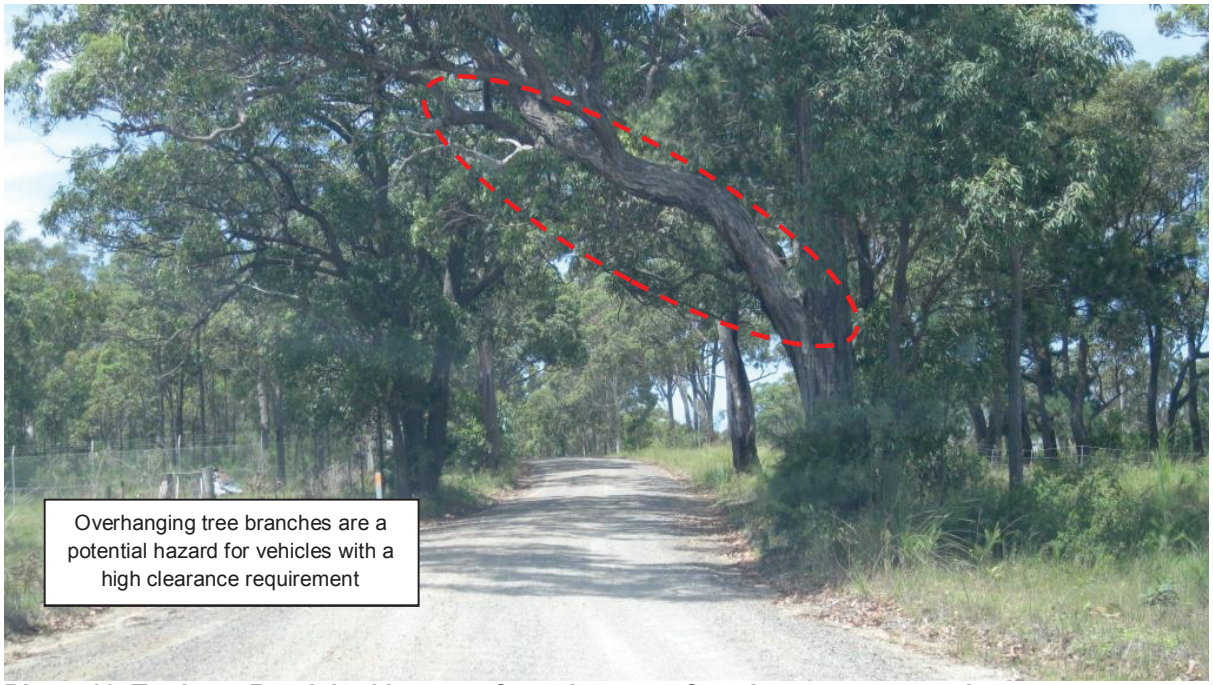


Photo 10 Tooheys Road, looking east from the east of a private access road

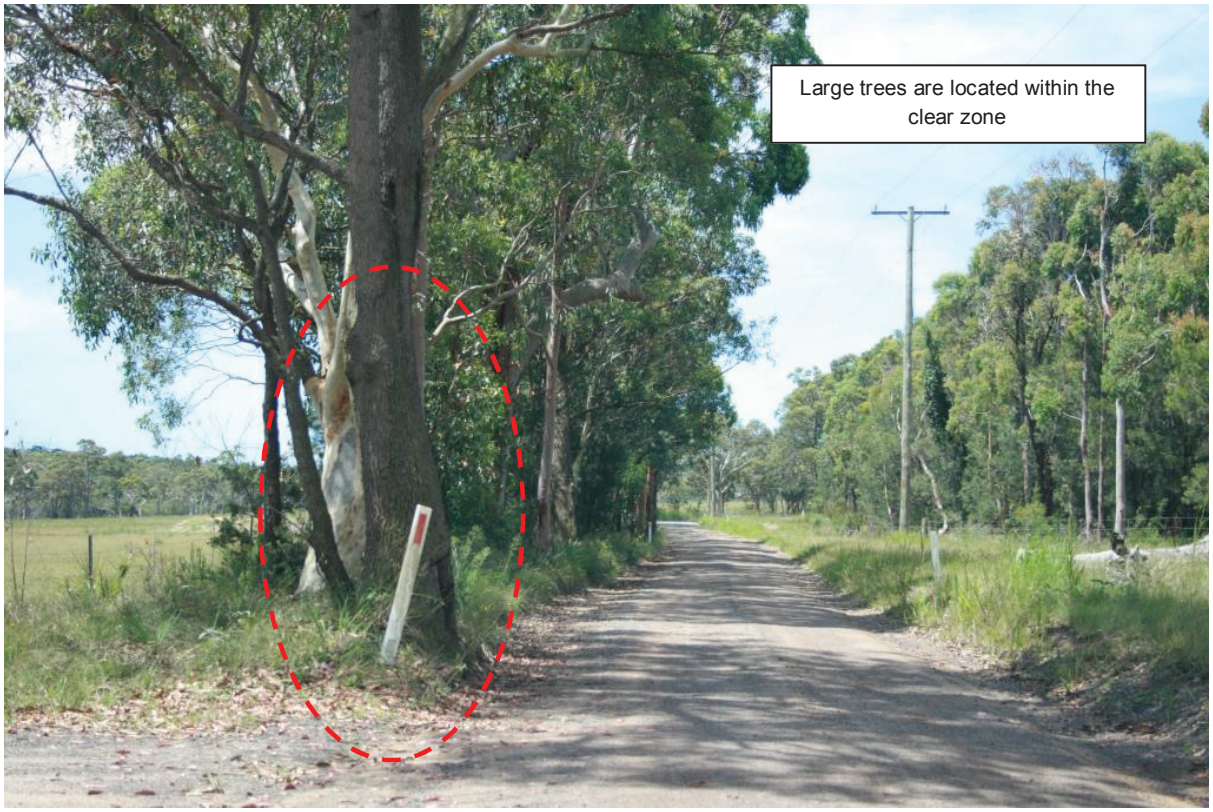


Photo 11 Tooheys Road, looking east from the east of a private access road

Photo 12 Tooheys Road, looking north west from the F3 underpass

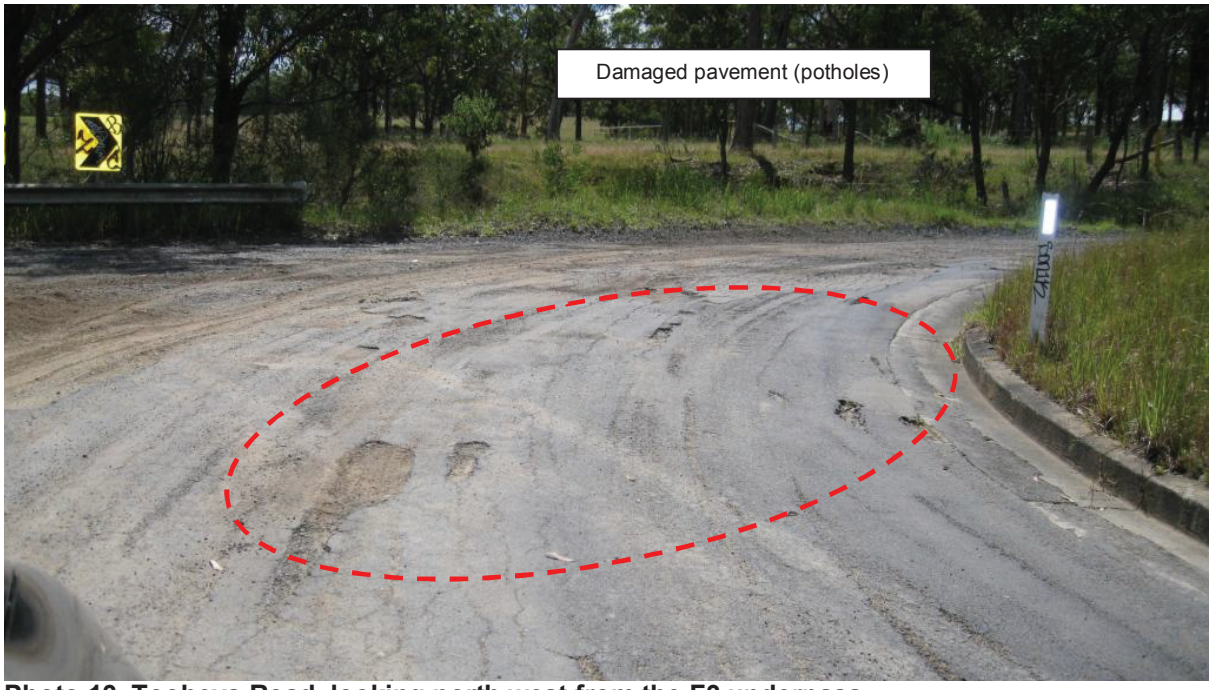


Photo 13 Tooheys Road, looking north west from the F3 underpass

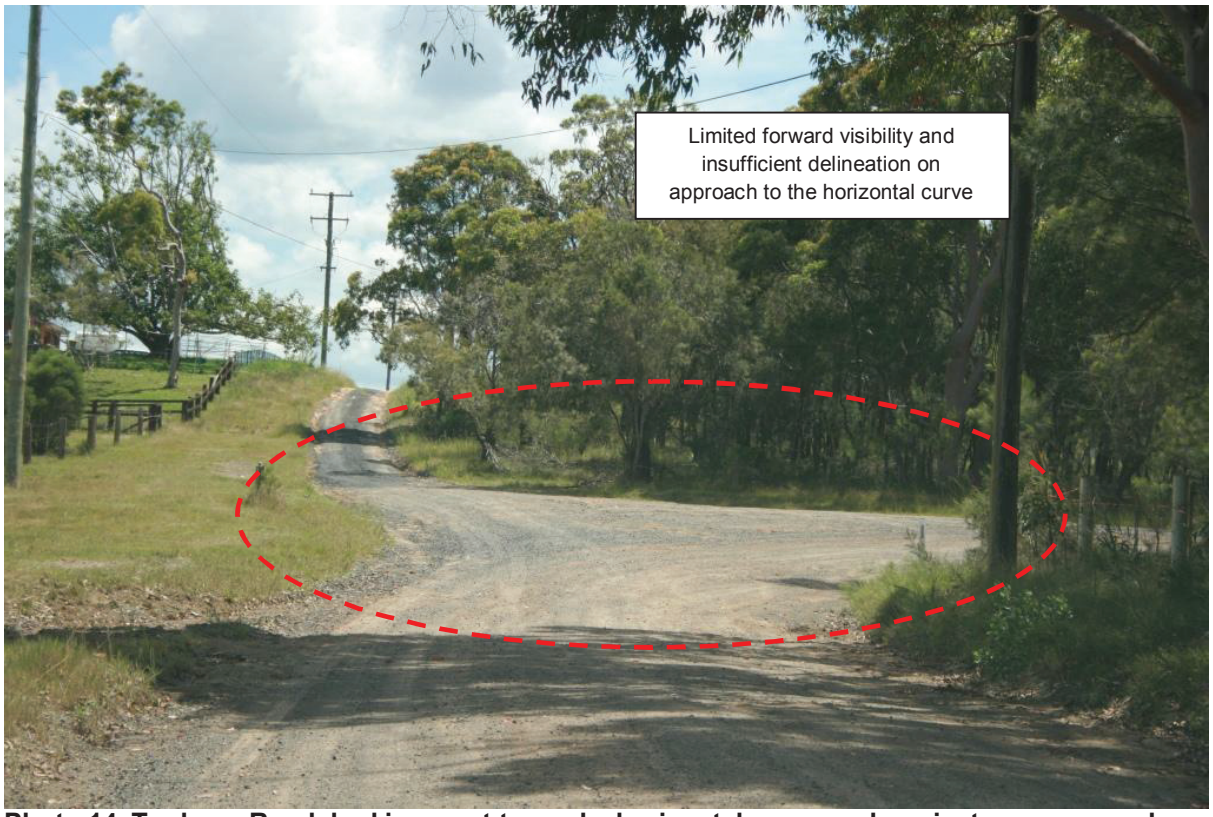


Photo 14 Tooheys Road, looking west toward a horizontal curve and a private access road

Photo 15 Tooheys Road, looking north west toward the F3 underpass

Photo 16 Tooheys Road, looking south west toward the bend, located to the north west of the F3 underpass

Hue Hue Road/Wyee Road intersection

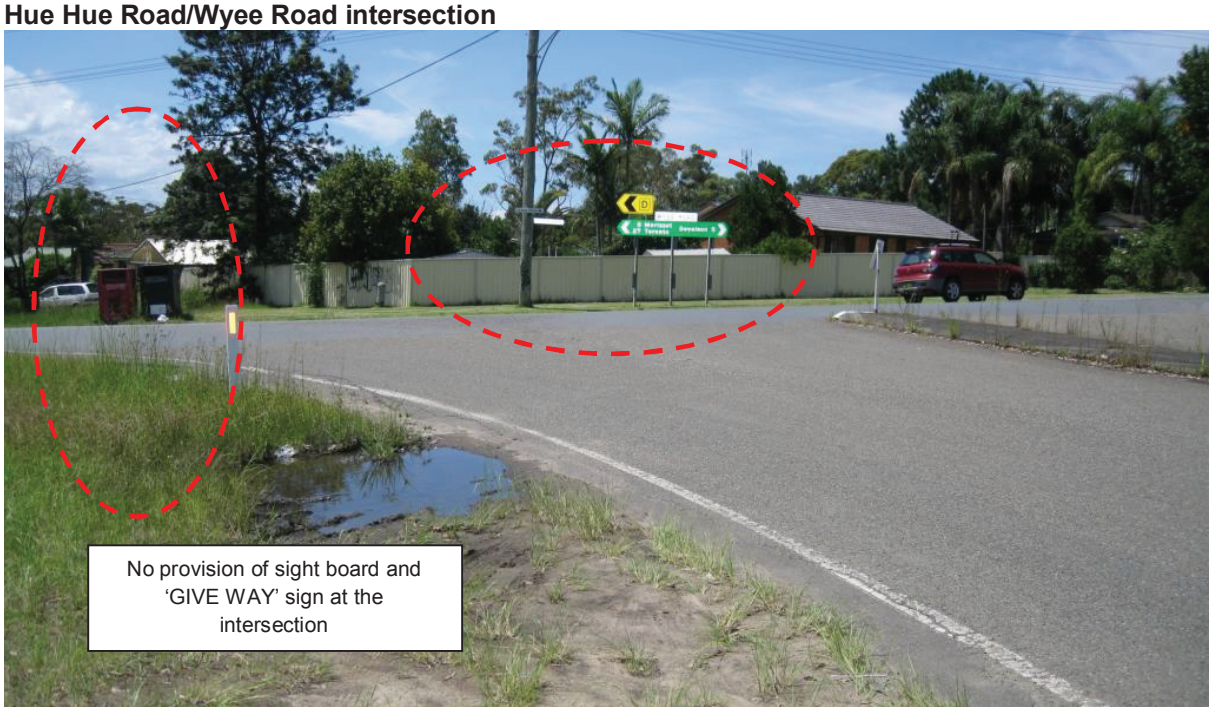


Photo 17 Hue Hue Road, looking north east towards its intersection with Wyee Road

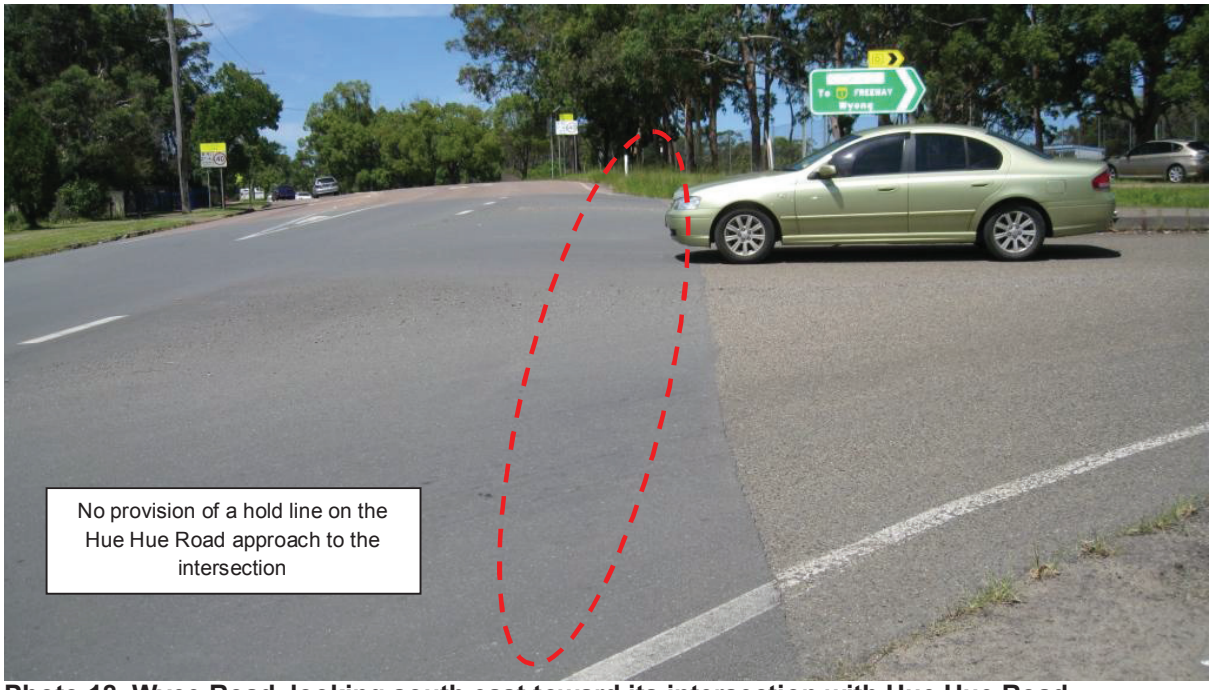


Photo 18 Wyee Road, looking south east toward its intersection with Hue Hue Road

Photo 19 Hue Hue Road, looking north east toward its intersection with Wyee Road

Photo 20 Hue Hue Road, looking south west from its intersection with Wyee Road

Hue Hue Road/Bushells Ridge Road intersection

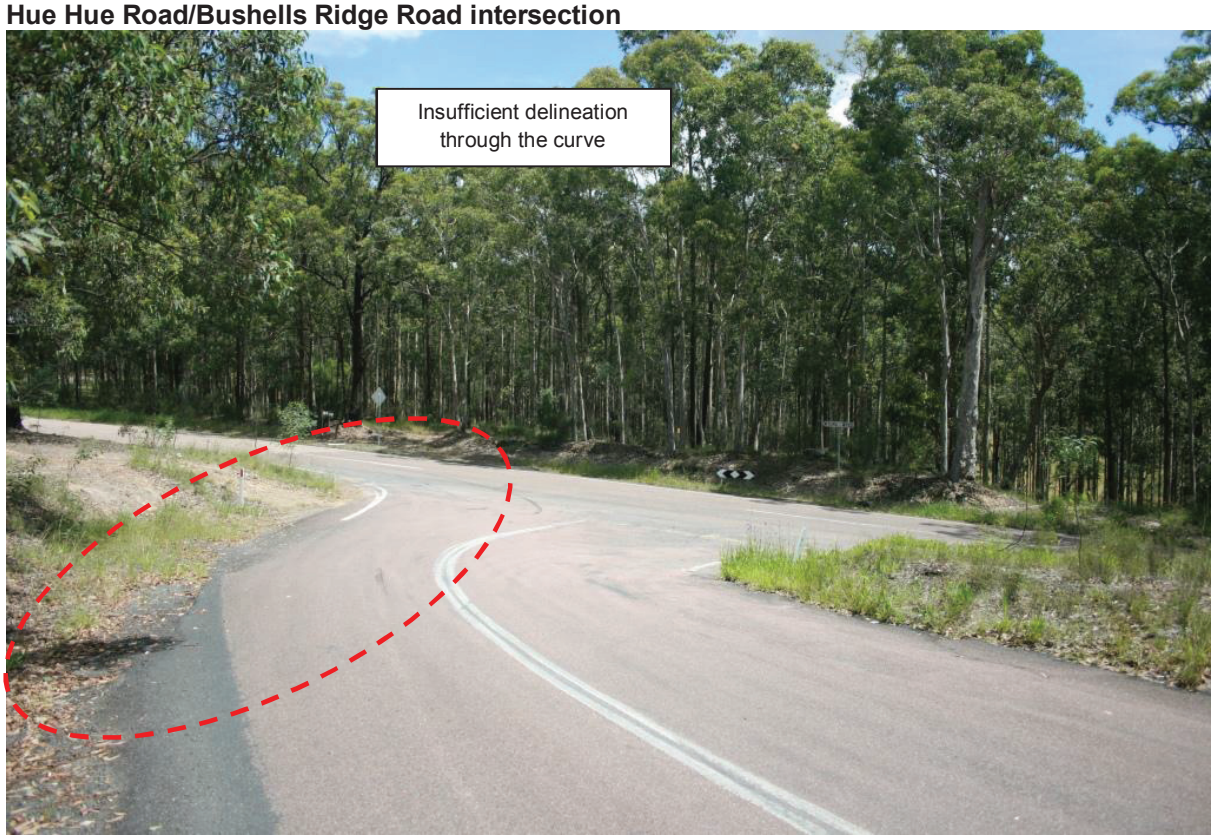


Photo 21 Bushells Ridge Road, looking south west toward its intersection with Hue Hue Road

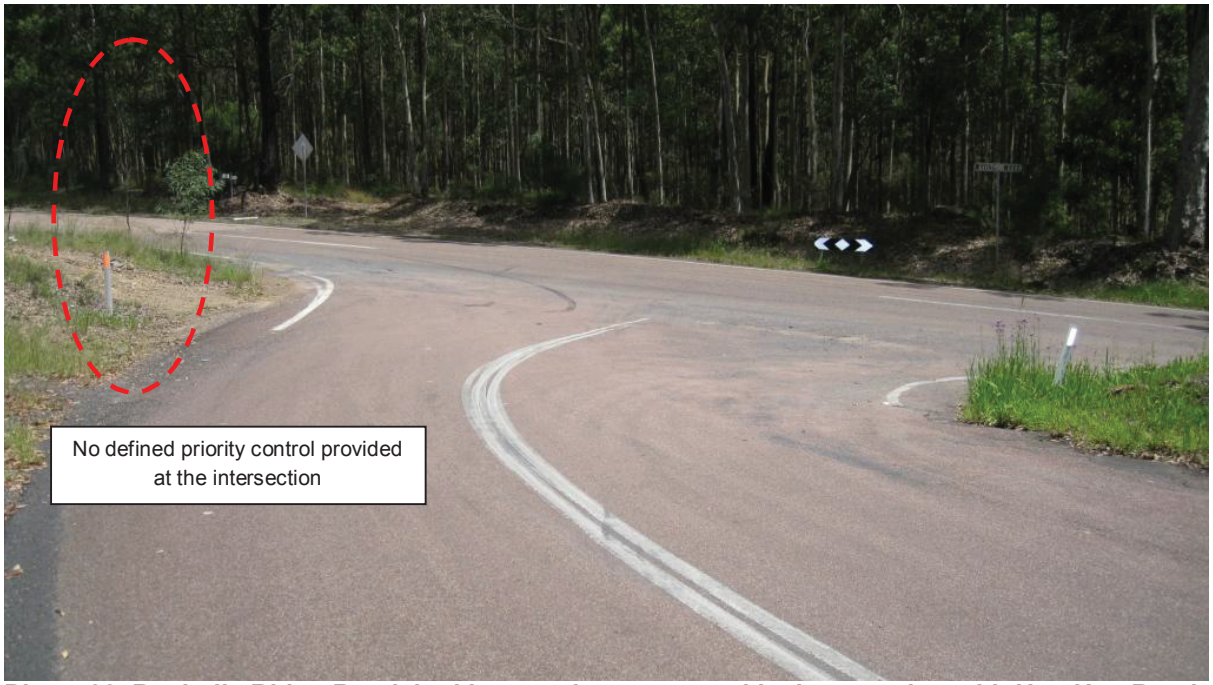


Photo 22 Bushells Ridge Road, looking south west toward its intersection with Hue Hue Road

Photo 23 Hue Hue Road, looking north toward its intersection with Bushells Ridge Road

Bushells Ridge Road

Photo 24 Bushells Ridge Road, looking west on the road section between Hue Hue Road and Tooheys Road

Sparks Road/Hue Hue Road intersection

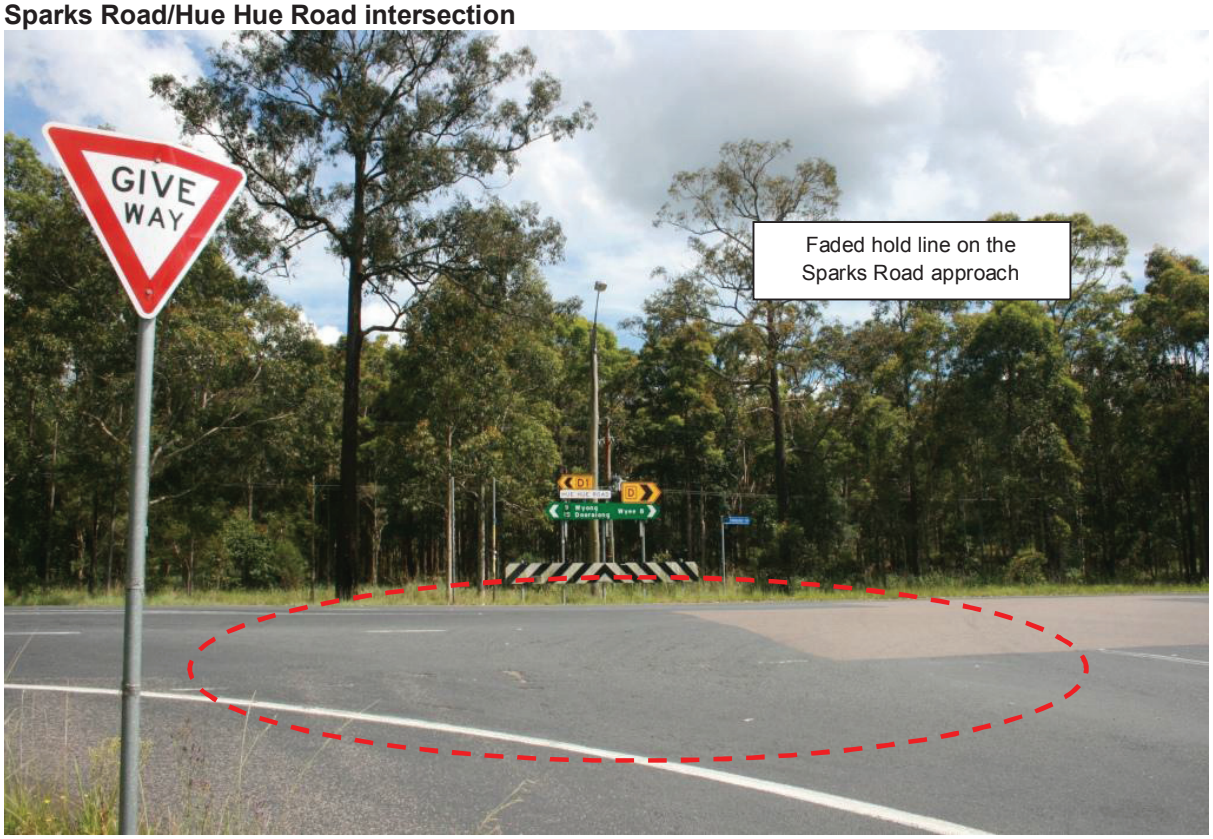


Photo 25 Sparks Road, looking west toward its intersection with Hue Hue Road

Hue Hue Road (between Wyee Road and Jilliby Road)

Photo 26 Hue Hue Road, looking north on the road section between Sparks Road and Bushells Bridge Road

Photo 27 Hue Hue Road, looking north on the road section between Sparks Road and Jilliby Road

Photo 28 Hue Hue Road, looking south on the road section to the south of Wyee Road

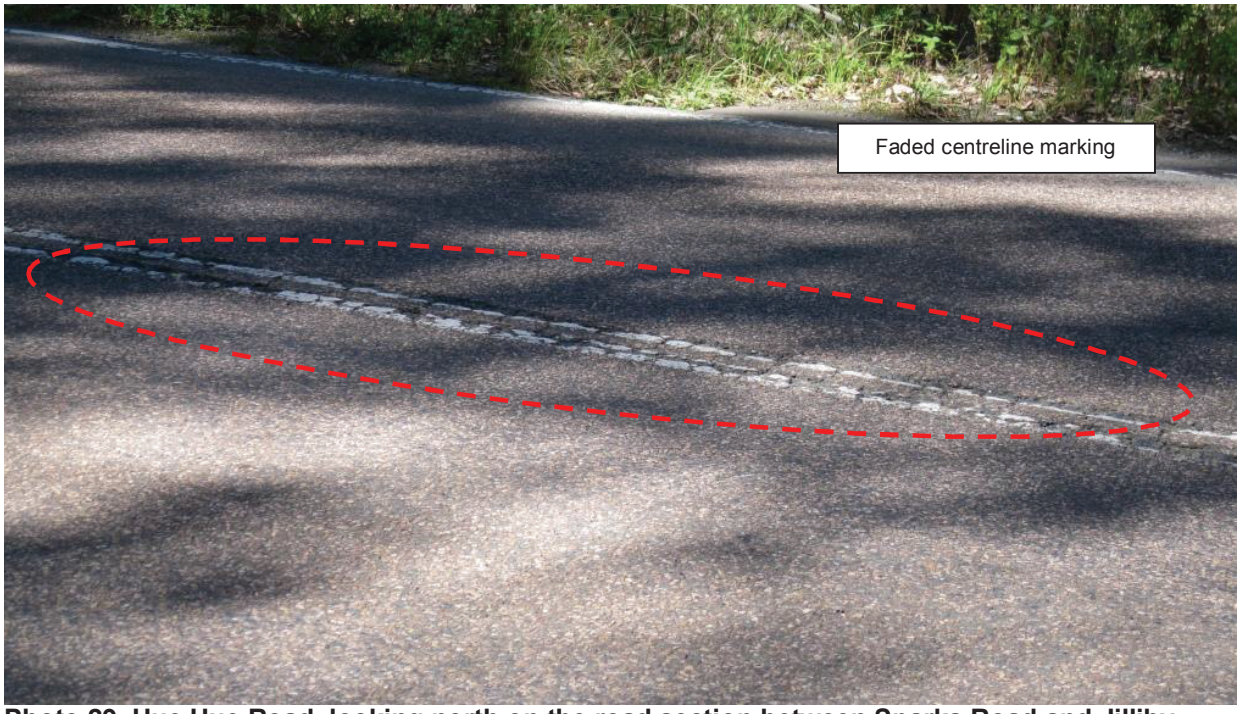


Photo 29 Hue Hue Road, looking north on the road section between Sparks Road and Jilliby Road

Photo 30 Hue Hue Road, on the road section between Bushells Road and Sparks Road

Photo 31 Hue Hue Road, looking north on the road section between Holloway Drive and Dickson Road

Photo 32 Hue Hue Road, looking north toward its intersection with Bushells Ridge Road

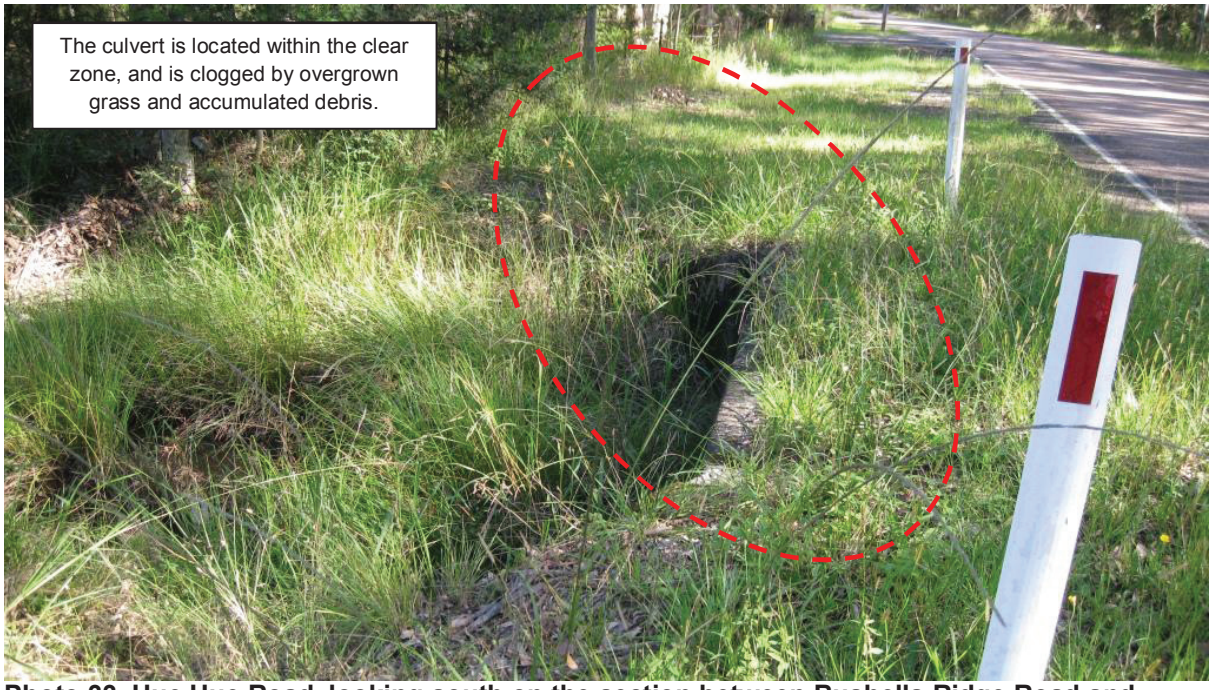


Photo 33 Hue Hue Road, looking south on the section between Bushells Ridge Road and Sparks Road

Photo 34 Hue Hue Road, looking south on the road section to the south of Dickson Road

Hue Hue Road/Jilliby Road intersection

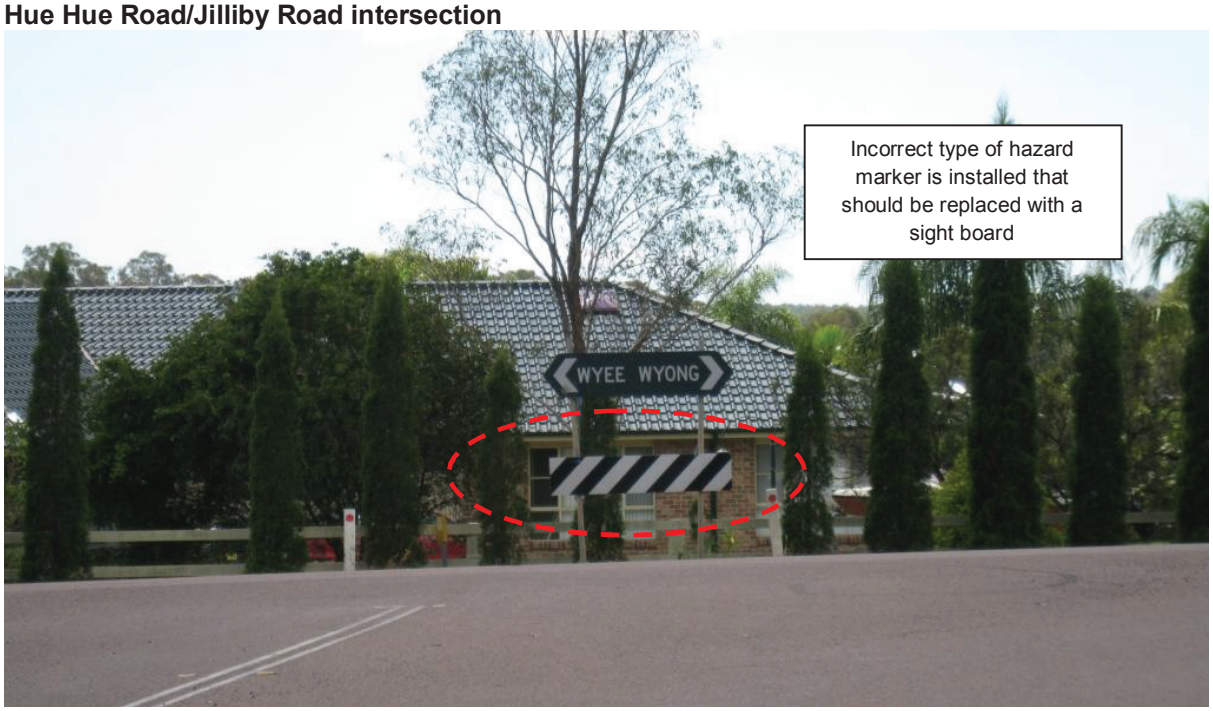


Photo 35 Jilliby Road, looking east toward its intersection with Hue Hue Road

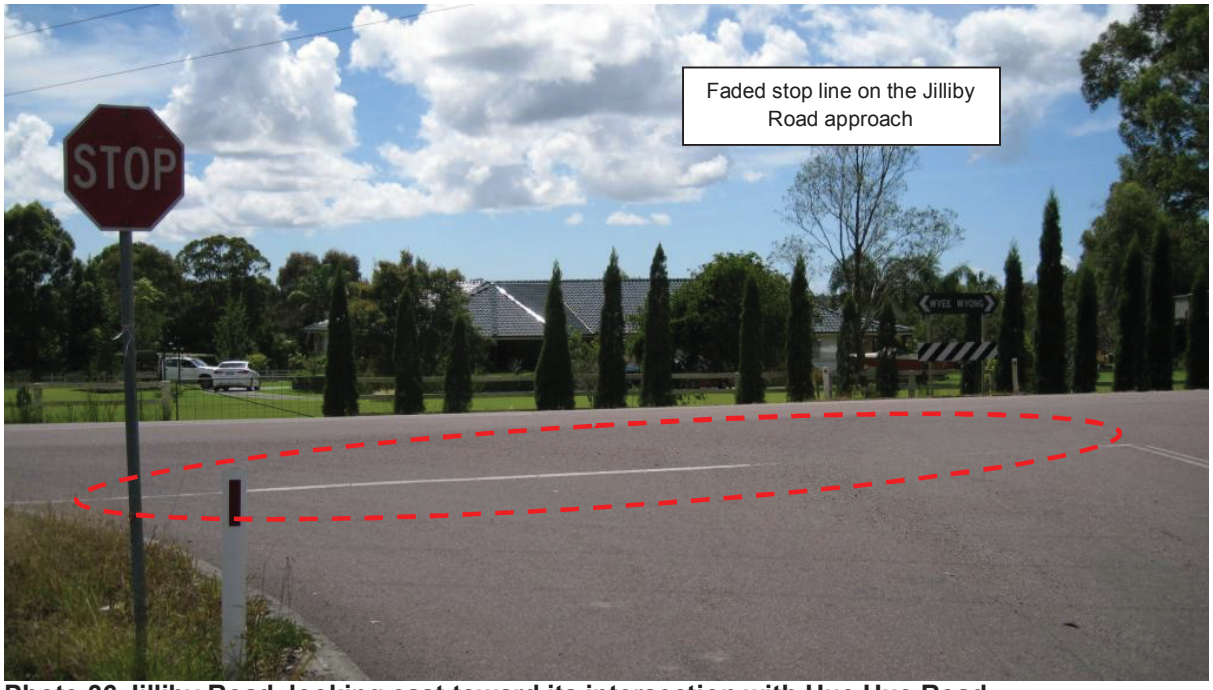


Photo 36 Jilliby Road, looking east toward its intersection with Hue Hue Road

Photo 37 Hue Hue Road, looking west toward its intersection with Jilliby Road

Jilliby Road

Photo 38 Jilliby Road, looking north from the road section to the north Watagan Forest Drive

Photo 39 Jilliby Road, looking north from the road section to the north Watagan Forest Drive

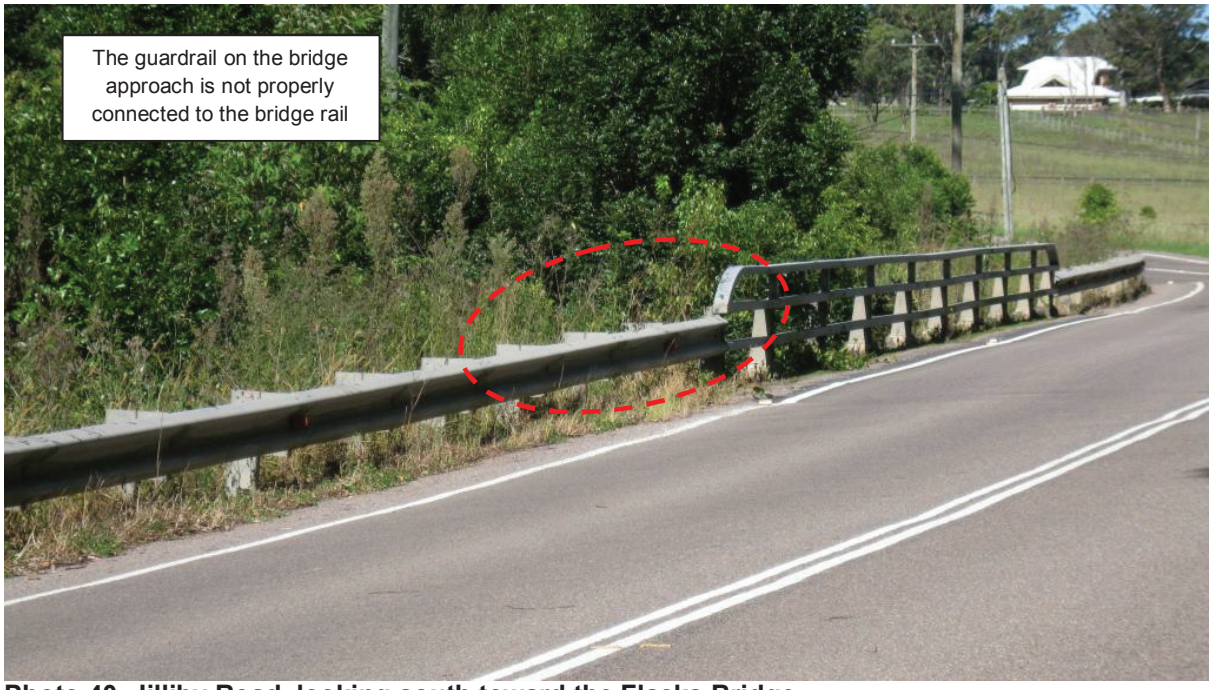


Photo 40 Jilliby Road, looking south toward the Flacks Bridge

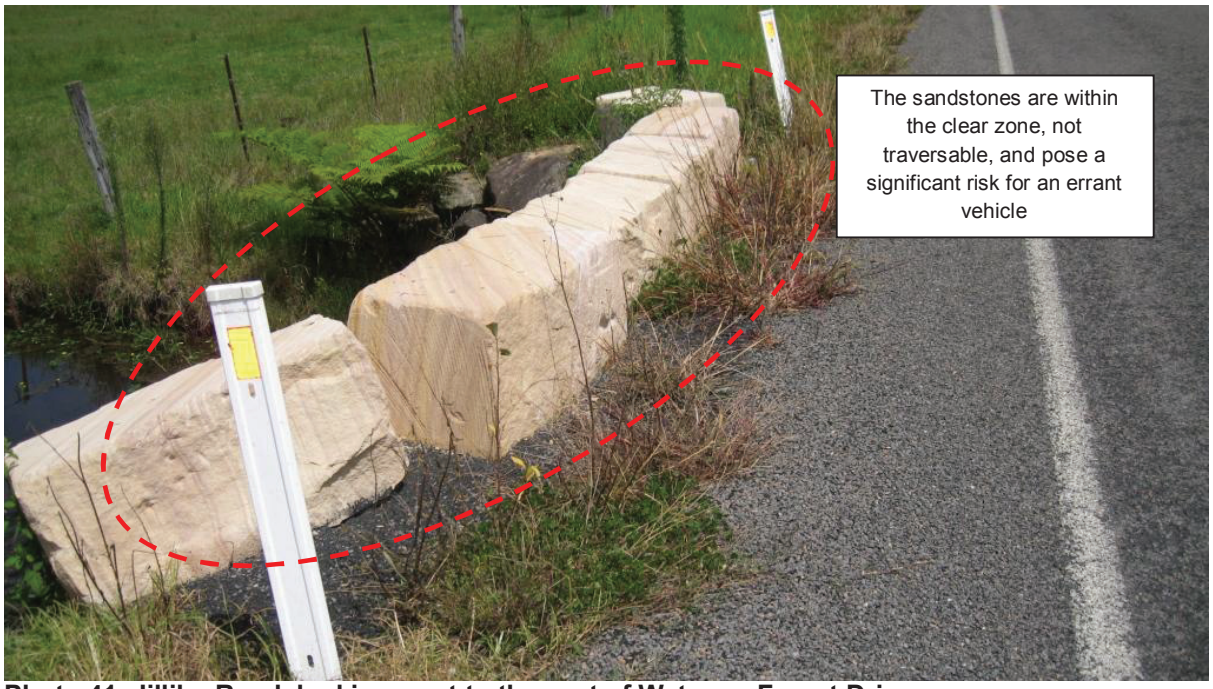


Photo 41 Jilliby Road, looking west to the east of Watagan Forest Drive

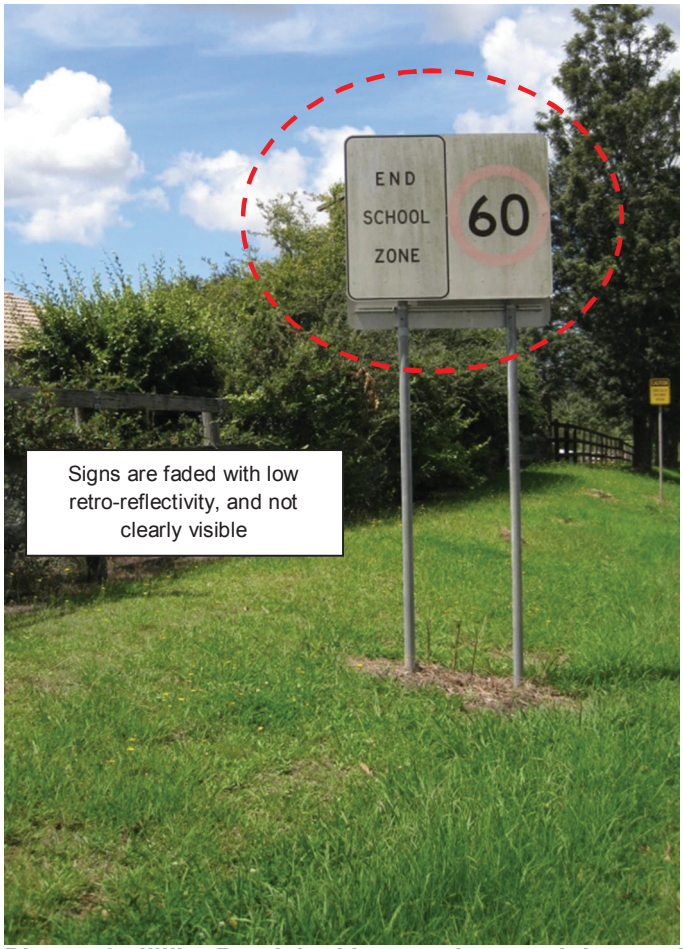


Photo 42 Jilliby Road, looking south toward the southern end of the 40 km/h school zone

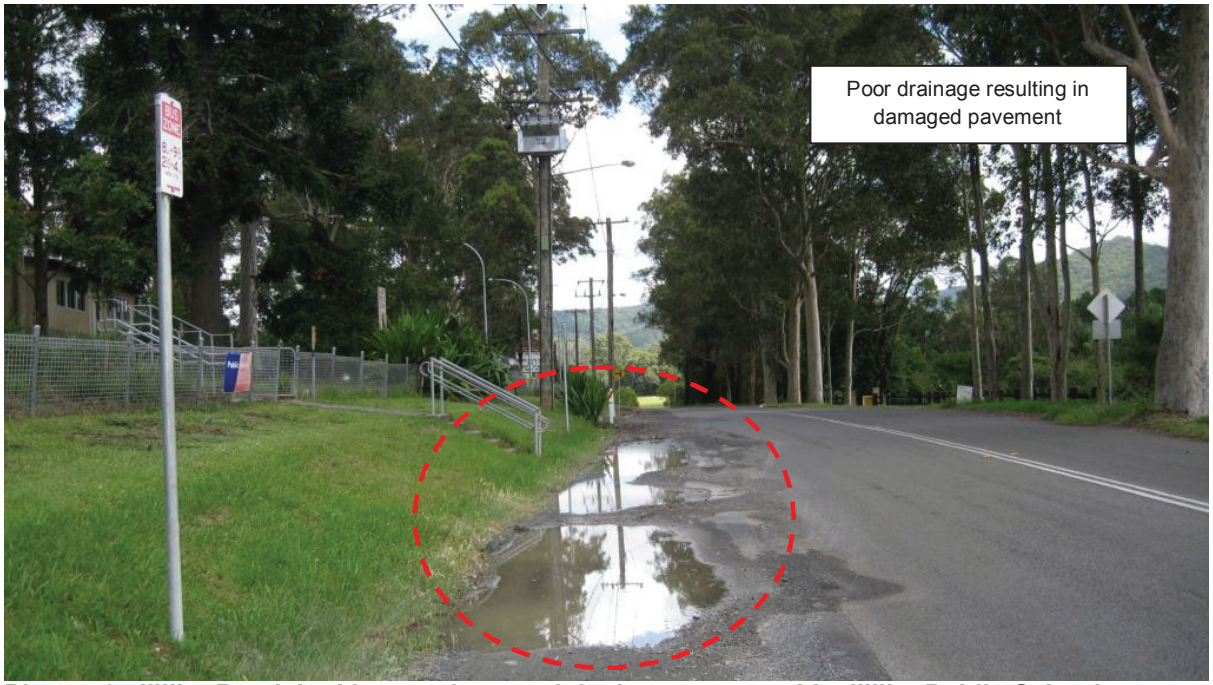


Photo 43 Jilliby Road, looking north toward the bus zone outside Jilliby Public School

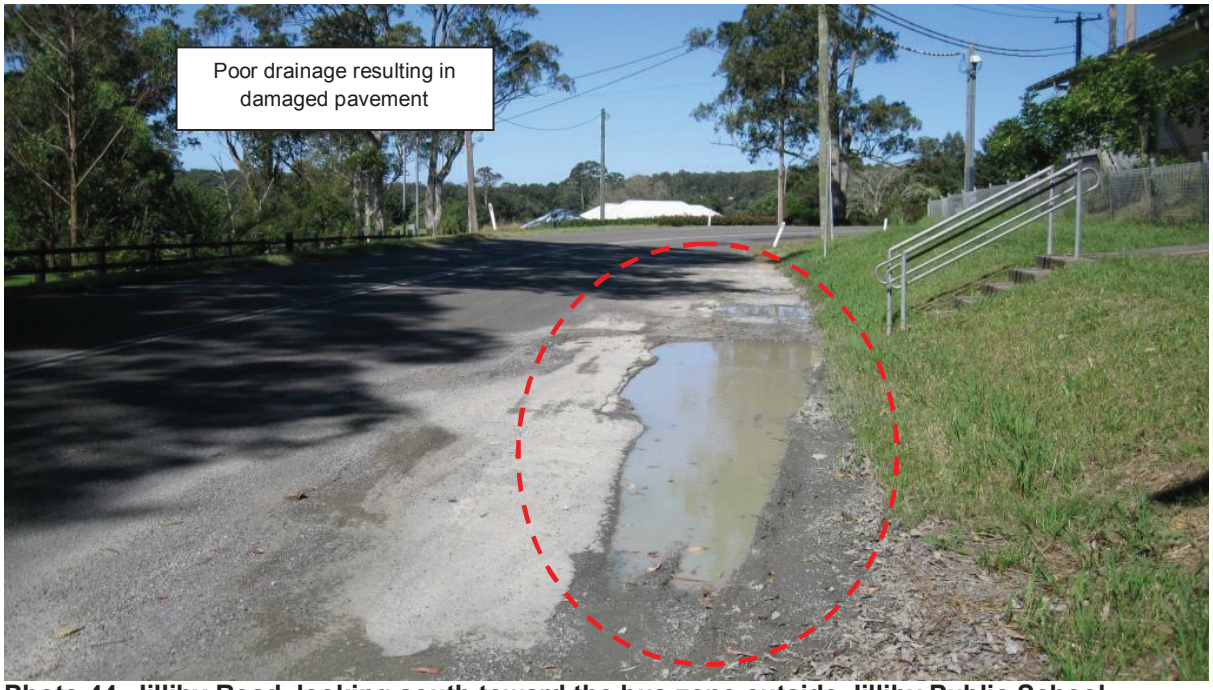


Photo 44 Jilliby Road, looking south toward the bus zone outside Jilliby Public School

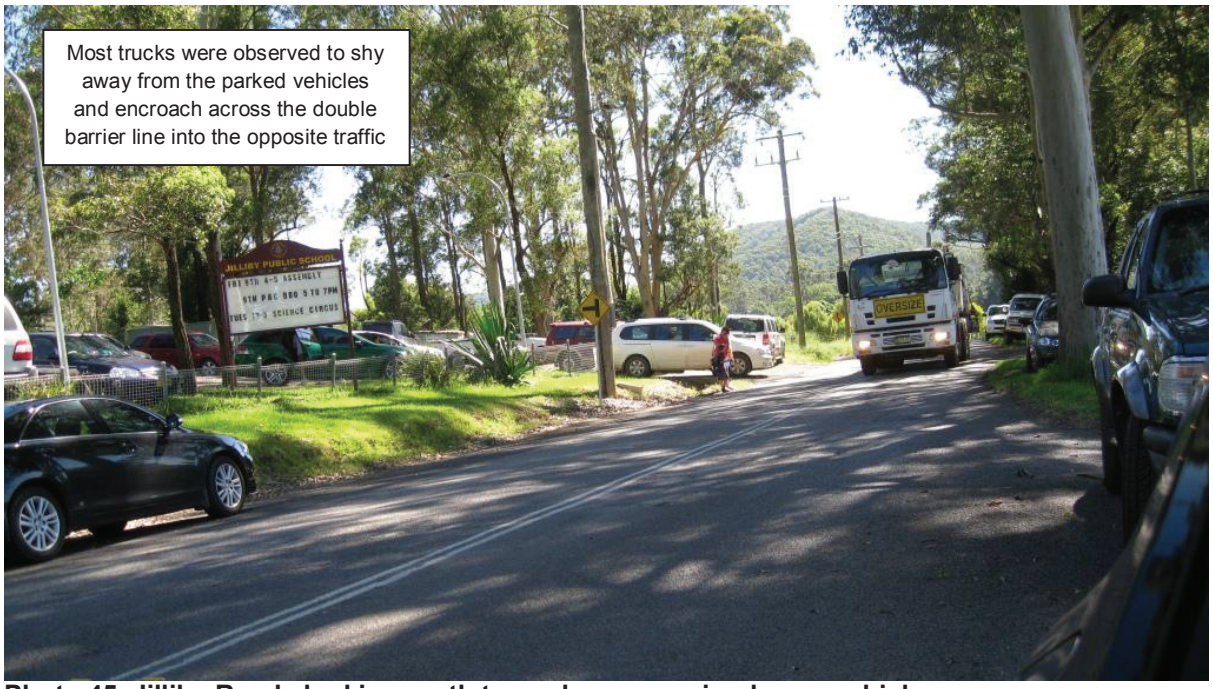


Photo 45 Jilliby Road , looking north toward an oncoming heavy vehicle

Photo 46 Jilliby Road, looking north toward an oncoming heavy vehicle that was encroaching across the double barrier centreline

Jilliby Road/Little Jilliby Road intersection

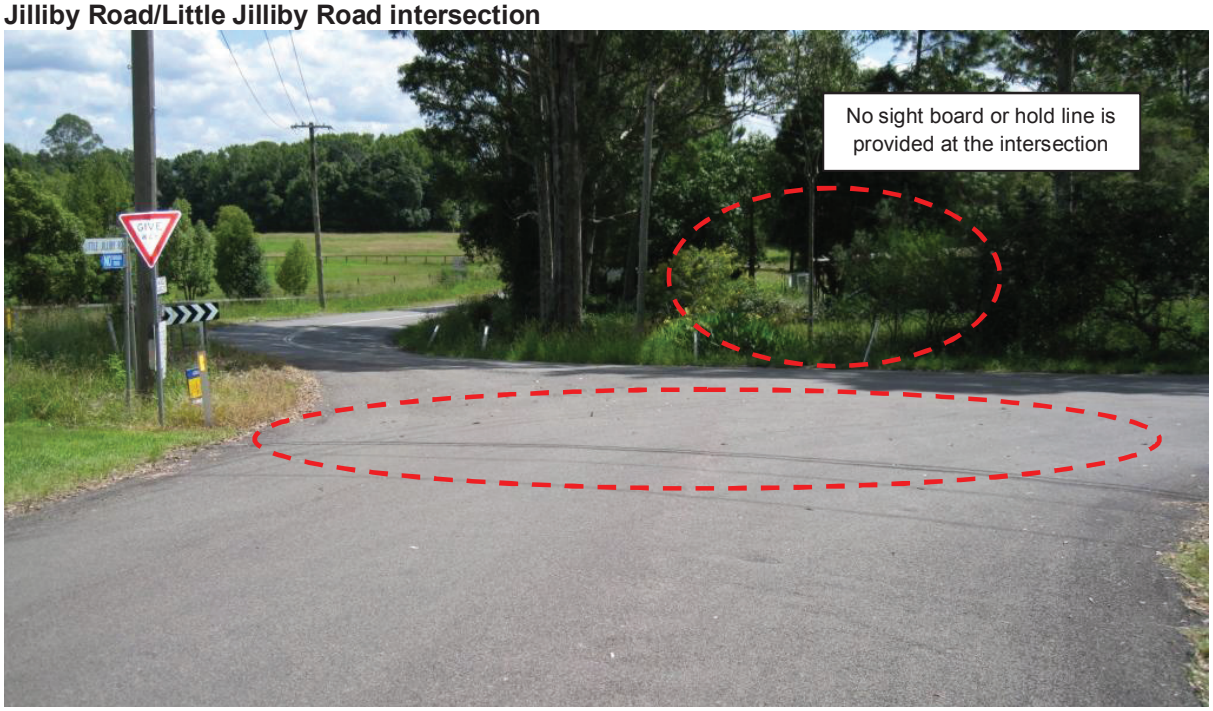


Photo 47 Little Jilliby Road, looking east toward its intersection with Jilliby Road

Photo 48 Jilliby Road, looking east toward its intersection with Little Jilliby Road

Little Jilliby Road/Brothers Forest Road intersection

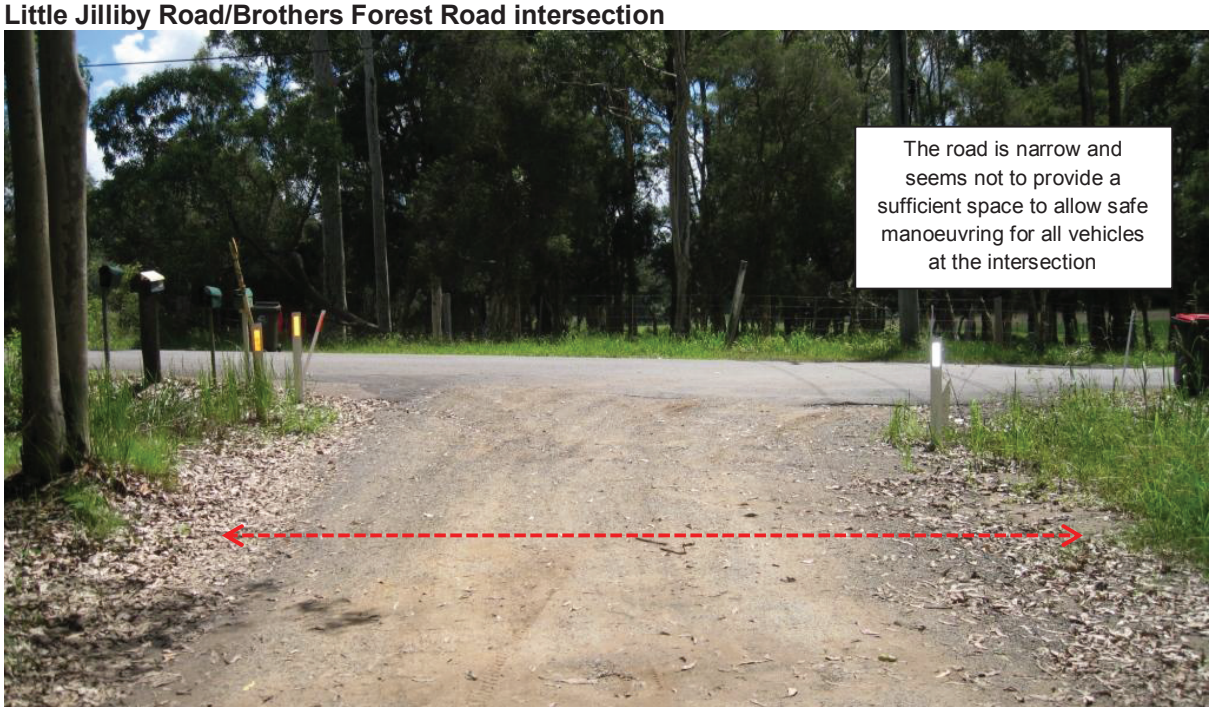


Photo 49 Brothers Forest Road, looking north toward its intersection with Little Jilliby Road

Appendix E

Road capacity improvements

F3/Sparks Road interchange (western side)

As indicated previously, the F3/Sparks Road interchange (western side) would need to be upgraded in order to accommodate the existing background traffic and its growth, irrespective of whether or not the Project proceeds.

The RMS has plans to upgrade Sparks Road between the F3 interchange and the Pacific Highway, as part of the Central Coast Transport Strategy (refer to section 2.12). Sparks Road is being planned to provide four lanes and ultimately six lanes in the future.

The SIDRA modelling has indicated that the capacity problem can be resolved through the provision of four right turn lanes on Sparks Road's eastern approach and three right turn lanes on the northbound off-ramp (refer to Figure E1). Table E1 shows the SIDRA modelling results of the intersection performance for 2026.

A sensitivity test in SIDRA modelling indicated that three right turn lanes on Sparks Road's eastern approach could only accommodate approximately 850 right turning vehicles. To provide sufficient capacity to accommodate approximately 1,100 vehicles right turning vehicles per hour, four right turns would be required. It should be acknowledged that the recommendation of the fourth right turn lanes on Sparks Road may not appear practical. However, this modelling demonstrates that the right turn volume is very high and indicates the need for a substantial upgrade to the intersection to resolve the capacity problem.

The RMS is recommended to consider a substantial improvement to this intersection as part of the Central Coast Transport Strategy.

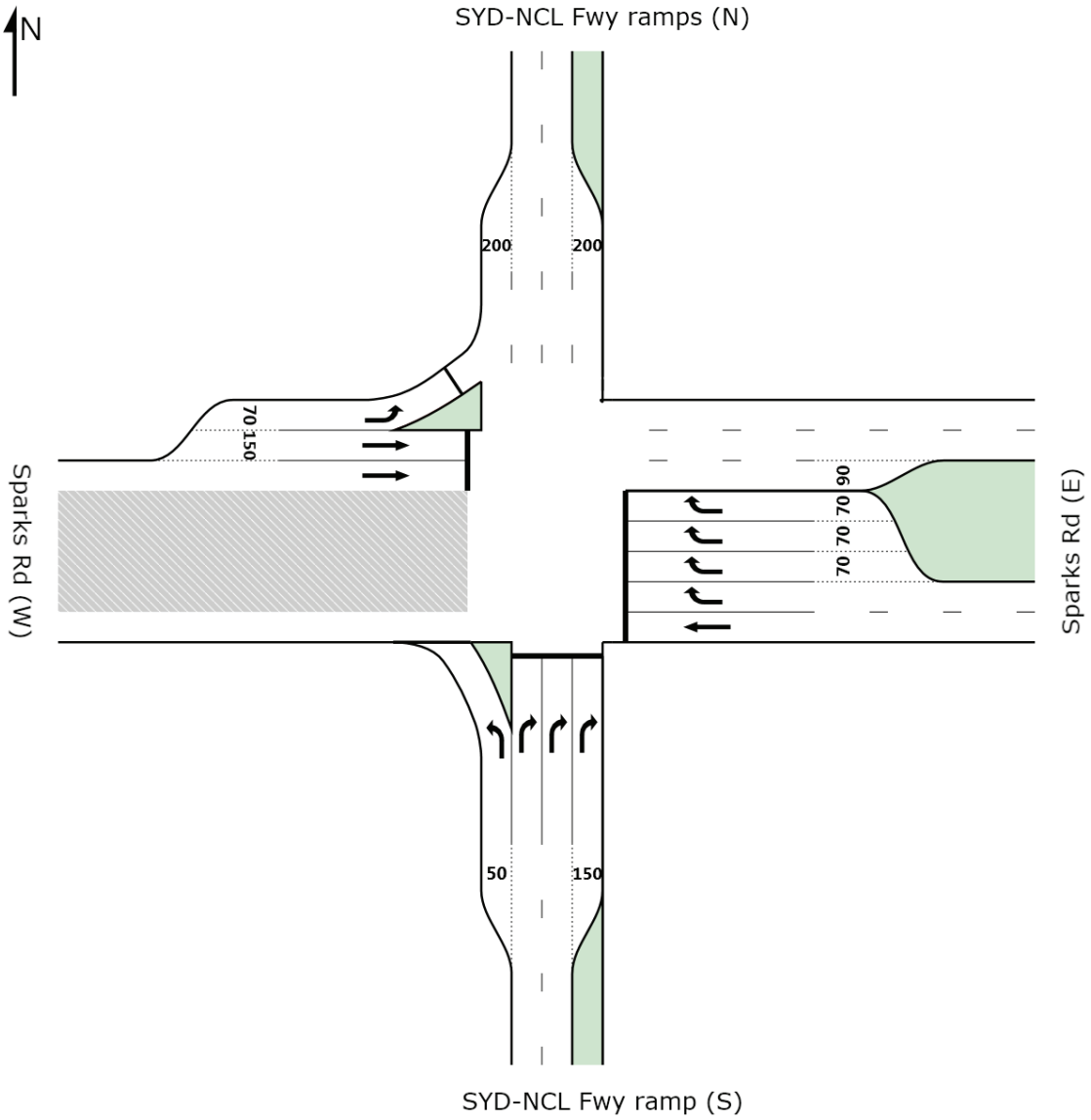


Figure E1 Recommended layout for F3/Sparks Road interchange (western side)

Table E1 Traffic conditions at the F3/Sparks Road interchange (western side) if upgraded to provide additional through and turn lanes

Scenario	Peak hours	DoS	Delay	LoS	Queue (m)
Scenario 6: construction of the Western Ventilation Shaft, mine operational phase of the Tooheys Road Site and Buttonderry Site (2026)	AM	0.89	47	D	165
	PM	0.85	43	D	216

As can be seen from Table E1, this performance of this intersection under the recommended layout would significantly improve and operate at an acceptable LoS D during both AM and PM peak hours, and the 95th percentile queue of the turn movements would not overflow to adjacent through lanes.

F3/Sparks Road interchange (eastern side)

F3/Sparks Road interchange (eastern side) would need to be upgraded in order to accommodate the future traffic demand in 2026, irrespective of whether or not the Project proceeds.

The RMS has plans to upgrade this intersection to be traffic signal controlled, as part of the Central Coast Transport Strategy (refer to section 2.12). Sparks Road is also being planned to provide four lanes and ultimately six lanes in the future.

Figure E2 shows the proposed intersection layout, while Table E2 shows the SIDRA modelling results of the intersection performance for 2026.

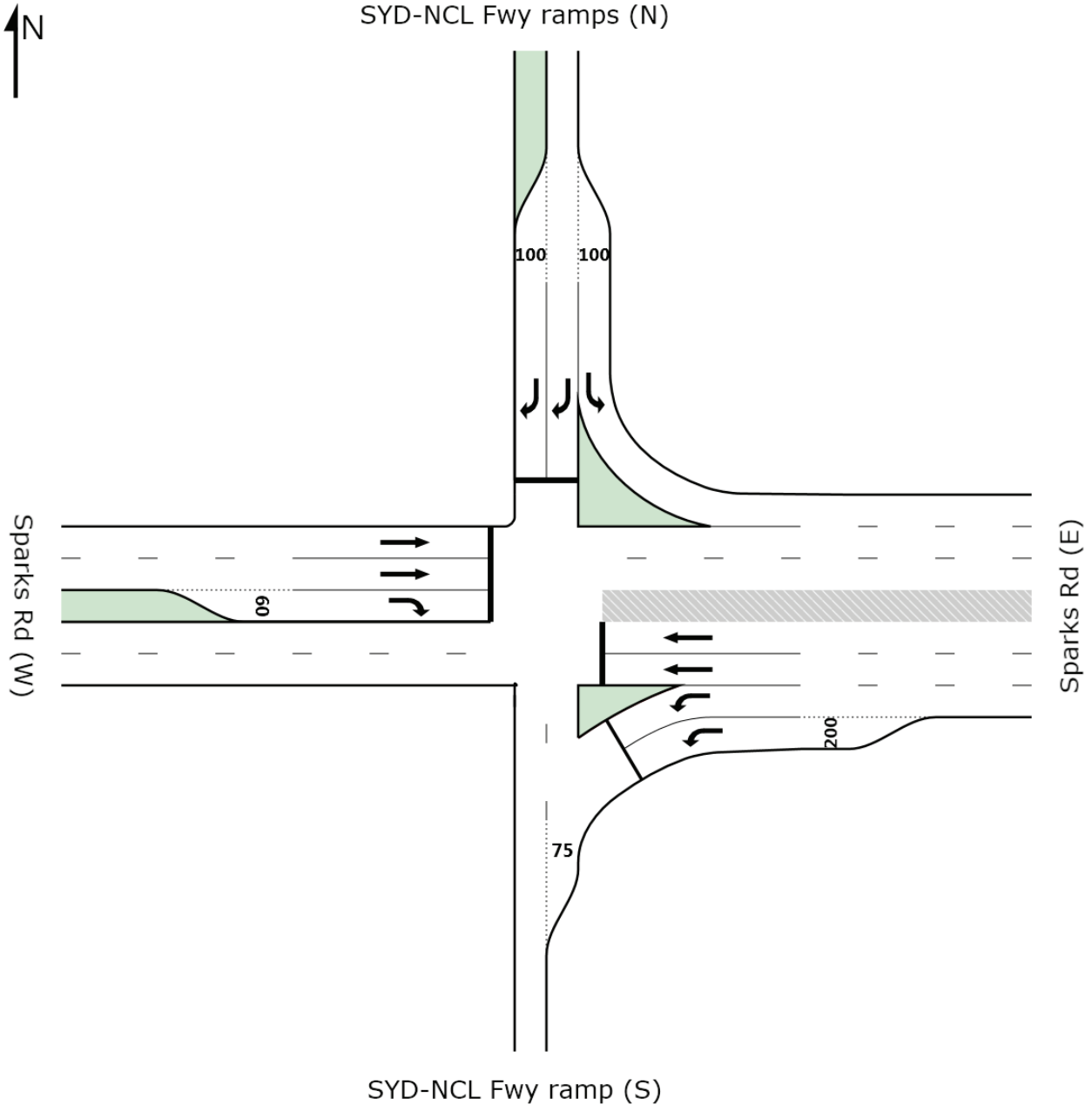


Figure E2 Proposed layout for the F3/Sparks Road interchange (eastern side)

Table E2 Traffic conditions at the F3/Sparks Road interchange (eastern side) if upgraded to be traffic signal controlled

Scenario	Peak hours	DoS	Delay	LoS	Queue (m)
Scenario 6: construction of the Western Ventilation Shaft, mine operational phase of the Tooheys Road Site and Buttonderry Site (2026)	AM	0.89	22	B	297
	PM	0.67	47	D	118

The performance of the F3/Sparks Road interchange (eastern side), as a traffic signal controlled intersection, would improve significantly in 2026, in accommodating the future traffic demand associated with the surrounding developments and the construction and operational activities of the Project.

Under this recommended layout, this intersection would operate at a satisfactory LoS B or better during both AM and PM peak hours, and the 95th percentile queue of the turn movements would not overflow to adjacent through lanes.

Hue Hue Road/Wyee Road intersection

The Hue Hue Road/Wyee Road intersection would need to be upgraded in order to accommodate the background traffic growth in 2026, irrespective of whether or not the Project proceeds.

The recommended roundabout would reduce the potential safety risks by simplifying conflicts; reducing vehicle speed; and by simplifying a driver's decision by providing by a clearer indication of the driver's right of way.

Figure E3 shows the proposed roundabout layout, while Table E3 shows the SIDRA modelling results of the intersection performance in 2026.

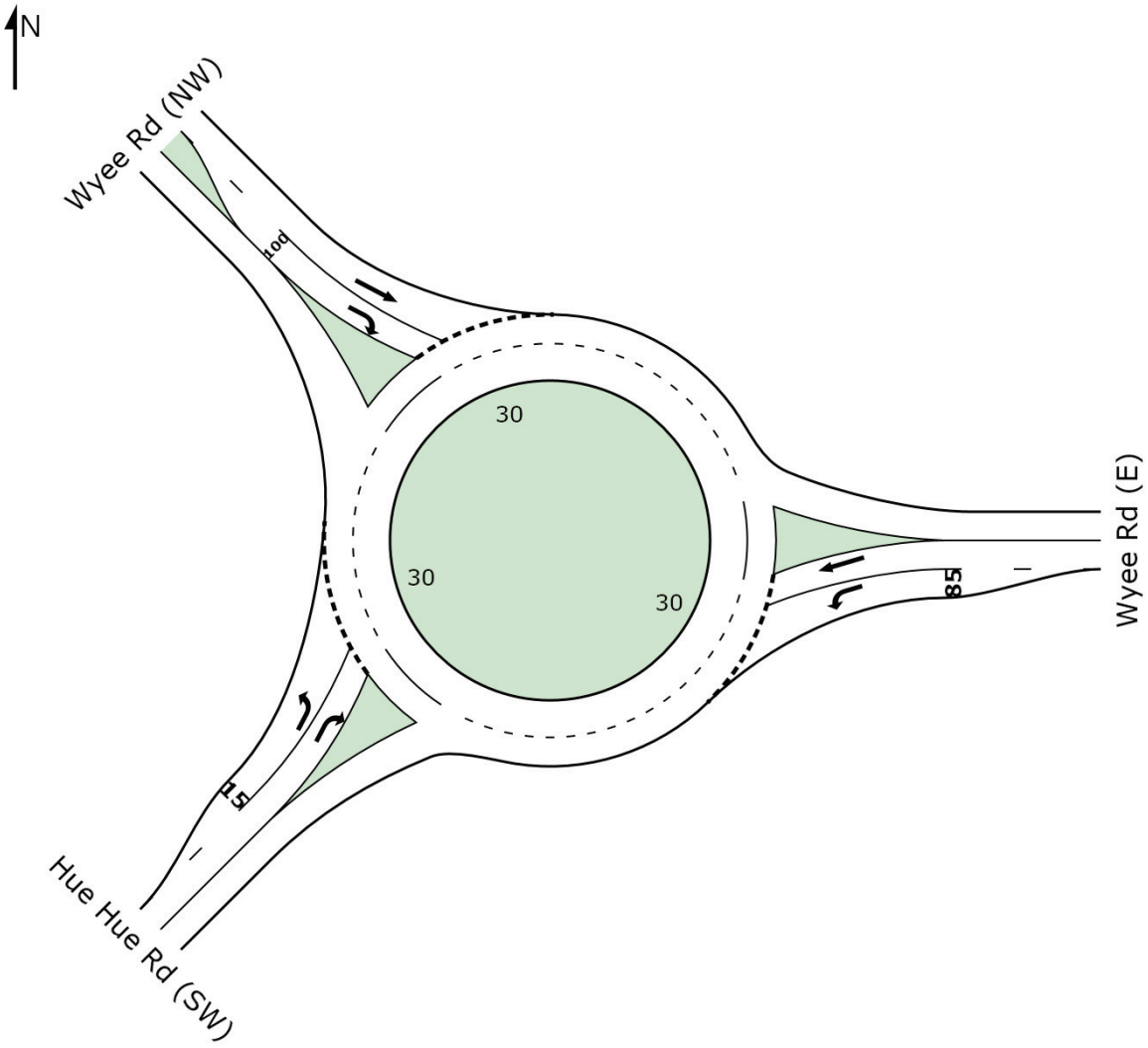


Figure E3 Proposed layout for the Hue Hue Road/Wyee Road intersection

Table E3 Modelled traffic conditions at the Hue Hue Road/Wyee Road intersection if upgraded to a two-lane roundabout

Scenario	Peak hours	DoS	Delay	LoS	Queue (m)
Scenario 6: construction of the Western Ventilation Shaft, mine operational phase of the Tooheys Road Site and Buttonderry Site (2026)	AM	0.28	12	A	12
	PM	0.46	12	A	27

As can be seen from Table E3, the performance of the Hue Hue Road/Wyee Road intersection, as a two-lane roundabout, would be improved significantly in 2026.

Under this recommended layout, this intersection would operate at a satisfactory LoS B or better during both AM and PM peak hours, and the 95th percentile queue of the turn movements would not overflow to adjacent through lanes.

Motorway Link Road/Tooheys Road interchange (northern side of the interchange)

The Motorway Link Road/Tooheys Road interchange (north side of the interchange) would need to be upgraded in order to accommodate the background traffic growth in 2026, irrespective of whether or not the Project proceeds.

Figure E4 shows the proposed roundabout layout, while Table E4 shows the SIDRA modelling results of the intersection performance for the forecast scenarios in 2026.

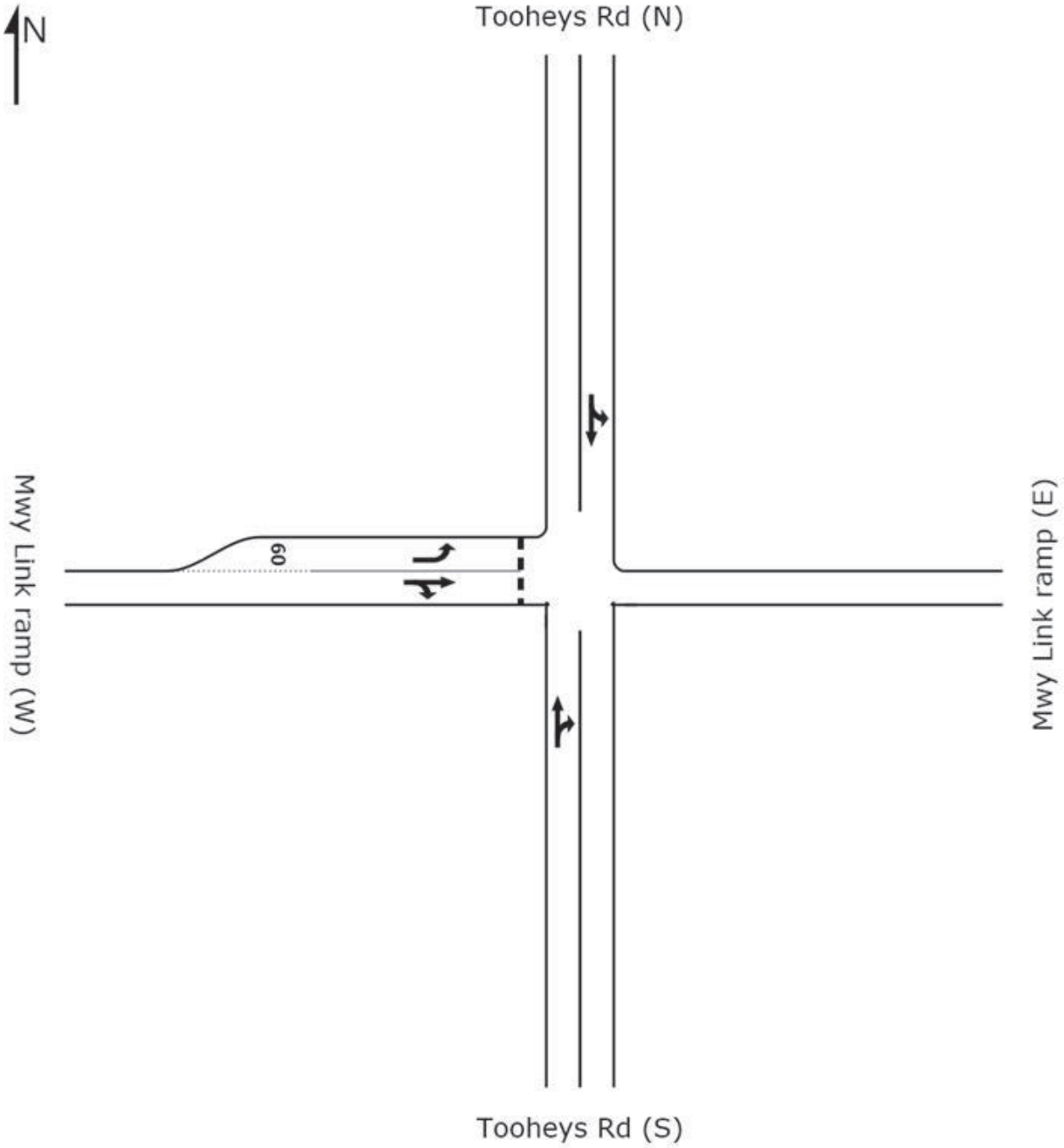


Figure E4 Proposed intersection layout for the Motorway Link Road/Tooheys Road interchange (northern side of the interchange)

Table E4 Traffic conditions at the Motorway Link Road/Tooheys Road interchange (northern side of the interchange) if upgraded to provide a short left turn lane

Scenario	Peak hours	DoS	Delay	LoS	Queue (m)
Scenario 6: construction of the Western Ventilation Shaft, mine operational phase of the Tooheys Road Site and Buttonderry Site (2026)	AM	0.78	14	A	47
	PM	0.49	22	B	8

As can be seen from Table E4, the performance of the Hue Hue Road/Jilliby Road intersection, as a single lane roundabout, would be improved significantly in 2026.

Under this recommended layout, this intersection would operate at a satisfactory LoS A during both AM and PM peak hours.

Hue Hue Road/Jilliby Road intersection

Hue Hue Road/Jilliby Road intersection would need to be upgraded in order to accommodate the background traffic growth in 2026, irrespective of whether or not the Project proceeds.

Figure E5 shows the proposed roundabout layout, while Table E5 shows the SIDRA modelling results of the intersection performance in 2026.

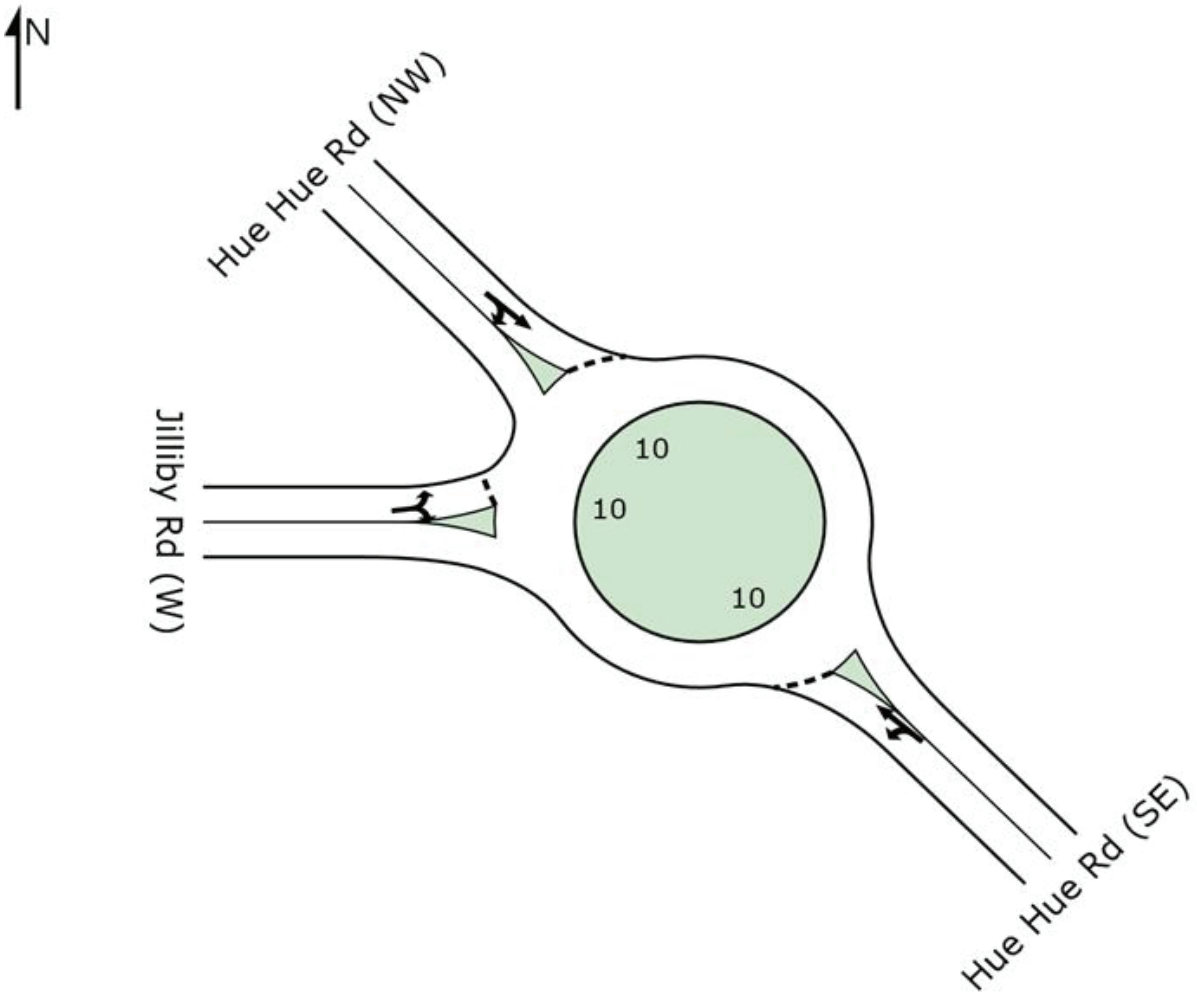


Figure E5 Proposed intersection layout for the Hue Hue Road/Jilliby Road intersection

Table E5 Traffic conditions at the Hue Hue Road/Jilliby Road intersection if upgraded to a single lane roundabout

Scenario	Peak hours	DoS	Delay	LoS	Queue (m)
Scenario 6: construction of the Western Ventilation Shaft, mine operational phase of the Tooheys Road Site and Buttonderry Site (2026)	AM	0.51	16	B	34
	PM	0.34	16	B	20

As can be seen from Table E5, the performance of the Hue Hue Road/Jilliby Road intersection, as a single lane roundabout, would be improved significantly in 2026.

Under this recommended layout, this intersection would operate at a satisfactory LoS A during both AM and PM peak hours.

Sparks Road

It is recommended that additional through lanes and turning lanes are provided on Sparks Road in order to sufficiently accommodate the future background traffic associated with the surrounding developments, irrespective of whether or not the Project proceeds.

Tooheys Road

It is recommended that four lanes are provided on Tooheys Road on its section between the Bushells Ridge Employment Estate access and the Motorway Link Road Interchange, in order to sufficiently accommodate the future background traffic associated with the surrounding developments, irrespective of the Project proceeding. Further, consideration should be given to the provision of exclusive turn lanes on Tooheys Road at the Bushells Ridge Employment Estate access to safely facilitate the left turn and right turn movements into the site.