Appendix C

Traffic Analysis

Appendix C Traffic Analysis

Existing Traffic Modelling

The spreadsheet model of existing traffic conditions was developed using the available traffic data. The distribution was used as a basis for forecasted growth and to determine peak hours for modelling.

The latest Manual Classified Count and Automatic Traffic Count data were used to determine representative traffic volumes along the New England Highway, Golden Highway and Putty Rd, as well as for peak hours at the following intersections along the New England Highway:

- New England Highway / Longworth Avenue
- New England Highway / Maison Dieu Road
- New England Highway / Bridgman Road
- New England Highway / Boundary Street / York Street
- New England Highway / Golden Highway

To separate Strategic and Local trips, the Rixs Creek count location used. Rixs Creek lies to the North of Singleton and therefore can be used to gauge the amount of traffic travelling between the Lower Hunter and Upper Hunter areas. At this location, count data indicated that traffic volumes were the highest from 6.00 – 7.00 AM for the morning period, and 4.00 – 5.00 PM for the evening period. These time periods were used as the AM and PM peak for the all data within the study area.

Count data provided for the Maison Dieu and Boundary St intersections did not include the time period 6.00 – 7.00 AM. Therefore a factoring process was used to increase turning volumes to match downstream volumes on the New England Highway. Turning volumes at Maison Dieu and Boundary St were scaled up uniformly until the volumes matched the New England Highway traffic entry and exit volumes from the Longworth Avenue and Bridgman Rd intersections.

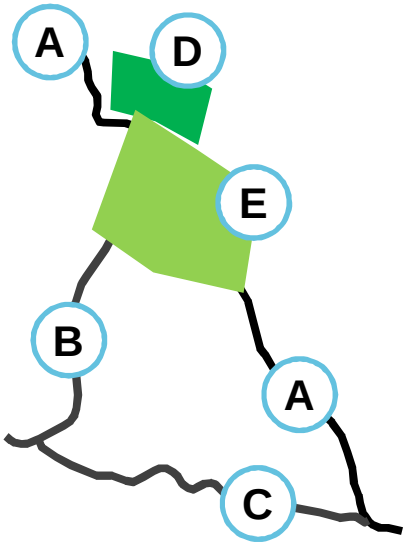
Separation of Strategic and Local Trip

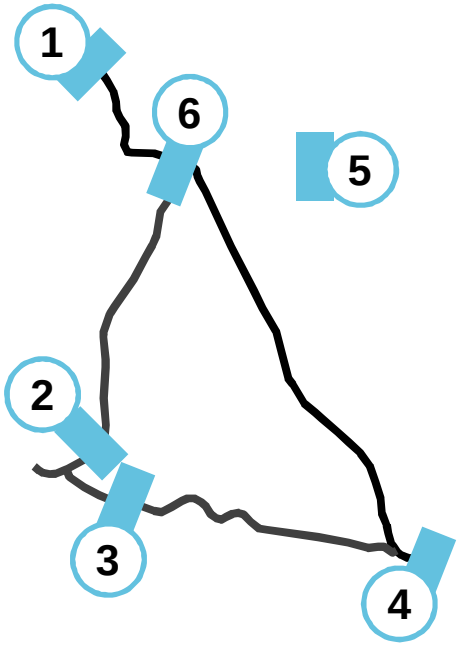
Traffic using the New England Highway was considered to have either a ‘Strategic’ or a ‘Local’ purpose. The procedure used separation of these trips is:

- Define types of Strategic and Local trips
- Calculate proportion of Strategic trips at Rixs Creek
- Calculate distribution of Local trips

Figure 23 below illustrates the key Origin-Destination cordon locations and roads used in calculation of the Strategic, Partial Strategic and Local trips.

Figure 23 Summary of Origin-Destination and Roads





Key

A The New England Highway

B Putty Rd

C The Golden Highway

D Singleton Heights

E Singleton town centre

Key

1 New England Highway – Rixs Creek Cordon

2 Putty Rd Cordon

3 Golden Highway Cordon

4 New England Highway – east of Golden Highway Cordon

5 Gresford Rd Cordon

6 New England Highway – Hunter Bridge Cordon

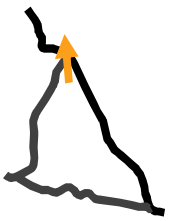
Strategic trips are those which have an origin and destination outside the study area, while local trips have both an origin and destination within the study area. Additionally, 'Partial' Strategic trips are those with only one origin or a destination outside the study area, such as a journey to work trip to Branxton from Singleton Heights. Examples of Strategic, Partial Strategic and Local trips are shown in Figure 24.

Figure 24 Types of Trips in Singleton

Strategic Trip

Partial Strategic Trip

Local Trip



For Strategic and Partial Strategic trips using the New England Highway, there is demand for a bypass due to the delays associated with travelling through Singleton. For local trips, the bypass was assumed not to provide any travel benefit. It is anticipated that a bypass may be used for some local trips; however the demand for Local trips was considered to be low and was not included in this analysis.

Strategic Trips

The calculation of Strategic trips was based on the Rixs Creek count location. Any of the count stations along the New England Highway will contain a percentage of potential bypass type trips, but only Black Creek, Hunter Bridge and Rixs Creek have an Origin-Destination survey conducted close to the count location. Rixs Creek was chosen for the following reasons:

- Rixs Creek has little or no adjoining retail or residential land uses, so majority of traffic has a Strategic or Partial Strategic purpose.
- Rixs Creek does not connect directly with the Golden Highway, so will not be affected by traffic heading to Mount Thorley or further west.
- The Origin-Destination results indicate that very few vehicles head from Rixs Creek to Putty Rd, so Putty Rd trips will not affect the traffic profile.

The proportion of Strategic trips at Rixs Creek was calculated using the Origin-Destination distribution at each peak hour. The percentages were based on the following calculations, both of which are expressed as a percentage of the traffic volumes at Rixs Creek:

$$\%\text{Trips Southbound} = \frac{\text{Number of vehicles recorded East of Golden Highway from Rixs Creek}}{\text{Total number of vehicles southbound at Rixs Creek}}$$

$$\%\text{Trips Northbound} = \frac{\text{Number of vehicles recorded at Rixs Creek from East of Golden Highway}}{\text{Total number of vehicles northbound at Rixs Creek}}$$

The proportions and traffic volumes of Strategic trips are listed in Table 8-1 below for the different peak periods.

Table 8-1 Proportion of Strategic Trips at Rixs Creek Count Location

Direction	Proportion		Strategic Traffic Volume		
	AM	PM	AM	PM	Daily
Northbound	33.7%	58.3%	430	214	2,478
Southbound	39.5%	20.9%	125	197	2,907

Source: AECOM based on Origin-Destination data

The volume of Strategic trips is the greatest during the northbound AM peak, which is consistent with a heavy mining demand in the morning peak north of Singleton.

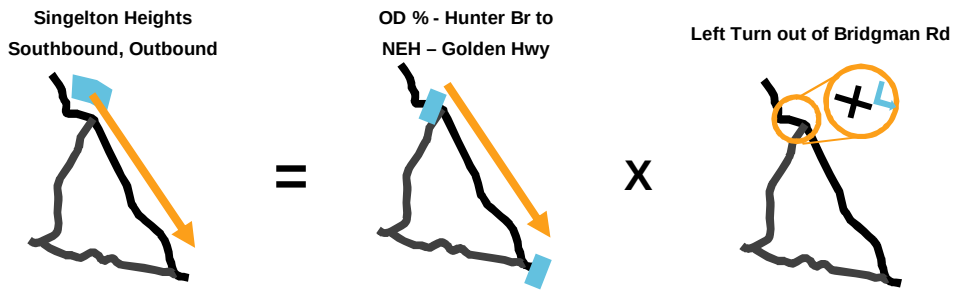
Partial Strategic Trips

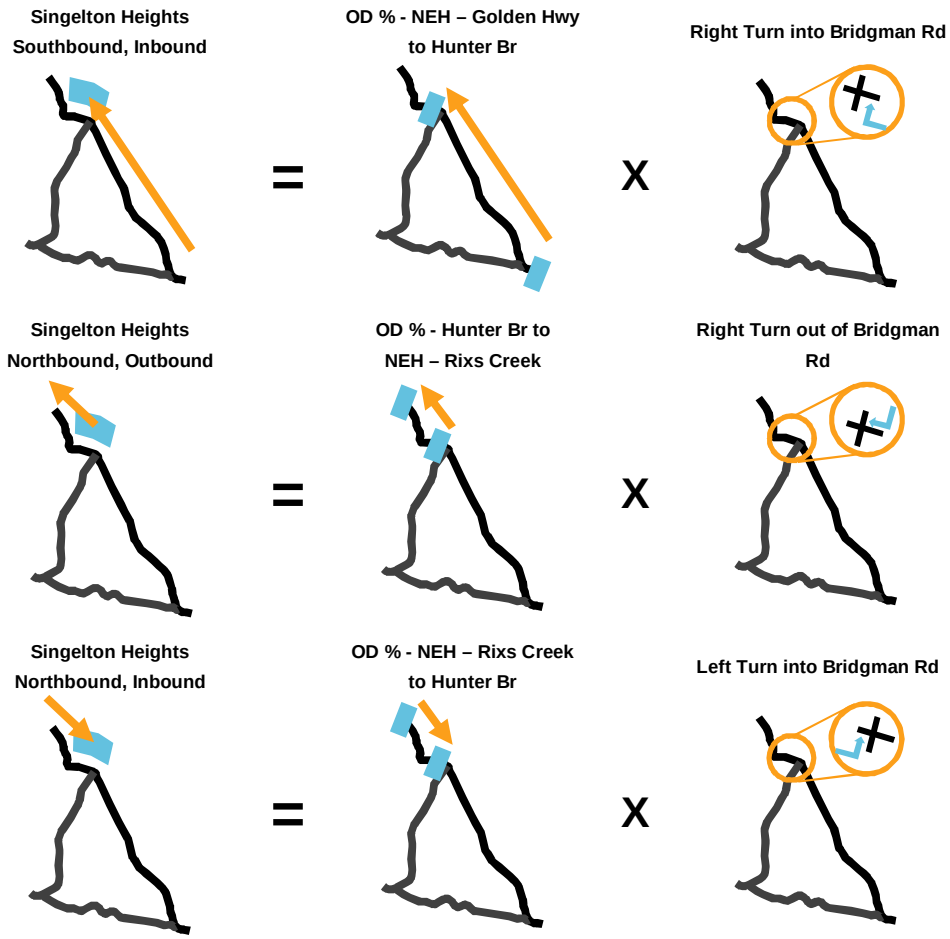
Two types of Partial Strategic trips are considered in detail:

- trips associated with Singleton Heights, and
- trips associated with Singleton town centre.

Partial Strategic trips were calculated using Origin-Destination and Manual Classified Count data. For Partial Strategic Trips relating to Singleton Heights, the turning volume from Bridgman Rd was factored by the appropriate proportion of trips recorded at the Hunter Bridge and Black Creek count stations. Figure 25 illustrates the methodology adopted.

Figure 25 Singleton Heights Partial Strategic Trips Methodology





This method calculated the total number of trips from Singleton Heights that head to and from the New England Highway outside of Singleton. To calculate the total number that would use the bypass, the Origin-Destination survey was used to calibrate the total number of trips.

The Origin-Destination survey indicated that 180 veh/h head from Hunter Bridge to the New England Highway east of Golden Highway in the AM peak. Of the 180 veh/h, 125 veh/h are Strategic Trips – see Table 8-1 Southbound AM. The remaining 55 veh/h were assumed to come from Singleton Heights.

The traffic volume originating at Singleton Heights, heading to New England Highway east of Golden Highway was calculated to be 90 veh/h using the above methodology. As this number exceeded the 55 veh/h identified using the Origin-Destination survey, the Singleton Heights volumes were all multiplied by 0.61, so that the 90 veh/h would match 55 veh/h. The final trips are recorded in Table 8-2.

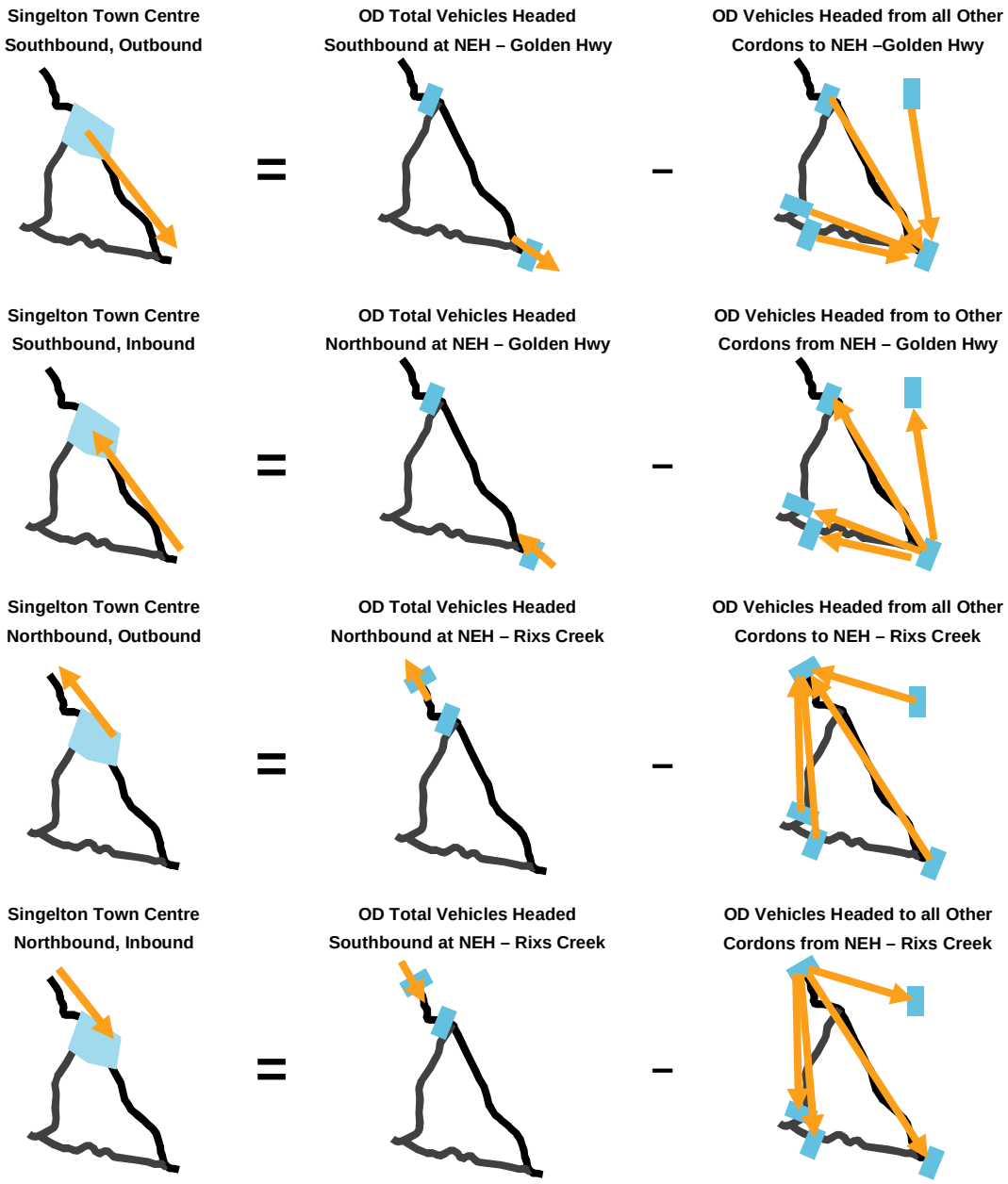
Table 8-2 Singleton Heights Partial Bypass Trips 2012

Direction	AM	PM
Northbound, Inbound	73	49
Southbound, Inbound	11	20
Northbound, Outbound	73	4
Southbound, Outbound	55	21

Source: AECOM based on Origin-Destination and Manual Classified Count data

For Partial Strategic Trips relating to Singleton town centre, traffic flows from the Origin-Destination survey were calculated and factored by a percentage of trips that would potentially access the bypass. Figure 26 illustrates the methodology adopted.

Figure 26 Singleton Town Centre Partial Strategic Trips Methodology



This method calculated the total number of trips from Singleton town centre that head to and from the New England Highway outside of Singleton. For the Northern and Southern layouts, Partial Strategic trips may not receive a travel time saving if they use the bypass, as they have deviate from their normal path by several kilometres to access the bypass.

For the Central option, the access to the bypass is located on Putty Rd within a kilometre of Carrington St, so will provide travel time savings for some town members. Given the spatial layout of Singleton, it was assumed that 50% of trips to and from NEH – Golden Hwy and 25% of trips to and from NEH – Rixs Creek would use the bypass. The final trips are recorded in Table 8-3.

Table 8-3 Singleton Town Centre Partial Bypass Trips 2012

Direction	AM	PM
Northbound, Inbound	235	92
Southbound, Inbound	24	136
Northbound, Outbound	119	13
Southbound, Outbound	19	348

Source: AECOM based on Origin-Destination data

For the Partial Strategic Trips from Singleton Heights and Singleton town centre, the AADT was calculated using the daily expansion factor from the Rixs Creek count data.

Austroads Delay Formula

The formula for calculating minor stream delay at priority controlled intersections is shown below.

$$W_m = \frac{q_p e^{q_p t_f}\left[e^{q_p t_a} - q_p t_a - 1\right] + q_m e^{q_p t_a}\left[e^{q_p t_f} - q_p t_f - 1\right]}{q_p\left[q_p e^{q_p t_f} - q_m e^{q_p t_a}\left(e^{q_p t_f} - 1\right)\right]}$$

Where

- W_m = average delay to minor stream vehicles, per vehicle, in seconds
- q_p = Major stream volume in veh/sec
- q_p = Minor stream volume in veh/sec
- t_a = Critical acceptance gap in seconds
- t_f = Follow-up headway in seconds

A critical acceptance gap of 5.0 seconds and a follow up headway of 3.0 seconds was adopted for all minor streams. For new intersections constructed as a result of the bypass and not assessed in SIDRA, for instance the intersection of the bypass and the New England Highway, major movements were assessed using first principles. Traffic flows were obtained from spread sheet analysis. Where an interchange or partial interchange was provided, it was assumed that delay due to the intersection was zero. Section 6.2.3 provides the details of intersection form by option.

For intersections were minor flows were not available, it was assumed that the volumes were as follows:

- 25 veh/h turning left out of the intersection in both peak periods
- 25 veh/h turning right out of the intersection in both peak periods
- 25 veh/h turning right into the intersection in both peak periods
- Major stream volumes were obtained from the traffic flow on the New England Highway 7.9 km east of Cambridge.

As a result, all 22 minor intersections were treated identically, and the vehicle delays experienced in one intersection, were multiplied by 22 to yield the total delay.

Forecasted Bypass Traffic Volumes for the High and Low Growth Scenarios

Table 8-4 to **Table 8-6** show the forecasted bypass traffic volumes for the High growth scenario.

Table 8-4 2025 Forecasted Bypass Traffic Volume – High Scenario

Location	2025				
	Do Nothing	Northern 1	Northern 2	Central 1	Southern 1
South of Town Centre	-	8,794	8,794	14,470	6,748
Between Town Centre and Singleton Heights	-	8,794	8,794	9,336	6,748
North of Singleton Heights	-	7,873	7,873	9,336	6,748

Table 8-5 2030 Forecasted Bypass Traffic Volume – High Scenario

Location	2030				
	Do Nothing	Northern 1	Northern 2	Central 1	Southern 1
South of Town Centre	-	8,854	8,854	16,475	6,768
Between Town Centre and Singleton Heights	-	8,854	8,854	10,011	6,768
North of Singleton Heights	-	7,918	7,918	10,011	6,768

Table 8-6 2040 Forecasted Bypass Traffic Volume – High Scenario

Location	2040				
	Do Nothing	Northern 1	Northern 2	Central 1	Southern 1
South of Town Centre	-	8,970	8,970	19,081	6,809
Between Town Centre and Singleton Heights	-	8,970	8,970	7,995	6,809
North of Singleton Heights	-	7,995	7,995	7,995	6,809

Table 8-7 to **Table 8-9** show the forecasted bypass traffic volumes for the Low growth scenario.

Table 8-7 2025 Forecasted Bypass Traffic Volume – Low Scenario

Location	2025				
	Do Nothing	Northern 1	Northern 2	Central 1	Southern 1
South of Town Centre	-	7,248	7,248	11,636	5,426
Between Town Centre and Singleton Heights	-	7,248	7,248	8,014	5,426
North of Singleton Heights	-	6,424	6,424	8,014	5,426

Table 8-8 2030 Forecasted Bypass Traffic Volume – Low Scenario

Location	2030				
	Do Nothing	Northern 1	Northern 2	Central 1	Southern 1
South of Town Centre	-	7,292	7,292	11,718	5,442
Between Town Centre and Singleton Heights	-	7,292	7,292	8,050	5,442
North of Singleton Heights	-	6,461	6,461	8,050	5,442

Table 8-9 2040 Forecasted Bypass Traffic Volume – Low Scenario

Location	2040				
	Do Nothing	Northern 1	Northern 2	Central 1	Southern 1
South of Town Centre	-	7,392	7,392	11,855	5,475
Between Town Centre and Singleton Heights	-	7,392	7,392	6,530	5,475
North of Singleton Heights	-	6,530	6,530	6,530	5,475