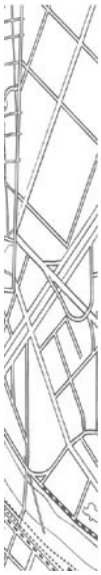
Appendix B – Operational Traffic Assessment of the Transition Options Considered



Traffic Report

Lane Cove Tunnel - Surface Transition Options

22 September 2006

Prepared for

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Document:

Title: Lane Cove Tunnel - Surface Transition Options
File Name: 052937r03 - Lane Cove Tunnel Transition Options V4.doc

Client:

Roads and Traffic Authority, NSW

Issue Date:

22 September 2006

Revision Number:

13

Authorised by:

Chris Wilson

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1. Introduction

After a lengthy planning process including the preparation of a comprehensive Environmental Impact Statement, the then Minister of Urban Affairs and Planning approved the Lane Cove Tunnel project on 3 December 2002.

The project, which comprises the connection of the Gore Hill Freeway and the M2 Motorway completing the Sydney Orbital, the connection of Falcon Street and Military Road to the Warringah Freeway, relief of congestion on Epping Road, improved public transport, and a new cycleway between Naremburn and North Ryde.

Key surface works include

- The Lane Cove Tunnel, a 3.6km, dual two/three lane tunnel generally running below the existing Epping and Longueville Road alignments connecting to the Gore Hill Freeway at Pacific Highway, the M2 Motorway and Epping Road at Mowbray Road West;
- The new north facing (tolled) ramps connecting the Warringah Freeway to Falcon Street and Military Road North Sydney;
- A 24 hour T2 transit lane, in addition to the existing two lanes, in each direction on the Gore Hill Freeway between the Pacific Highway and Merrenburn Avenue;
- Reduction of Epping Road from the current five through lane tidal flow arrangement to generally four lanes, consisting of a dedicated bus lane and general traffic lane in each direction;
- Implementation of a T3 transit lane on Epping Road between Pittwater Road and Mowbray Road;
- The introduction of two right turning movements;
- Provision of a bus interchange and pedestrian overpass; and,
- A shared pedestrian/cycleway on the southern side of Epping Road.

In accordance with the Minister for Planning's approval, the widening of the Gore Hill Freeway is to be completed on opening of the Tunnel and the remaining surface works, referred to as 'Stage 2' works, are to be completed within six months of Tunnel opening.

Construction of the Project commenced in April 2004 and is now nearing completion of Stage 1 works which will lead to the opening of the Tunnel. Opening was originally scheduled by 9 May 2007. Connector Motorways has advised the RTA that the construction works are ahead of schedule and that the current estimated date of tunnel opening is 10 December 2006.

This report discusses potential traffic issues that are likely to arise in the period between the opening of the Tunnel and when traffic patterns on the road network have reached equilibrium with respect to the new facility. This report provides the context for understanding the need for the proposed staging of the implementation of the approved Stage 2 works in accordance with a preferred Transition Option which has not yet been determined. It addresses the likely impacts to motorists and buses under the Proposed Modifications.

The proposed modifications do not change the approved project (except the staging of the pedestrian crossing at the intersection of Epping and Mowbray Roads) but rather the timing of implementation of the Stage 2 works. The Transition Options are discussed in Section 3.4 of "Lane Cove Tunnel Surface Traffic Modifications Environmental Assessment Report" by the Roads and Traffic Authority (RTA).

This report examines the traffic implications of all five Transition Options considered by the Lane Cove Tunnel Implementation Group All of the five Transition Options aim to:

- Provide a satisfactory level of service on the network during the ramp-up period; and,
- Provide a "seamless" integration of the Project into the operation of the surrounding road network.

The assessment process adopted in this investigation is consistent with that used in the EIS process. Strategic network modelling has been employed to forecast traffic flows at the various stages of the implementation of the surface works. The investigation has been improved with the use of microsimulation traffic modelling which predicts more confidently traffic operating conditions on the surface network at the various stages of the works. Such technology was not available when the EIS investigations were undertaken.

2. The Need and Justification

The traffic studies undertaken for the EIS assessment assumed equilibrium traffic conditions on the road network, i.e. the tunnel had captured its full patronage potential. No analysis had been undertaken on traffic conditions during the transition phase preceding equilibrium traffic conditions.

The five Transition Options proposed are a staged implementation of the Approved Scheme on Epping Road.

A staged implementation is required as new road infrastructure projects do not reach full patronage immediately upon opening. A period of traffic adjustment known as the "ramp up" occurs from opening. This usually lasts for about two years but might be anywhere from one to four years depending on the nature of the road infrastructure project.

As the LCT is replacing an existing major road and motorists are already using the corridor, ramp up is expected to occur over a shorter time than other Sydney projects. Accordingly, a two year profile for ramp up (based on the observed Eastern Distributor ramp up profile which is a characteristically similar project) has been used to determine the likely increase in patronage for the Tunnel (and hence the reduction in vehicles on Epping Road).

As ramp up is unique to each project, this assumed profile only gives an indication of the potential traffic growth. Ramp up is generally used for the patronage of new infrastructure, not the alternative routes. In this case the corollary of the Tunnel ramp up is a ramp down in traffic flow on Epping Road and other surface alternatives.

For this analysis, the ramp down process is seen to be the inverse of the ramp up process but at a slightly quicker rate as levels of congestion resulting from withdrawal of capacity will divert traffic out of the corridor as well as into the Tunnel.

2.1 Need for a Transition Strategy

Post ramp up analysis of the LCT Project shows the traffic conditions will operate satisfactorily for both the Tunnel and Epping Road.

However, during early stages of ramp up, significant congestion is forecast on Epping Road should Stage 2 works proceed immediately after Tunnel opening

Traffic modelling predicts significant congestions levels at all major intersections along Epping Road in the morning peak period as well as extensive queuing at the in Epping Road, North Ryde west of Mowbray for eastbound traffic. In the evening peak period, severe congestion is predicted for the intersections of Epping Road with Longueville Road and Centennial Avenue, as well as at Epping Road and Old Pittwater Road.

Additionally, the intersection of Falcon Street with the new Warringah Freeway ramps is also predicted to experience high levels of traffic congestion during the ramp up period.

Not only will ramp up impact on the travel times of the general motoring public but also bus patrons. High levels of congestion on the network would have two effects. Firstly, it would trap buses in the general traffic stream and prevent access to bus lanes on Epping Road, and secondly would precipitate high levels of illegal usage of bus lanes by general traffic seeking to avoid extensive queuing.

Consequently, the travel time advantages of the bus lanes would not be realised for bus patrons.

To provide an illustrative example of the effect of ramp up on Epping Road, traffic demands have been derived for eastbound travel between Centennial Avenue and Longueville Road for the AM peak hour. These demands have been compared to the capacity provided on Epping Road in this section after the completion of the approved LTC Project. It should be noted that the graph only represents one section of Epping Road in the AM peak hour, and while it may be representative of the entire Epping Road corridor it is not a detailed analysis of demand and capacity for the corridor.

Figure 2-1 shows the potential traffic demand on Epping Road for the Approved Project**.**

This graph shows that initially the demand for use of Epping Road exceeds the available capacity, shown as the gap between the blue and red lines. As time passes, demand and capacity reach a similar level. Demand would be expected to exceed capacity on other sections of Epping Road.

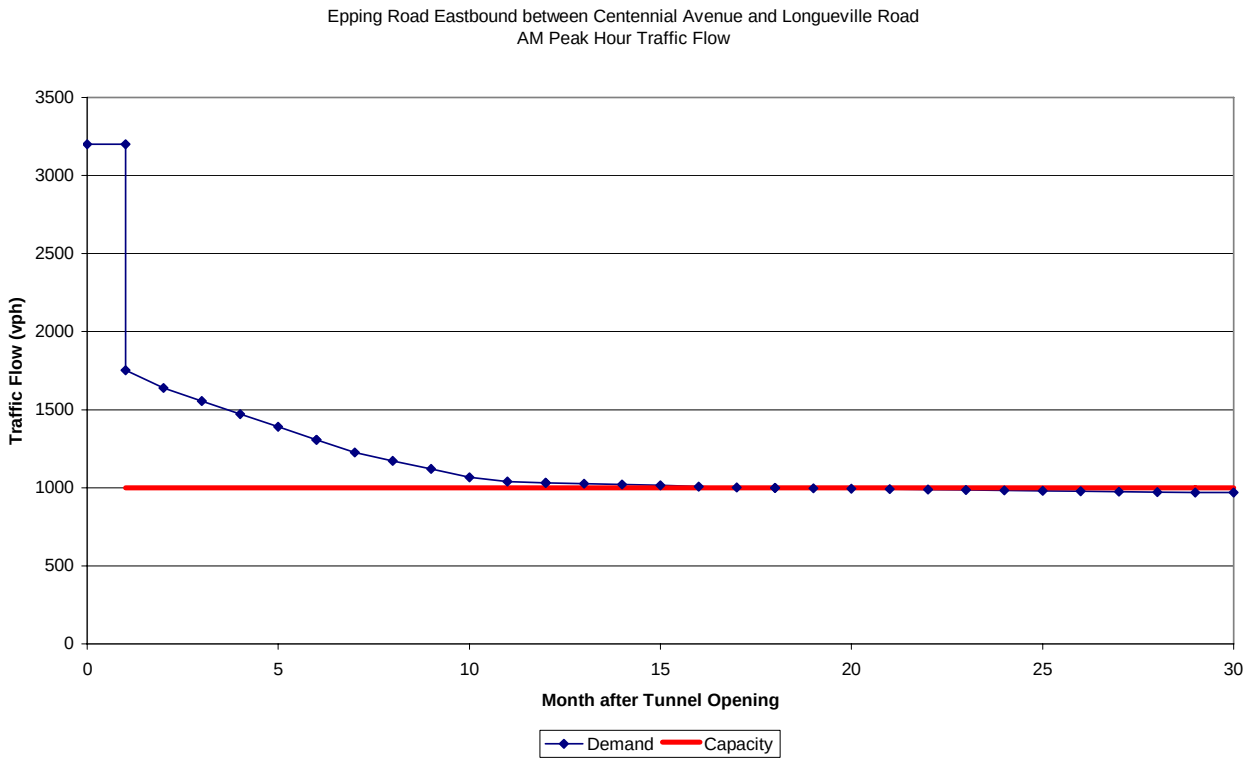

Figure 2-1 Approved Project

The queuing resulting from this imbalance of demand and capacity would result in excessive congestion, with queues likely to extend beyond Wicks Road. This would restrict buses from entering the bus lane and therefore cause excessive delays for buses.

It is this shortfall in capacity that causes a need for a transition strategy for Epping Road that limits the difference between demand and capacity.

2.2 Transition Strategy Issues

The effect of any transition strategy is to increase capacity on Epping Road. As a consequence there is the potential to further increase the traffic demand in the corridor. In the short term, this may have the effect of encouraging a redistribution of traffic into the Epping Road/Lane Cove Tunnel Corridor.

If the additional capacity was to continue over an extended period, this additional capacity in the road network may induce new private vehicle trips onto the road system from other modes (including public transport). This is not seen as a sustainable outcome and therefore any changes to the road network from that proposed in the in the Approved Project should only be temporary to avoid any induced demand effects.

3. Transition Options

Five Transition Options are described in the "Lane Cove Tunnel Surface Traffic Modifications Environmental Assessment Report" prepared by the RTA.

The five options have a varying degree of impact on the performance of the road network. Each of the options and their impact on the road network and public transport are discussed in the following sections. Impacts on pedestrians and cyclists are discussed in the "Lane Cove Tunnel Surface Traffic Modifications Environmental Assessment Report" prepared by the RTA. Suffice to say, this is at worst a delay in the implementation of the shared pedestrian/cycleway on the southern side of Epping by only six months.

For comparative purposes, in the following discussion the traffic demand over time for each of the options has been plotted against the capacity for the eastbound section of Epping Road between Centennial Avenue and Longueville Road for the AM peak hour.

The announced one month no toll period adds a further level of complexity to the already complex calculation of "ramp down" on Epping Road. For the purposes of this analysis, the effects of the no toll period have been ignored. It is however anticipated that the flows on Epping Road in the Tunnel bypass section will be substantially reduced during the no toll period.

3.1 Transition Option 1

Transition Option 1 would be implemented over the shortest timeframe. In the first 6 months, Stage 2 works would be constructed with a minimum of two general traffic lanes being provided along Epping Road in each direction on opening of the Tunnel and with bus priority arrangements provided where possible at bus stops and intersections. The construction of the bus interchange, pedestrian bridge and pedestrian/cycleway and removal of the Kimberley Avenue pedestrian overbridge would also occur during the first six months. During this period, the implementation of the bus lanes, right turns, AM T3 transit lanes on Epping Road between Pittwater and Mowbray Road, and the Gore Hill Freeway T2 transit lanes and the Pacific Highway link

to Longueville Road and the Tunnel off ramp link to the Gore Hill Freeway T2 lane would be deferred (the "outstanding works"). The remainder of the Stage 2 works (the "outstanding works") would be progressively implemented from six months after opening. These outstanding works would be expected to take approximately one month.

Figure 3-1 shows the demand and capacity for Transition Option 1.

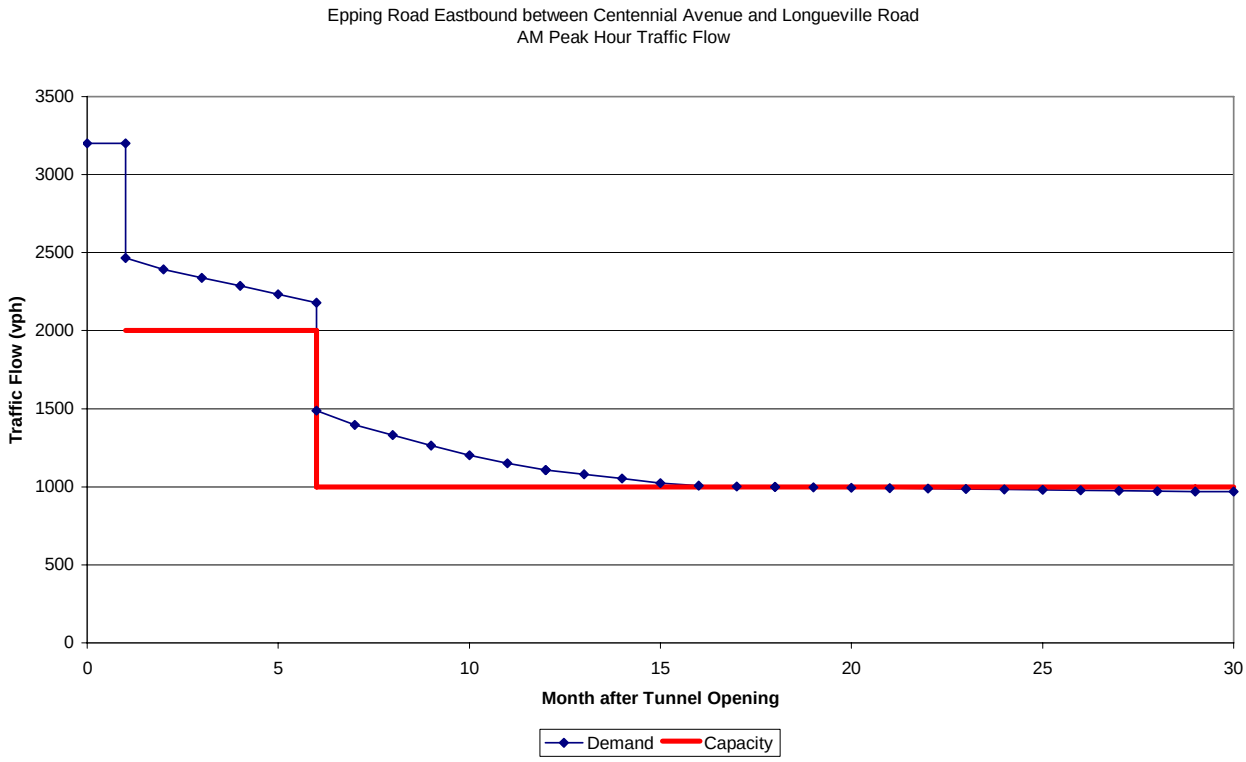

Figure 3-1 Transition Option 1

Figure 3-1 shows that demand exceeds capacity for over 14 months, with significant queuing expected for at least 10 months. The graph indicates up to 500 vehicles (the difference between demand and capacity) in queues. Similar issues of demand exceeding capacity would be expected on other sections of Epping Road.

With demand exceeding capacity by such a large amount, significant queuing would be expected. The queuing would likely impact the ability for buses to access the bus lanes from month six, resulting in increased travel times for buses until ramp up is complete.

3.2 Transition Option 2

Under Transition Option 2, the surface arrangements would be the same as Transition Option 1 for the first 6 months. For the second six month period, i.e. starting six months after Tunnel opening, the remainder of the Stage 2 works (the "outstanding works") would be implemented in the same manner as for Transition Option 1 except that T3 lanes (instead of bus lanes) would be implemented on Epping Road between

Mowbray Road and the Gore Hill Freeway. The T3 lanes would then be converted to bus lanes 12 months after opening. Similarly, the "outstanding works" and the T3 lanes would be expected to take approximately one month.

Figure 3-2 shows the demand and capacity for Transition Option 2.

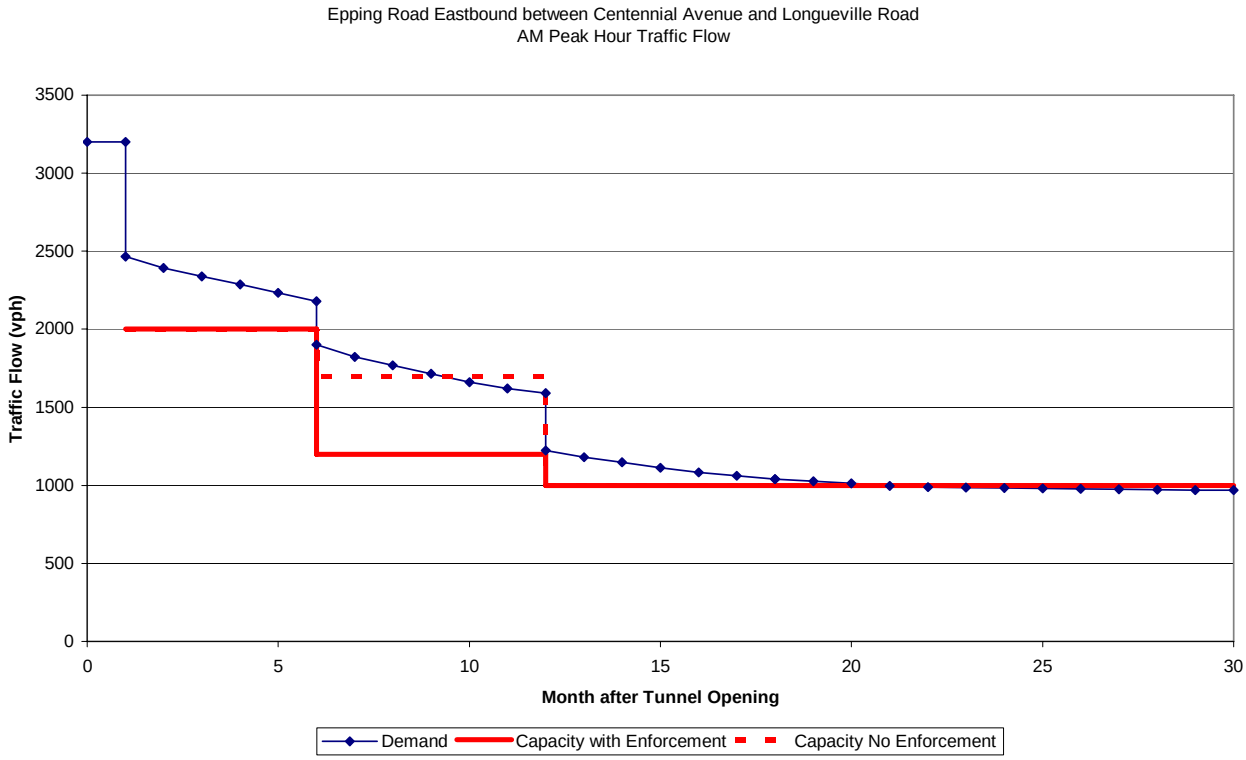

Figure 3-2 Transition Option 2

Two capacity lines are shown during the T3 phase of Transition Option 2. Because of the difficulties in policing transit lanes, a notional maximum and minimum capacity is used during this period. Actual capacity could be anywhere between the minimum capacity and the full two lane capacity (however the capacity would not be expected to exceed the notional maximum shown in Figure 3-2).

Figure 3-2 shows a significant improvement in balancing demand and capacity, however there is still a significant gap between demand and capacity for the first six months of the project (and during the T3 period if transit lanes are enforced). During these times, excessive queuing is likely, resulting in extended delays for all vehicles (including buses).

3.3 Transition Option 3

Under Transition Option 3, the current traffic arrangements, including tidal flow with three lanes provided in the AM and PM peaks, would continue during the first 6 months and the only construction would involve the bus interchange and pedestrian bridge and removal of the Kimberley Avenue pedestrian overbridge on Tunnel opening. The eastbound AM T3 transit lane on Epping Road between Delhi Road and Pittwater Road and the T2 transit lane between Pittwater Road and the Pacific

Highway would also remain in place and the T2 transit lanes on the Gore Hill Freeway would be deferred. The opening of the Pacific Highway link to the Longueville Road and the Tunnel off ramp link to the Gore Hill Freeway T2 transit lane would also be deferred. At six months, Stage 2 would be implemented with a minimum of two general traffic lanes being provided along Epping Road, with bus priority arrangements provided where possible at bus stops and intersections and construction of the pedestrian cycleway. The bus lanes, right turns, T3 transit lanes on Epping Road eastbound between Pittwater Road and Mowbray Road, and the Gore Hill Freeway T2 transit lanes would be deferred and the Pacific Highway link to Longueville Road and the Tunnel off ramp link to the Gore Hill Freeway T2 lane would be closed during this period (the "outstanding works"). At 12 months the "outstanding works" would be implemented, except that Epping Road bus lanes would be replaced with T3 transit lanes. The T3 transit lanes on Epping Road would then be converted to bus lanes 18 months after opening. The outstanding works and the T3 lanes would be expected to take approximately one month to implement.

Figure 3-3 shows the demand and capacity for Transition Option 3.

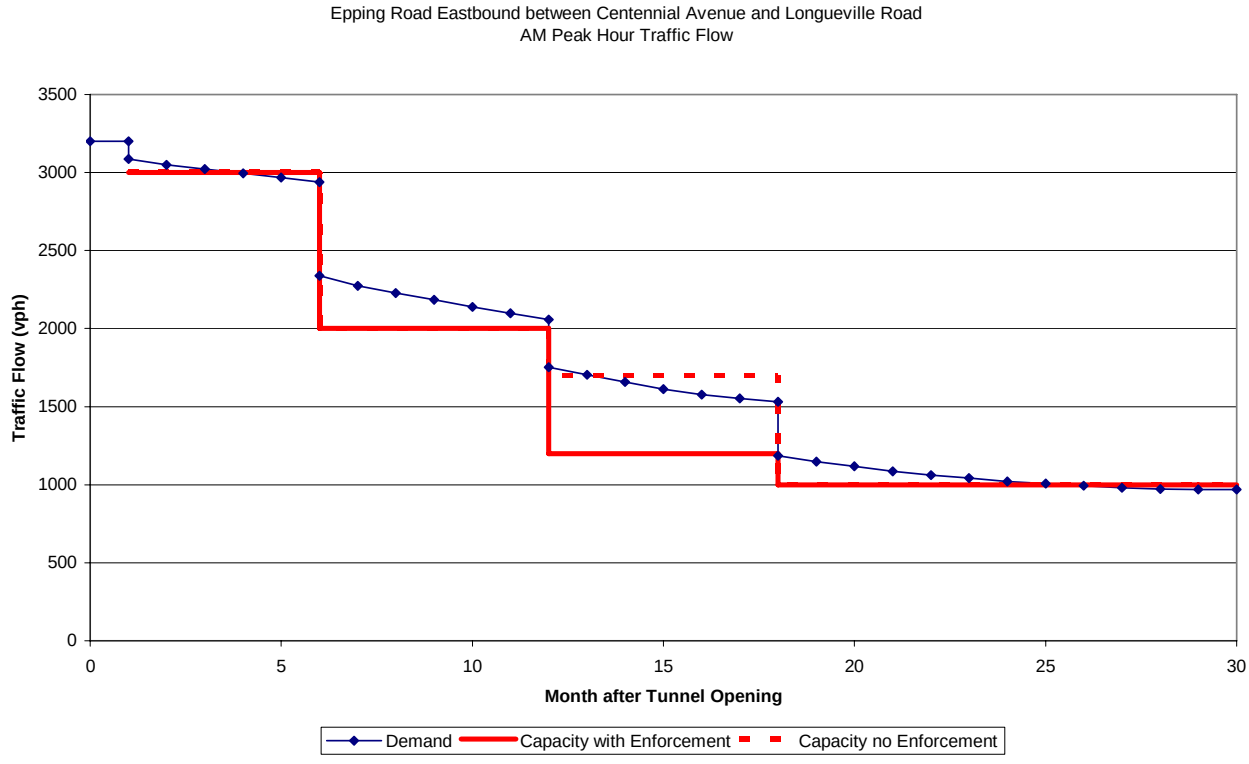

Figure 3-3 Transition Option 3

As with Transition Option 2, two capacity lines are shown during the T3 phase of Transition Option 3. Because of the difficulties in policing transit lanes, a notional maximum and minimum capacity is used during this period. Actual capacity could be anywhere between the minimum capacity and the full two lane capacity (however the capacity would not be expected to exceed the notional maximum shown in Figure 3-3).

Figure 3-3 shows a good correlation throughout the ramp up period. Some queuing will still be observed when changing stages of transition; however these queues are not seen to be significant. The worst case is where the T3 lanes are implemented with full police enforcement in the third stage. Demand exceeds capacity by 500 vehicles.

It is expected that this option would have limited impact on bus operations.

3.4 Transition Option 4

Transition Option 4, would involve exactly the same implementation strategy as Transition Option 3 up until 12 months, at which time all the outstanding works would be implemented including the Epping Road bus lanes.

Figure 3-4 shows the demand and capacity for Transition Option 4.

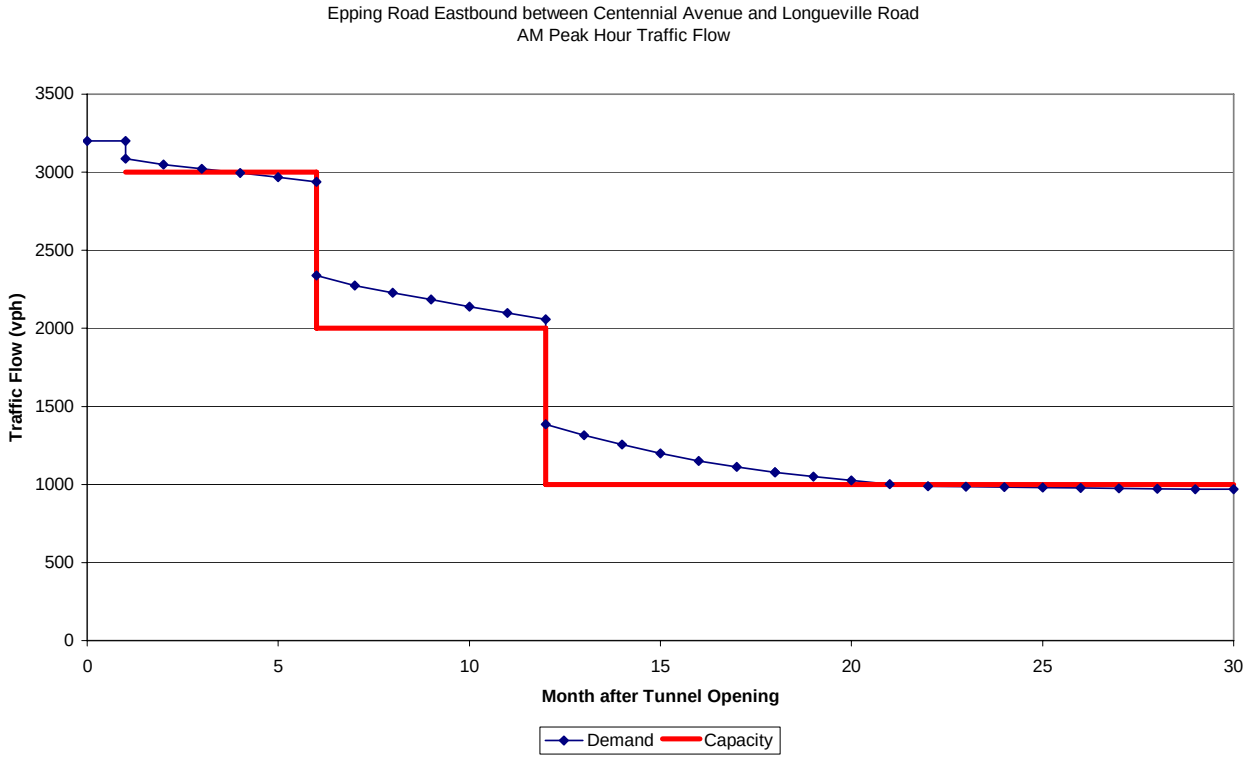

Figure 3-4 Transition Option 4

Figure 3-4 shows a good correlation throughout the ramp up period. Some queuing will still be observed when changing stages of transition; however these queues are not seen to be significant.

It is expected that this option would have limited impact on bus operations, assuming the T3 lanes are fully enforced by the Police.

3.5 Transition Option 5

Transition Option 5 would involve the same implementation strategy as for Transition Option 4, except that the implementation timeframes would be linked to Contract milestones to take advantage of the potential for early opening of the Project and avoid some contractual issues associated with the Project exceeding current contractual completion dates. The first period, during which no work would be undertaken except for the construction of the bus interchange and the pedestrian bridge would end on 9 May 2007. Stage 2 Works would then be implemented by 7 November 2007, with the bus lanes implemented by October 2007.

Assuming the Project is opened on the current estimated date by Connector Motorways of 10 December 2006, this option effectively shortens the stages in the Transition Option 4 by one month to 5 and 11 months respectively.

Figure 3-5 shows the demand and capacity for Transition Option 5.

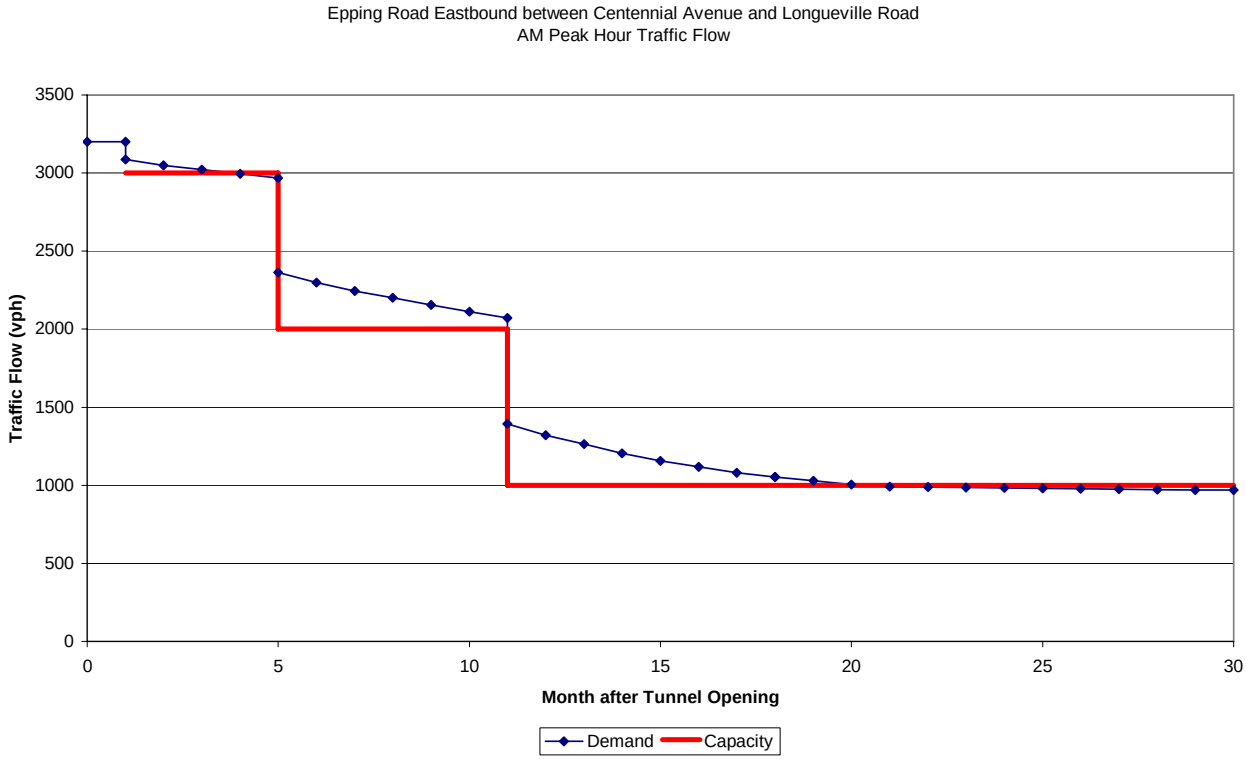

Figure 3-5 Transition Option 5 (December Opening)

Figure 3-5 shows a good correlation throughout the ramp up period. Some queuing will still be observed when changing stages of transition; however these queues are not seen to be significant.

Some delays to bus services would be expected, however these are not seen to be significant.

Given that the changes to the arrangements on Epping Road are based on dates rather than months after opening, if the Tunnel is opened later than 10 December 2006 the first step of the transition will be shortened, reducing its effectiveness in assisting traffic flow during ramp up.

As an example, Figure 3-6 shows the effects if the Tunnel is opened in January 2007 instead of December 2006.

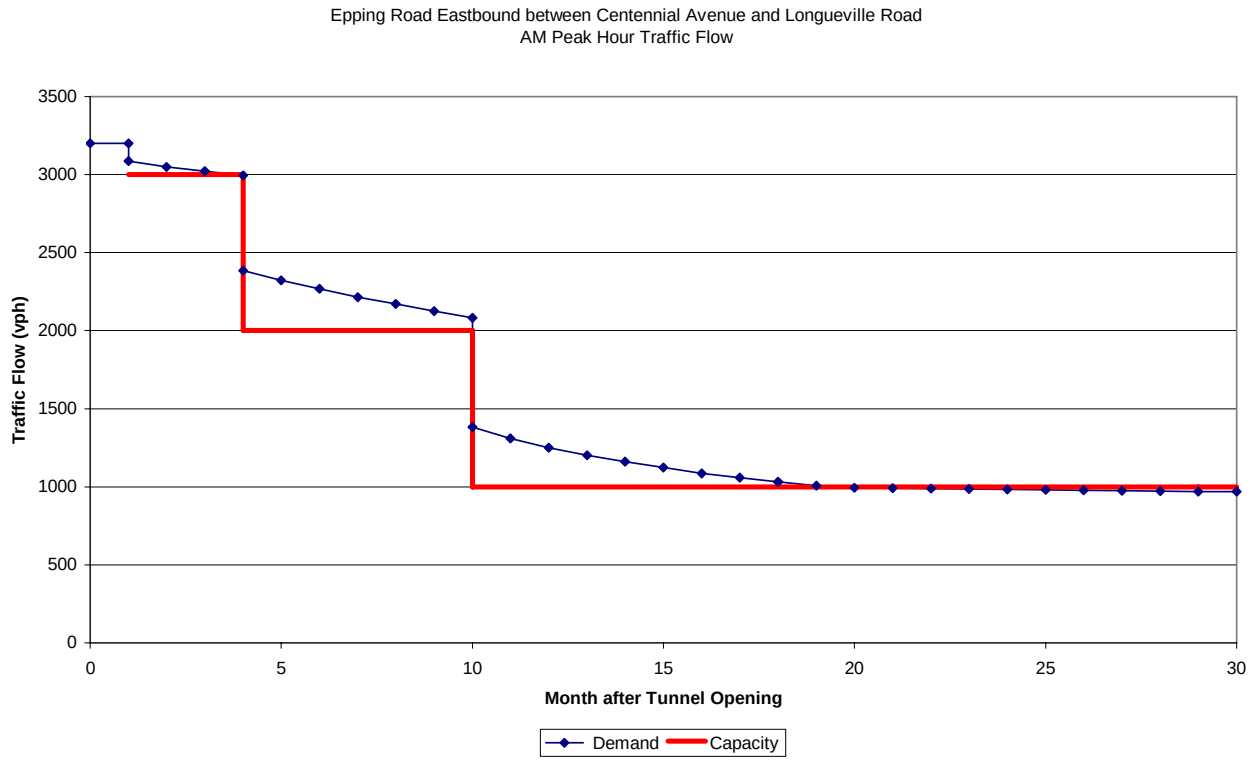

Figure 3-6 Transition Option 5 (January Opening)

Figure 3-6 shows a slight increase in the gap between demand and capacity as the first transition period is shortened. A further shortening of this period will increase this imbalance between capacity and demand.

4. Conclusions

Given the scale of the Lane Cove Tunnel Project, significant traffic congestion is likely at the time of opening and during the ramp up period as traffic patterns adjust to make use of the new facility. Implementing all works on Epping Road at opening, as currently required by the Minister for Planning's Conditions of Approval would further exacerbate these problems. Queues would extend along Epping Road restricting access to the Lane Cove Tunnel and side roads. This congestion supports the need for the staging of the implementation of surface traffic changes (the Proposed Modifications). In the longer term if additional capacity was provided, it may promote induced traffic.

A transition strategy that matches the reduction in capacity to the expected demands would assist in alleviating some of this congestion and allow for a seamless integration of the LCT. Any one of the five Transition Options would provide relief during ramp up with Options 3, 4, and 5 achieving a more acceptable level of service along Epping Road.

It is anticipated that bus services would be significantly affected if full implementation of the Epping Road works was undertaken immediately after Tunnel opening. A transition strategy is essential to minimise impacts on the road based public transport services during the Project ramp up period.

Post ramp up analysis shows that traffic conditions would operate satisfactorily for both the Tunnel and Epping Road.