flow
TRANSPORTATION SPECIALISTS

technical note

PROJECT	**ACUP006**
SUBJECT	**FUTURE TRAFFIC FLOWS IN THE AUCKLAND CITY CENTRE**
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1 INTRODUCTION

This Technical Note summarises the anticipated effects of increases in traffic flows on the future operation of the road network in the Auckland City Centre. The focus of the inquiry relates to the amount of parking that should be provided in the future, however this work seeks to understand the magnitude of the predicted traffic flow increases and the effects of those increases, at a broad level.

2 FORECAST TRAFFIC FLOWS

Auckland Council has provided existing and forecast flows entering and exiting the city centre, according to the Auckland Regional Transport (ART) model. Information has been provided from the base (2006) model and the future (2041) model, for the morning peak, inter peak and evening peak periods. The 2041 forecasts include the predicted effects of the City Rail Link.

The total flows are summarised at Tables 1 and 2 below, while Table 3 illustrates the percentage growth in traffic volumes between these years.

Table 1: 2006 City Centre Screenline Traffic Demands

	Morning Peak	Inter Peak	Evening Peak	Daily
Inbound	35,700	29,350	27,310	209,800
Outbound	22,240	26,130	34,990	187,900
Total	**57,950**	**55,480**	**62,300**	**397,600**

Table 2: 2041 City Centre Screenline Traffic Demands

	Morning Peak	Inter Peak	Evening Peak	Daily
Inbound	42,500	39,920	38,480	280,600
Outbound	35,110	37,460	38,180	260,600
Total	**77,620**	**77,370**	**76,660**	**541,100**

Table 3: Percentage Growth in Screenline Traffic Volumes, 2006 to 2041

	Morning Peak	Inter Peak	Evening Peak	Daily
Inbound	19%	36%	41%	34%
Outbound	58%	43%	9%	39%
Total	**34%**	**39%**	**23%**	**36%**

The above figures indicate that significant increases in traffic demands are predicted by the ART model, throughout the day. The predicted growth in the peak directional flows (inbound in the morning peak and outbound in the evening peak) is relatively modest, at 19% and 9% respectively (which equate with around 0.55% and 0.25% per year). However, growth in the contrapeak directions and during the inter peak is predicted to be more significant.

These forecasts need to be set in context and we note the following:

- The ART model is a strategic tool. It assigns predicted trips to the various modes of transport, taking into account a number of factors, including an assessment of parking costs, but we understand that it should not be expected to accurately reflect parking restraint
- The forecasts are demands only and the model does not accurately reflect overcrowding or congestion. In terms of traffic forecasts, this means that the demands need not actually reach the city centre, as the "actual" flows will be constrained by the capacity of the network further out. For example, in the morning peak, any increase in traffic demands from the North Shore to the city centre will mean an extension of the back of the queue on the Northern Motorway, and not an increase in flows entering the city centre in the peak hour
- Various documents identify the objective to accommodate increases in peak demands by modes of travel other than the private car. For example, the Draft City Centre Masterplan states that the number of vehicles entering the city centre during the peak period is expected to remain relatively static, with some growth in freight and delivery vehicle trips in the inter peak periods[1]
- The ART model may not fully reflect the visions and aspirations of the City Centre Masterplan that may reduce the capacity of the road network. Key aspirations, such as the Quay Street Waterfront Boulevard, the two waying of Hobson Street and Nelson Street and further shared space programs (eg Queen Street) will adversely affect the ability of the city centre road network to be able to accommodate the anticipated level of traffic, with the above volumes not being able to access the city centre if some/all of the aspirations are realised.

3 TRAFFIC FLOW PROFILES

Given the predicted increases in demands to/from the city centre, we have investigated the effects of increases in flows, at a broad level. That is, we have taken the existing traffic flow profiles and provided nominal growth rates to these, in order to understand a roads ability to accommodate increases in traffic movements throughout a day. The existing traffic flow profiles have been established for the following six locations:

[1] Auckland Council (2011), Draft City Centre Masterplan, September 2011", page 47

- Fanshawe Street (between Beaumont Street and Daldy Street)
- Quay Street (adjacent to the Vector Arena)
- Symonds Street (north of the State Highway 1 overbridge)
- Karangahape Road (east of the State Highway 1 overbridge)
- Nelson Street/Hobson Street (the State Highway 1 and 16 off/on ramps)
- Grafton Gully (under Grafton Bridge)

In order to consider the effects of increases in demands we have assumed that the current maximum two way flow reflects the capacity of the particular road. We have then applied growth in demands, based on two growth scenarios. Where the forecast flow exceeds the capacity, this is assumed to add to the queue, with the excess demand added to the following hour.

It is important to note that we have assessed the capacity based on the two way flows, not the peak directional flow[2]. As noted above, the forecast flows are expected to increase at a significantly higher rate in the contrapeak direction than the peak direction. Also, the main constraints in capacity relate to the peak direction. However, while increases in contrapeak demands will have no effect on conditions in the peak direction in some locations, it will have an effect in others. For example, an increase in flows turning right out from Wynyard Quarter (from Beaumont Street or Halsey Street) in the morning peak would lead to a demand for longer green phases at the signals, for that traffic, which in turn would adversely affect the capacity for traffic entering the city centre via the Fanshawe Street motorway off ramp.

We have undertaken a sensitivity test, looking at the peak directional flows only, at Section 3.1 below.

Two scenarios have been considered for 2041 traffic flows, being:

- Scenario 1: A 10% increase in the morning and evening peak traffic flows, and a 25% increase in interpeak traffic flows. This scenario is intended to reflect "limited" increase in the peak directional flows, but a reasonable increase in the inter peak. We understand that this scenario is fairly close to that noted by Ross Rutherford and Don Houghton in the assessment of future parking requirements in the city centre
- Scenario 2: A 20% increase in morning and evening peak traffic flows, and a 40% increase in interpeak traffic flows. This latter scenario more closely follows the predicted growth in traffic flows, according to the ART3 model.

Figure 1 to Figure 6 show the existing flow profiles for each of the six locations, along with the future flow profiles under both Scenario 1 and Scenario 2.

[2] We have taken the two way for Hobson and Nelson Street, combined

Figure 1: Fanshawe Street Traffic Flow Profile: Both Directions

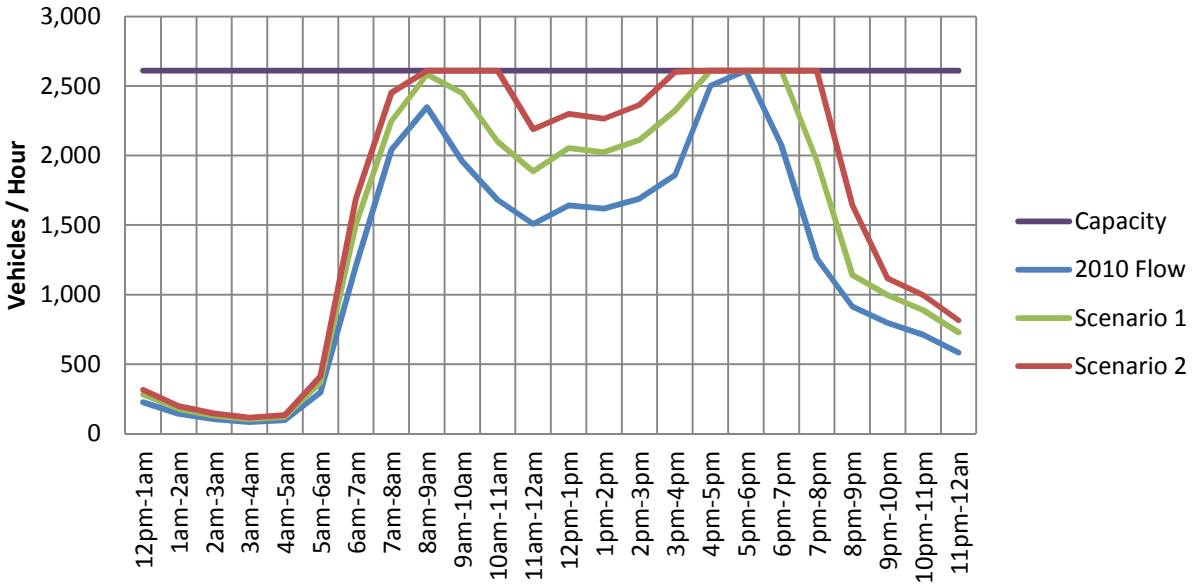


Figure 2: Karangahape Road Traffic Flow Profile: Both Directions

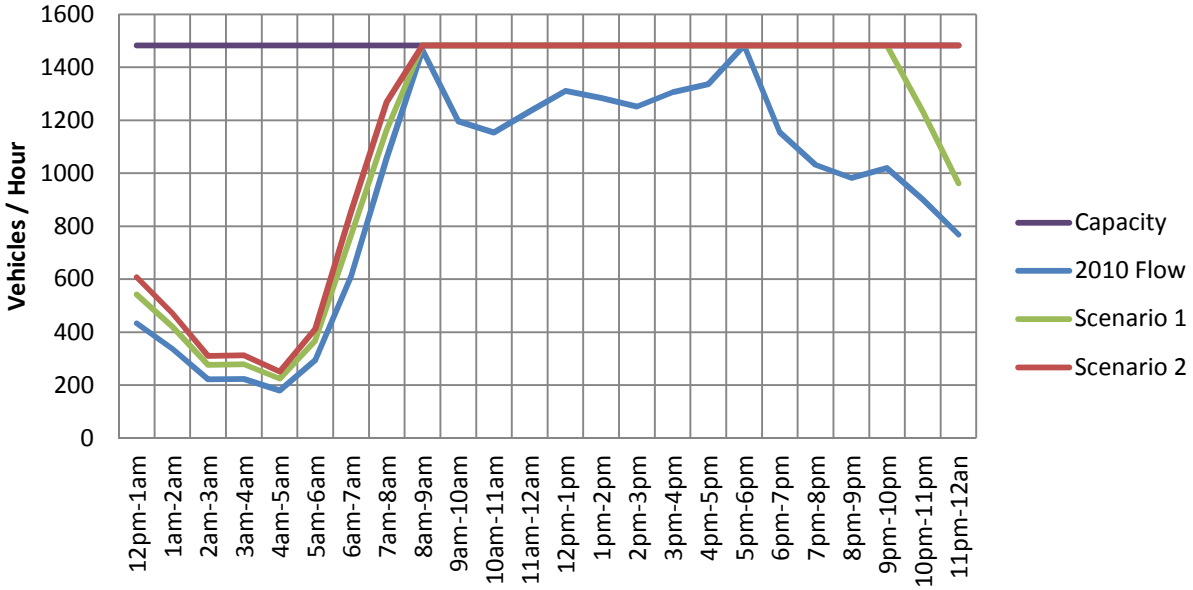


Figure 3: Quay Street Traffic Flow Profile: Both Directions

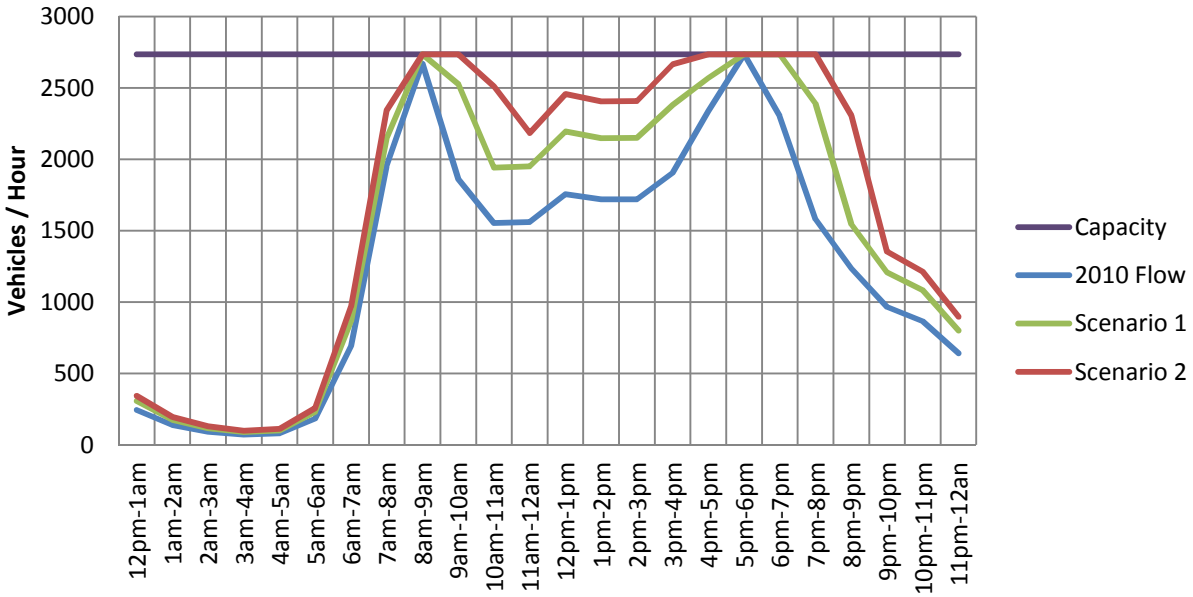


Figure 4: Symonds Street Traffic Flow Profile: Both Directions

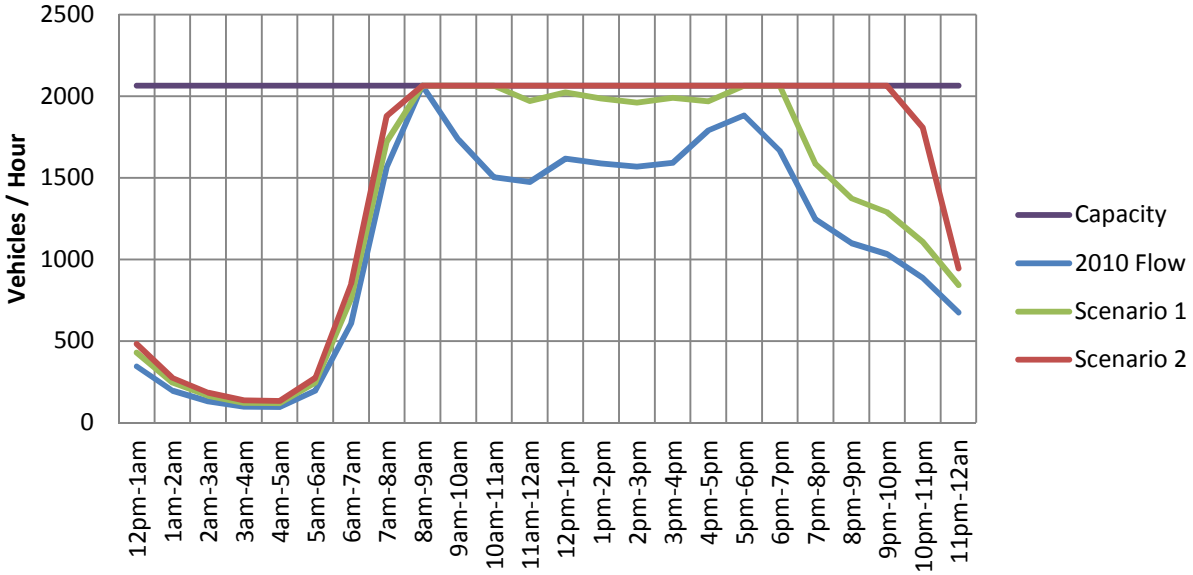


Figure 5: Nelson Street/Hobson Street Traffic Flow Profile: Both Directions

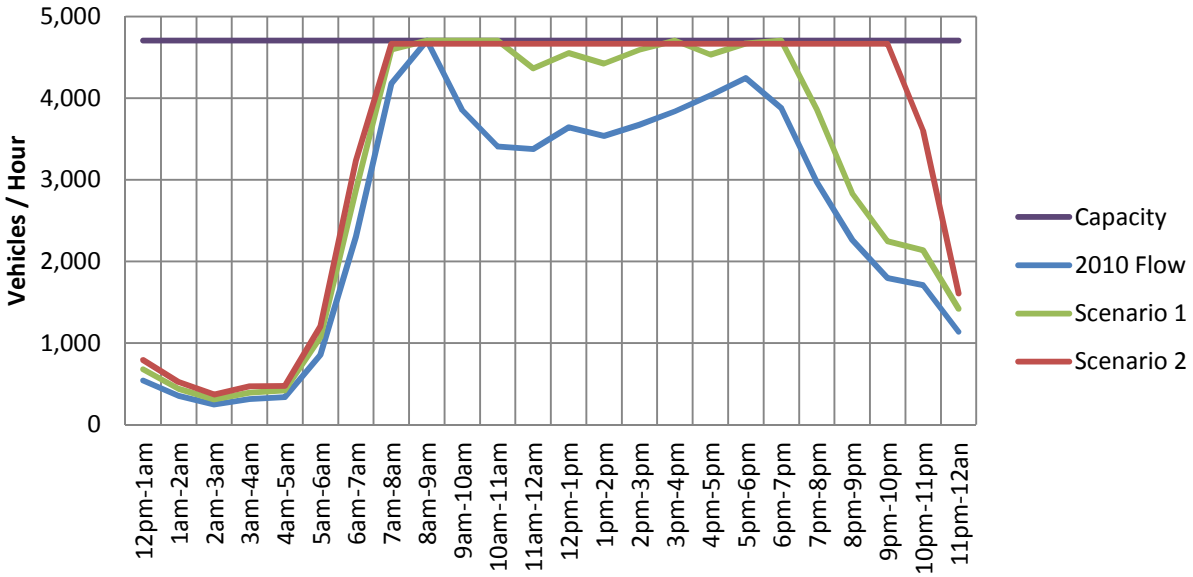
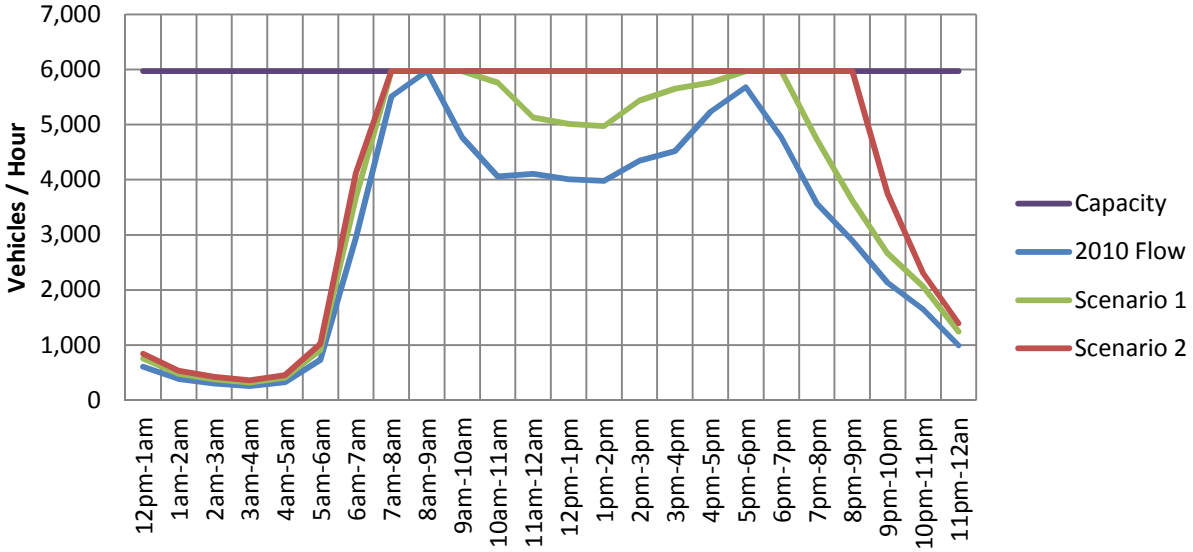


Figure 6: Grafton Gully Traffic Flow Profile: Both Directions



The existing traffic flow profiles (shown in blue) along Fanshawe Street and Quay Street show the "classical" situation, with flows in the morning and evening peak significantly higher than those during the inter peak period. However, the peaks are less prominent along Karangahape Road, Symonds Street and Nelson Street/Hobson Streets. Grafton Gully lies somewhere between these two profiles.

The profiles for Scenario 1 (shown in green) show the inter peak flows increasing on Fanshawe Street, Quay Street and Grafton Gully during the inter peak, but the inter peak flows will still be significantly lower than those in the peaks, on Fanshawe Street and Quay Street. This means that (other things being equal[3]), it can be expected that roads of this nature can be expected to continue to operate reasonably during the inter peak, which in turn means that some increase in the availability of short term parking could be accommodated.

However, the profile for Karangahape Road with Scenario 1 is shown as being flat, indicating that the demands in the inter peak would reach or exceed the current peak flows. If this demand eventuated (ie with no diversion or suppression of trips), Figure 2 indicates that it would take until around 9pm before the flows reduce to less than the capacity. In other words, there would be congestion throughout the working day. The profiles for Symonds and Nelson Street/Hobson Street are predicted to be quite flat with Scenario 1, with flows during the inter peak predicted to hover just below the capacity.

The profiles for Scenario 2 (shown in red) indicate that the higher rate of growth could still be accommodated on Fanshawe Street and Quay Street, in theory, during the middle of the inter peak period. However, the plots show that the peaks would be expected to extend on both sides (eg both before and after the morning peak). This is in part due to flows, for example, just before the current evening peak being greater than those during the preceding hours. Also, the situation during the hours after the peak periods reflect the release of the excess peak demands.

The profiles for Karangahape Road, Symonds Street, Nelson/Hobson Streets and Grafton Gully indicate that these routes would be operating at or over capacity for extended periods – beyond midnight in the case of Karangahape Road, and through the day to 8 to 10pm on Grafton Gully, Symonds and Nelson Street/Hobson Street. In reality, at this level of congestion, some trip suppression or trip diversion could reasonably be expected[4].

3.1 Sensitivity Test

In order to test the importance of the assumption that the analysis is based on the two way flow, we have rerun the assessment based on the one directional flows, for Fanshawe Street. Figure 7 and Figure 8 below illustrate the traffic flow profiles in each direction, using Scenario 1.

[3] There could be more turning traffic or greater call for pedestrian crossings during the inter peak period, which could mean that there could be congestion at lower flows than can be accommodated during the peak periods

[44] Trip suppression suggests that the trip may not take place. For example, people may choose not to make a discretionary shopping trip. Trip diversion could mean diversion between modes (for example from car to public transport), or the trip could take place at a different time, or in the example above of a shopping trip, people could choose to shop somewhere else, other than the city centre

Figure 7: Fanshawe Street Traffic Flow Profile: Westbound

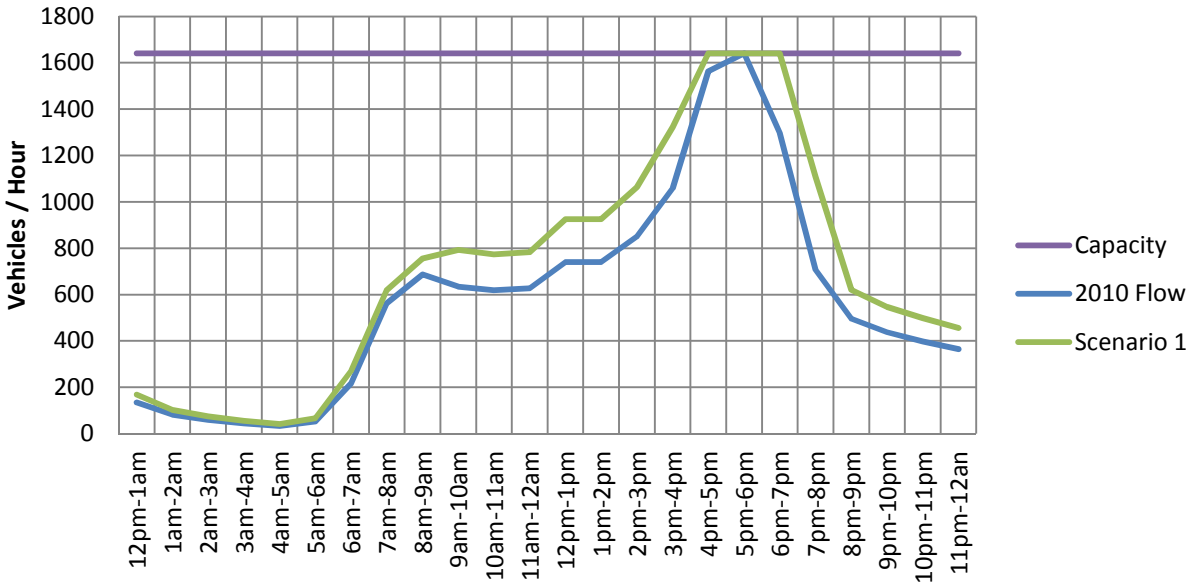


Figure 8: Fanshawe Street Traffic Flow Profile: Eastbound

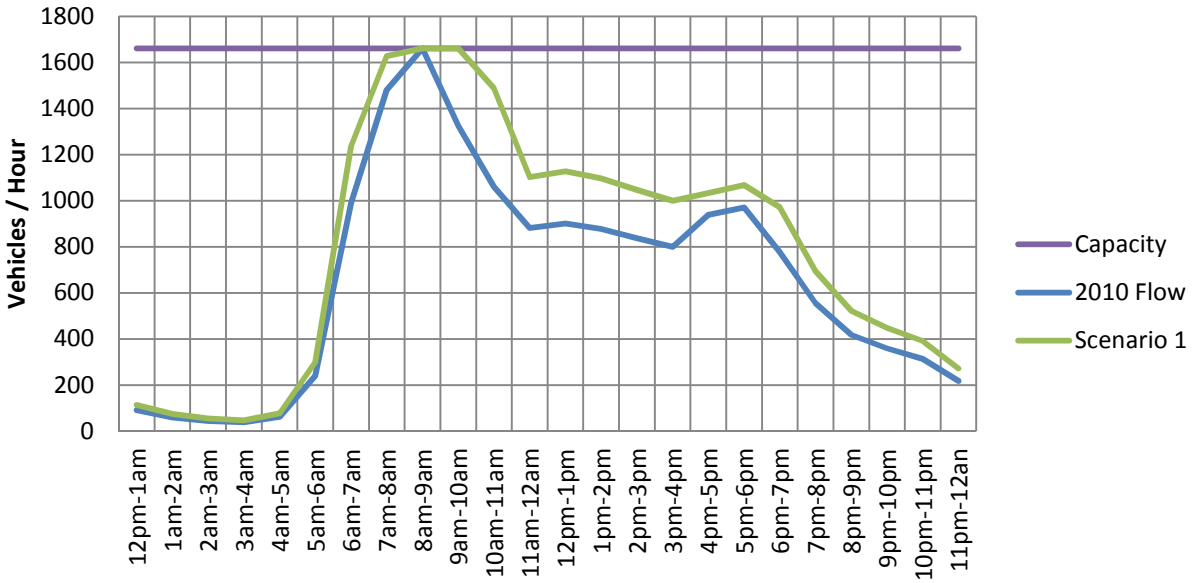


Figure 7 shows the dominance of the evening peak period on the westbound flow profile, while Figure 8 shows the dominance of the morning peak period on the eastbound flow profile. Both figures indicate that the inter peak should continue to operate satisfactorily along this route, but the peak periods would be expanded.

4 CONCLUSIONS

This technical note has considered the likely effects of increases in traffic flows in the city centre, in order to offer guidance on the question of parking standards.

- Based on the limited data assessed, it would appear that some increase in traffic flows can be reasonably accommodated in the inter peak on some streets. These streets are predominantly "commuter routes"
- However the flow profiles on several other streets are already somewhat flatter, meaning that there is limited capacity for increases in flows in the inter peak. The streets examined are still key arterials, so they carry some commuter traffic, but they also provide access about the city centre throughout the day
- Some increase in short term parking could therefore be considered in the city centre, but this would be likely to increase congestion. This may or may not be considered acceptable
    - On the one hand, the additional parking could facilitate desired activity which is essential to businesses
    - On the other hand, the additional parking may encourage additional travel by car, and may adversely affect essential movement (eg freight, deliveries and buses)
    - It is also worth noting that an increase in short term parking can be achieved without providing new parking. For example, a change in the management of parking could be considered, with less long term parking (or less "early bird" parking at public facilities) immediately providing the potential for more short term spaces
- A key question on the provision of additional parking is the effect on the peak periods. Congestion in the peaks is to be expected in a large city centre, but "gridlock" has obvious effects in terms of accessibility for essential trips, adverse environmental effects, and so on. While the additional parking may be aimed at stimulating/facilitating activity and movement in the inter peak period, there may be effects on the peaks. For example, if people arrive in the city centre in the early afternoon, they may wish to leave during the evening peak period and it is difficult to see how this can be avoided.

The above points suggest that there would appear to be significant transport risks in pursuing additional short term parking in the Auckland city centre. In this case, it may be advisable to focus the concept on particular targeted areas, where there is acknowledged as being a deficiency in parking and where the adverse transport effects are assessed as being less significant than in other locations.

Reference: S:\ACUP\006 Traffic Modelling for CBD Parking Standards\TN1B120426.docx – IClark