

# Post Implementation Review

## (SH1) Te Rapa Road–Eagle Way Signalised Intersection

Hamilton City Council



August 2016

The purpose of NZ Transport Agency Post Implementation Reviews are to:

- assess how well a project (or package) has delivered its expected benefits
- explain any variation between actual results and expected benefits and costs
- identify any lessons learned that can be used to improve future projects

## Executive summary

This project converted the intersection of Te Rapa Road and Eagle Way in north Hamilton from a roundabout to a traffic signalised intersection. The intersection is a main access point into The Base, a major retail and commercial area. The need to signalise the intersection was necessitated by ongoing major development and growth of The Base, with resultant capacity constraints at the intersection.

The project was coordinated with the opening of the Te Rapa Bypass, part of the SH1 Waikato Expressway road of national significance.

The expected benefits of the project were to improve traffic capacity through the intersection, reduce traffic delays, improve safety, and provide better local pedestrian and cycling facilities.

### Summary assessment of project outcomes

---

This post implementation review found the intersection is working well operationally, with increased traffic capacity. The project has assisted economic development by facilitating increased activity locally, especially ongoing growth of The Base. But travel time savings have not eventuated as predicted. Travel times have increased slightly, partly as a result of the introduction of the traffic signals, but also due to a reduction in the speed limit on Te Rapa Road.

The intersection is also dealing with higher than forecast traffic volumes. It was predicted that the opening of the Te Rapa Bypass would significantly reduce traffic on Te Rapa Road. This has not happened. Traffic volumes are mostly unchanged since the intersection rebuild was completed.

Safety improvements have successfully been implemented. The number of crashes in the project area reduced by 83% post-implementation. This is far more than 35% crash reduction observed in the wider Hamilton City area over the same period.

Pedestrian and cycling facilities through and around the intersection are generally improved from when it was a roundabout. However, it was observed that many cyclists prefer using the traffic lanes instead of the provided cycle lanes. Some pedestrians were also observed crossing at unsafe locations by the intersection.

### Project delivery and cost

---

The project was originally approved through agreement between three parties: Hamilton City Council, the NZ Transport Agency, and The Base Limited. All three parties contributed funding.

The intersection conversion was completed in December 2012, within its scheduled construction timeframe of three months. The project's actual cost on completion was eight percent under budget, at \$2.8 million.

### Good practice identified and lessons learned

---

Several examples of good practice were identified with this review. These include:

- Pedestrian and cycling facilities represent a considerable improvement over previous conditions.
- The overall quality and finish of the project was high.
- Information on car parking availability is automated and integrated with the operation of Te Rapa Road.
- Pre and post implementation data on state highway traffic is available.

These good practice examples are discussed in more detail in *Section 3: Good practice*

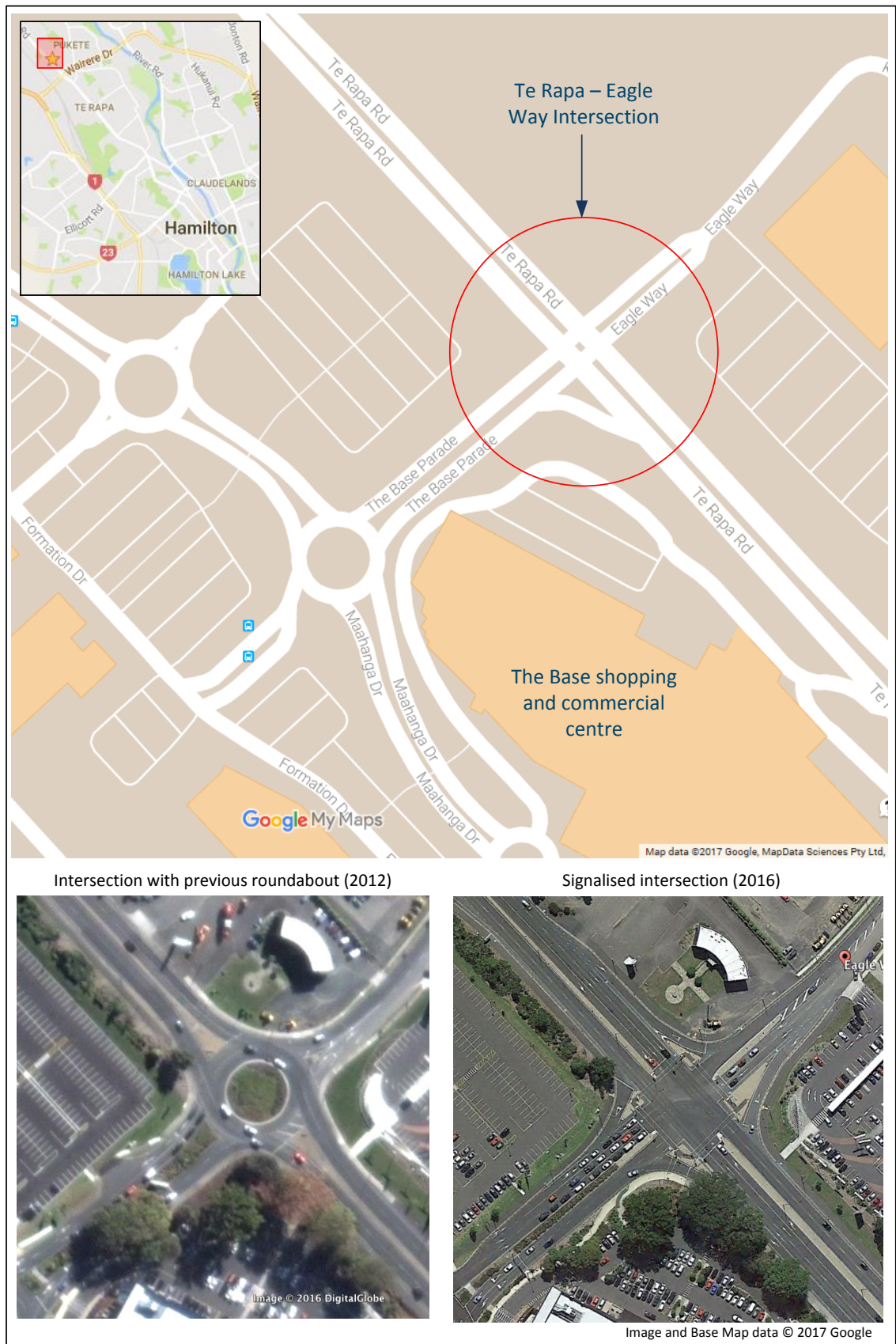
*identified* of this report.

Lessons with relevance for other future projects include:

- An Integrated Transport Assessment rather than a Scheme Assessment Report was used for project planning and funding approval
- There is a mismatch between crossing facilities at the intersection and the footpath alignment between the Te Rapa Road retail areas.
- The new signals do not appear to be fully co-ordinated with the Wairere Drive signals.
- Northbound cyclists on Te Rapa Road are reluctant to use the dedicated lanes provided.

These lessons for future projects are discussed in more detail in Section 4 of this report.

**Figure 1: Te Rapa Road–Eagle Way Intersection location map, and before and after aerial photos**



# 1. Project benefits

## Project background and description

---

This project converted the intersection of Te Rapa Road and Eagle Way in north Hamilton from a roundabout to a traffic signalised intersection. The improvement was necessitated, in part, by the intersection acting as a primary access to “The Base” a large retail and commercial development to the west of Te Rapa Road.

The 29-hectare block of land that The Base sits on is adjacent to the main trunk railway and at the intersection of major arterial routes. The latest phase of The Base, the mall ‘Supa Centre,’ was the subject of a November 2012 Integrated Transport Assessment (ITA). This assessment was used instead of a more conventional Scheme Assessment Report (SAR) as part of justification for the intersection project.

The Base provides more than 87,000 sq. m of retail space, with 3,000 free car parks.

The Te Rapa Road – Eagle Way intersection forms the primary access to The Base. Its conversion was timed to coincide with the opening of the Te Rapa Bypass, part of the SH1 Waikato Expressway Road of National Significance (RoNS). The easing of traffic pressure associated with the Bypass, together with the increase in capacity at the new intersection, accommodated the additional traffic generated by further commercial and retail development at The Base. Further commercial development may also proceed in the future in the vicinity of The Base, to the north and west of the existing retail area.

Te Rapa Road, formerly SH1, accommodates a range of adjacent commercial development and a number of substantial road improvements and access junction changes along Te Rapa Road have been implemented to accommodate new development and traffic growth.

A long-term plan to develop a passenger rail service, accessed from with a station close to The Base remains under active consideration by Hamilton City Council.

The Te Rapa Road-Eagle Way improvement consisted of several components:

- A four-arm road junction on a dual carriageway section of state highway.
- Multiple stop lines and associated flaring on all approaches.
- Pedestrian footpaths, pedestrian crossing tactile facilities and signals.
- Cycle crossing, shared and on-road cycle lane facilities

Nearby northbound diverge lanes (immediately north and south of the intersection) into The Base car parks were completed prior to the signalisation of the main intersection. These are not strictly part of the review, but are integral to the operation of the intersection.

The intersection is used by a mixture of commuters travelling to and from Hamilton City Centre and traffic attracted to the local commercial and retail activities. The opening of the Te Rapa bypass and reductions in through traffic movements enabled SH1 revocation and speed management measures (reduction in speed limit from 80 km/hr to 60 km/hr) on Te Rapa Road outside The Base to be implemented.

The availability of a second access to The Base from the west (from Kowhai Road East) provides a degree of relief to Te Rapa Road especially in busy periods.

## Expected project benefits

---

The expected benefits from the project included:

- Creation of improved capacity to facilitate local traffic movements and development traffic.
- Reduced traffic delay.
- Better safety, even with additional development traffic, due to better quality design, better conflict and speed management.
- Better cycling and walking facilities, at the intersection and along connecting road approaches.

In terms of the economic evaluation supporting the project's funding, it was forecast that travel time cost savings would account for 79.8% of total benefits, crash reduction benefits 16.7%, vehicle operating cost savings 3.2% and emissions (CO<sub>2</sub>) reduction 0.3%.

## There were mixed results with the accuracy of the project's forecasts

---

Forecasts were not clearly reported for this project as there was no scheme assessment report. The Integrated Transport Assessment (ITA) did not explicitly look at the impacts on the external road network outside of The Base. It was more concerned with the commercial and retail operations within The Base's property.

From what can be seen the traffic demand forecasts were inaccurate as the ITA modelling assumed there would be a *"significant reduction in the volume of traffic on Te Rapa Road"* which has not occurred.

Forecast travel time savings also appear to not have been achieved.

Safety forecasts were good and close to post-implementation conditions.

## The signalised intersection works well operationally...

---

From site observation, the intersection appeared to work well operationally in the weekday morning peak, inter-peak and evening peak periods. There were minimal exceptions observed of queuing traffic taking more than one cycle of the traffic signals to clear. The only issue affecting the external road network appears to be the potential need for better co-ordination for platoons of northbound traffic leaving the Wairere Drive intersection and approaching the project intersection in the weekday evening peak.

There is congestion at The Base, but this is mainly contained within its internal road network, rather than affecting Te Rapa Road. Delays are mainly experienced by vehicles seeking to exit in the evening weekday and weekend retail peaks.

## ...but predicted travel time savings have not eventuated

---

Travel times on the external road network increased as a result of the project. This is partly due to the introduction of traffic signals and partly due to the introduction of a lower speed limit.

Average travel times and travel time variability along Te Rapa Road (between the Wairere Road and Church Road intersections, approximately 0.5 km either side of the Te Rapa Road-Eagle Way intersection) are shown in Figure 2.

## Figure 2: Travel times and speeds through Te Rapa Road – Eagle Way

(Comparison of before and after project; May–July 2011 compared with May–July 2013)

	All Day			PM peak		
	Average Travel Time Change	Speed km/hr Change	Variability Change	Average Travel Time Change	Speed km/hr Change	Variability Change
<b>Northbound</b>	10s	-6.87	14.08	6s	-4.16	15.91
<b>Southbound</b>	10s	-5.42	9.31	8s	-3.6	8.86

Notes: Measurements were taken for a 3-month period (May, June and July) in 2011. This was compared with the same 3-month period in 2013. All day data represents 24 hrs 7 days a week and PM peak is between 4 and 6pm on weekdays. Variability is measured as the difference between 15th and 85th percentile speeds.

Source: TomTom Traffic Stats

The results show reductions in average speeds with associated slight increases in average travel times.

Variability has increased more substantially, probably as a result of encountering static queues at red lights. There may also have been changes in the amount of turning traffic having a greater effect on through movements.

Average post-implementation speeds remain reasonable for an urban arterial, in the range 39 to 42 km/hr all day, and only slightly less in the evening peak, between 37 and 42 km/hr. It is probable that the true peak is less than the two hours and conditions at weekends could also be slower, given the retail nature of The Base.

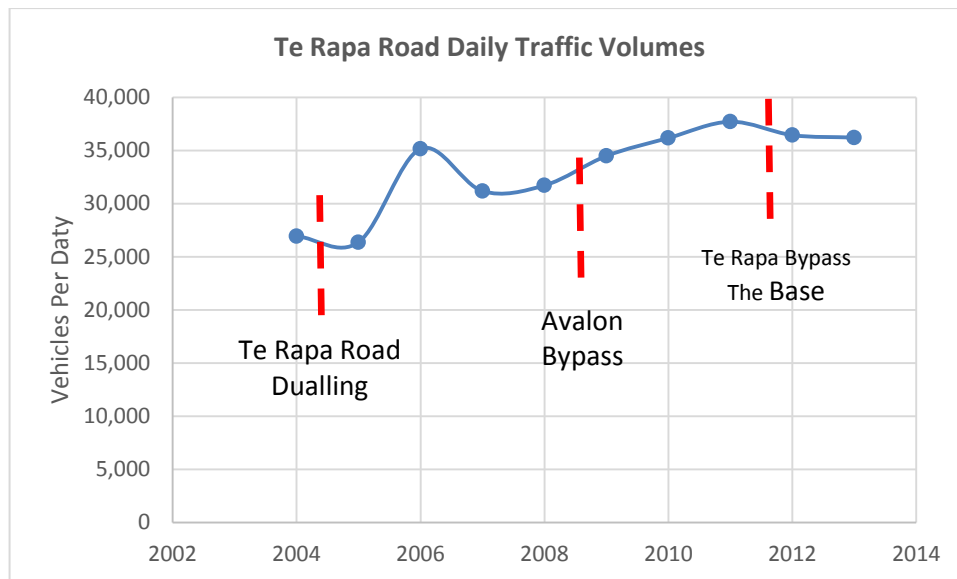
### Traffic volumes have not reduced as predicted

---

Past trend analysis indicates that increased traffic growth occurred on Te Rapa Rd following the dualling of Te Rapa Road and the opening of the nearby Avalon Drive Bypass (in late 2009).

The effects of the Te Rapa Bypass, as reported in the ITA, were expected to reduce through traffic by 50% and this was expected to lead to a significant reduction in the volume of traffic on Te Rapa Road. However, this is not evident from the recorded Te Rapa Road traffic volumes, which are virtually unchanged over the period 2010–2013, as shown below (Figure 3).

**Figure 3: Traffic volumes**



Source: NZ Transport Agency, State Highway Traffic Volumes

The lack of change in volumes following the opening of the Te Rapa Bypass is probably due to the introduction of additional Base traffic and traffic rerouting from other roads in the Hamilton urban network. The interpretation is that The Base largely absorbed the capacity on Te Rapa Road made available by the Te Rapa Bypass.

Post-implementation congestion does exist but is mainly contained within The Base retail development, and therefore difficult to quantify.

### **The project has successfully improved intersection safety**

Crash analysis for this review shows that the project area has experienced a large reduction in annual crash rate of 83 percent. This is a comparison of reported crashes between December 2012 to July 2016 after the intersection was signalised with a before period between September 2008 and September 2012.<sup>1</sup>

Over the same period, the wider Hamilton area crash rate fell by 35 percent. It should be noted that in comparison with background trends, the project area crash reduction is statistically significant. This means it can be concluded with a high level of confidence that the observed reduction in crash rates can be attributed to the project's interventions, and is not result of random fluctuations in crash incidence.

The project's improved safety outcomes are mainly due to a lowering of roundabout related collisions and a reduction in mid-block crashes, due to better junction design, improved approach layout, traffic lane improvements and speed management on Te Rapa Road.

<sup>1</sup> The construction period (September 2012–December 2012) is excluded from the comparative crash analysis because construction activity can create unusual conditions.



**Figure 3: Record of crashes before and after intersection signalisation**

	Total Recorded Crashes			Change
	Before Period (13 Sept 2008 – 12 Sept 2012)	Construction Period (13 Sept 2012 – 12 Dec 2012)	Actual after period (13 Dec 2012 – 12 July 2016)	
	<i>5 years</i>	<i>3 months</i>	<i>3 years 7 months</i>	
<b>Project Area (crash totals)</b>	89	1	11	
<b>Project Area (crash type)</b>	1 serious, 22 minor, 66 non-injury	1 non-injury	1 serious, 2 minor, 8 non-injury	
<b>Project Area (crashes p.a.)</b>	17.8	4.0	3.1	-83%
<b>Wider District (crashes p.a.)</b>	1,218	417	787	-35%

Source: NZ Transport Agency, Crash Analysis System (CAS)

### **There are improved pedestrian and cycling facilities but with a couple of issues**

Site observation done with this review indicates reasonable use<sup>2</sup> of pedestrian and cycling facilities provided as part of the project along and across Te Rapa Road.

These were observed to work well in general. A couple of exceptions were:

- Informal crossing activity immediately to the south of the intersection on Te Rapa Road where the alignment of paths on either side of the road acts to direct pedestrians to cross the road at an inappropriate, and what appears to be unsafe, point.
- Northbound cycle lanes on Te Rapa Road, parallel to the car park diverges on either side of the intersection, were not observed to be used by through cyclists who preferred to ride close to the through lane instead.

Cycle network connections are available to and through The Base and there are plans (contained in the ITA) to further develop the local cycling network.

### **Public transport reliability into The Base is poor but not a result of the project**

Bus stops are located within The Base development itself, meaning buses turn on and off Te Rapa Road for boarding and de-boarding passengers. Bus usage was observed to be low to moderate during the site visit for this review.

Bus service reliability was observed to be poor during the site visit. This is likely to be partly due to the fact that some services are orbital. They therefore face delays when crossing busier radial routes) and others operate on long routes in the peak period. The ITA predicted that public transport would help relieve local congestion.

<sup>2</sup> No pedestrian or cycle usage monitoring data was available.

## 2. Project implementation (scope changes, cost and timeframe)

### The intersection improvements were completed under budget...

The project was originally approved through agreement between three parties: Hamilton City Council, NZ Transport Agency and The Base Limited. Hamilton City Council and NZ Transport Agency were jointly responsible for 50% of construction costs and The Base Limited was responsible for 50% of construction costs.

The project was completed for just under \$2.8 million, eight percent under budget (Figure 4). Significant cost savings were achieved through using an alternative pavement material and construction technique proposed by the project contractor.

**Figure 4: Budgeted and actual cost comparison**

Description	Budgeted	Change
Construction approval	\$3,040,484	
Actual cost at project completion	\$2,797,160	-\$243,314 (-8%)

Excluded from the above cost figures are the car park diverge lanes which were completed before the intersection conversion.

### ...and within the planned timeframe

The timeframe for project implementation was three months. The project was completed within this timeframe, between mid-September and mid-December 2012.

## 3. Good practice identified

This review identified good practice aspects from the Te Rapa Road/Eagle Way signalised intersection project:

- **Pedestrian and cycling facilities represent a considerable improvement over previous conditions.** Pedestrian and cycling facilities are comprehensively included in all intersection crossing points and approaches.
- **The overall quality and finish of the project was high.** This is true of the Intersection, approaches to it and the northbound off-slips into adjacent parking areas. Examples of this include surfacing, equipment, and footpath construction adjacent to the northbound Te Rapa Road approach to Eagle Way intersection.
- **Information on car parking availability is automated and integrated with the operation of Te Rapa Road.** The automatic detection of individual parking space availability and the linkage to real time electronic signage advising approaching drivers represents good practice. This assists in reducing potential wasted travel, minimises uncertainty and increases the efficiency of the adjacent road network.
- **Pre and post implementation data on state highway traffic is available.** This is not usually the case on revoked state highways, meaning it can be difficult to establish the effect of replacement bypasses. Te Rapa Road is an example of maintaining a traffic count station for a full year, post revocation. This extension is unusual in state highway traffic volume data terms, although further years would also have been useful.

## 4. Lessons learned

Several lessons with relevance for other future projects were identified by this post implementation review:

- **An Integrated Transport Assessment rather than a Scheme Assessment Report was used for project planning and funding approval.** Despite the fact that the ITA was done to a relatively high standard, this is an unconventional approach on what was a state highway at the time. The ITA also did not cover some key areas, for example: project economics, forecasts of effects on adjacent road network (including state highway traffic volumes) and other measurable post implementation outcomes. No monitoring was either proposed or undertaken. It is suggested that if an ITA is to be used instead of a SAR it should have higher minimum requirements.
- **There is a mismatch between crossing facilities at the intersection and the footpath alignment between the Te Rapa Road retail areas (immediately to the south of the Eagle Way intersection).** This alignment may have been more appropriate for pedestrian movements at a roundabout but does not lead pedestrians to a safe crossing point for a signalised design. Potentially unsafe and informal pedestrian crossing movements were observed to occur here on site visits, in particular, children running over the road between queuing vehicles.
- **The new signals do not appear to be fully co-ordinated with the Wairere Drive signals.** It is unclear how well the Wairere Drive and project intersections are linked. From site observation, the timing offsets were not effective in co-ordinating the movement of platoons of northbound traffic leaving the Wairere Drive Intersection in the evening peak.
- **Northbound cyclists on Te Rapa Road are reluctant to use the dedicated lanes provided.** This is common to all such facilities associated with long merges, or in this case diverges either side of the Eagle Way intersection. The northbound cycle lanes operate best for cyclists entering the base car parks. For all other northbound movements, cyclists either need to use the left-hand side and then cross the left turning traffic stream, or alternatively remain on the Te Rapa Road straight ahead lane with diverging and through traffic passing either side of them.

## Appendix: Illustrations

- Te Rapa Road looking south from Eagle Way intersection, showing shared and separate cycle lanes and 60 km/hr limit.



- Left slip to northern car park on Te Rapa Road, north of the Eagle Way intersection.



- **Alignment of east-west footpath between retail areas, contributing to informal crossing movements of Te Rapa Road south of Eagle Way intersection**



- **Northern Te Rapa Road approach to Eagle Way intersection, showing left turn slip lane and straight ahead cycle lane**



- Northbound Te Rapa Road left slip and approach to Eagle Way intersection, showing advance parking signage, footpath and cycle lane.

