

Post Implementation Review

Avalon Drive Bypass

Waikato Highways and Network Operations



March 2013

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

Project description

The Avalon Drive Bypass project relocated a section of State Highway 1 in the Nawton area of Hamilton city onto a new 2km bypass. The bypass stretches from Rotokauri Road and Crawford Street in the north to Norton Road and Rifle Range Road in the south. See Figure 1 on page 3 for a map of the project location. Features of the bypass project included construction of: major roundabouts at each end of the two lane bypass, an overbridge to carry bypass traffic over Forest Lake Road, and lowering part of Norton Road at the southern end of the bypass to go under a new railway bridge that replaced the previous level crossing. Associated project features included extensive noise walls, and the creation of a network of shared footpaths and cycleways with underpasses.

This project sought to improve traffic flows through Hamilton and relieve local congestion by removing state highway through-traffic off its pre-existing route along Avalon Drive onto the new bypass. Avalon Drive had become heavily congested and was exceeding its capacity. It was carrying both the state highway through-traffic and local traffic travelling to and from the city's western suburbs. Significant traffic delays were being experienced as a result, especially at Avalon Drive's multiple intersections during peak times, and also for vehicles attempting to enter it from local side roads and businesses. This had increased the incidence of "rat running" by drivers along local roads to try and avoid the congested Avalon Drive.

Summary assessment of project outcomes

Overall, this project has achieved its expected outcomes and benefits. The bypass has diverted state highway traffic off Avalon Drive. This has resulted in a substantial reduction in traffic volumes along Avalon Drive, which has relieved congestion and improved traffic flow in the area. The bypass is designed for free flow, high capacity travel of the state highway traffic to reduce travel times and improve trip reliability. This contrasts with the state highway's previous route along Avalon Drive, which included ten intersections and multiple access points to local businesses impeding the state highway traffic flows.

There is some queuing of traffic around the bypass's southern roundabout at peak times, which may have been influenced by traffic volume growth in recent years. This queuing should be monitored as the traffic volumes handled by the roundabout are approaching its capacity limits. However, the completion of the Hamilton portion of the Waikato Expressway is predicted to divert traffic away from the bypass.

Favourable weather conditions and effective project management contributed to the bypass being completed a year earlier than planned. This resulted in the project's final cost of \$34.85 million being nearly \$6.2 million (15%) less than its original approved funding allocation.

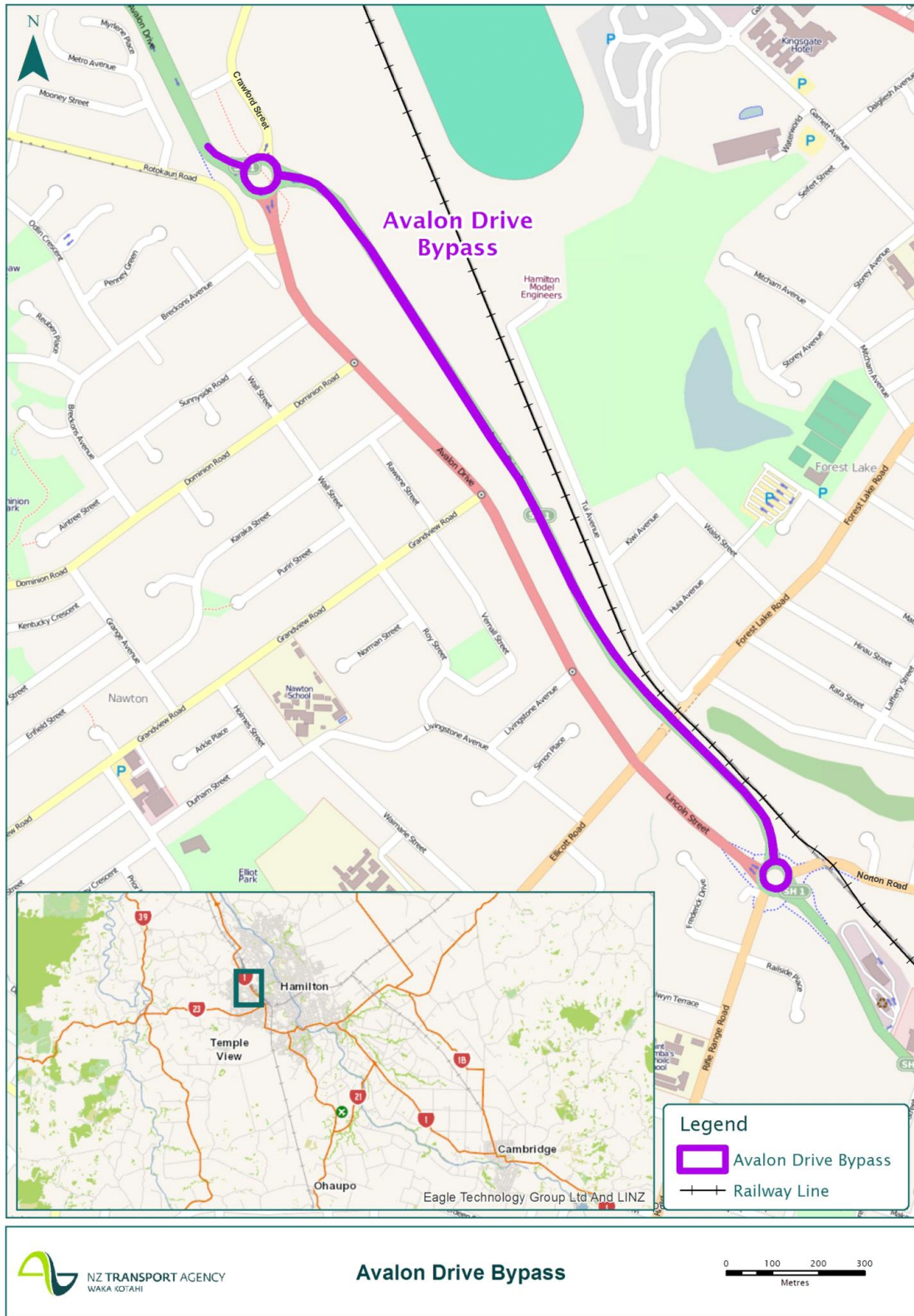
Lessons learned

Future projects of the size, scale and cost of the Avalon Drive Bypass will be required to have defined performance measures agreed with the NZ Transport Agency as a condition of funding. This will help avoid some of the difficulties this review experienced assessing the outcomes of the bypass project. This was due to the lack of some relevant baseline performance measures to clearly make "before and after" comparisons of travel times and congestion relief.

The impact of this state highway project on traffic flows and patterns on surrounding local roads demonstrates the importance of the Transport Agency and local authorities

collaborating with a “one network” approach when setting and monitoring suitable performance measures.

Figure 1: Location of Avalon Drive Bypass, Hamilton City



1. Project benefits

This project sought to improve traffic flows through Hamilton by separating inter-regional state highway traffic from internal city traffic at a congested area of the city around Avalon Drive. The new Avalon Drive Bypass was expected to carry most of the state highway through-traffic on a free-flowing high capacity route, thereby reducing traffic volumes and congestion on Avalon Drive. This was predicted to help reduce travel times, improve trip reliability, and reduce the incidence of local “rat running” along ill-suited residential streets adjacent to Avalon Drive.

In terms of the benefit cost ratio (BCR) that supported the project’s original approved funding, travel time related benefits dominated the predicted benefits. Travel time savings made up 88% of the expected benefits, with reduced vehicle operating costs contributing a further 10%. Accident cost savings and vehicle emission reduction savings each contributed one percent of the remaining predicted benefits.

Traffic volumes and congestion relief along Avalon Drive

The introduction of the Avalon Drive bypass has reduced traffic volumes and congestion along Avalon Drive, but not to the extent originally predicted. Avalon Drive was reaching capacity before the bypass’s construction, with traffic volumes approaching 30,000 vehicles per day (vpd). It was predicted that more than 65% of the existing traffic flow on Avalon Drive would be diverted onto the bypass. Hamilton City Council forecast this would reduce the volumes along Avalon Drive to around 10,000 vpd.

Available traffic count data do show significant reductions in average daily volumes along Avalon Drive.¹ But the scale of the reduction varies depending on which section of the former state highway corridor is examined. Referring to Figure 2 on page 5, which summarises average daily traffic volumes at several sites along the corridor before and after the bypass’s opening, it is seen that average daily traffic volumes on Avalon Drive immediately south of the northern roundabout of the bypass were 13,000 vpd in 2013 (see site 2 in Figure 2). This represents substantial congestion relief along the northern part of the road since the bypass was opened.

Further south on Avalon Drive and connecting Lincoln Street, the reductions of traffic volumes have been lower but still significant, falling from nearly 29,000 vehicles per day before the bypass was opened, to around 16,400 and 17,500 vpd in 2013 (see Sites 3 and 4 in Figure 2). This difference may reflect growth of internal city traffic travelling to and from the Hamilton central business district and the suburbs immediately west of Avalon Drive. A main route for this traffic flow is along Norton Road from the city, through the southern roundabout of the bypass into Lincoln Street and Avalon Drive and west along Grandview Road approximately half way along Avalon Drive. There has been strong traffic volume growth along this route in recent years. For example, Grandview Road’s average daily traffic volumes have grown from 5,300 vpd in 2008 to 6,400 vpd in 2013 (+21%; Site 7 in Figure 2). Similarly, recorded traffic volumes at the western end of Norton Road where it meets the southern roundabout connecting to both the bypass and Avalon Drive have grown from 10,800 vpd in 2008 to 13,900 vpd in 2013 (+26%; site 6 in Figure 2).

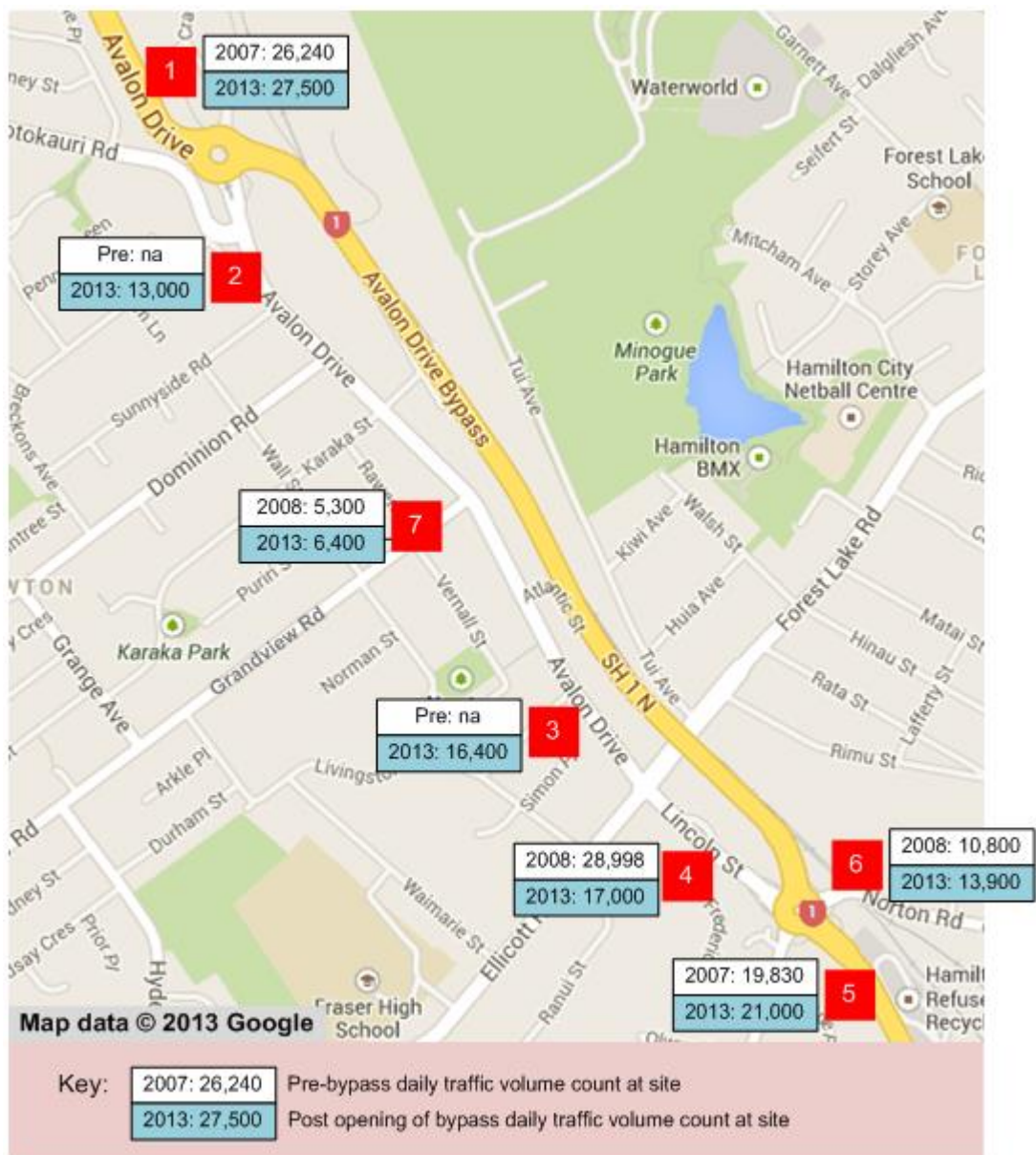
This traffic volume growth may be contributing to some limited queuing issues evident for vehicles entering the southern roundabout of the Avalon Drive bypass at peak times. Two specific traffic queuing issues sometimes occur:

¹ The traffic count data used here is from Hamilton City Council. The council derives average daily traffic volumes for each year from limited counting data. They are therefore only estimates of average daily traffic. (Most sites are counted for a seven day period once every one or two years and then adjusted using factors derived from some continuous counting sites to get an estimate of the average daily traffic for the year.) The NZ Transport Agency supplies traffic volume data for state highway sites.

- traffic queuing back along Norton Road under the rail underpass waiting to enter the roundabout, and
- delays for traffic travelling south on the bypass can sometimes back up waiting to give way to heavy volumes of traffic entering the roundabout from Lincoln Street/Avalon Drive.

This queuing at the roundabout should be monitored, especially if traffic volumes continue to grow and the flow of state highway traffic along the bypass is impeded. Currently, the dual lane design of the roundabout can cope with volumes of 35,000 vpd, but it is starting to approach its limitation. However, a lot of inter-regional state highway traffic is expected to transfer onto the Hamilton section of the Waikato Expressway once it is completed. This is predicted to reduce traffic demand on the bypass.

Figure 2: Comparison of traffic volume counts at selected sites before and after completion of the Avalon Drive Bypass



Traffic volumes along the Avalon Drive Bypass

Traffic volumes recorded immediately north of the northern roundabout connecting the bypass and Avalon Drive (Site 1 in Figure 2) show that traffic volumes grew from 26,240 vehicles per day in 2007 to 27,500 in 2013 (up 5%).² Taken in conjunction with the observed reduction in traffic volume along Avalon Drive, this indicates the bypass has helped divert inter-regional traffic onto the bypass as planned.

Safety outcomes

Predicted accident cost savings only accounted for one percent of the expected benefits of this project. But pre- and post-project completion crashes were still analysed to ensure that the project had not introduced safety concerns.

Between 2003 and 2007 before the bypass opened, there was an average of 8.4 injury crashes per year along Avalon Drive. Over 2009 to 2012 after the bypass was opened, the injury crash rate per year on Avalon Drive and the bypass combined dropped to 6.3. This is in line with trends within Hamilton City, where injury crashes have generally reduced in recent years.

There were 179 recorded crashes along Avalon Drive between 2003 and 2007, when it was still the State Highway 1 route. These were made up of 42 injury and 137 non-injury crashes.³ The most significant crash types were rear end/obstruction (45%), and crossing/turning (34%). This reflects the high traffic volumes travelling along Avalon Drive and entering and leaving it from its multiple intersections, side roads, and local businesses.

There has been a reduction in recorded crashes since the bypass was opened, with 123 recorded between 2009 and 2012 in Avalon Drive and the Avalon Drive Bypass combined. Crossing/turning crash types along Avalon Drive remains a common cause of these recorded crashes (48% of the total) along with rear/obstruction (25%). There have been very few crashes recorded on the bypass since it opened.

The southern roundabout of the bypass which connects it to Avalon Drive, Norton Road, and Rifle Range Road has had a relatively high level of recorded crashes. Between 2009 and 2012, 34 crashes have been recorded, all low severity (minor injury or non-injury). The high traffic volumes carried by this roundabout appear to have influenced the incidence of crashes at it. In particular, the queuing at peak times of traffic entering the roundabout from Norton Road have contributed to ten crashes being recorded at this site between 2009 and 2012.

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

Project scope

There were no major scope changes to this project. Overall, cost/scope adjustments were dominated by a returning of surpluses due to the project tracking and being completed ahead of schedule. Total cost/scope adjustments reduced the total project cost by nearly \$6.2 million.

² The traffic counts at this site have stayed relatively stable on average each year since 2010 at around 27,500 vehicles per day.

³ Caution should be used when interpreting minor injury or non-injury crash rates, as reporting and recording of these crash types is highly variable.

Project cost and timeframe

The total final construction cost for the project was \$34.85 million, \$6.15 million (15%) less than its original funding allocation of \$41.00 million.

The main driver of the saving in construction costs was the project being completed well ahead of schedule. Construction started in February 2007 and had been approved to be completed by late October 2009. Instead, the bypass was opened a year ahead of schedule in late October 2008. Some remedial work was required on the road surface and this was completed in September 2009.

Contributing factors for early project completion that were identified in this review and an earlier Contract Management Review included:

- a comprehensive delivery programme was used well;
- there was strong quality assessment checks on construction and materials;
- an effective environmental management plan was used to deal with environmental issues;
- there was evidently an effective working relationship between the contract parties, and active consultation with key stakeholders to help quickly resolve any construction or contract issues; and
- earthworks for the project were accelerated by good weather conditions over the summer months.

Figure 3 summarises the difference between estimated and actual cost and completion dates for this project.

Figure 3: Project cost and timeframe comparisons

	Approved/estimated at start of project	Actual result	Variance
Practical completion date	29 October 2009	18 October 2008	-54 weeks
Total project construction cost	\$41,000,000	\$34,847,723	-\$6,152,277 (-15%)

3. Lessons learned

Performance measures for assessing and monitoring project outcomes

A lack of both relevant baseline measures in project documentation and suitable monitoring of data impeded how well the predicted benefits and outcomes for this project could be assessed. In particular, the following two shortcomings were identified with this review:

1. Baseline measures of travel times along the pre-bypass State Highway 1 corridor that was replaced by the bypass (i.e. Avalon Drive/Lincoln Street) were unavailable. These would have been useful for:
 - a. comparing travel times along Avalon Drive after the bypass was opened to better evaluate the reduction of traffic delays and improved traffic flows; and

- b. examining travel times on the bypass to help assess reduction in delays for inter-regional State Highway 1 traffic travelling through Hamilton.
2. Three residential streets in the area immediately west of Avalon Drive were identified in a supporting report for the bypass project to be suffering from high volumes of traffic “rat running” to avoid congestion and delays in Avalon Drive. Traffic volume data was also unavailable for these streets, except for a statement that they were estimated to be carrying up to 15,000 vpd more traffic than their design and purpose. Monitoring traffic volumes on these streets before and after the opening of the bypass would have been a relatively simple way to assess the effectiveness of the project in tackling this rat running problem.

The NZ Transport Agency introduced a new performance measure requirement in March 2013. This will help improve the assessment of the outcomes of future projects and how well they achieve their predicted benefits. The requirement applies for all improvement activities approved since 1 July 2012 costing \$10 million or more. These projects will need to have agreed performance measures and targets set as a condition of funding. Some other improvement activities of lesser value may also be nominated by Transport Agency staff to provide performance measures.⁴

This Avalon Drive Bypass is a good example of a project requiring a “one network” approach, with collaboration between NZ Transport Agency (Highways & Network Operations Group) and local authorities for effective performance monitoring. Although it was a Transport Agency state highway project, many of the main expected project benefits were expected to affect the local road network (such as improved traffic flows and removal of rat running problems).

4. Waikato Highways & Network Operation’s response to findings

Waikato Highways & Network Operations were invited to provide their response to the findings of this post implementation review. Specific comments were provided by a Project Manager involved in the project, as follows:

- I am not aware of any data that we have to support the before and after travel time savings as this was not specifically documented at the scheme stage of the project. The economics were developed based on a network model, so I don’t recall actual travel time savings along Avalon Drive being determined or stated in any documents.
- One issue the reviewer has not picked up on, is the release of latent demand as a result of removing traffic off Avalon Drive onto the Bypass route. There were many vehicles rat running through local streets due to the difficulty in accessing Avalon Drive. When the through traffic was removed, these vehicles came back to Avalon Drive via the many side roads. This was an objective of the project, and was captured in the economic assessment. However, I doubt it was readily accounted for when observations were being made by Hamilton City Council or NZTA about the potential percentage of traffic diversion to the bypass. This is one of the reasons that the volume of traffic on Avalon Drive may be higher than the NZTA reviewer expected.

⁴ Further information of this performance measures requirement can be found in NZ Transport Agency General Circular N° 13/02, *Performance Measures of NZTA Investments*, available on the NZ Transport Agency website.