

Post Implementation Review

SH20 Mount Roskill Extension

Auckland Highways and Network Operations



May 2014

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 Mount Roskill project extended the SH20 motorway in Auckland City from Queenstown Road to Maoro Street. This project is part of the strategy to develop a continuous alternative western route between SH1 and SH16 for traffic currently using the southern motorway (SH1) and the local road network. Figure 1 on page 3 shows the extent of project works.

Summary assessment of project outcomes

This Post Implementation Review found the project achieved its primary objective to reduce SH20 travel times. However, it should be noted that the full extent of the project's predicted outcomes will not be realised until the Waterview Connection is opened in 2017. The travel time improvement and other project outcomes are summarised below and discussed in more detail in *Section 1: Project Benefits* of this report:

- The travel time on the section of SH20 between Queenstown Road and Hillsborough Road reduced by 21% following the project opening.
- Recorded traffic volumes, between Queenstown Road and Sandringham Road, were 9% less than forecast in 2011.
- Post-implementation traffic levels on local roads were substantially (21 percent) higher than forecast. As a consequence, only limited traffic relief (6 percent) was achieved on the local network.
- The project resulted in a significant reduction in crashes in the immediate area affected by the project.
- Potential bus priority measures were identified in the project funding application but to date, none have yet been implemented. Land was also reserved for rail corridor purposes, but although provision for rail was made at some bridge structures, Kiwirail still does not have plans to develop the corridor.

Project delivery and cost

The project was delivered at a cost of \$227 million, 22 percent higher than the \$186 million estimate at the time of funding approval in 2005. The additional costs were mainly due to the project being completed a year later than planned due to a need to undertake additional legislative and consultation procedures.

Lessons learned

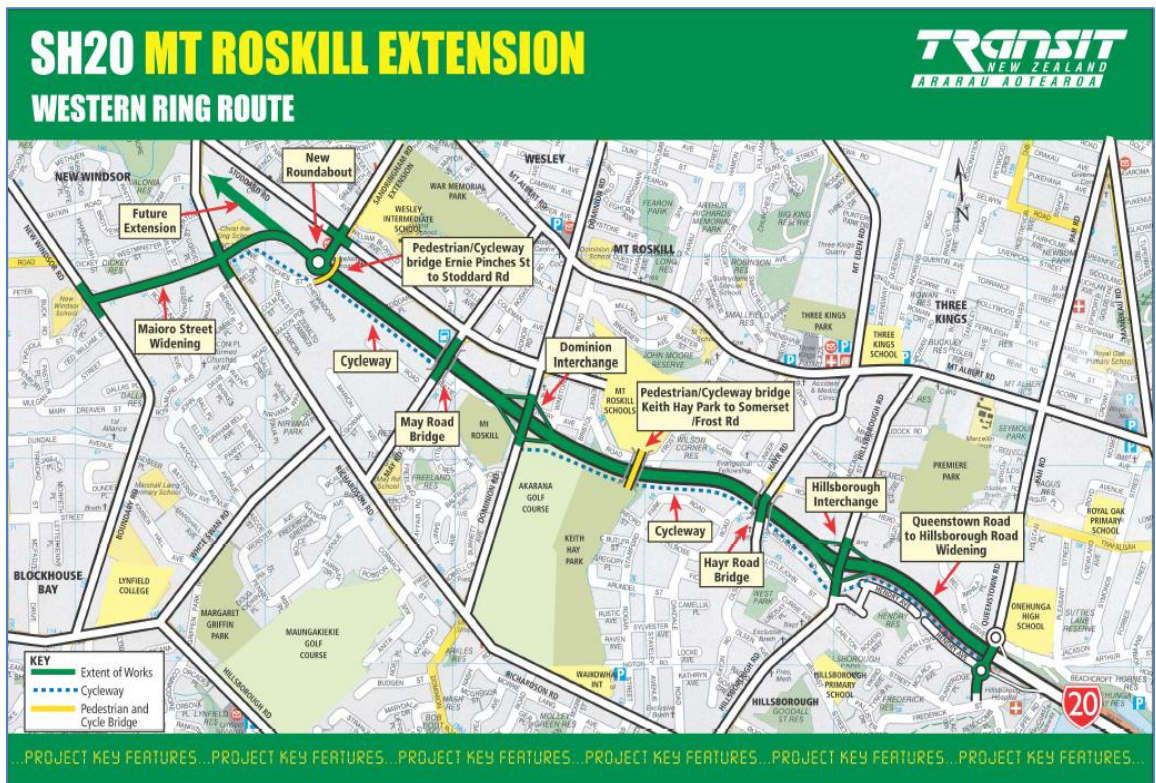
Lessons with relevance for other future projects are listed below and discussed in more detail in *Section 4: Lessons Learned* of this report:

- Responses to difficulties experienced during project implementation proved useful in improving procedures on subsequent major road projects.
- More accurate tender information would have improved the accuracy of the original cost estimate and have reduced the risk of cost escalation during construction.
- Better integration of the different aspects of consultancy and contractor work would have saved time and money.
- If commitments are made at the time of funding to monitor outcomes, these should be fulfilled.

Recommendation

We recommend that HNO reviews its systems to ensure that all commitments relating to future projects are fulfilled.

Figure 1: Mount Roskill Extension project plan



Sourced from NZ Transport Agency project files

Figure 2: Mount Roskill Extension project location



Sourced from NZ Transport Agency project files

1. Project benefits

The project extended the SH20 motorway by 4.5 km and reconstructed several intersections to increase the capacity of the road network in the Mount Roskill area. The main project objectives were to reduce SH20 travel times and to reduce traffic levels on alternative routes.

The primary benefits of the project in the economic evaluation were: travel time savings 99.34 percent; improved safety 0.51 percent; vehicle operating cost savings 0.14 percent; and reduced emissions 0.01 percent.

Accuracy of forecasts

Recorded post-implementation SH20 traffic volumes in 2011 between Queenstown Road and Sandringham Road were nine percent less than forecast. However, subsequent recorded traffic growth rates between 2011 and 2013 were greater than forecast. In this context, SH20 forecast accuracy can be regarded as reasonable. It should also be noted that these forecasts were reliant on the Auckland Regional Transport model and no detailed project traffic model was developed.

Local road traffic volume data is more sporadic and not always available for the same year as the forecast year (2011). An analysis of five locations - Richardson Road, Hayr Road, Maioro Street and Hillsborough Road (two sections, to the north and south of Richardson Road) - shows that:

- Post implementation traffic levels on local roads were 21 percent higher than forecast for 2011.
- As a consequence of this, limited traffic relief (6 per cent) was achieved on the local network (project forecast 22 percent traffic reduction).

The overall post-implementation pattern of traffic effects is therefore: less traffic on SH20 than forecast, more traffic on local roads than forecast and therefore less traffic relief from the project than expected. Traffic growth rates in the immediate vicinity of the project have been in the order of 5 percent p.a. between 2004 and 2011. This is higher than the background (Auckland-wide) growth rate over the same period of approximately 2.5 percent p.a.

These differences are likely to have arisen through the reliance on strategic modelling rather than developing a more detailed project traffic model with better local representation of travel patterns and capacities.

Travel times

Travel time information has to be considered in conjunction with the contiguous Manukau Harbour Crossing project, whose construction period overlapped with the Mount Roskill Extension by approximately 10 months. Completion of the State Highways 20 to 1 Manukau Extension project also post-dated the opening of the Mt Roskill Extension by 15 months.

Apart from very general 'level of service' forecasts, specific travel time information and associated forecasts were not identified either in the project Scheme Assessment Report or any other materials available for this review.

The Auckland Travel Time Surveys (NZ Transport Agency) 2004 to 2011 for SH20 between Queenstown Road and Hillsborough Road show that travel time reduced by 21 percent as a result of the project. This is based on the average of morning and afternoon periods for weekday surveys. The average saving is nearly 1 minute (57.4 seconds) per vehicle.

Post-implementation average peak period post-opening (2011) speeds between Queenstown Road and Sandringham Road were recorded as 94 km/h, compared to the design speed and speed limit of 100km/h.

Site observations during the review generally confirmed the primary Auckland Travel Time Survey data. During some short periods of heavy flow, lower speeds (down to 80 km/h) were observed on the section of SH20 between Hillsborough and Queenstown Road.

Public transport

Improvements in public transport reliability and reductions in bus travel times were forecast but no bus monitoring data was available for the review. Although Auckland HNO currently collects very good data on bus travel times and reliability, they do not have similar 'before' data for the network affected by the project.

Originally it was stated the project would make provision for three metre shoulders that could be used as bus lanes. This was confirmed in the funding board paper, where it stated that, the aims of Transit New Zealand, Auckland City Council and Auckland Regional Council for this project summary include *"to not compromise the ability to develop the existing rail designation and must include provision for dedicated bus lanes"*.¹

However, shoulder lanes are currently of variable width or absent at some points, which are constraints to achieve appropriate design standards for merges, diverges and traffic lanes. Also, a relatively low number of buses currently use this section of the network. As a consequence, no bus priority measures have been introduced.

Walking and cycling

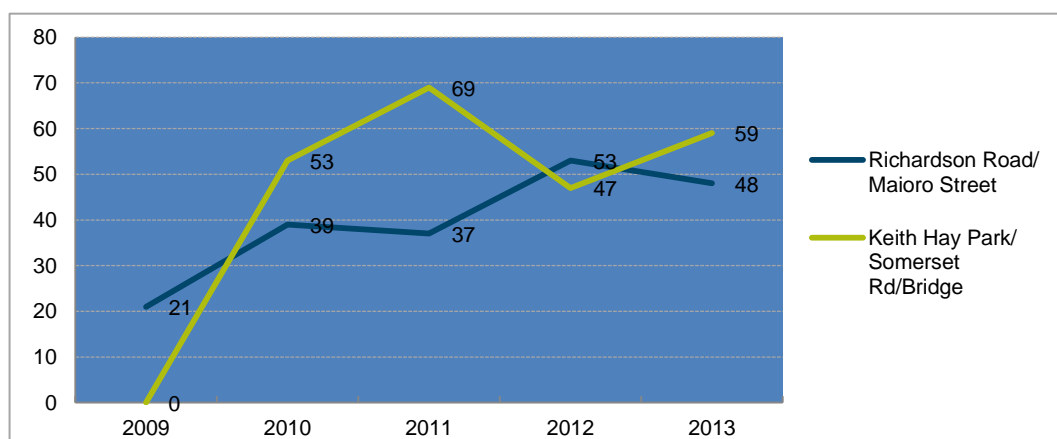
Walking and cycling benefits were not the key purpose of the project, but were included to provide multi-modal options to users. The facilities that were provided appear to be well used.

Pedestrian facilities are located on the local road bridge crossings at Maioro Street, May Road, Dominion Road, Hayr Road, Hillsborough Road and Queenstown Road.

Off-road footpaths and cycle paths were provided parallel and to the south of the motorway, from Queenstown Road to Dominion Road and from May Road to Maioro Street.

Figure 3 below shows cyclist count data after completion (2009) of the cycle paths provided on two locations: Richardson Road/Maioro Street and Keith Hay Park/Somerset Road/Bridge routes. Over the last four years, Richardson Road/Maioro Street had an annual average of 44 daily cycle counts, while Keith Hay Park/Somerset Road/Bridge had 57 daily cyclist movements.

Figure 3: Cycle Counts 2009-2013



¹ Mt. Roskill Extension construction funding board paper, 24 June 2004

Safety

An examination of the Crash Analysis System database in terms of total recorded crashes indicates the project area experienced a reduction in annual crash rate of 25 percent (see figure 4 below). Over the same period, the region-wide crash rate fell by 9 percent. The project area crash reduction is statistically significant when compared with background trends. As the project was not a safety initiative, we did not analyse the safety findings further. We are satisfied that the project has not created safety issues.

Figure 4: Record of Crashes

| | Total Recorded Crashes | | | Change |
|--|--|--|--|--------|
| | Before Period (Jan 1991 – Dec 1995) | Between Period (Jan 1996 – Aug 2005) | Actual after period (Jan 2009 – Mar 2014) | |
| | <i>5 years</i> | <i>9 years 8 months</i> | <i>4 years 9 months</i> | |
| Project Area (crash totals) | 2,165 | 4,948 | 1,728 | |
| Project Area (crash type) | 9 fatal, 80 serious, 382 minor, 1,694 non-injury | 14 fatal, 134 serious, 661 minor, 4,139 non-injury | 5 fatal, 43 serious, 342 minor, 1,338 non-injury | |
| Project Area (crashes p.a.) | 427 | 512 | 364 | -25% |
| Region (crashes p.a.) | 12,435 | 13,092 | 11,745 | -9% |

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

Project scope

The Mount Roskill project extended the SH20 motorway by 4.5km from Queenstown Road to Hillsborough Road. The Mount Roskill Extension project consisted of the following:

- Extension of SH20 to provide two continuous traffic lanes in each direction between Hillsborough Road and Richardson Road, with an additional auxiliary lane on most sections for climbing, merging or diverging purposes.
- Development of grade separated interchanges at Hillsborough Road and Dominion Road
- Improved road connections to Maioro Street (interim roundabout solution at Sandringham Road)
- Local road crossings at Maioro Street, May Road, Dominion Road, Hayr Road and Hillsborough Road
- Dedicated pedestrian/cycleway bridges across the motorway at Ernie Pinches Street and Keith Hay Park

- Cycleway to the south of and parallel to the project
- Land reservation for future rail corridor purposes
- Allowance for potential bus priority measures on (some) motorway shoulders
- Ramp metering at all access points.²

This project is part of a strategy to develop a continuous alternative western route between SH1 and SH16 for strategic traffic currently using the southern motorway (SH1) and the local road network. An overall network plan is shown in figure 2 on page 4.

Other major projects closely associated with the Mount Roskill project include:

- Manukau Harbour Crossing project (completed 2010) and post implementation review PIR completed in 2014,
- Manukau Extension connection to SH1 (completed 2010) and post implementation review scheduled for 2015, and
- Waterview Connection project (estimated completion in 2017).

The construction period for the Mount Roskill Extension partly overlapped with the construction periods for the Manukau Extension and Manukau Harbour Crossing projects.

An associated Auckland Transport local road scheme, the 'Tiverton Wolverson Upgrade', was complementary to the Mount Roskill Extension Project. This upgrade provided increased capacity on Maioro Street between the northern termination of SH20 and New Windsor Road. The first phase of the upgrade was completed in 2007 and the scheme was fully completed in 2014. However, this local road improvement was not a component of this review.

At the time of the funding approval, it was reported to the Transfund Board that Transit, along with Auckland City Council and Auckland Regional Council, made commitments to develop performance measures and intervention plans to sustain the benefits of the Mount Roskill Extension project. This was documented in the 'Joint Response to Conditions of Funding.'

Monitoring was proposed to quantify congestion relief, travel time variations, the timing of free-flow conditions and changes in person carrying capacity. Possible indicators included:

- Queue length and duration
- Speed (on local arterials and the motorway)
- Travel time
- Impact of incidents
- Vehicle occupancy
- Vehicle flows
- Bus frequency
- Bus patronage
- Cyclist demand.

In view of these commitments, Transfund decided not to impose any formal conditions of funding relating to monitoring or intervention plans. Following this approval, the indicators were to have been developed and refined further along with the processes, times and locations for data collection which were to be incorporated into a 'Final Operations Document.'

However, this review identified no material to show any further action or follow-up reporting was taken to implement the commitments made. Project specific post-implementation monitoring has not been done. Furthermore, no one currently associated with the project appears to have been aware of the original commitments made with respect to monitoring and intervention plan development. The fact that all of the original organisations involved in the original funding application no longer exist should not be taken as an excuse for

² This was a late addition which was paid for separately.

inaction as successor bodies have inherited the respective responsibilities and duties involved. The responsibility for not following through on the planned monitoring lies primarily with the applicant for funding (Transit, subsequently NZTA HNO) who made the original commitment. However, it also has to be acknowledged that there have been shortcomings in oversight by the funding organisation (Transfund, subsequently Land Transport NZ and the Transport Agency P&I).

Project cost and timeframe

The project was delivered at a cost of \$227 million, which was 22 percent more than the \$186 million estimate immediately before construction began in 2005, as shown in figure 5 below.

The main reasons for increases were unforeseen ground conditions, associated earthworks, other items not fully specified or considered in the original tendering process and consent requirements.

The project was completed between October 2005 and April 2009, a year later than originally forecast. The main reason for the delay was the need to undertake additional volcanic cone consent procedures.

Figure 5: Budgeted and actual cost comparison

| Description of cost | Date | Project cost |
|---|------------|--------------------------|
| Project cost estimate when funding approved | April 2005 | \$186,000,000 |
| Actual cost at project completion | April 2009 | \$227,000,000 |
| Variance (over budget) | | +\$41,000,000 +22.04% |

3. Good practice identified

A number of good practice aspects were identified:

- In response to problems encountered over the course of the project, closer team relationships were developed and team co-ordination was improved to assist with project delivery.
- The design process was responsive to assessments and consultations undertaken. Significant adjustments were made to the preferred design in order to minimise impact on the Mount Roskill volcanic cone.
- Auckland Highways and Network Operations worked closely with Auckland Council. This resulted in the first stage of the Tiverton - Wolverson Upgrade project being implemented ahead of Mount Roskill Extension opening, to provide increased capacity at the termination of the project at Maoro Street, where traffic flows were forecast to increase substantially.
- Although this was a major roading project, corridor planning was undertaken in a multi-modal context. In particular, efforts were made to integrate the proposed works with potential bus and rail networks in conjunction with the PT authority, Auckland Regional Council and the rail authority.

- Improvements were made in terms of team co-ordination and project delivery methods, over the course of the project implementation period, in response to difficulties experienced.

4. Lessons learned

Lessons with relevance for other future projects were identified as follows:

Improvement in planning and procurement methods

Responses to difficulties experienced during project implementation proved useful in improving procedures on subsequent major road projects. In particular, improvements to planning and procurement methods were made and more emphasis placed on integrating project implementation teams on subsequent major road projects.

Need for a more accurate original cost estimate

Outturn project costs were significantly higher than the originally approved budget. The reasons for the outturn cost rising by 22 percent were: consent problems, difficult ground conditions and earthwork issues, which were not fully considered or foreseen at the time of project tendering.

The Lessons Learnt Review (LLR) in August 2009 acknowledged that more thorough investigations and more accurate tender information would have improved the accuracy of the original cost estimate and have reduced the risk of cost escalation on the project during construction.

Integration of the different aspects of consultancy/contractor work

The project was delivered approximately 12 months behind the originally estimated timescale. This was mainly due to consent delays although there were also delays due to design and contract variations during the course of the project and difficulties in obtaining approvals for these variations.

HNO's Lessons Learnt Review (LLR) recognised the need for better integration of the different aspects of consultancy and contractor work, including linkages between quantity surveying and the design team. The need for better co-ordination with local/service authorities was also identified in the LLR, along with the need for better risk assessment techniques.

Development of performance measures and monitoring plans

At the time of the final funding approval in June 2006, it was reported to the Transfund Board that the applicant for funding (Transit), along with Auckland City Council and Auckland Regional Council, had made commitments to develop performance measures and intervention plans to sustain the benefits of the Mount Roskill Extension project (Joint Response to Conditions of Funding, May 2004).

In view of these commitments, no specific funding conditions with respect to monitoring were imposed by Transfund. However, no material has been identified by this review that indicates any further action was taken to implement the commitments to develop performance measures, and associated monitoring programmes and intervention plans. Missing performance indicators include: queues, local road volumes and travel times, vehicle occupancies, bus patronage and cycle demand data.

5. Recommendation

This post implementation review recommends that HNO reviews its systems to ensure that all commitments relating to future projects are fulfilled.

6. Auckland Highways and Network Operations' response to findings

Auckland Highways & Network Operations indicated they were comfortable with the findings of this review. Specific comments were received from a Project Manager for the project, with minor amendments made to the report as a result.