

# Post Implementation Review

## Bell Block Bypass

### Taranaki Highways and Network Operations



June 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 bypass project is located in State Highway 3 in the township of Bell Block, about 5km north east of the city of New Plymouth.

The main objective of this bypass project was to separate the state highway traffic from the urban area Bell Block.

### Summary assessment of project outcomes

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Overall, this Post Implementation Review (PIR) found that the Bell Block bypass project has achieved its objectives of improving the efficiency and travel times in the area. The opening of the new bypass eased congestion by separating local and highway traffic, and provided an interchange with direct access to the Bell Block township and a local industrial area.

The project has also helped improve safety. Crash rates for both injury crashes and all crashes reduced significantly since the opening of the project.

Project outcomes included a new highway bridge, two new underpasses, resurfacing and pavement works, and the relocation of utility services.

### Project delivery and cost

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The Bell Bypass project was completed within expected time frame. Project construction started in January 2007 and the new road was opened to traffic in March 2010, three months earlier than its expected completion of 15 June 2010.

Approved funded cost was \$23 million. The final out turn cost came in slightly under budget at \$22.8 million resulting from earlier completion of the project.

### Good practice identified

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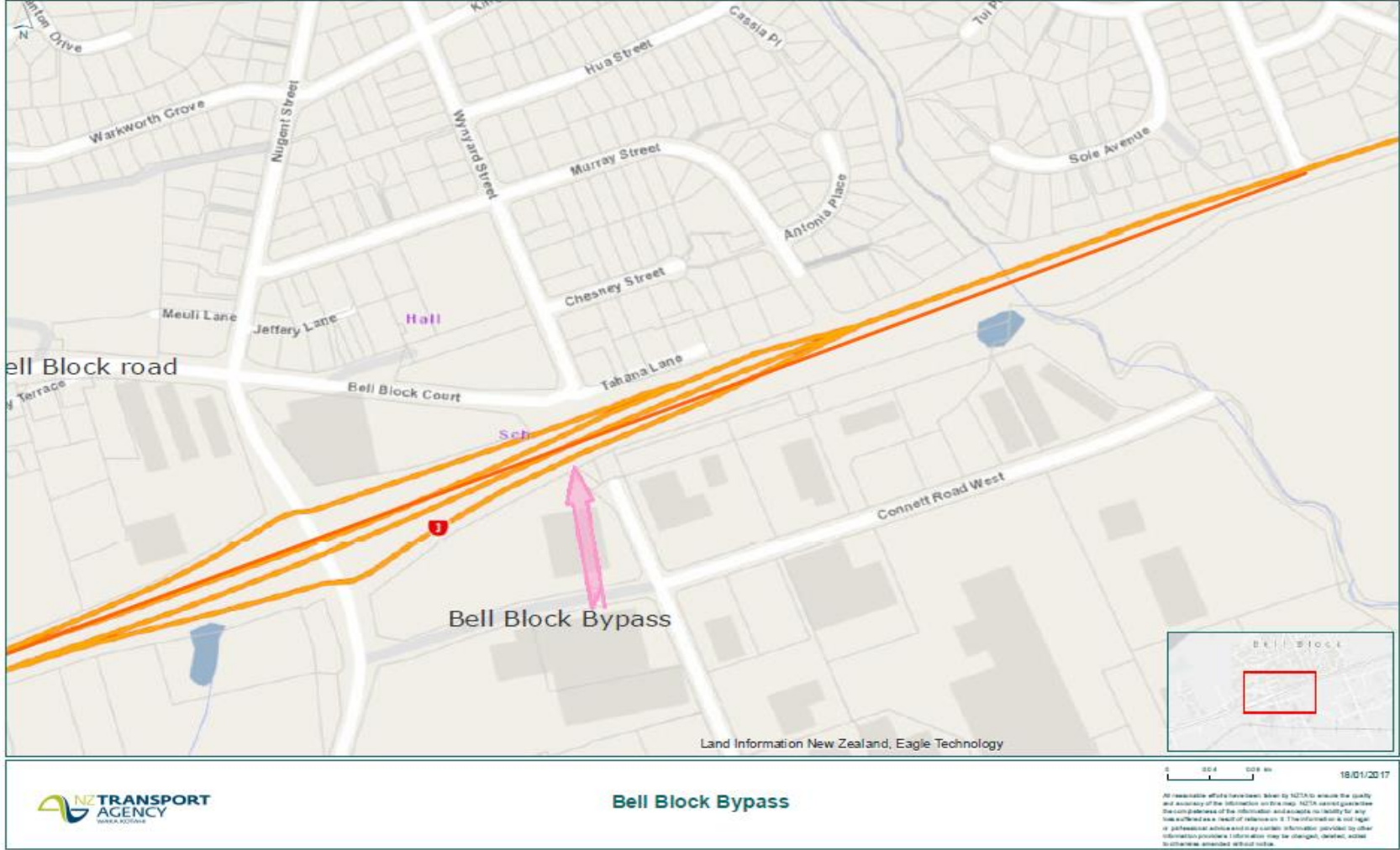
A good practice was identified in the delivery of this project. Items of value found during the excavation were offered back to the local iwi and a Māori stone has been put on permanent display on the corner of Devon and Smart roads demonstrating good cultural sensitivity.

### Lessons learned

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A lesson learned with relevance for other future projects is that, pre-project traffic surveys or monitoring report would have been beneficial for a more effective assessment of the project's success or failure.

Figure 1: Location of the Bell Block Bypass project



# 1. Project benefits

## Project description and objectives

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The Bell Block bypass project is located on State Highway 3, about 5km north east of the city of New Plymouth.

The new state highway alignment aimed to:

- separate the state highway traffic from the urban areas of Bell Block to help prevent accidents caused by crossing and turning vehicles
- implement well-defined access control at the Egmont Road and Henwood Road interchange
- provide two lanes in each direction separated by a median barrier

Key expected benefits included: travel time savings 66%, accident cost savings 30% and vehicle operating cost savings 4%.

## The bypass has successfully reduced travel times ...

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Travel time savings was a main expected benefit of the bypass project. They accounted for 66% of monetised benefits in the economic evaluation supporting the project's funding, with the travel-time derived benefit of reduced vehicle operating costs contributing an additional 4.2% to the total predicted benefits.

The main feature of the project expected to contribute to reduced travel times were bypassing the Bell Block settlement with a 100km/h state highway with limited access (including the grade separated interchange at Bell Block itself), removing the previous need to lower the stage highway speed limit to 50km/h through the settlement.

No specific post-implementation monitoring data was available to confirm the scale of changes in travel times or reliability either before or after project implementation.

This review used historical traffic data from the TomTom Traffic Stats database to evaluate the project's travel time outcomes. The database is a collection of anonymised floating car data taken from TomTom navigation devices, in-dash systems, and apps. An estimation process was used as a relatively crude indicator of pre-bypass travel times. A more detailed commentary on the travel time estimation performed for this review is provided in the Appendix.

## Summary travel time results

**Figure 1: Travelling northbound on SH3 from Egmont Road to Airport Drive**

	Distance (km)	Travel time (min.sec)	Average speeds (km/h)
Before bypass (previous SH3 route through Bell Block) average travel time [using estimation as detailed in the appendix]			
2007/08	4.39	4.54	
After bypass opening – average travel times [using all times of day average)			
Jul–Dec 2010	4.22	3.04	
2011		2.48	86
2012		2.48	87
2013		2.50	82
2014		3.00	77
2015		3:08	76

Source: TomTom Traffic Stats [and estimation for before bypass described above]

Referring to the table above, it can be concluded that the project has successfully improved average travel times as a result of SH3 bypassing Bell Block. There has been some modest erosion of travel time savings since 2014, reflecting a reduction in average speeds along the route. The reason for this could not be determined.

### **... and reduced crashes to improve local safety**

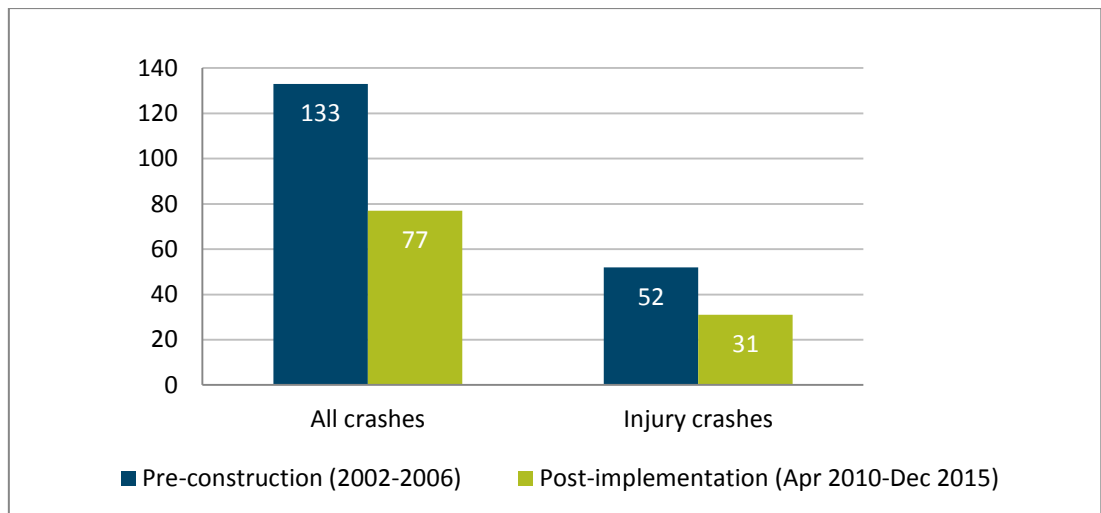
Accident cost savings made up 27.8% of the predicted monetised benefits in the economic evaluation supporting the project's funding.

Overall, improved safety benefits from the project have been achieved. As evident from figure 2 below, both injury crashes and all crashes (which also includes non-injury crashes) are more than 40% lower since the bypass opened compared with the five years before its construction began.

The new alignment provided two lanes in each direction separated by a median barrier eliminating the occurrence of head on crashes and incidents of crossing/turning accidents in the area.

The injury crash rate (crashes per year) nearly halved from 10.4 in 2002–2006 to 5.4 in April 2010–Dec 2015. Over the same period, the all crashes crash rate also halved from 26.6 to 13.4.

**Figure 2: Comparison of recorded crashes Bell Block before and after bypass**



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

The reduction in both injury and all crashes is statistically significant using the Poisson distribution with 90% confidence. This statistical significance means it can be concluded with a high level of confidence that the observed reduction in crashes has been the result of the safety interventions made by the project and not just reflective of random fluctuations in the crash rate – which has a tendency to happen with crashes due to the randomness and variety of factors which can cause them.

The observed crash reduction was trend adjusted using all state highway crashes within New Plymouth District as a control group. This was done to test if wider trends or movements in crash incidence in the region might have driven/influenced the observed reduction at Bell Block. This did reduce the expected number of crashes based on pre-project crash history from 60 to 51 – indicating that wider regional trends with less crashes did play a part in the reduction in crashes at Bell Block. But the Bell Block crash reduction is still statistically significant at 90% confidence meaning we can conclude that the project’s safety interventions were a primary influence on improved safety at its location.

More detailed commentary on the crash analysis performed for this review is provided in the Appendix.

### Project cost and timeframe

The Bell Bypass project was completed within expected time frame. Project construction started in January 2007 and the new road was opened to traffic in March 2010, three months earlier than its expected completion of 15 June 2010.

The total project cost estimate was \$23 million. The final out turn cost was \$22,803,452, slightly under budget by \$196,548, resulting from earlier completion of the project.

**Figure 3: Breakdown of cost**

Description of cost	Date	Project cost
Project cost at approval		\$23,000,000
Actual project cost at completion		\$22,803,452
Under budget		(\$196,548)

## **2. Good practice identified**

A good practice was identified in the delivery of this project. Items of value found during the excavation were offered back to the local iwi and a Māori stone has been put on permanent display on the corner of Devon and Smart roads demonstrating good cultural sensitivity.

## **3. Lessons learned**

A lesson learned with relevance for other future projects is that, pre-project traffic surveys or monitoring report would have been beneficial for a more effective assessment of the project's success or failure.

## **4. Taranaki Highways and Network Operations' response to findings**

In the absence of a relevant project manager, this report was provided to the Palmerston North Highway Manager for comment on the findings. He was satisfied with the report and no comments were made about this review.



## Appendix: Detailed crash analysis

This appendix provides more detail about the crash analysis summarised in Section 1 which was used to assess how well the Bell Block project achieved its predicted safety benefits.

### Crash analysis coverage

It is preferable with analysis of crashes before and after a project to focus on high severity (fatal and serious) crashes. However, there were too few of these at Ohingaiti–Makohine to enable significant conclusions to be made. Therefore, all crashes were analysed.<sup>1</sup>

Information on the crash history analysis originally done to support the project's application for funding was unavailable for this review. It was therefore not known what years were used to build the monetised benefits for crash cost savings. Typically a five year period of crash history is used, with the post implementation review crash analysis extending this to also include crash history up to the start of project construction. In this case, a five year crash history from 2002 to 2006 was used instead to compare post project crash history. The post-project crash history was taken from April 2011 to December 2015.

Crashes from the construction period January 2007 to March 2010 were excluded from the crash analysis as construction activity can disrupt crash factors and types.

Two crash datasets were used:

- Crashes along State Highway 3 from Egmont Street to Airport Drive – a distance of approximately just over 4.2km.
- Crashes on state highways within the New Plymouth District were used as a control group to assess the potential effect of wider regional crash or reporting trends on the observed number of crashes on the studied section of State Highway 3 by Bell Block.

### Crashes along State Highway 3 at Bell Block

Figure A1 summarises the analysis of *all crashes* at the Bell Block location covered by the crash analysis.

On the basis of the crash history in the five years before project construction started, it was estimated that 60 crashes could have been expected in the post construction period between April 2010 and December 2015. The actual result of 31 crashes is therefore a substantial reduction on the expected number, which is statistically significant at 90% confidence using the Poisson distribution.<sup>2</sup> This means that it can be concluded that the reduction in crashes were very likely an outcome of improved safety from the state highway bypassing Bells Block rather than the result of chance variation in the underlying crash rate.

To test whether the observed reduction in crashes at the site area might have been reflective of wider trends in crash rates, the results were trend adjusted using a control group of all state highway crashes in New Plymouth District. It is evident that wider downward trends with crash incidence in the district have contributed to the improved safety evident at Bell Block – adjusting for wider trends lowers the predicted number of crashes from 60 to 51. However, despite this influence, the crash reduction at Bell Block is still statistically significant.

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<sup>1</sup> All crashes include recorded fatal, serious, minor injury, and non-injury crashes.

<sup>2</sup> Due to the chance nature of their occurrence, crashes tend to vary randomly over time in a way which is best represented by the Poisson distribution. This distribution applies when a relatively small number of uncommon independent events occur over a set time period.



**Figure A1: All crashes analysis table**

	Before period (2002– 2006)	After period (April 2010 – December 2015)	Crashes expected in after period
	5 years	5 years, 9 months	
Bell Block site crashes	52	31	60
Crash rate (crashes per year)	10.4	5.4	
Bell Block crashes trend corrected using control group of state highway crashes in New Plymouth District			51