NZ TRANSPORT AGENCY
WAKA KOTAHI

Post Implementation Review

Albany Highway Upgrade

Auckland Transport

June 2018

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

The Albany Highway Upgrade sought to improve journey times and encourage more sustainable modes of travel. Notably the project included new transit lanes to provide additional capacity and encourage car-pooling, as well as improvements to walking and cycling facilities. The project was delivered within budget and well ahead of schedule.

Figure 1 on the following page highlights the project's location and key physical work inclusions.

Changes to project scope occurred during project delivery…

Project documentation assessed transit lane options (T2 versus T3) and concluded that a T3 lane would best meet the intent of the project; the Transport Agency concurred with this assessment and approved funding on the basis of T3 lanes. Auckland Transport revised the transit lane to a T2 during the construction phase without any formal change process involving the Transport Agency.

Despite being a Transport Agency condition of funding, no data was collected to monitor project performance; as such, it is not possible to conclude whether the project successfully influenced travel behaviour.

We have not assessed whether there was merit in either of the notable project scope changes, but have made recommendations to help improve visibility of such changes in future (these are detailed in Section 2).

… journey times better than expected but worse than those pre-construction…

While the journey time savings achieved are greater than those originally envisaged, they have eroded quickly and journey times are already worse than they were four years ago in 2014. Delay induced by signalising intersections and/or possible downstream congestion is likely to be largely responsible for this finding.

… good practice identified

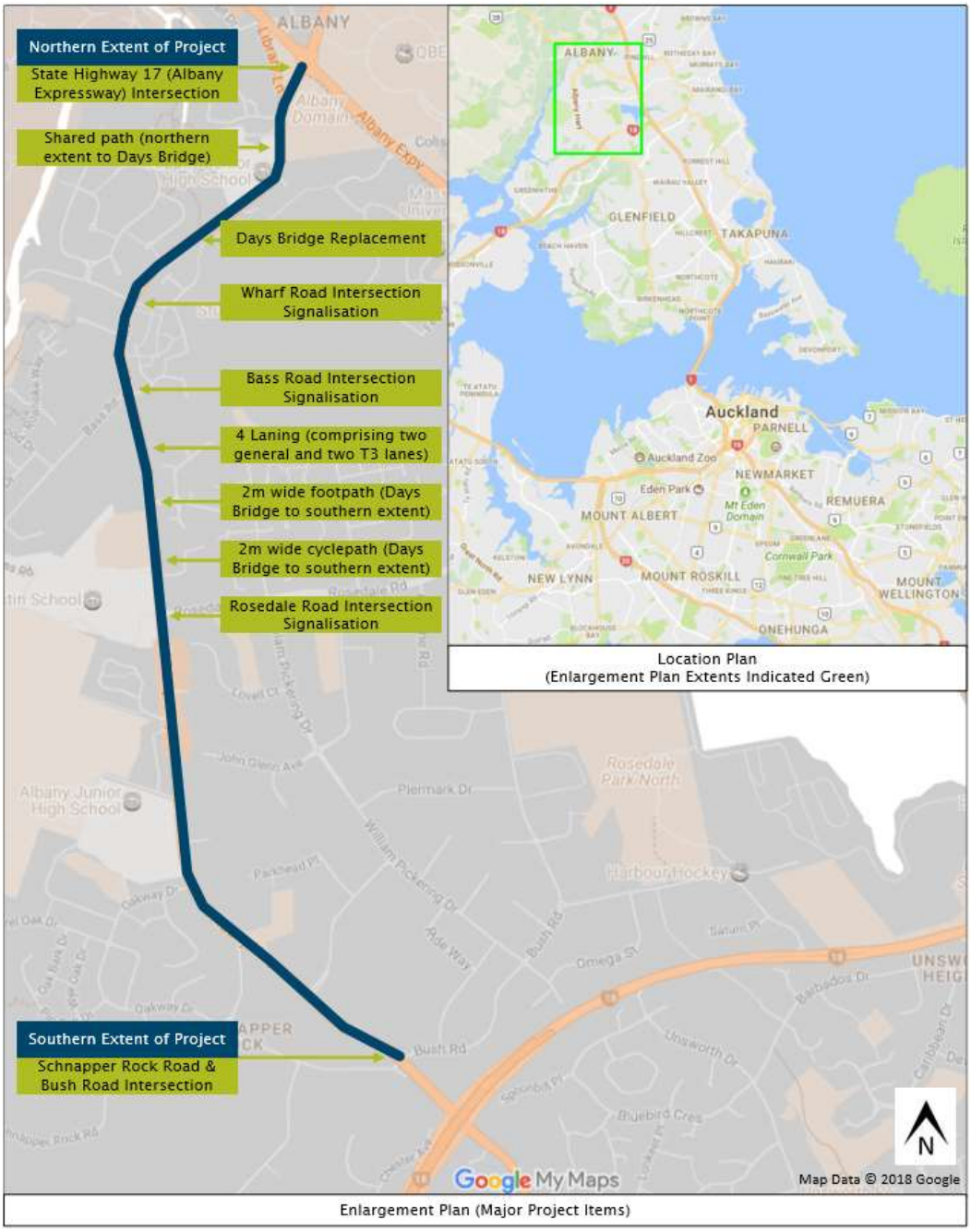
Auckland Transport has delivered facilities that will be a very attractive to pedestrians and both commuter and less-confident cyclists. This has been achieved by providing cyclists choice at how they wish to cross intersections. The provision of rubbish bins at regular intervals has ensured a path that is largely free of litter, and in particular broken glass improving amenity and providing cyclists' confidence that they are unlikely to receive a puncture. Good practice findings are discussed in more detail in Section 3.

1. Project outcomes

Project description and objectives

The project involved a major upgrade of the Albany Highway and provided: four traffic lanes (with two general traffic and two Transit T3[1] lanes) for the full extent of the project (including intersection upgrades and bridge replacement); and improved/new walking and cycling facilities (including footpaths, cycle paths, shared paths and crossings). Figure 1 below highlights the major items of work completed as part of the project. A more detailed project scope including enabling works is provided in Appendix A.

Figure 1: Project Location and Details Plan



[1] Auckland Transport later revised the T3 lanes to T2 lanes.

Construction of the project occurred between November 2014 and October 2016. As identified in the Scheme Assessment Report (GHD, Mar 2011) and the Detailed Design Report (GHD, Nov 2013) the project objectives were to:

- improve travel times (particularly at intersections during peak periods) and cater for future growth;
- improve safety for all road users; and,
- encourage alternative modes of transport, such as bus travel, cycling and carpooling.

The project had a reported benefit cost ratio of 4.0[2] (excluding wider economic benefits). In line with the improvements outlined above, monetised project benefits comprised of travel time and associated vehicle emission and operating cost savings (95.5%), health benefits from increased walking and cycling activity (4.0%) and crash cost savings (0.5%).

Project outcomes discussed in the following sections focus only on the major project benefits anticipated, and are based on a review of available data, observations made on site, and through discussions with project personnel.

Journey times better than modelled projections but already worse than four years ago

Project documentation estimated average travel time savings to be in the order of between 01:44 and 02:19 minutes based on a traffic model comparing a 2016 'Do Minimum' and 'Post-Construction' scenario. The project also forecast a marginal increase in travel time for northbound traffic travelling outside the AM peak period. A comparison of post-construction travel times with the modelled 'Do Minimum' scenario found that the average travel time savings achieved by the project far exceeded that expected. Actual average travel time savings ranged from between 01:04 and 05:45 minutes. The difference between actual and expected average travel times is summarised in Figure 2.

Figure 2: Expected and Actual Average Travel Time Savings

Route	Period	Post-Construction Average Travel Time Savings		Difference between Actual and Expected Average Travel Time Savings
		Expected (based on traffic model outputs)	Actual (based on TomTom data)	
Northbound	AM Peak	01:49	03:16	01:27
	Inter Peak	-00:13	01:07	01:20
	PM Peak	-00:16	01:04	01:20
Southbound	AM Peak	02:19	02:34	00:15
	Inter Peak	02:02	05:45	03:43
	PM Peak	01:44	04:19	02:35

While the completion of the Albany Highway upgrade outperformed expectation, average travel times are already greater than those in the pre-construction period, just four years earlier[3]. The increase in overall travel time is highly likely to be reflective of the delay induced by the signalisation of intersections along the route, and/or possible delay resulting from downstream congestion.

Figure 3 and Figure 4 illustrate average journey time data for trips on Albany Highway between the intersections of State Highway 18 and State Highway 17, in the north and southbound direction respectively. In summary these figures illustrate that:

[2] The benefit cost ratio if recalculated today (on the basis of anticipated benefits) would be significantly higher. Since the economic evaluation was undertaken the discount rate has reduced from 8% to 6%. These changes result in enhanced value being derived from future project benefit.

[3] A finding also supported by analysis undertaken in August 2017 by Auckland Transport.

- Travel time in the post-construction period (December 2016 – December 2017) has increased by between 00:02 and 01:30 minutes compared with travel times in the pre-construction period (October 2013 – October 2014); and,
- With the exception of northbound traffic travelling in peak periods, travel time reliability[4] has decreased. Such decreases have been minor in all cases except in the southbound direction during the PM peak where travel times increased significantly[5].

Figure 3: Northbound Travel Times Before and After Construction

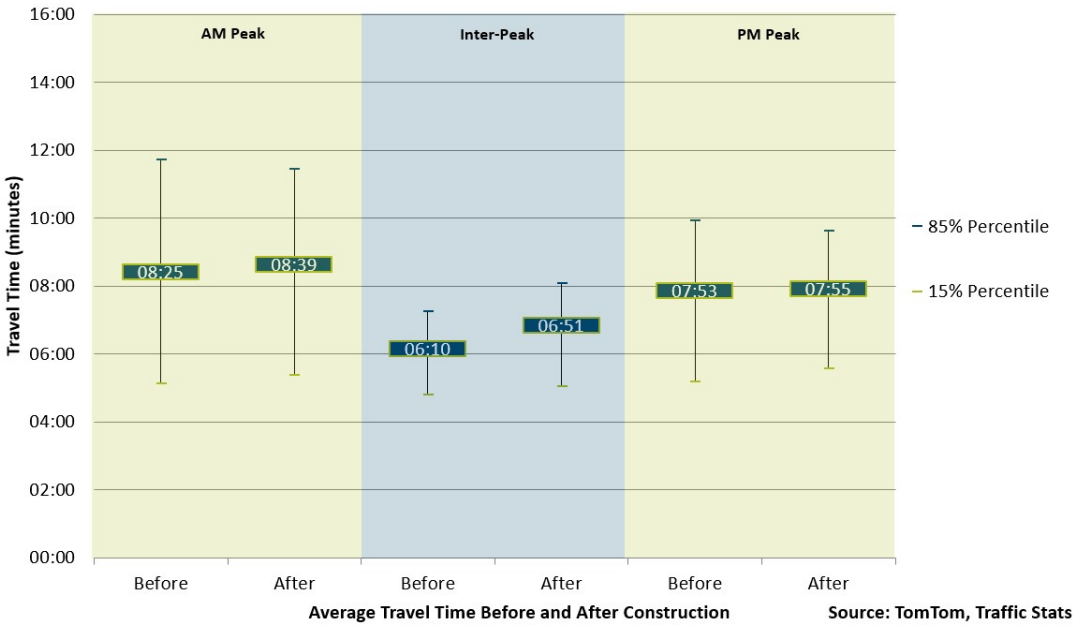
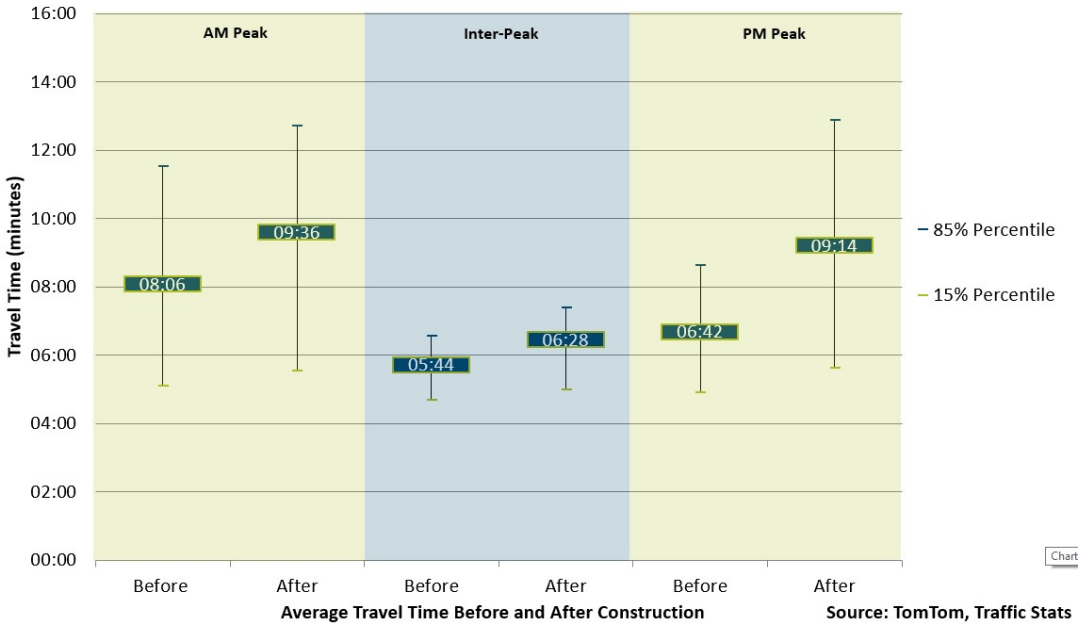


Figure 4: Southbound Travel Times Before and After Construction



4 Travel time reliability for the purposes of this review is based on the travel time range between the 15th and 85th percentile travel time.

5 Likely reflecting increased traffic congestion downstream, namely that at Bush Road and State Highway 18 which according to Auckland Transport experienced significant growth in recent years.

The Albany Highway experienced an average annual traffic growth rate of around 3.0% based on traffic count data collected in 2013 and 2017. This growth rate is comparable to that expected within the Auckland Region.

More detailed travel time information and analysis is presented in Appendix B.

T2 lane unlikely to provide any journey time advantage or carpooling incentive

As part of Auckland Transport's annual transit lane review, the Albany Highway transit lane was changed from a T3 to a T2 (before it actually opened). This decision was made despite the funding application recommending that while a T2 would provide the highest economic benefit, a T3 lane would provide a greater incentive for carpooling.

The Ministry of Transport (2015) has reported that average vehicle occupancy in Auckland is 1.51 people per vehicle[6]. A reasonably high proportion of vehicles would therefore likely qualify for T2 lane use. It is unlikely that T2 lane operation would provide users with similar journey time advantages as T3 operation. This outcome is therefore less likely to incentivise carpooling.

Walking and cycling facilities are good but some opportunities for improvement exist

The absence of count data makes it difficult to determine whether pedestrian or cyclist numbers have increased in the post-construction period. Overall the facilities have been well constructed, but some minor actions could improve user safety and comfort. We note the following observations:

- The choice for cyclists at intersections to remain off-road or to utilise short length on-road cycle lanes (to obtain right of way) is an attractive proposition to both commuter and less confident cyclists.

- The adjacent asphalt road surface will likely provide a more attractive riding surface for commuter cyclists due to it being smoother and offering lower rolling resistance compared to concrete cycleway/shared path.
- Reflective tapes installed on the galvanised bollards at Days Bridge do not indicate the full width of the hazard posed, and may be insufficient to warn pedestrians and cyclists during low light conditions[7]. Other hazards such as bridge end rails which

[6] No detailed vehicle occupancy data pertaining to the Albany Highway was available.

[7] Noting pedestrians rely on street lighting and cyclists do not always use or have adequate lighting.

would be difficult to see at night and pose a significant hazard to cyclists had no hazard markings at all.

- In a number of locations the adjacent grassed areas were observed to be sufficiently lower than the concrete path. This could pose a trip hazard to pedestrians or cause a cyclist to lose control if they strayed off the path. In a number of isolated locations, low service lids could also present a trip hazard to pedestrians (such as those located near Summerfield Lane).

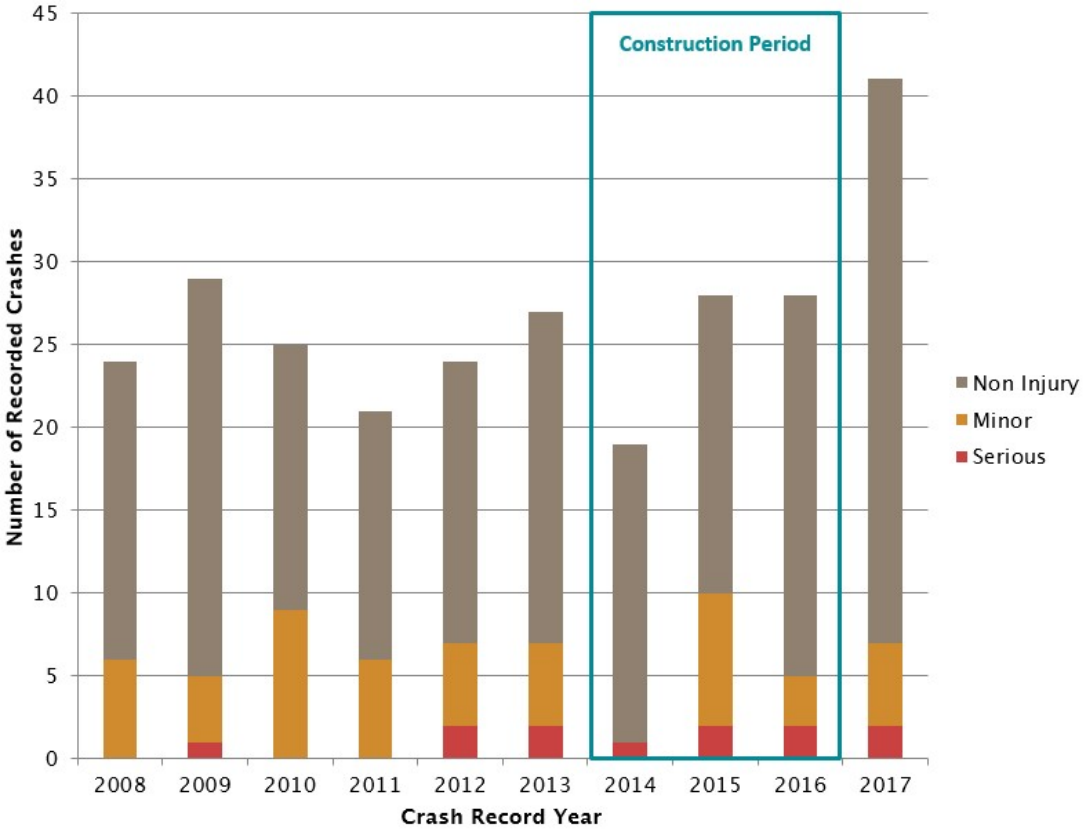
- Significant separation between pedestrians and cyclists (such as that at 427 Albany Highway) has resulted in the footpath being located directly adjacent to property boundaries. In this location a boundary fence has resulted in poor inter-visibility (between those exiting the driveway and pedestrians) presenting a safety risk. Reducing separation distance at these locations would have minimised this risk.

- Bus stops were well provisioned with pedestrian refuges at suitable crossing locations and rubbish bins (which appear to have been successful in minimising rubbish along the Albany Highway).

Unknown road safety impact but improvements to process required

It is too soon to provide any robust commentary on crash trends given that typically at least five years post-construction crash data is required to undertake meaningful analysis of crash rate trends. Crash data presented in Figure 5 suggests while minor and serious injury crash numbers have remained consistent, non-injury crashes have increased. It is not possible to conclude whether the increase in non-injury crashes is statistically significant given the limited data available[8].

Figure 5: Number of recorded crashes within the project area



Road safety audit processes appear to have complied with required procedures (as detailed in Road Safety Audit Procedures for Projects (NZTA, 2013). Though we note that the findings of the post-construction road safety audit have not had timely consideration or resolution. The audit was completed in May 2017. A year later no progress was evident in the decision tracking required to resolve the issues. Road users have therefore potentially been exposed to safety risks for an extended and unreasonable length of time.

The required performance measure monitoring has not occurred

The 2014 construction phase funding request recommended that performance measure monitoring be established as a condition of funding in accordance with Planning and Investment Knowledgebase requirements[9]. This requirement was confirmed through the approval of the funding application as approved by the Transport Agency. Despite this, no performance measures were established, and no before or after construction monitoring took place.

[8] The safe system approach is primarily focused on death and serious injury crashes.

[9] The recommendation to include performance measure monitoring as a condition of funding also ensured consistency with the funding approval granted at the design phase in 2013.

Performance monitoring was established as a requirement in July 2012 to enable the collection of information that would:

- help demonstrate that the Transport Agency and Auckland Transport are achieving value for money with land transport investments;
- enable the Transport Agency to learn from our investments and apply the learnings to future investments;
- align Transport Agency investment review processes with the Transport Agency's Business Case Approach; and,
- facilitate more efficient and effective post implementation reviews by providing more comprehensive performance/benefits information.

The collection of data relating to performance measures would have assisted greatly in enabling a more robust and thorough assessment of project outcomes. Most notably such data could have informed our understanding of changes in mode share (particularly changes to pedestrian and cycling activity) and the effects of the T2 lane on vehicle occupancy.

Project delivered under budget and well ahead of schedule

Transport Investment Online records that the construction phase of the project was delivered for $53.4m[10], approximately 7% under the $57.7m approved construction phase budget (as illustrated below in Figure 6).

Figure 6: Budgeted and actual cost comparison

Description	Cost
Approved construction funding budget	$57,700,000
Recorded construction delivery cost (Transport Investment Online)	$53,431,152
Project cost difference	-$4,268,848 (- 7%) under budget

The project was competitively tendered, and let for a total of $37.4m. By completion, the project construction costs had risen by 19% through contract variations to a total of $44.16m. Remaining construction phase costs comprised $4.38m third party costs (associated with enabling works such as service relocations) and $4.90m Auckland Transport project management and overhead costs.

Construction work for the Albany Highway Upgrade commenced in November 2014 and was complete by October 2016. The construction phase was completed approximately six months faster than that originally envisaged, resulting in significantly less disruption to road users and neighbours. Auckland Transport staff attribute much of this time saving to:

- The co-location of project delivery staff and the contractor which improved the speed of decision making and issue resolution; and
- The contractor's proactive management of stakeholder expectations through weekly communications detailing upcoming work and project progress.

[10] Project cost account has not yet been closed (no major additional expenses are expected).

2. Recommendations

Recommendations to improve project processes and outcomes include:

That the Transport Agency should review its approach to delegated authorities or project scope and funding condition control mechanisms. Funding as approved by the then Group Manager (Planning and Investment) stipulated the delivery of T3 lanes and a funding condition to undertake performance measure monitoring. Neither were satisfied. Improved Transport Agency controls are required to ensure project scope and funding conditions are satisfied, or modified with appropriate agreement.

That the Transport Agency explicitly note the condition category for all conditions imposed as part of funding approval. The Planning and Investment Knowledge Base defines "condition precedent" as a condition that must be fulfilled before funding will be released; and, "condition subsequent" as a condition that needs to be fulfilled by a specified time or event, but the decision can be put into effect. Highlighting the need to undertake performance monitoring as a 'condition precedent' would have ensured greater internal and external awareness, maximising the opportunity for this funding condition to be satisfied.

That Auckland Transport ensure compliance with best practice delineation standards at the Days Bridge bollards. The reflective tapes applied to bollards do not highlight the full extent of the hazard, and no advanced warning is provided to warn of their presence. Improved delineation will ensure improved safety is afforded to cyclists who may not use or have adequate lighting.

3. Good practice

Good practice that could be of relevance to future projects include:

Through the provision of short on-road cycle lanes and standard shared path type crossings at intersections, the facility has a wider target audience. The provision of standard shared path crossings will attract less confident cyclists who seek a greater feeling of safety, while the on-road cycle lanes will greatly assist with reducing journey times a key attractor for commuter cyclists (as they are afforded priority at intersections).

The provision of rubbish bins at bus stops appears to have supported a more litter free pedestrian and cyclist environment. Minimising rubbish provide a more attractive walking and cycling environment; and the reduced risk of broken glass provides more certainty to cyclists that they won't be inconvenienced with a puncture.

The contractor provided weekly online updates regarding project progress and imminent work to inform affected residents/landowners. This approach allowed road users and affected residents/landowners to be informed. Informed stakeholders are able to ask timely questions (allowing concerns to be addressed in advance of works) and provide an opportunity to make decisions that reduce construction impacts (for example having an early night the day before planned night works).

4. Auckland Transport's response to findings

The comments regarding the performance measures are noted and steps have been taken to ensure these are in place and measureable for new projects. A joint approach between AT and NZTA to ensure these are in place at funding approval would be beneficial to both organisations.

NZTA's comments regarding the issues around the existing footbridge bollards are noted and whilst this was not included within the scope of the Albany Highway Upgrade project it is recognised that items such as this should be included in future to ensure current best practice is achieved where economically possible. A request will be made to AT's Road Corridor Maintenance team to add additional delineation to these bollards.

AT accepts the comments regarding closing out the Stage 4 RSA in a timely manner and efforts are being made to do so as soon as possible.

5. Transport Agency response to findings

Recommendations section: It is agreed that improved processes are required between the Agency and Approved Organisations to ensure that the scope of a project does not change without Agency knowledge or consent.

It is acknowledged that a 'condition precedent' requirement for performance measures monitoring at the implementation funding stage may have provided greater incentive to complete this task. The funding paper however did mention in good faith that AT and the Agency expected performance monitoring measures be completed without too much delay, however unfortunately this did not materialise.

Appendix A – Detailed summary of project scope

The Albany Highway Upgrade project included the delivery of the following components:

- Four traffic lanes (with two general traffic and two Transit lanes) from the Schnapper Rock Road / Bush Road Intersection to SH17;
- Signalisation of three major intersections (currently roundabouts) along the route (at Rosedale Road, Bass Road and Wharf Road);
- Amendments to the existing traffic signal intersections at Oakway Drive and the two adjacent to Albany Senior High School (ASHS). The northern ASHS intersection includes provisions for an access for the future Coliseum Drive Extension and the southern ASHS intersection includes provision for an access to the proposed development by Massey University;
- All traffic signal intersections have pedestrians and cyclist facilities; with the opportunity to reduce delays to public transport through demand management technology;
- Two signalised pedestrian crossings have been provided. One north of Appleby Road and another near the current location of Kristin School Gate 1, which will be closed to vehicular traffic (as part of the Kristin School re-development) and used by pedestrians and cyclists;
- A combination of central flush and raised medians, with planting where possible, and pedestrian refuge islands within the flush medians;
- A continuous 2-metre wide segregated footpath from Schnapper Rock Road / Bush Road to Days Bridge with shared cycleway/pedestrian footpath north of Days Bridge;
- A continuous 2-metre wide segregated cycle path along corridor length from Schnapper Rock Road / Bush Road to Days Bridge with shared cycleway/pedestrian footpath north of Days Bridge;
- Landscaping in the central median and grass berms where practicable with emphasis on tree planting including retention of existing trees where possible;
- Stormwater detention / treatment (on site where possible) with use of sand filters and detention ponds;
- Relocation and undergrounding of main utility services (gas, water, telephone and electricity); Construction of a new four lane bridge over the Oteha Stream (Days Bridge) raised above the 1 in 100 year flood level;
- Street lighting upgrade using LED lanterns;
- Offsite mitigation works on third party property; and
- Mitigation planting and acoustic fencing along property frontages where required.

Appendix B – Travel Time Analysis

The NZTA Upper Harbour Corridor (UHC) SATURN traffic model formed the basis of determining the expected travel time benefits for the project. The model produced base travel time estimates for journeys on Albany Highway between the intersections of State Highway 18 and State Highway 17. Model estimated travel times were validated and updated based on observed travel times. Figure 7 summarises modelled results, and includes our assessment of the actual travel times experienced in the pre-construction period based on TomTom data (for approximately the same routes). Our own assessment suggests that in all but one instance, the UHC traffic model under-estimated actual travel time in the pre-construction period.

Figure 7: Pre-Construction Travel Time Comparison

Route	Period	Supporting Project Documentation		Our Review of Actual Pre-Construction 2012 Travel Time Data (TomTom)
		UHC Model Travel Time Estimates for 2012	Observed Travel Times in 2012 & Callibrated Model Inputs	
Northbound	AM Peak	07:46	07:30	08:25
	Inter Peak	05:46	05:00	06:10
	PM Peak	07:40	07:30	07:53
Southbound	AM Peak	09:19	08:55	08:06
	Inter Peak	05:29	05:05	05:44
	PM Peak	05:56	05:55	06:42

To quantify likely travel time savings offered by the Albany Highway upgrade, the UHC model was used to compare estimated travel times in 2016 for a 'Post-Construction' and 'Do Minimum' scenario. Figure 8 summarises the modelled results of this comparison, and includes our assessment of the actual travel times experienced in the post-construction period based on TomTom data (for approximately the same routes). Our assessment found that:

- The 2016 do-minimum travel time estimates appeared reasonable (based on our projections of actual travel time data pertaining to 2012 and 2014);
- The UHC traffic model over-estimated actual travel time in the post-construction period; and,
- The completion of the Albany Highway upgrade appears to have resulted in total travel time savings 2.5 times greater than that expected (on average).

Figure 8: Post-Construction Travel Time Comparison

Route	Period	Supporting Project Documentation		Our Review of Actual Post-Construction 2017 Travel Time Data (TomTom)
		2016 Do Minimum Travel Time Estimates	2016 Post-Construction Travel Time Estimates	
Northbound	AM Peak	11:55	10:06	08:39
	Inter Peak	07:58	08:11	06:51
	PM Peak	08:59	09:15	07:55
Southbound	AM Peak	12:10	09:51	09:36
	Inter Peak	12:13	10:11	06:28
	PM Peak	13:33	11:49	09:14

The travel time savings reported in project documentation related specifically to a comparison between a 2016 'Post-Construction' and 'Do Minimum' scenario. The UHC traffic model predicted travel times to worsen on Albany Highway between the pre-construction (2012) and post-construction (2016) periods, as inferred by a comparison of Figure 7 and Figure 8. The expected and actual travel time increases are quantified in Figure

9 below and confirm that while having increased, they are on average almost 3.5 times less than expected.

Figure 9: Expected and Actual Travel Times Increases Between the Before and After Construction Periods

Route	Period	Expected Travel Time Increase As Reported in Project Documentation	Actual Travel Time Increase Based on Travel Time Data (TomTom)
Northbound	AM Peak	02:36	00:14
	Inter Peak	03:11	00:41
	PM Peak	01:45	00:02
Southbound	AM Peak	00:56	01:30
	Inter Peak	05:06	00:44
	PM Peak	05:54	02:32

Actual travel times for north and southbound traffic on Albany Highway is presented in Figure 3 and Figure 4 respectively. These figures illustrate that:

- Travel time in the post-construction period has increased by between 00:02 and 01:30 minutes;
- Northbound traffic travelling during the AM and PM peak periods experienced an average travel time increase of eight seconds;
- Travel time reliability for northbound traffic has improved marginally, except during the inter-peak period;
- Southbound traffic travelling during the AM and PM peak periods experienced an average travel time increase of just over two minutes;
- Travel time reliability for southbound traffic has decreased, most notably during the PM peak period; and,
- Traffic travelling during the inter-peak period experienced an average travel time increase of just over 40 seconds.