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TRANSPORTATION SPECIALISTS

technical note

PROJECT	**TOTARA STREET CYCLEWAY**
SUBJECT	**DEMAND ASSESSMENT AND ECONOMIC EVALUATION UPDATE**
TO	**KAREN HAY, ANDY VUONG (TAURANGA CITY COUNCIL)**
FROM	MICHAEL JONGENEEL
DATE	16 OCTOBER 2020 (UPDATED 21 OCTOBER 2020)

Contents

1 Executive summary

This technical note follows an earlier technical note from July 2020[1] which summarised the economic evaluation of the propose Totara Street Cycleway in Tauranga. Subsequent changes to the project, and additional information, have required that economic evaluation to be updated. Those changes have included:

- Revised project construction costs
- Delayed construction period
- Updated NZ Transport Agency Waka Kotahi (Waka Kotahi) economic evaluation procedures
- Feedback from Waka Kotahi following a review of the economic evaluation
- Design changes that include the proposed the signalisation of the left turn from Hewletts Road into Totara Street, and additional signalised crossings of both Hull Road and Triton Avenue
- Consideration of new developments, including a possible future upgrade of Totara Street, and the parallel Mt Maunganui Innovating Streets project.

As a result of the above, the project BCR has been assessed to be between **1.5 and 2.2**. Sensitivity testing has indicated a wider BCR range of 0.87 to 2.7. Refer to Section 3 of this document for further detail.

[1] Flow Technical Note: Totara Street Cycleway Demand Assessment and Economic Evaluation; 10 July 2020 (updated 21 July 2020)

2 Changes to the economic assessment since July

2.1 Project costs

The July assessment applied project costs of $6.97 million, supplied by Tauranga City Council. Cost estimates have subsequently been updated, and now sit at $8.4 million. We have updated the economic evaluation accordingly.

Our assessment assumes an annual operating and maintenance cost of 0.5% of this capital cost ($42,000 per annum).

2.2 Construction period

The July assessment assumed a construction period beginning in October 2020, and extending for 6 months. For our updated assessment we have assumed a construction start date of January 2021, with the 6-month construction period retained.

2.3 Traffic effects

The July assessment included the general traffic dis-benefits associated with two new signalised midblock pedestrian crossings on Totara Street. The economic assessment has been updated to reflect feedback from Waka Kotahi, including the inclusion of vehicle congestion costs, operating costs and emissions costs.

Subsequent design changes have now introduced a signalised pedestrian crossing of the existing left turn slip lane from Hewletts Road (west) into Totara Street (north). The updated economic assessment has included the general traffic dis-benefits associated with signalising this slip lane. This is discussed more fully in the General Traffic Benefits section of Appendix A.

Additional signalised crossings have also been introduced on side streets, including across Hull Road and Triton Avenue. No traffic modelling was carried out for these crossings, so we have estimated their economic effects, based on the modelling carried out for the proposed Totara Street crossing north of Hewletts Road.

2.4 Evaluation period

Our July assessment applied a 60-year economic evaluation period, on the advice of Waka Kotahi's Investment Decision-Making Framework Review report (10 July 2020), which signalled a 60-year evaluation period in the upcoming Economic Evaluation Manual (EEM) update. The updated, now the Monetised Benefits and Costs Manual (MBCM) has subsequently retained instead the EEM's 40-year evaluation period. We have revised our economic evaluation accordingly.

2.5 Project life-span

Tauranga City Council has also advised that the section of Totara Street between Hewletts Road and Hull Road may receive a more significant road upgrade in the next 10 to 20 years, to accommodate growth

in general traffic and freight. If so, that portion of the Totara Street cycleway may be removed at that time, ending the benefit stream for that section of cycleway.

We consider it very unlikely however that, should the southern section of Hewletts Road be upgraded in the future, the proposed cycleway would be removed and not replaced. In practice, where existing cycle facilities are in place and a future road widening project requires that space, a replacement cycling facility of at least equal standard is provided. In this case, the future road widening project does not accrue cycling related benefits, as the future project is replacing an existing facility like-for-like.

As a result, our conclusion is that, if the southern section of Totara Street is to be upgraded in the future, this would not affect the BCR of the Totara Street cycleway.

For completeness however, we have considered the following two sensitivity tests:

- What would the project's BCR be, if the section between Hewletts Road and Hull Road was removed in 10 years' time and not replaced?
- What would the project's BCR be, if the section between Hewletts Road and Hull Road was removed in 20 years' time and not replaced?

We emphasise however that both of the above scenarios are very unlikely, for the reasons discussed above.

2.6 The Mt Maunganui Future Streets project

The Mt Maunganui Innovating Streets project begins at Banks Ave/Salisbury Ave, approximately 400m north of the Totara St project, and extends a further 1.2km to the base of Mauao. While the project is still in development, it is expected to make cycling within Mt Maunganui safer and more appealing. If so, the Mt Maunganui Innovating Streets project is likely to increase the future cycle demands on Totara St, as collectively the two projects would enable more cycle trips between Mt Maunganui and central Tauranga.

The Mt Maunganui Innovating Streets project is expected to be implemented in early 2021, and has committed funding from both Tauranga Council and Waka Kotahi. As a result, it can be considered part of the Totara Street project's Do Minimum.

We have considered the potential implications of this new Do Minimum in two ways as follows.

Tauranga Cycle Programme considerations

- Future traffic calming within the above area of Mt Maunganui was included in the modelling carried out for the Tauranga Cycle Programme. This traffic calming is likely to be broadly equivalent to the Mt Maunganui Innovating Streets project, in terms of its impact on cycling
- Future cycling improvements on the City/west side of the Harbour Bridge were also part of the Tauranga Cycling Programme. These projects would increase cycle demands on Totara St if built, by providing western connections to it

- The Tauranga Cycle Programme also included future cycling improvements between Mt Maunganui and Bayfair (via Maunganui Rd or some other route). This future cycleway would be parallel to Totara Street to some degree, and can be expected to reduce cycle demands on Totara Street, by providing an alternative route for some trips
- Collectively, the full Tauranga Cycle Programme was predicted to result in 50% more cyclists using the Totara Street cycleway, than should Totara Street be built alone
- The impact of the Mt Maunganui Innovating Streets project on Totara Street will be less than this 50% figure. We have assumed a 20% impact, which is conservative given that the Innovating Streets project is the most closely aligned project to Totara Street within the Tauranga Cycle Programme

Covid lockdown considerations

- The recent Covid-19 lockdowns resulted in significant increases in cyclist volumes on Marine Parade, including
    - A 60% increase during Level 2, relative to the same period in 2019
    - A 190% increase during Level 3
    - A 250% increase during Level 4
- These increases demonstrate the potential latent demand for recreational cycling within Mt Maunganui, should users feel safe
- The numbers may slightly over-estimate the true latent demand, due to the novelty factor at the time, the lack of alternative exercise options available other than walking, and other unique factors during the Covid-19 lockdowns
- Notably, there was no significant increase in cyclists on Totara Street during the Covid-19 lockdowns – possibly the result of government instructions to 'keep local' when exercising, which removed the option of cycling across the Harbour Bridge
- It's difficult to draw conclusions from the above data that would help assess what impacts the Innovating Street project may have on the Totara Street cycleway. The 20% impact developed above has been used in our assessment.

3 Summary of project benefits and costs

The following table summarises the project's estimated economic benefits.

Table 1: Summary of project benefits

Benefit stream	Source of benefits	Discounted benefits	
		Low e-bike scenario	High e-bike scenario
Cycling benefits			
Travel time savings	Reduction in perceived travel times	$0.62 million	$1.01 million
Crash cost savings	Crash reductions due to cycle infrastructure	$2.37 million	$2.37 million
Health benefits	Benefits of increased physical activity	$14.08 million	$19.21 million
Walking benefits			
Crash cost savings	Crash reductions due to pedestrian infrastructure	negligible	negligible
Heath & environment	Benefits of increased physical activity	negligible	negligible
General traffic benefits			
Travel time, congestion, vehicle operating, emissions and reliability costs	Travel cost changes due to mode shift away from car use	$0.64 million	$0.88 million
	Travel cost changes due to new signalised crossings	-$3.84 million	-$3.84 million
Total benefits		**$13.9 million**	**$19.6 million**

We understand that a number of queries have been raised regarding the origin of general traffic benefits, vehicle emissions costs and the local benefits to Tauranga. These are addressed below

- The economic analysis has estimated general traffic dis-benefits of -$3.8 million. The source of these dis-benefits includes
    - -$1.2 million (32%) associated with the signalisation of the existing left turn slip lane from Hewletts Road into Totara Street
    - -$1.3 million (33%) associated with the new signalised midblock crossing of Totara Street, north of Hewletts Road
    - -$0.8 million (20%) associated with the new signalised midblock crossing of Totara Street, south of Kawaka Street
    - -$0.5 million (12%) associated with the new signalised midblock crossing of Hull Road
    - -$0.15 million (4%) associated with the new signalised midblock crossing of Triton Avenue
- The above general traffic dis-benefits are mostly associated with increased travel times (95%, including an allowance for "congested time"). Much smaller proportions are associated with increased vehicle operating costs (5%) and increased vehicle emissions (0.3%). These proportions

are fairly typical for projects that change traffic capacity (or demand) on a congested network. Similar proportions would apply to the estimated $0.6 to $0.9 million in positive benefit associated with mode shift.

- The above benefits will be accrued both by local Tauranga residents and businesses, as well as visitors to the region. The benefits will be apportioned relative to the proportions of local/visitor general traffic and cyclists. We have no data on these proportions, but estimate the visitor proportion to be negligible in this location.

Project costs have been supplied by Tauranga City Council and include $8.4 million for construction, including project risk allowance, training and education. We have in addition assumed an annual operating and maintenance cost of 0.5% of this capital cost ($42,000 per annum).

We have assumed a construction start date of January 2021, extending 6 months.

Discounted, and including ongoing maintenance, the costs sum to $9.0 million.

4 Benefit cost ratio

With discounted project benefits of between $13.9 and $19.6 million, and discounted costs of $9.0 million, the project has an estimated **Benefit Cost Ratio range (BCR) of 1.5 to 2.2.** The majority of the project's benefits are expected to be health benefits associated with increased cycling, with a smaller cycling safety component.

The results of the additional sensitivity tests are presented below.

Table 2: Benefit Cost Ratios – Sensitivity Tests

Sensitivity Test Scenario	Discounted Project BCR	
	Low e-bike scenario	High e-bike scenario
Totara Street cycleway (Hewletts to Hull) removed in 10 years and not replaced by future Totara Street upgrade	0.87	1.2
Totara Street cycleway (Hewletts to Hull) removed in 20 years and not replaced by future Totara Street upgrade	1.2	1.6
Totara Street cycleway (Hewletts to Hull) removed in 10 years and replaced by future Totara Street upgrade	Same as default BCR	
Totara Street cycleway (Hewletts to Hull) removed in 20 years and replaced by future Totara Street upgrade	Same as default BCR	
Default BCR range	**1.5**	**2.2**
Mt Maunganui Innovating Streets part of Do Minimum scenario	1.9	2.7

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APPENDIX A – ECONOMIC EVALUATION METHODOLOGY

Cycling benefit streams

General

As of 1 September 2020, the Transport Agency's Monetised Benefits and Costs Manual (MBCM) had replaced its predecessor, the Economic Evaluation Manual (EEM). Throughout our economic analysis, we have relied on the new MBCM procedures.

We have generally evaluated the project's cycling benefits using Simplified Procedures 11 (SP11) from the MBCM. Recognising however that SP11 contains a number of simplistic approximations, we have modified the SP11 procedures, primarily by using the 2026, 2031, 2043 and 2063 TCM to inform the economics, rather than SP11's default demand estimation tool.

Cycling benefits for intermediate years have been interpolated from the 4 forecast years. This differs from SP11, which typically considers only a single opening year, and applies a cycle growth rate to future years.

Health benefits for cyclists

SP11 calculates health benefits only for that portion of a new cyclist's trip that takes place on the facility itself, as per Equation 1 below. This is a significantly conservative assumption, as the average cycle trip within Tauranga is in the order of 4 km long, while only a portion of that trip will be on project infrastructure itself.

Equation 1: Health and Environment Benefits Calculation

Length of new cycling facility	x	Number of new daily cyclists	x	Benefit rate from SP11

It is also noted that some existing cyclists will gain health benefits from the project, if, by changing from their existing, arterial road route onto the new facility, they cycle a greater distance (choosing to do for the safety and amenity of the new facility).

To better account for this benefit stream, cyclist health benefits have been calculated for the collective increase in distance cycled, due to each investment option. This quantity has been obtained directly from the TCM, with the total length of cyclist-km travelled under the Reference Case and Option scenarios compared, and the difference being the total distance of new (or extended) cyclist-km trips. This value replaces both the 'Length of new cyclist facility' and the 'Number of new daily cyclists' from Equation 1 above.

The MBCM applies a rate of $2.20 per new cyclist-km, as well as $1.00 per new e-bike-km. We have applied a composite of these rates, assuming 30% of Totara Street's cyclists will use e-bikes in the low e-bike forecast scenarios, based on data collected on Auckland's Northwestern Cycleway in 2018. For the high-e-bike scenarios, we have applied a rising e-bike proportion from 30% in 2026 to 80% in 2063, as documented in the TCM model development report.

This benefit stream has been capped at $2,500 per annum per user, and $2,000 per annum per new e-bike user as per the new MBCM guidance.

Cyclist perceived travel time benefits

Perceived travel time cost savings for cyclists have been determined for all existing cyclists on Totara Street, as per SP11. Travel time cost savings for cyclists have also been determined for all new cyclists predicted to use the proposed facilities, by applying the 'rule of half' method. This method assumes that new users gain half of the travel time benefits of existing users, relative to their travel choice without the Project (ie using other modes or not travelling at all).

Travel times have been adjusted to reflect perceived travel times, depending on the quality of the cycle infrastructure on each modelled link. This is consistent with the approach applied in SP11, which adjusts travel times for Relative Attractiveness, applying ratings of 2.0 (for an off-street cycle path) to 1.0 (for on-street cycling on an arterial road with no cycle infrastructure). The evaluation has applied a graduated scale within this range, to account for the qualities of cycle infrastructure (with ratings lower than 2.0 applied to proposed shared use paths with regular vehicle conflicts).

A value of time of $11.46 has been applied, being the weighted average of $7.80 (cycling for commuting) and $6.90 (cycling for other purposes), updated by the current 1.54 MBCM value of time update factor, and weighting for the estimated relative proportions of commuter cyclists to recreational and school cyclists (60%/40%).

We note that travel time cost savings may or may not be applicable to all recreational cyclists. In this instance, 'recreational' refers to a range of different user types, some of whom may benefit from improved perceived travel times, and some of whom may not. The issue of travel time savings in the case of recreational trips is not well defined within the MBCM, and economic evaluation procedures do typically apply travel time cost savings to recreational car trips. As recreational travel time cost savings are a relatively small component of the overall benefits in this assessment, these have not been adjusted to account for users that may or may not gain these benefits.

Mean speeds of 20 km/h have been applied to both the Reference Case and Project, based on typical on-street cycle speeds obtained from cycle tube counters.

Cycle safety benefits

SP11 allows cycle safety benefits to be calculated for both new and existing cycle trips, where an improved cycling facility is provided. SP11 applies a rate of $0.05 per cyclist-km travelled on improved routes, regardless of the crash history on that route, or the relative safety improvement provided by the project. Typically, crash costs using the SP11 method tend to be relatively small, accounting for only 2% of the overall benefits for the wider Tauranga Cycle Programme, for example.

In the case of Totara Street, the SP11 method would significantly underestimate the safety benefits of the project. Instead, a crash by crash procedure has been used, following full MBCM procedures (method A).

In the 5 years to the end of June 2020, there have been four reported cyclist crashes on Totara Street, including

- One fatal crash, 50 m north of the Waimarie Street intersection and involving a truck changing lanes across the painted cycle lane
- Two minor injury crashes – one each at the Hull Road and Triton Avenue intersections
- One non-injury crash at the Hull Road intersection

Together, the above crashes have a collective, annual social cost of $263,000, with 82% of this the result of the single fatal crash. We have arrived at this figure using standard MBCM processes, including under reporting rates, fatal/serious crash correction ratios and crash trend adjustments.

The MBCM's Crash Compendium does not provide a crash reduction factor for shared paths or off-road protected cycle facilities, such as those proposed by the project. We note however that the fatal cyclist crash would likely not have occurred if the project were in place at that time, suggesting an 82% crash reduction rate could be applied to the above annual crash costs. Conservatively, we have applied half of this – 40% – the crash analysis.

Walking benefit streams

Pedestrian health and environment benefits

SP11 also allows health and environment benefits to be calculated for new pedestrian trips, where an improved pedestrian environment encourages more walking trips. These may be calculated either per new pedestrian-km travelled on new pedestrian facilities such as new shared use paths, or alternatively per new pedestrian in the case of 'hazardous sites'. In the case of the Totara Street project, no new footpaths are proposed, so no pedestrian health and environment benefits have been calculated.

Pedestrian safety benefits

The programme is expected to result in improved pedestrian safety outcomes, as a result of new and improved pedestrian crossings and treatments of side roads. This level of detail has not yet been resolved at this stage of the programme development however, and there is no history of pedestrian crashes on Totara Street. As a result, this benefit stream is expected to be negligible, and has been omitted as a result.

Pedestrian travel time benefits

The Totara Street project is not expected to result in significant pedestrian travel time benefits.

General traffic benefit streams

General traffic safety benefits

The Totara Street project may result in minor general traffic safety benefits, as a result of reduced traffic speeds where traffic calming is applied to existing side streets and slip lanes. The level of detail of this

traffic calming has not yet been resolved, so we have omitted this potential benefit stream, which is not anticipated to be significant.

Road traffic reduction benefits from new cycling trips (decongestion)

Decongestion benefit rates

Decongestion benefits are a significant proportion of the overall project benefits, as the project would provide improved alternatives to private car travel on currently congested road corridors. As a result, any mode shift in favour of cycling will reduce existing (or forecast future) congestion on the road network.

The default SP11 decongestion value of $0.10 per new cycle-km travelled applies to all cycle trips, regardless of time of day or weekday, but is known to under value decongestion benefits. The MBCM also allows a decongestion value of $0.42 per vehicle-km removed from the commuter peak period network within regional cities (Table SP9.1, updated to 2019 values). These flat values were derived in 2008 however, and do not recognise how congestion may vary across Tauranga however, nor how congestion may be expected to change over time.

Tauranga specific values were developed by Beca, for application to the TCM, by removing vehicle trips from the 2026 and 2043 TTHM models and carrying out economic evaluation of removing these trips. This process captured the general traffic travel time, operating cost, congestion and emissions benefits of reduced vehicle trips within Tauranga. The rates developed were as follows:

- $0.37 per vehicle-km during the 2026 peak periods, and $0.17 in the interpeak period
- $0.39 per vehicle-km during the 2043 peak periods, and $0.24 in the interpeak period

These rates have been applied to the cycle programme economics. It is noted that these rates are lower than the $0.42 per peak period vehicle-km permitted by the MBCM, but higher in the interpeak, for which the MBCM does not provide a value.

Car diversion rates

It is important to recognise that not every new cyclist trip due to the cycle programme would otherwise take place by private car. Table SP9.1 of the MBCM provided a car diversion rate of 0.675 for new public transport trips within regional cities (ie 67.5% of new public transport person-trips are assumed to correspond to users who previously drove a car). It is expected that lower car diversion rates would apply to new cycle trips, but the MBCM did not provide an alternative.

Car diversion rates have been developed and applied to the forecast new cycle trips at a matrix level, with this process documented more fully in the TCM Model Development Report. The resulting car diversion rates range from 0.60 (in 2063) to 0.62 (in 2026), which is sensibly lower than the 0.675 given in the MBCM for new public transport trips.

Dis-benefits due to reduced general traffic provision

The cycle infrastructure proposed will generally be off-road shared paths and cycleways. These facilities are not generally expected to require reductions to the capacity available for general traffic.

Two new signalised midblock pedestrian/cyclist crossings are proposed however, one north of Hewletts Road, and the second south of Kawaka Street. The first of these was modelled by Beca using the Tauranga Transport Hybrid Model (TTHM), and we have used the outputs of this modelling to inform the economic evaluation. That modelling has indicated:

- An average 3 second delay increase for Totara Street traffic in the 2017 commuter peak periods (3-hour periods), affecting 10,800 vehicles
- An average 1 second delay increase for Totara Street traffic in the 2021 commuter peak periods (3-hour periods), affecting 10,900 vehicles

We note that smaller delay increases are predicted in 2021 than in 2017, which is unusual. We consider it unlikely that delays will decrease over time, and that the model results are the result of inherent model noise/variability. To better represent expected delays, we have averaged the 2017 and 2021 outcomes.

We have applied the above predicted delay increases to the economic evaluation by annualising the delays and applying standard MBCM values of time for mixed arterial traffic. The assessment has included travel time costs (including congestion), vehicle operating costs and emissions costs.

Traffic modelling carried out by Beca was for the new signalised midblock crossing of Totara Street north of Hewletts Road only. The second proposed signalised crossing of Totara Street, south of Kawaka Street, was not modelled. Nor were the two additional signalised crossings of side streets, at Hull Road and Triton Avenue. We have estimated the economic effects of these signalised crossings on traffic, based on the economic effects of the crossing north of Hewletts Road, and the relative traffic volumes in these four locations.

The project will also signalise the existing left turn slip lane from Hewletts Road (west) into Totara Street (north). Traffic modelled by Beca using the TTHM has indicated that signalising this slip lane would:

- Increase average evening peak, eastbound, 2018 delays on Hewletts Road by 1.7 minutes
- Have negligible impact by 2028, as downstream bottlenecks on Totara Street will govern the operation of this left turn

We have annualised the above general traffic disbenefits, in the same way as the new signalised pedestrian crossings above. We have assumed a linear progression from the 1.7 minute delay in 2018 to zero delay in 2028.

APPENDIX B – CYCLE MODEL FORECAST PLOTS

Figure 1: Forecast daily cyclists, 2031 without project (left) and with project (right)