

SH2: Maunganui-Girven Road and Te Maunga, Tauranga – Intersection Improvements

ROAD SAFETY AUDIT of the SCHEME DESIGN

A REPORT PREPARED FOR
NZ TRANSPORT AGENCY

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1.0 BACKGROUND

1.1 Road safety audit procedure

Road safety audit is a term used internationally to describe an independent review of a future road project to identify any safety concerns that may affect the safety performance. The safety audit team considers the safety of all road users and qualitatively reports on road safety issues or opportunities for safety improvement.

A road safety audit is therefore a formal examination of a road project, or any type of project which affects road users (including cyclists, pedestrians, mobility impaired etc), carried out by an independent competent team who identify and document road safety concerns.

The primary objective of a road safety audit is to deliver a project that achieves an outcome consistent with Safer Journeys and the Safe System approach, that is, minimisation of death and serious injury. The road safety audit is a safety review used to identify all areas of a project that are inconsistent with a safe system and bring those concerns to the attention of the client in order that the client can make a value judgement as to appropriate action(s) based on the guidance provided by the safety audit team.

The key objective of a road safety audit is summarised as:

To deliver completed projects that contribute towards a safe road system that is increasingly free of death and serious injury by identifying and ranking potential safety concerns for all road users and others affected by a road project.

A road safety audit should desirably be undertaken at the following project milestones:

- Concept stage
- Scheme or Preliminary design stage
- Detailed design stage, and
- Pre-opening / Post-construction stage.

A road safety audit is not intended as a technical or financial audit and does not substitute for a design check on standards or guidelines. Any recommended treatment of an identified safety concern is intended to be indicative only to focus the designer on the type of improvements that might be appropriate. It is not intended to be prescriptive and other ways of mitigating the road safety concerns identified should also be considered.

In accordance with the procedures set down in the revised NZTA Guideline "Road Safety Audit Procedures for Projects" (interim release May 2013), this is a report to the client who then refers the report to the designer. The designer should consider the report and comment to the client on each of the concerns identified, including their

cost implications where appropriate, and make a recommendation to either accept or reject the safety audit report recommendation.

For each audit team recommendation that is accepted, the client shall make the final decision and brief the designer to make the necessary changes and/or additions. As a result of this instruction the designer shall action the approved amendments. The client may involve a safety engineer to provide commentary to aid with the decision.

Decision tracking is an important part of the road safety audit process. A decision tracking table is embedded into the report format at the end of each set of recommendations to be completed by the designer, safety engineer and client for each issue documenting the designer response, client decision and action taken.

A copy of the report including the designer's response to the client and the client's decision on each recommendation shall be given to the road safety audit team leader as part of the feedback loop. The road safety audit team leader will disseminate this to team members.

1.2 Project background, objectives and desired outcomes

The project for which this is the road safety audit is the preferred option to improve capacity at two SH2 intersections in Tauranga: the Maunganui-Girven Road intersection (MGI) and the Te Maunga intersection with a series of flyovers. This option proposes widening into the existing rail corridor, and relocating the railway into an alternative corridor behind the Owens Place retail park.

The SH2 Eastern Corridor in Tauranga is of national and regional importance to provide efficient and reliable delivery of freight to the Port of Tauranga (PoT). The SH2 Eastern Corridor includes the Tauranga Eastern Link (TEL) which is a 23 km long, 4 lane motorway that is currently under construction. The TEL not only represents a significant investment in transport infrastructure, but supports the existing and future local and regional strategic roading network, which it forms part of. Between the TEL and the PoT lie two roundabouts; one at the intersection with SH29 at Te Maunga/Baypark and one at Maunganui Road/Girven Road.

The MGI intersection operates at a Level of Service (LOS) F and the SH2/29 intersection operates at a LOS C, during peak traffic periods. These delays are anticipated to increase considerably as a result of higher traffic volumes generated by the opening of the TEL. In addition the East Coast Main Trunk railway runs adjacent to SH2 with level crossings on Matapihi Road and SH29. Current and future train movements (which are predicted to increase by 50% in 10 years) have a significant detrimental effect on the efficiency and reliability of traffic along SH2, SH29 and the local roads.

Options to improve the performance of MGI resulted in predicted increases to delays at the SH2/SH29 intersection. In addition, the layout of the potential MGI intersection improvements would need to be compatible with the SH2/SH29 intersection improvements. Due to the close proximity of the intersections and concerns with weaving and lane assignment it was identified that the solutions need to consider the combined intersections.

The NZ Transport Agency (NZTA) engaged Beca Limited (Beca) to investigate options for improvements at the Maunganui/Girven (MGI) and SH2/SH29 intersections, to identify the preferred option and deliver a Detailed Business Case (DBC) that defines an effective, long term solution.

The stated project objectives are:

- Improved access for inter-regional road freight to the Port of Tauranga whilst maintaining rail services;
- Improved safety for all road users;
- Reduce congestion, vehicle journey times and provide efficient traffic flows along a major transport link into Tauranga from the east;
- Operation of an optimised “One Network” plan that balances the needs of complementary and competing travel demands across the area;
- Improved access for public transport users; and
- Improved access for tourism through and within Tauranga.

To deliver on these objectives the desired outcomes for the project are:

- Provide greater priority to inter-regional road freight traffic associated with the commerce and industrial areas of Tauranga over other road users along this section of SH2;
- Improve the reliability of journey times for all motorised users along this section of SH2 and on the link to SH29; and
- Alignment with Regional Land Transport Strategy (RLTS) and Bay of Plenty Regional Council Public Transport policy in the design for the intersection for pedestrians and cyclists and public transport users in this area, consistent with the “One Network” optimisation plan.

1.3 Existing site description

Maunganui Road (SH2) is a four lane highway both north and south of the MGI intersection and is subject to a 70 km/h speed limit. It is a key route to-from the Port of Tauranga and consequently carries a significant number of heavy commercial vehicles (HCVs). It is classed as a Road of National Significance (RON). Apart from its regional strategic importance, Maunganui Road is also important in terms of general accessibility for the local community.

The existing intersection at Maunganui Road/Girven Road is a two lane roundabout outside a central island diameter of approximately 25m and with two lane entries and exits on all approaches. The key driver for upgrading this intersection is capacity, both now and in the future, plus ensuring efficiency of access to/from the Port of Tauranga in particular.

Approximately 750m to the south of the Maunganui Road/Girven Road intersection is the junction of SH2 and SH29 which will also be the termination of the Tauranga Eastern Link (TEL). Adjacent to this intersection is the Bay Park stadium (capacity approximately 15,000) and events centre/arena (capacity approximately 3,000-5,000). The proximity of the stadium and events centre can also generate pedestrian movements through the SH2/SH29 and Maunganui Road/Girven Road intersections.

As there is limited access onto Maunganui Road, Girven Road is an important link to SH2 for the Arataki area and the northern part of Papamoa. Consequently there is a high number of turning movements out of and into Girven Road at the Maunganui Road/Girven Road intersection.

During the PM peak period as a result of the queues southbound on Maunganui Road, there is a significant amount of "rat running" through the local streets Concord Avenue-Farm Street and Spur Avenue-Links Avenue-Concord Avenue-Farm Street routes.

Matapihi Road serves a residential area that can only be accessed from the Maunganui Road/Girven Road intersection. Immediately west of the intersection there is a rail crossing. When the crossing barriers are activated by a train, traffic queues back onto the roundabout which can lock up. Adjacent to the intersection is the large Bayfair shopping centre in the northeast quadrant and the smaller Home Zone centre in the southwest quadrant (Owens Place). The latter has predominantly large format retail outlets.

Given the locations of the above retail centres, other community facilities and the residential areas both sides of SH2, there is a significant degree of community connectivity across SH2 on foot and bike, as well as by private vehicle, the demand for which is likely to increase.

Currently, the only connectivity provisions for pedestrians and cyclists at the Maunganui Road/Girven Road intersection are:

- A shared path on the north side of Matapihi Road which connects to
- A subway under SH2 (north of the intersection) that leads into the Bayfair shopping centre car park
- A footpath on the south side of Matapihi Road that connects to an at-grade crossing point over SH2 and the footpath on the east side of SH2 and thence to Girven Road

Note: The crossing point across SH2 south of the intersection is inherently unsafe given the need to cross a multi-lane road approximately 30m from the roundabout and the lack of visibility of left turning traffic from Girven Road when crossing from the east side. The footpath on Matapihi Road has no safeguard at the rail crossing.

1.4 Preferred option description

Recent studies have identified and assessed a large range of options. The previous investigations concluded that the form of the solution should be grade-separated. The Option 3C shown in the Appendix is currently considered by the designer to be the best arrangement to achieve the project objectives and desired outcomes.

Option 3C consists of a two lane flyover over an at-grade signalised intersection at MGI. The SH2 corridor remains at-grade at the SH2/SH29 intersection with the local and SH29 movements grade separated over SH2. The road widening occurs to the west for this option, which requires the railway to be relocated to the alternative designated railway corridor west of Owens Place. This arrangement also grade separates SH29 from the railway line. A new at-grade level crossing will be provided across Matapihi Road, approximately 150 metres west of the current rail crossing.

This option also requires the purchase of 10 residential properties along SH2, between Exeter St and the SH2/SH29 intersection, as their access would be blocked by the ramp to the SH29 bridge over SH2.

Traffic speed along SH29, on the approach to SH2/SH29 intersection is controlled by the introduction of a roundabout. Access to Truman Lane, the TECT Arena and Baypark stadium is maintained by providing a connection to the roundabout

Additional works include pedestrian and cycleway connections and stormwater collection, treatment and discharge.

1.5 Documents provided

The drawings provided to the road safety audit team were prepared by Beca, Tauranga. They consist of the following drawings which were used for the road safety audit:

Drawing List		
Drawing No.	Rev	Drawing Title
3933377-C-001	A	Cover Sheet, Drawing List & Locality Plan
3933377-C-K088	B	Option 3C Roundabout on SH29 General Arrangement
3933377-C-K092	A	General Arrangement Option 3C Sheet 1
3933377-C-K093	A	General Arrangement Option 3C Sheet 2
3933377-C-K094	A	General Arrangement Option 3C Sheet 3
3933377-C-K090	A	Option 3C Roundabout on SH29 to Te Maunga Plan and Longsection Sheet 1
3933377-C-K091	A	Option 3C Roundabout on SH29 to Te Maunga Plan and Longsection Sheet 2
3933377-C-K100	A	SH2 Typical Cross Sections Sheet 1
3933377-C-K101	A	SH2 Typical Cross Sections Sheet 2
3933377-C-K102	A	SH29 Typical Cross Sections Sheet 1
3933377-C-K103	A	Local Roads Typical Cross Sections Sheet 1
3933377-C-K098	A	Signage
3933377-C-K095	A	Maunganui / Girven Intersection Plan
3933377-C-K096	A	Te Maunga Intersection Plan

At the briefing meeting a background report was provided with supporting information:

“Maunganui Girven Road Intersection Upgrade – Detailed Business Case Safety Audit Briefing” by Beca and dated 01 November 2013,

1.6 The safety audit team

This road safety audit was carried out, as far as practicable, in accordance with the revised NZTA Guideline “Road Safety Audit Procedures for Projects” (interim release May 2013) by:

- s 9(2)(a), Senior Associate, Traffic Planning Consultants Ltd, Hawke’s Bay
- s 9(2)(a), Robinson Transportation Consulting, Tauranga
- s 9(2)(a), Senior Safety Engineer, NZTA, Hamilton.

The safety audit team (SAT) attended a briefing meeting at the NZTA Tauranga offices on Thursday 7 November 2013 and undertook a desk top review of the drawings and site visit that afternoon and the following morning. An exit meeting was held in the afternoon of Friday 8 November to give an early indication of the findings of the SAT.

1.7 Previous safety review

A road safety review was undertaken by the team leader of the current safety audit team of three options that were being considered for the upgrading of the SH2 (Maunganui Road)/Girven Road intersection. The findings were summarised in a report dated 18 August 2011.

1.8 Report format

The potential road safety problems identified have been ranked as follows.

The expected probability of a crash occurring (frequency) is qualitatively assessed on the basis of expected exposure (how many road users will be exposed to a safety issue) and the likelihood of a crash resulting from the presence of the issue. The severity of a crash outcome (the likelihood of a fatality or serious injury) is qualitatively assessed on the basis of factors such as expected speeds, type of collision, type of vehicle, and road user involved.

Reference to historic crash rates or other research for similar elements of projects, or projects as a whole, have been drawn on where appropriate to assist in understanding the likely crash types, frequency and likely severity that may result from a particular concern.

The frequency and severity ratings are used together to develop a combined qualitative risk ranking for each safety issue using the Assessment Matrix in Table 1 below. The qualitative assessment requires professional judgement and a wide range of experience in projects of all sizes and locations.

Table 1: Assessment Matrix

Likelihood of Fatality or Serious Injury	Probability of a Crash Occurring			
	Frequent	Common	Occasional	Infrequent
Very Likely	Serious	Serious	Significant	Moderate
Likely	Serious	Significant	Moderate	Moderate
Unlikely	Significant	Moderate	Minor	Minor
Very Unlikely	Moderate	Minor	Minor	Minor

While all safety concerns should be considered for action, the client or nominated project manager will make the decision as to what course of action will be adopted based on the guidance given in this ranking process with consideration to factors other than safety alone. As a guide a suggested action for each category of concern is given in Table 2 below.

Table 2: Categories of Concern

CONCERN	Suggested Action
Serious	Serious concern that must be addressed and requires changes to avoid serious safety consequences.
Significant	Significant concern that should be addressed and requires changes to avoid serious safety consequences.
Moderate	Moderate concern that should be addressed to improve safety.
Minor	Minor concern that should be addressed where practical to improve safety.

In addition to the ranked safety issues, it is appropriate for the safety audit team to provide additional comments with respect to items that may have a safety implication, but which lie outside the scope of the safety audit. Therefore a comment may include items where the safety implications are not yet clear due to insufficient detail for the stage of project, items outside the scope of the audit (such as existing issues not directly impacted by the project) or an opportunity for improved safety but not necessarily linked to the project itself. While typically comments do not require a specific recommendation, in some instances suggestions may be given by the safety auditors.

All potential concerns, comments and recommendations set out in this safety audit report should be noted and acted upon if appropriate.

1.9 Disclaimer

The findings and recommendations in this report are based on an examination of available relevant documents and the opinions of the safety auditor. However, it must be recognised that eliminating safety concerns cannot be guaranteed since no road can be regarded as absolutely safe and no warranty is implied that all safety issues have been identified in this report. Road safety audits do not constitute a design review or an assessment of standards with respect to engineering or planning documents.

Readers are urged to seek specific advice on matters raised and not rely solely on the report. While every effort has been made to ensure the accuracy of the report, it is made available strictly on the basis that anyone relying on it does so at their own risk without any liability to the safety auditors or their organisations.

2.0 GENERAL CONSIDERATIONS

2.1 Significant Concern – System design

Probability of Crash Occurring – Common
Likelihood of Serious/Fatal Injury – Likely
Outcome – Significant

The project options have evolved from an initial focus on at-grade solutions to the Maunganui Road/Girven Road roundabout congestion, to a realisation that grade-separation would be necessary. All options aim to separate strategic state highway traffic from local traffic to a greater or lesser extent. However, the various grade separation options all extend this MGI interchange footprint closer to the SH2/SH29 intersections at Te Maunga. Thus available weaving lengths between the interchanges have become shorter to separate or merge traffic with origin or destination on SH29.

The adjacent interchanges have essentially been designed separately. This is manifested in gore locations which allow for potentially hazardous crossing movements which could occur between the mainline SH2 and the Maunganui Road one-way frontage roads. There is no way for SH29 traffic to use the SH2 overpass of Girven Road in either direction. The preferred option 3C provides an overpass at MGI for regional SH2 traffic. However regional SH29–SH2 through traffic, including a significant truck proportion, is still required to use both surface street intersections to get through the system.

The SH29 link between the Truman Lane roundabout and the SH2 interchange is a tight alignment and adds an additional surface intersection for SH29 traffic to negotiate. In terms of functional hierarchy, as a “system” interchange between state highways SH2/SH29 should rank above the “service” interchange of SH2 with Girven and Matapihi Roads, which are city streets.

The safety audit team (SAT) considers that the SH2/SH29 system interchange design should drive the overall design by configuring the various connecting ramps to maximise the uninterrupted flow of regional SH2 and SH29 traffic. The design objective should be for both SH2 and SH29 regional through traffic to use the overpass of Girven Road, thus providing for the safe separation of local and regional traffic and minimising the impact on the safety of other modes.

Recommendation:

Review the design to enable both SH2 and SH29 regional through traffic to use the overpass of Girven Road. (NB The SAT considers that there are a number of potential single-line designs that could be developed to achieve this basic outcome. The grade-

separation of all regional through traffic should result in a more compact and safer pedestrian and cyclist environment at the surface intersections by reducing the number of at-grade through lanes on Maunganui Road.)

Designer Response	Through the scoping design and preliminary design processes we have undertaken a robust option identification and selection process to determine the most suitable options for the project. The selection process has considered safety, traffic flow and management, project footprint and land acquisition, , effects on stakeholders and residents, environmental impacts, capital costs and project benefits. The scheme options developed are considered to be appropriate for the site and associated constraints.
Safety Engineer:	Acknowledge that there has been an option identification and selection process to determine the most suitable project options. However the principal requirements for the project should be developed such that they provide the flexibility of an interchange design to differ from the project options. The interchange design should be one that can provide a greater safety outcome, an outcome that may not yet been realised through the project options.
Client Decision:	Design alternatives will be considered where possible, particularly where a greater safety outcome will be achieved, but given the extensive project development process undergone during the I&R phase, subsequent phases will be bound by the scope of the Preferred Scheme.
Action Taken:	

2.2 Moderate Concern – Directional signage

Probability of Crash Occurring – Common
Likelihood of Serious/Fatal Injury – Unlikely

Outcome – Moderate

Drawing K098 shows the proposed signage general arrangement for the preferred option 3C. The reliance on multiple directional signs is an indication of a layout that is difficult to interpret from a driver perspective. This may result in late lane changes, late braking and indecision which can lead to crashes, plus increased driver anxiety, especially for drivers who are visiting and unfamiliar with the area. Unfamiliar drivers may not be aware of local names for attractions, streets and suburbs which are inconsistent without an apparent hierarchy.

Examples are Baypark “Stadium” which is shown as a brown attraction panel, while similar sounding “Bayfair” shopping centre is shown in the same lettering as “Hamilton” city and “Matapihi” suburb. It is not clear whether “Tauranga” refers to the “City” centre as any destination on SH29 is labelled as “Hamilton” although many

Tauranga suburbs such as Welcome Bay and Greerton are served from SH29. On a southbound approach to the Girven intersection, Bayfair is shown with a through arrow while the Bayfair shopping centre is to the left and would require a left turn to reach. The directions to the regional Airport are shown symbolically, while the regional Hospital on route SH29 is not shown at all.

Some of the overhead gantry signs indicate a destination lane that is exit only, but is not signed as such, and could result in unsafe late lane changing by inattentive drivers or unfamiliar drivers favouring the left hand lane. It would also be beneficial for drivers to be advised on the gantry signs of the distance to the exit so that they know how long they have to get in the correct lane.

(NB The system re-design recommended in item 2.1 would simplify the directional signage requirements.)

Recommendations:

- a. Provide a consistent hierarchy of destination names to distinguish between cities, suburbs, streets, and attractions.
- b. Provide continuity of destination titles on consecutive signs until the destination exit.
- c. Include supplementary "Exit Only" warning plates and distances to the exits on overhead gantry signs above trap lanes.

Designer Response	The signage notation shown on the scheme drawings has been prepared on a preliminary basis and will be developed further as part of the specimen/detailed design phase.
Safety Engineer:	Agree with the designer's response that the signage notation will be developed further as part of the specimen/detailed design phase, and that it will incorporate the safety audit team's recommendations as above.
Client Decision:	Implement Safety Engineer recommendations.
Action Taken:	

2.3 Significant Concern – Railway crossings and alignments

Probability of Crash Occurring – Occasional
 Likelihood of Serious/Fatal Injury – Very Likely
Outcome – Significant

The relocation of the railway in option 3C and a new grade-separated interchange at SH2/SH29 has provided an opportunity to eliminate the level crossing near Truman Lane. However, the relocation of the level crossing on Matapihi Road has not been

grade-separated. There is a significant residential area east of the crossing with a lot of pedestrian and bicycle movement to the shopping centres. Matapihi Road remains the only road providing vehicular access to the relatively undeveloped Matapihi peninsula with an estimated 6000 vpd already using Matapihi Road west of Owens Place.

From a Safe System perspective, railway crossings in urban areas should be grade separated when feasible to do so.

(Note: Although not a safety concern, lowering the railway may also assist with mitigation of noise and visual impacts and the land elevation to the south appears to be lower than Matapihi Road for tie-in to the “Y” junction.)

The new railway alignment re-locates a “Y” junction between East Coast Main Trunk railway and the railway to the Port of Tauranga container terminal, Hamilton and Auckland. A wide berth of the residential area is provided, but there is no provision behind the Owens Place industrial area for future local roadway links which may divert local traffic from the SH2 corridor. To preserve long-term opportunities to serve cyclists, pedestrians and vehicles along a safer alternate local route on the west side of SH2 and Maunganui Road and north of SH29, consideration should be given to the proposed location and size of the railway “Y” junction footprint to provide local street connectivity between Owens Place, developable land, and the Stadium.

Recommendations:

- a. Investigate the feasibility of lowering the railway alignment below Matapihi Road to provide a safe grade-separated crossing for all road users. .
- b. Given that the SH29/railway is to be grade-separated, investigate long-term opportunities to provide a local pedestrian and bicycle route or to extend Truman Lane north under the same underpass as the railway to provide safer local connectivity and access between Owens Place and the sporting complexes south of SH29.
- c. Review the proposed location and size of the railway “Y” junction footprint in order to provide local street connectivity between Owens Place, developable land, and the Stadium.

Designer Response	The existing rail level crossing at the Maunganui Rd / Matapihi Rd intersection will be moved further westwards along Matapihi Rd to provide greater separation between the rail and State Highway traffic. The new rail alignment will be located beyond Owens Place which will reduce all forms of traffic flow (vehicle, pedestrian, cyclists) thus improving traffic flow efficiency and safety at the new level crossing. Grade separating the rail under Matapihi Road would be prohibitive to the project in terms of cost. The new level crossing will be controlled by signs, barriers, lights and bells. Pedestrian crossing will be controlled via a maze. Adequate sight distance for vehicles and pedestrians is achieved.
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	<p>Pedestrian connectivity along Owens Place/Truman Lane has been considered as part of Option 3 by extending Owens Place to tie into the Truman Lane roundabout. Option 3 was not considered to be the preferred option due to cost effects on the Owens Place businesses and potential for rat running.</p> <p>The rail alignment has been developed to meet KiwiRail design criteria, which prevents any modification.</p> <p>We agree that the width of the underpass could be widened at a low cost to allow for a possible future pedestrian and cyclist connection between Owens Place and Truman Lane.</p>
Safety Engineer:	<p>a) The designer should be able to demonstrate by evidence that the grade separated railway crossing is cost prohibitive over that of the at-grade crossing option in terms of the additional safety benefits offset by the additional cost.</p> <p>An ALCAM safety assessment should also be undertaken to demonstrate the decision making process for an at-grade railway crossing.</p> <p>b) Agree with the designer's response that the underpass be widened to provide for pedestrian and cyclists facilities.</p> <p>c) Agree with the designer's response that during the option selection process that "Y" junction footprint had been investigated in terms of providing local street connectivity between Owens Place, developable land, and the Stadium, and that through the option selection process was not the preferred option. However the ability to develop this option should not be precluded from the principal's requirements if this could produce a greater safety outcome that is not yet been realised. Refer also the Safety Engineer's response to Item 2.1 above.</p>
Client Decision:	<p>a) Costs to trench rail prohibitive. Implement ALCAM assessment as per Safety Engineer recommendation</p> <p>b) Further investigate value of widening underpass during Design phase.</p> <p>c) Decision as per Item 2.1</p>
Action Taken:	

2.4 Comment – Rat running through local streets

The SAT noted a significant amount of "rat running" through local streets in the PM peak period. In terms of the proposed operation of the Maunganui Road/Girven Road/Matapihi Road intersection, the traffic that currently uses local streets to bypass this intersection should be taken into account in order to reduce the level of "rat running" which can generate crashes on local streets if left unchecked. It is noted on drawing K095 that the left turn lane for the movement from Maunganui Road into Girven Road is quite short (60m) and the SAT queries whether this will be adequate to

deal with the demand for the Maunganui Road to Girven Road movement in the PM peak period.

Designer Response	The rat-running is expected to reduce following completion of the project and this is reflected in the traffic model. The traffic model indicates the length of the left turn lane from Maunganui Road into Girven Road provides adequate storage/stacking to cope with the forecast future PM peak period. If it is economical to extend the left turn lane then we agree it should be considered in the design phase.
Safety Engineer:	Agree with the designer's response that the extent of the left turn lane will be determined in the detailed design phase.
Client Decision:	Implement as per Safety Engineer's recommendation.
Action Taken:	

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3.0 MAINLINE SH2 and SH29

3.1 Moderate Concern – SH2 Maunganui Road/Concord Avenue median

Probability of Crash Occurring – Occasional

Likelihood of Serious/Fatal Injury – Likely

Outcome – Moderate

The northern end of the SH2 overpass of Girven Road terminates near the Concord Avenue left-in left-out intersection which is enforced with a rather short length of raised median island on Maunganui Road opposite the intersection. The gore of the overpass shown on drawing K092 is to be south of Concord Avenue with a 135m taper and a wire rope median which would presumably terminate on the existing concrete raised median. The northern extent of works is demarcated south of Concord Avenue at this point and it is not clear what the safe barrier terminal treatment would be. Given the complex origin-destination patterns, there is also a possibility that northbound traffic on the overpass may attempt to perform a U-turn at the north end of the concrete median to get into Concord Avenue or turn south on Maunganui Road to Bayfair.

Recommendations:

- a. Extend the raised median on Maunganui Road from Concord Avenue further north towards the northern end of the Links Avenue football sports fields to prevent northbound U-turns.
- b. Provide adequate safe termination of the wire rope barrier on the overpass.

Designer Response	The location of the barrier termination will be confirmed at the design stage. This will be coordinated with the median island extent (if the median island is necessary). Preventing U-turns past the extent of the current island is currently not within the scope of this project.
Safety Engineer:	<ol style="list-style-type: none"> a) A physical median treatment should extend to the Hewletts flyover to eliminate all possibility of u-turn movements. b) Agree with the designer's response that a safe termination of the wire rope barrier system will be provided at the detailed design stage.
Client Decision:	<ol style="list-style-type: none"> a) Safety engineer recommendations extend beyond scope of project boundary. Will consider options to incorporate these works within the project. b) Implement as per Safety Engineer recommendations.
Action Taken:	

3.2 Significant Concern – Operating speeds and overpass geometry at Girven Road

Probability of Crash Occurring – Common
Likelihood of Serious/Fatal Injury – Likely
Outcome – Significant

The briefing document states that the Tauranga Eastern Link will operate as a “motorway” which excludes cyclists. However, the sections further north will be “expressway” which does allow bicycles.

The existing speed limits are:

- SH2 Northern tie-in (Maunganui Road) 70 km/h
- SH2 Southern tie-in (Tauranga Eastern Link) 100 km/h
- SH29 Western tie-in 100 km/h
- Local Roads 50 km/h

The design speeds are given as:

- SH2 MGI Flyover 80 km/h
- SH2 Te Maunga 90 km/h
- SH29 (at intersections) 50 km/h

Thus it is intended that northbound vehicles on SH2 will progressively reduce their speeds from 100 km/h on the motorway standard TEL to 90 km/h under SH2/SH29 interchange to 80 km/h over passing Girven Road. The SAT site visit observed prevailing speeds on Maunganui Road between Girven Road and Hewlett Road to be about 80 km/h, or 10 km/h above the existing 70 km/h speed limit.

It is not apparent to the SAT that the design would be sufficiently self-explaining to achieve the 80 km/h design speed which the horizontal and vertical alignment of the overpass assumes. It is quite likely that an operating speed of 90 km/h would occur, requiring a “flatter” flyover design and thus extended landing points. In addition, on the mainline SH2 (drawing K093) the crest vertical curve of the overpass has a K value of 24.5 which for a major highway relates to a design speed of 60-70 km/h or about 75 km/h for an urban road.

Referring to Austroads Guide To Road Design Part 3: Geometric Design Table 8.7 for a reasonably alert driver with a reaction time of 2.0 seconds and coefficient of deceleration $d=0.36$, a desirable minimum K value of 29.3 for stopping sight distance is called for at a design speed of 80 km/h. If the design speed is/h then the desirable minimum $K=42.9$.

Exacerbating the problem for the northbound movement in particular is the fact that a 350m radius horizontal curve is developed on this substandard crest curve.

Northbound motorists approaching the overpass would not clearly see the horizontal curve and this can lead to some drivers failing to negotiate the horizontal curve safely. It is also noted that the superelevation on the 350m radius horizontal curve is to be 3.5% which, based on the State Highway Geometric Design Manual, equates to a design speed of under 80 km/h.

The typical cross section on drawing K100 shows 1.5m shoulders adjacent to rigid barriers for the overpass. This will apply over a length of some 500m. A broken down vehicle will be stopped partially in the traffic lane and doors will also open into the traffic lane. Whilst the total width between edge and median barriers will be approx. 6.5m, there is still the risk of a stationary vehicle, open door or person being hit, given the above geometric limitations.

Southbound on the Girven Road overpass, there is a slight reverse curve in the travel lane caused by the transition to tangent at the end of the horizontal curve 2 to achieve forward sight distance along the median barrier.

Recommendations:

- Flatten the crest curve of the overpass at Girven Road to achieve a design speed of 90 km/h. If 90 km/h design speed cannot be achieved, flatten the crest curve to achieve a design speed of at least 80 km/h and introduce measures to encourage speed reduction northbound prior to the overpass.*
- Increase the superelevation on horizontal curve 2 to 4%.*
- Increase the shoulder width adjacent to the rigid edge barriers along the overpass.*
- Relax the reverse curve in the southbound travel lane at the end of curve 2.*

Designer Response	The alignment has been designed to best fit into the constraints of the site and provide a speed transition from the Tauranga Eastern Link to Maunganui Road. It is likely that 80km/hr design speed is the maximum achievable at the Girven Road overpass, requiring careful design for horizontal, vertical geometry, crossfall and sight distance and signage. This will occur in the design phase. The posted speed is to be reviewed during the specimen/detailed design phase.. The solution would appear to be posting a 70km/hr speed limit throughout the project to match the current speed limit along Maunganui Road. A gateway feature will be required at the transition between TEL and SH2 to promote the speed reduction
Safety Engineer:	Agree with the designer's response that the balance of design elements will need to be carefully developed during the detailed design phase to provide the optimal safety outcome with the overpass geometry. Any review of speed limits will need to be cognisant of any outcomes from the National Speed Review currently being developed.
Client Decision:	Implement as per Safety Engineer recommendations, subject to findings of the National Speed Review.

Action Taken:	
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3.3 Serious Concern – SH2 mainline weaving between Girven Road and Te Maunga interchanges

Probability of Crash Occurring – Common
 Likelihood of Serious/Fatal Injury – Very Likely
Outcome – Serious

At the mid-block section immediately prior to Exeter Street there is a 100m gap between the end of the overpass barrier and the start of the barrier between the on-ramp and the Maunganui Road link to the SH29 interchange, which only has painted gore areas. This gap would allow drivers from the Girven Road overpass to cut across the painted gore areas to access SH29 via Maunganui Road and avoid the traffic lights at the Girven Road signalised intersection. Such manoeuvres would be very dangerous.

Similarly, at the same mid-block cross section in the northbound direction there are two southbound lanes with a gap to accommodate SH2 vehicles who wish to exit to Girven Road or Matapihi. However, this gap would also allow a crossing movement from the ramp from SH29 onto the Girven Road overpass, to avoid the Girven Road signalised intersection.

This midblock weaving zone was alluded to in item 2.1 as requiring a systematic revision of the SH2/SH29 regional traffic movement designs. It was recommended in item 2.1 that a system interchange be designed for uninterrupted flow between SH2 and SH29 using the Girven Road overpass. This would reduce the midblock weaving on the section of SH2 and Maunganui frontage Road between the Girven Road and Te Maunga interchanges.

Recommendations:

- a. Review the overall design to achieve a state highway to state highway system interchange and so eliminate the potential unsafe mid-block weaving (refer item 2.1).
- b. Alternatively, provide physical barriers or relocated gore and barrier termini to prevent southbound SH2 overpass traffic being able to cut across to the Maunganui frontage Road, **and**
- c. Provide physical barriers or relocated gore and barrier termini to prevent northbound traffic from SH29 being able to cut across to the Girven Road overpass.

Designer Response	As per the response to Item 2.1 a system form of interchange was considered in the early option identification stage. However it was not
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	<p>able to be accommodated due to the size and effects on the surrounding area, combined with the interaction with the MGI intersection.</p> <p>A review of the barrier termination locations will be undertaken during the specimen/detailed design phase. The installation of flexible delineator posts within the gore areas will also be considered to provide a barrier to weaving.</p>
Safety Engineer:	<p>a) Refer to the Safety Engineer's response to Item 2.1 above.</p> <p>b) and c) Agree with the safety audit team's response that physical barriers be provided to prevent vehicles weaving from the southbound SH2 overpass to the Maunganui frontage Road, and from the SH29 northbound traffic to cut across to the Given Rd overpass.</p>
Client Decision:	<p>a) Decision as per Item 2.1</p> <p>b) And c) Investigate barrier termination locations during design phase to prevent undesirable movements occurring.</p>
Action Taken:	

3.4 Moderate Concern – SH29 alignment between Te Maunga interchange and Truman Lane roundabout

Probability of Crash Occurring – Common
 Likelihood of Serious/Fatal Injury – Unlikely
Outcome – Moderate

The short 400m length of SH29 between the Truman Lane roundabout and the interchange with SH2, which serves 32,800 vpd (7.8% HCV), is aligned on a set of reverse horizontal curves, one of which is on a crest curve, with a 45 km/h design speed and a 6.3% gradient, a design which seems rather inappropriate for a state highway. Drivers travelling at more than the design speed are likely to stray out of lane and this can lead to crashes.

A roundabout at Truman Lane/SH29 serves as an effective slow point/threshold communicating a change of speed environment to drivers. The mainline could therefore be straighter with better intersection sight distance in each direction by remaining substantially on the exiting horizontal alignment. If so, Truman Lane would need to be re-aligned, either through the Stadium parking lot (refer to item **4.1**), or by using the railway underpass to form a north leg of the roundabout (refer to item **2.3**).

Recommendation:

*Provide a more direct alignment for SH29 with a higher design speed and improved intersection sight distance to the roundabout and signalised interchange (refer also item **4.1**).*

Designer Response	The SH29 roundabout location and 400m length have been designed to encourage speed reduction on the approach to the signalised intersection. The alignment and roundabout position is restricted by the Truman Lane connection and the adjacent railway corridor. Deviating Truman Lane through the Baypark Stadium parking area as a public road is not considered appropriate for the function that Truman Lane has and the conflict with the stadium use. The alternate layout described in the safety audit recommendation was considered and would require traffic management to be installed on SH29 during a stadium event creating a safety issue. The preferred option avoids this scenario.
Safety Engineer:	a) The designer should confirm that safe intersection sight distance for the SH29 northbound approach to the Truman Lane roundabout can be provided. b) Agree with the designer's response that the roundabout design and mid-block alignment designed to manage speed on the approach to the signalised intersection.
Client Decision:	a) And b) Implement as per Safety Engineer recommendations.
Action Taken:	

3.5 Comment – Forward sight distance

The SAT has assumed that forward sight distance has been checked along the mainline with respect to design speed.

Designer Response	The designer advises that this has been undertaken. It will be checked again during detailed design.
Safety Engineer:	Agree with designer's response that forward sight distance will be reviewed as part of the detailed design phase.
Client Decision:	Implement as per Safety Engineer recommendations.
Action Taken:	

3.6 Comment – Street lighting

The SAT acknowledges that street lighting has not been considered at this stage of design, but notes that there will need to be lighting on the overpass to help define the alignment as well as lighting the carriageway. Mounting height and location of street lights at grade will need to take account of possible glare for drivers using the overpass.

Designer Response	The designer notes that this will be undertaken during specimen/detailed design.
Safety Engineer:	Agree with the designer's response that lighting design will be incorporated into the detailed design phase. The lighting design should take into account the use of LED lighting that may address the glare issues raised by the safety audit team.
Client Decision:	Lighting design to consider use of LED lighting but will also take into account lighting environment immediately up and down stream of project.
Action Taken:	

4.0 INTERCHANGES and INTERSECTIONS

4.1 Significant Concern – SH29/Truman Lane/Baypark access roundabout

Probability of Crash Occurring – Common
 Likelihood of Serious/Fatal Injury – Likely
Outcome – Significant

The existing Truman Lane roundabout is to be replaced with a new roundabout on SH29 about 400m further west. The west leg of SH29 is offset so that approaching drivers do not look at the central island until they are into the final entry curve.

All approaches appear to have insufficient splitter island lengths for high speed roads such as SH29. They should extend upstream to at least the safe stopping sight distance and also around horizontal approach curves.

Three legged roundabouts frequently have more crashes than standard four leg roundabouts owing to the lack of deflection on one or more legs. In this respect the Truman Lane entry to SH29 exit westbound does not appear adequate. This is caused by an offset central island, which also makes the adjacent SH29 entry curve quite severe, with inadequate spacing and an acute angle with the Truman Lane leg. Crash models have identified the acuteness of angle between adjacent legs as a significant crash factor in part because of the smaller gap times that must be recognised by the downstream entering traffic and also since the upstream entering traffic is focussed on looking right.

The roundabout re-location has resulted in the Stadium left-in left-out driveway, which is used for event management, now being situated on the opposite side of the Truman

Lane roundabout. This removes the opportunity for a traffic-coned free-flow entry lane from SH29 or free flow exit lane onto westbound SH29 before or after major events, respectively.

The SAT is of the opinion that the roundabout should be relocated further west on SH29 at the extension of the western boundary service road of the Stadium and Arena. This would allow for a three legged roundabout with equally spaced approaches. Truman Lane would be re-designated to follow the main internal stadium access road which currently connects with Truman Lane south of the stadium. Longer term, if recommendations for access in items **2.3** and **3.4** were implemented then Truman Lane could become a fourth perpendicular north leg of the roundabout.

Recommendations:

- a. Relocate the proposed SH29/Truman Lane roundabout further west on SH29 with SH29 as the straight through route. Provide a roundabout leg on the south to serve the stadium and arena. Realign and co-locate Truman Lane on this leg to share the main Baypark stadium access road, which is 4 lanes wide. In the longer term consider providing a fourth north leg to the roundabout tying in to an extension of Truman Lane sharing the railway underpass and to provide access to the north side of SH29 for the Matapihi area.
- b. Design the roundabout with raised median splitter islands on SH29 extending at least beyond the safe stopping sight distance and any approach curves.
- c. At the detail design stage incorporate threshold treatments on SH29 southbound to induce a reduction in speed prior to the roundabout.

Designer Response	The deviation of Truman Lane through Baypark Stadium is not considered appropriate, refer 3.4. The extension of Owens Place has been discounted due to cost and effects on business operations along Owens Place. The splitter islands will be designed to provide adequate stopping sight distance on the approach to roundabout. A raised splitter island is proposed for the 400m length of SH29 approaching the signalised intersection. The final layout will be confirmed at the design stage.
Safety Engineer:	a) Agree with the designer's response that the deviation through Baypark Stadium is not appropriate. b) and c) Agree with the designer's response that the roundabout splitter islands will be designed to provide safe stopping sight distance to the roundabout, and threshold treatments will be provided to induce speed reduction prior to the roundabout.
Client Decision:	Implement as per Safety Engineer recommendations.
Action Taken:	

4.2 Minor Concern – Te Maunga SH2/SH29 interchange

Probability of Crash Occurring – Occasional

Likelihood of Serious/Fatal Injury – Unlikely

Outcome – Minor

The SH2/SH29 interchange has been designed as a “tight urban diamond” form, with approximately 40m of queuing distance between the signalised intersections on the overpass. The three phase signals are coordinated to provide progression for major movements to minimise queuing.

Pedestrian and cyclist crossings and access is provided across the south side of the intersection and bridge.

The SAT was generally satisfied with the design when considered in isolation. However, this interchange has been implicitly critiqued in other sections of the report in terms of the relationship with adjacent elements. To re-cap:

- Items **2.1**, **2.2** and **3.3** discussed the need for the two interchanges to function as one system design rather than two adjacent but independent interchanges with weaving issues in the mid-block between them. This would also provide clearer more direct routes for travellers and facilitate simpler directional signage.
- Items **2.3** and **3.4** addressed the SH29 approach and possible local connectivity and access between the stadium in the southwest quadrant and Matapihi/Owens Place in the northwest quadrant.

Thus the SAT is of the opinion that this interchange design will be impacted to address the above concerns.

Comment: We note that no longitudinal sections were provided for the ramps at Te Maunga and therefore the SAT could not verify that adequate sight distance has been provided.

Recommendation:

Modify the SH2/SH29 interchange design at Te Maunga in response to accommodating concerns discussed in those items that relate to adjacent roadway and railway design elements.

Designer Response	See designers response to the items noted above.
Safety Engineer:	Refer to the Safety Engineer’s response to Item 2.1 above.
Client Decision:	Decision as per Item 2.1.
Action Taken:	

4.3 Significant Concern – Girven Road/Maunganui Road/Matapihi Road intersection

Probability of Crash Occurring – Common

Likelihood of Serious/Fatal Injury – Likely

Outcome – Significant

The Maunganui Road/Girven Road/Matapihi Road roundabout will be replaced by a “single point” interchange design controlled as one large signalised intersection centred under the SH2 two-lane overpass. The intersection has a large footprint with dual exit lanes on three of the legs, 5 lanes on the northbound Maunganui Road approach, 4 lanes each southbound and westbound, and 3 lanes eastbound.

Thus, the wide intersection will require long clearance times for all modes including cars, trucks, buses, cyclists, and pedestrians to cross safely without conflicts in space and time. Long truck and trailer combinations and slower cyclists are of particular concern and the signal timing plans should be designed for them to clear. The size of the intersection will also result in long waiting times, which can lead to red light running. The safety concerns relating to non-motorised users at specific points are discussed separately in Section 0

As well as creating a visual barrier across Maunganui Road, the design decision for SH2 to overpass rather than underpass Girven Road in a trench, will result in a significant proportion of the intersection area being shaded during daytime in contrast with the directly day-lit adjacent areas. This will hinder the ability of users to react to conflicting traffic streams with cyclists in particular not readily seen if in shadow.

Recommendations:

- a. Investigate options to relocate regional SH29 traffic onto the overpass to reduce intersection conflicts and therefore the number of approach and exit lanes (refer item 2.1).
- b. Investigate alternative signalised intersection layouts to minimise safe clearance distances and intervals, reducing impatience and possibilities of risky crossing behaviour.
- c. Ensure that the signal timing plans that are implemented have adequate clearance intervals for long combination truck and trailers, cyclists and pedestrian crossings.

Designer Response	<p>Note designers previous response to item 2.1</p> <p>The intersection layout is required to cater for a high volume of vehicle traffic which reduces the level of service able to be provided to pedestrians. However the combined pedestrian crossing time of SH2 and Matapihi Rd is approximately 2 minutes, which is not uncommon in Tauranga. This duration is mitigated somewhat by staggered crossings which reduce crossing distances and crosswalk times. Further analysis</p>
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	during the detailed design phase will optimise the intersection operation for all parties. The philosophy of providing cyclists with off road crossing facilities has been discussed with Tauranga City Council and has received their support.
Safety Engineer:	<ul style="list-style-type: none"> a) Refer to the Safety Engineer's response to Item 2.1 above. b) Agree with the safety audit team's recommendations that further analysis of the signalised intersection layout should be undertaken. In particular the standard "diamond" phasing for signalised interchanges should be provided that has the internal limit lines within the interchange. Also a signalised crosswalk should be provided for across the Girven Road approach. c) Agree with the safety audit team's recommendation that the signal timing plans have adequate clearance times. d) The signal design should be reviewed by Tauranga City Council as part of our collaboration process on Traffic Operations.
Client Decision:	<ul style="list-style-type: none"> a) Decision as per Item 2.1. b) Signalised crosswalk on Girven Road to be implemented as per Safety Engineer recommendations. Signals design to be analysed and refined during design phase. c) Implement as per Safety Engineer recommendations. d) Implement as per Safety Engineer recommendations.
Action Taken:	

4.4 Moderate Concern – Matapihi Road/Owens Place intersection

Probability of Crash Occurring – Common
Likelihood of Serious/Fatal Injury – Unlikely
Outcome – Moderate

The Matapihi Owens Place T-intersection is currently priority controlled on the south leg with a single approach lane and a pedestrian crossing on the west leg across Matapihi Road. The Owens Place approach is a single shared lane for left or right turns. Further west is a driveway access to the Owens Place shopping centre. The design would relocate the pedestrian crossing to the Maunganui Road/Matapihi Road intersection and signalise it. Eastbound, Matapihi Road would have three lanes opposite Owens Place on the approach to the Maunganui Road signals. Right turners from Owens Place would need to select one of these lanes to exit into depending on their destination.

There are already queues generated in Owens Place and the SAT observed some drivers accepting small gaps for right turns out of Owens Place. The SAT is concerned that in the future the right turn from Owens Place onto Matapihi Road would need to

cross two eastbound through lanes if turning into the left lane onto Maunganui Road which would increase the risk of a crash. There is a direct relationship between traffic density and crash frequency as the critical gap decreases as traffic flow increases. The risk increases further on multi-lane roads.

There is also the risk that if a driver cannot easily turn right out of Owens Place (due to delay or queues on Matapihi Road), he/she will turn left and then do an unsafe U-turn.

Also, since Owens Place is a significant local shopping destination, the current location of the pedestrian crossing is preferable to the new signalised crossing of Matapihi Road to be provided as part of the design, which would require a crossing of Owens Place as well.

Recommendations:

- a. Signalise the intersection of Matapihi Road/Owens Place and coordinate it with the other signals on Girven Road corridor.
- b. Provide separate left turn and right turn approach lanes on Owens Place and a westbound left turn pocket between Maunganui Road and Owens Place on Matapihi Road.
- c. Allow signalised pedestrian crossings of the south and west legs of this intersection in place of the two stage crossing at Maunganui Road.

Designer Response	The MGI project does not change the traffic demand through the intersection, nor does the project require the intersection to be signalised for the MGI project to function. Any intersection capacity improvements, other than those necessary for tying into the MGI intersection lanes, are the responsibility of TCC who have advised that they do not intend to signalise the intersection. The final lane arrangement on Matapihi Road will be confirmed in the detailed design to suit the geometric lane requirements.
Safety Engineer:	<ol style="list-style-type: none"> a) Agree with the safety audit team's recommendation that the Matapihi Rd/Owens place intersection be signalised. The close proximity of the two intersections would seem to necessitate having both intersections signalised and co-ordinated, and would also allow co-ordination with the at-grade railway crossing. b) Providing separate left turn slip lanes on the Matapihi Rd and Owens Road approaches would reduce the potential of excessive queues extending from the intersection. c) A signalised crosswalk will need to be provided across the Owens Place approach. The two stage crossings across Matapihi Road should be retained. d) The signal design should be reviewed by Tauranga City Council as part of our collaboration process on Traffic Operations.
Client Decision:	a) Operation and performance of local road intersection will remain unchanged by scope of project. Will recommend Tauranga City Council develop Owens Place/Matapihi Road signalised intersection,

	<p>and to be coordinated with MGI signals.</p> <p>b) Will further investigate traffic modelling and operation of intersection to determine whether proposed scheme provides sufficient queue space.</p> <p>c) Refer to a) above.</p> <p>d) Implement as per Safety Engineer recommendations.</p>
<i>Action Taken:</i>	

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5.0 CYCLISTS and PEDESTRIANS

5.1 Serious Concern – Cyclists on expressway

Probability of Crash Occurring – Common
Likelihood of Serious/Fatal Injury – Very likely
Outcome – Serious

There is no indication that cyclists southbound on Maunganui Road will not be able to cycle on the overpass. The narrow shoulders (see item 3.2) would present a significant safety issue for cyclists given the operating speed and shy effect of the rigid barrier. Furthermore any cyclists would then need to cross the on-ramp from the Maunganui Road frontage road and downstream would find themselves on the TEL motorway.

Recommendation:

Prohibit cyclists from the SH2 overpass and through route between Girven Road and Te Maunga interchanges.

Designer Response	The SH2 overpass directs road users onto the Tauranga Eastern Link, which cyclists are prohibited from using. We agree that cyclists should be prohibited from using the SH2 overpass and appropriate signage is to be confirmed in the design phase.
Safety Engineer:	Agree that pedestrians and cyclists be prohibited from being on the SH2 overpass, and that cyclists should also be prohibited from the Maunganui Road sections between Te Maunga and Matapihi Rd/Girven Road. An off-street shared cycle/pedestrian path should be provided on the northern side of Maunganui Road between the two intersections.
Client Decision:	Implement as per Safety Engineer recommendations.
Action Taken:	

5.2 Serious Concern – Girven Rd/Matapihi Rd/Maunganui Rd at-grade crossing facilities

Probability of Crash Occurring – Frequent
Likelihood of Serious/Fatal Injury – Likely
Outcome – Serious

Drawing K095 indicates a formal signalised pedestrian crossing will be provided across the north leg of the Maunganui Road frontage roads (two stage crossing), and across Matapihi Road (two stage crossing). There will be no provision for pedestrian crossings on Girven Road or across the south leg of Maunganui Road frontage roads. Thus the

southeast quadrant of this intersection will not have safe pedestrian access to any of the other quadrants.

The only provision for cyclists are narrow (1.5m) cycle lanes between the left turn and through lanes on Girven Road and Matapihi Road. There is no provision for cyclists on the Maunganui Road frontage roads. The layout is very vehicle-centric and many cycle movements are not catered for. For example, when on site, the SAT noted cyclists moving between Girven Road and Maunganui Road (north) by having to use the Bayfair car park and the subway

Overall, the SAT considers that there is inadequate safe provision for vulnerable road users at this large and busy intersection. The cycle time coupled with the long two-stage signalised crossings will mean that many pedestrians are likely to attempt to cross roads without waiting for the pedestrian signal. This may be more prevalent in inclement weather. Cyclists, too, are likely to attempt manoeuvres and crossing of roads that will put them at risk.

Any cyclist crossing between Girven and Matapihi Roads (70m) or making right turns from those roads may not have cleared the intersection before conflicting traffic gets a green light, especially if the cyclist has entered the intersection late on the green phase. This will put cyclists at significant risk.

Recommendations:

- a. Review the form and layout of the intersection per the recommendations in item 4.3 with particular emphasis on safe provision for vulnerable road users.
- b. Provide a pedestrian crossing of Girven Road with a crossing signal phase.
- c. Provide cycle lanes on Maunganui Road northbound and southbound approach lanes between the exclusive left turn lanes and the adjacent through lanes.
- d. Provide bicycle lanes on all four exit legs of the intersection.
- e. Make provision for cyclists to undertake safe right turns by way of marked bicycle boxes or hook turns on all approaches.

<i>Designer Response</i>	<ol style="list-style-type: none"> a. Refer to designers response in 4.3 regarding the intersection operation. b. A signalised pedestrian crossing of Girven Road is to be provided at Maunganui Road. c. Tauranga City Councils' Cycling Strategy is to encourage/promote cyclists (via signage and advertisements) to use the Matapihi Road / Girven Road / Grenada Street. The project will be maintaining this route and not encouraging cyclist to use the State Highway. It is recommended that cycle lanes are not provided on the Maunganui Road approaches, particularly with cyclists prohibited from using the Tauranga Eastern Link. d. In discussion with TCC, their preference is for an off road cycle path on Girven Road (east side) and Matapihi Road (west side), which
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	<p>can be provided. On road straight through cycle lanes between Girven Road and Matapihi Road can also be provided within the space available.</p> <p>e. These are not considered necessary, based on the response to c. and d.</p>
Safety Engineer:	<p>a) Refer to the Safety Engineer's response to Item 4.3 above.</p> <p>b) Agree with designer's response that a signalised pedestrian crossing of Girven Road is to be provided at Maunganui Road.</p> <p>c) Agree with the designer's response that cycle lanes not be provided on Maunganui Road between the intersections. An off-road shared cycle pedestrian path should be provided on the northern side of Maunganui Road.</p> <p>d) Agree with the designer's response that off-road shared cycle/pedestrian paths be provided on Girven Road and Matapihi Road. Also the off-road shared cycle/pedestrian path should be extended west of the intersection to allow eastbound cyclists to leave Manganui Road prior to the intersection.</p> <p>e) Agree with the safety audit team's recommendation for providing bicycle boxes on Girven Road and Matapihi Road. Hook turns could also be provided providing these can be accommodated within the signal phasing.</p>
Client Decision:	<p>a) Decision as per Item 4.3.</p> <p>b) to e) Implement as per Safety Engineer recommendations.</p>
Action Taken:	

5.3 Significant Concern – No grade-separated crossing facilities

Probability of Crash Occurring – Common
 Likelihood of Serious/Fatal Injury – Likely
Outcome – Significant

The existing subway under Maunganui Road between Bayfair shopping centre and Matapihi Road is well used by pedestrians and bicyclists. The SAT also witnessed regular mid-block crossings of Girven Road to and from Bayfair shopping centre.

As a result of discussions with the public regarding personal security concerns using the existing underpass, and the fact that it would require to be lengthened, the decision was made to close the underpass and replace it with at-grade signalised crossings.

However, given the SAT concerns regarding the numerous at-grade safety deficiencies for pedestrians and cyclists expressed in item 5.2, in our opinion a grade separated crossing of this major intersection is warranted as either a supplement to or replacement of the at-grade design elements for pedestrian and cyclist facilities. It is acknowledged that this presents a significant design and cost challenge; however,

remedying the deficiencies noted with the at-grade crossings would be similarly challenging.

Recommendation:

Provide grade-separated crossings for pedestrians and cyclists between all four corners of the intersection.

Designer Response	As the SAT team acknowledge, there is a significant design and cost issue with grade separating all pedestrian and cyclist movements. Additional facilities are proposed as outlined in the response to 5.2.
Safety Engineer:	Agree with the designer's response that there is a significant design and cost issue with grade separating all pedestrian and cyclist movements. However the principal's requirements should not preclude the provision of grade separated facilities if this can provide a greater safety outcome.
Client Decision:	Decision as per Item 2.1.
Action Taken:	

5.4 Moderate Concern – Girven Road/Bayfair Shopping Centre intersection

Probability of Crash Occurring – Common
Likelihood of Serious/Fatal Injury – Unlikely

Outcome – Moderate

The western Bayfair driveway access to Girven Road is currently restricted to left-in, left-out, right-out and operates using gap acceptance (no signal). The raised median on Girven Road currently provides a storage area for right-out vehicles to perform a two-stage manoeuvre to merge with Girven Road westbound traffic. This movement is also performed by some of the bus routes that pass through the Bayfair shopping Centre parking area.

The proposed design would remove the provision for right-out movements by closing the raised median gap on Girven Road. However, drawing K095 shows that the median would not extend far enough east to deter vehicles from turning left-out followed by a U-turn to head west on Girven Road.

Since the right-out bus route would no longer be possible, the bus terminal in the front car park is proposed to be relocated behind the shopping centre near Farm Street, where it would be less visible and less convenient to potential bus patronage. Pedestrians and cyclists were observed crossing midblock onto this median from the walkway through to Eversham Road.

Further east at the Girven Road/Gloucester Road intersection, a signalised intersection provides the only signal protected crossing of Girven Road and also signalised right-out movements from the parking garage in the shopping centre.

The next intersection serving the rear of the shopping centre is Farm Street, which experiences long queues and delays in the pm peak hour. Pedestrians from the Baywave swim centre were observed to cross Girven Road mid-block between these intersections.

The high demand for safe crossing points on Girven Road for pedestrians, cyclists and vehicles is not currently being met by the only signals at Gloucester Road. The SAT was told that the Tauranga City Council is considering providing a mid-block signalised pedestrian crossing in proximity to the left-in left-out shopping centre access. The SAT is of the opinion that this driveway should be fully signalised to provide for pedestrian, cyclist and bus movements across Girven Road, particularly if the Maunganui Road/Girven Road signal does not provide a pedestrian crossing on the east leg. The signals should be coordinated with the master Maunganui Road/Girven Road signals, as well as others on the Girven Road corridor.

The SAT considers that the council should also consider providing a coordinated signal at Girven Road/Farm Street.

Recommendations:

- a. Provide a signalised intersection at the Girven Road/Bayfair shopping centre west driveway to provide for safe passage of pedestrians, cyclists and buses. Coordinate these signals with the master intersection at Maunganui Road/Girven Road.
- b. Implement a coordination sub-system between all proposed signals along the Girven Road-Matapihi Road corridor. This would provide the ability to meter the master intersection on Maunganui Road and shorten clearance intervals..

Designer Response	The signalisation of the local road network intersections is considered to be outside the scope of the project. The coordinated sub-system is not necessary for the current project scope which has less signalised intersections than the SAT recommend. Liaison has and continues to be undertaken between NZTA, TCC and AMP (Bayfair) regarding the Bayfair Masterplan.
Safety Engineer:	a) The Girven Road/Bayfair shopping centre west driveway should remain as left-in, left-out as shown. b) Agree with the Safety Audit Team's recommendation that a co-ordination sub-system between all proposed signalised intersections be implemented. This would be the case if all signalised intersections are SCATS integrated.
Client	a) Implement as per Safety Engineer recommendations.

Decision:	b) Refer to Item 4.4 – sub-system only required if Owens Place/Matapihi Road intersection becomes signalised.
Action Taken:	

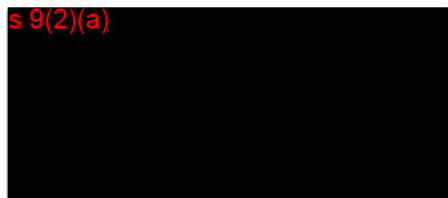
5.5 Comment – Routes and wayfinding signage for cyclists and pedestrians

Whatever the final design of the MGI and Te Maunga interchanges, there will be challenges for pedestrians and cyclists to safely negotiate the interchanges. To this end safe and attractive pedestrian/cyclist routes together with good wayfinding signage at the interchanges and linking to facilities on the local road network will be essential.

Designer Response:	The design of signage for pedestrians/cyclists will be coordinated during detailed design with TCC to provided route linkage with the local network.
Safety Engineer:	Agree with the designer’s response that the design of signage for pedestrians/cyclists will be coordinated during detailed design with TCC to provided route linkage with the local network.
Client Decision:	Implement as per Safety Engineer recommendations.
Action Taken:	

6.0 AUDIT STATEMENT

We certify that we have used the documents noted in section 1.5 and have examined the specified roads and their environment, to identify features of the project we have been asked to look at that could be changed, removed or modified in order to improve safety. The problems identified have been noted in this report, together with recommendations, which should be studied for implementation.

s 9(2)(a)


Signed:.....Date: 23 November 2013

s 9(2)(a)


Senior Associate
 Traffic Planning Consultants Ltd, Hawke’s Bay

s 9(2)(a)

Signed:.....Date: 23 November 2013

s 9(2)(a)

Robinson Transportation Consulting, Tauranga

s 9(2)(a)

Signed:.....Date: 23 November 2013

s 9(2)(a)

Senior Safety Engineer
NZ Transport Agency, Hamilton

Released under Official Information Act 1982

APPENDIX



		<table border="1"> <tr> <th>Date</th> <th>Author</th> <th>Checked</th> <th>Approved</th> </tr> <tr> <td>12/06/2018</td> <td>...</td> <td>...</td> <td>...</td> </tr> <tr> <td>13/06/2018</td> <td>...</td> <td>...</td> <td>...</td> </tr> </table>	Date	Author	Checked	Approved	12/06/2018	13/06/2018		SH2 MAUNGANUI / GIRVEN AND TE MAUNGA INTERSECTION IMPROVEMENTS	OPTION 4 ROUNDABOUT ON SH29 GENERAL ARRANGEMENT	CIVIL 3933377-C-K089
Date	Author	Checked	Approved															
12/06/2018															
13/06/2018															