Tauranga City Council

Level Crossing Safety Impact Assessment Totara Street Rail Crossings

Tauranga City Council

Level Crossing Safety Impact Assessment

Totara Street Rail Crossings

Prepared By

Bridget Feary
Principal Traffic Engineer

Opus International Consultants Ltd

Auckland Civil
The Westhaven, 100 Beaumont St
PO Box 5848, Auckland 1141
New Zealand

Reviewed By

pp
Richard Landon-Lane
Senior Transportation Engineer

Telephone: +64 9 355 9500

Facsimile:

Date: 13 November 2017
Reference: 2-9B278.09
Status: Issue 2

Approved for Release By

Kevin Coleman
Project Director - Transportation

Contents

1 Executive Summary

Tauranga City Council are planning to construct a new on-road cycle facility along Totara Street in Mt Maunganui, crossing the Mt Maunganui Branch line at two locations. For this reason, KiwiRail requested that a Level Crossing Safety Impact Assessment (LCSIA) be completed for the existing pedestrian level crossings at each site. The Level Crossing Safety Score (LCSS) procedure assesses and scores the risk of each crossing point at each assessment stage of the project. The tables below detail the progression of the LCSS for the level crossings for the four stages of the LCSIA.

Two proposed designs are assessed for each site. Proposed Design 1 aims to achieve KiwiRail criteria 2, by providing a lower LCSS than the updated Existing LCSS. Proposed Design 2 aims to achieve KiwiRail Criteria 1, of a Low or Medium-Low LCSS. The Future Score is an assessment based on the proposed design which achieves Criteria 2, to show how the risk increases in time.

No changes are proposed to the Road Level Crossings, therefore only the existing LCSS scores for the road crossings are tabulated below.

Table 1: Existing LCSS Road Crossings

Crossing	**Existing LCSS**
	Roadway
Totara Street 1926	16/60
	Low
Totara Street 1950	31/60
	Medium

Tabulated below are the results of the evaluation of the pedestrian level crossings. The future score is based on the proposed design which achieves Criteria 2, with a 2% per annum growth rate applied to user numbers over the 10-year period post opening (i.e. 260 users per day).

Table 2: LCSS Pedestrian Crossing 1927 – South of Astrolabe Street

Crossing	**LCSS – Pedestrian Crossings**			
	Updated Existing	Proposed Design 1	Proposed Design 2	Future Score
Totara Street 1927	33/60	26/60	15/60	28/60
	Medium	Medium-Low	Low	Medium-Low
Achieves Criteria:		1 and 2	1 and 2	(based on Proposed Design 1)

The pedestrian crossing #1927 has an existing LCSS of 33/40 (Medium) with the Proposed Design 1 achieving a lower LCSS of 26/60 (Medium-Low). Therefore, the proposed upgrade does achieve Criteria 2.

The existing ALCAM risk band was Medium-High and stayed at Medium-High after the Proposed Design 1 suggestions. Despite this the ALCAM risk score reduced by 7%.

Table 3: LCSS Pedestrian Crossing 1591 – north of Hull Road

Crossing	LCSS – Pedestrian Crossings			
	Updated Existing	Proposed Design 1	Proposed Design 2	Future Score
Totara Street 1591	36/60	30/60	28/60	30/60
	Medium	Medium	Medium-Low	Medium
Achieves Criteria:		Nil.	1 and 2	(based on Proposed Design 2)

Pedestrian crossing #1591 has an existing LCSS of 36/60 (Medium) with the Proposed Design 1 achieving a LCSS of 30/60, just on the cusp of moving from a Medium score to Medium-Low. The ALCAM risk band was High and remained High, increasing by 7% with the increased exposure due to the higher volume of pedestrians at opening than existing.

The SRT proposed design 2 has a LCSS of 28/60 (Medium-Low), meeting Criteria 1 and 2. The ALCAM risk band for the SRT option is Medium-High and reduces the ALCAM score by 13%. The SRT design incorporates all the improvements proposed by Option 1 with the addition of manual gates.

1.1 Recommended Improvements

Both crossings have two tracks, which may unduly affect the ALCAM infrastructure scores in terms of the apparent risk to pedestrians of crossing when there are consecutive trains or trains travelling in both directions. Proposals tested in the ALCAM LXM system which included an 'Active sign "another train coming" warning control significantly reduced the infrastructure and exposure factors on both crossings, moving both crossings into the "Low" ALCAM risk band.

If there is no or very low likelihood there will be trains travelling in close sequence or from one direction then another immediately following in the opposite direction then the risk to pedestrians of crossing two tracks should be significantly diminished, which should ensure both designs as proposed meet KiwiRail criteria.

1.2 Future User Volume surveys

Tauranga City Council is required to conduct additional user volume (and proportion of user types) surveys two years after the opening of the facility and review whether a change in control is required. Subsequent surveys and reviews must be completed in three yearly cycles thereafter.

1.3 Safety Review

1.3.1 Existing Crossings – General Improvements

In addition to the LCSS, a general safety review was completed at each existing crossing, with safety improvements to signs, markings, controls and surfacing identified.

The report concludes the following regarding general safety improvements to the existing road crossings:

Crossings 1926/1927, South of Astrolabe Street

The LCSIA scores place the road crossing in the LOW risk band and the pedestrian crossing in the MEDIUM risk band. When designing to upgrade the existing facilities, the pedestrian/cycle facilities should be improved to achieve a Low or Medium-Low level of risk.

The recommendations encompass improvements to the existing facilities including:

- Upgrading the footpath over the level crossing to comply with Part 9 of the Traffic Control Devices Manual.
- Installing Level Crossing warning signs for pedestrians so that both approach directions are covered.
- Providing a level and even path surface free of trip hazards and obstacles.
- Installing rail X markings on both approaches.

Crossings 1590/1591, North of Hull Road

The LCSIA scores place the road in the MEDIUM risk band and the pedestrian crossing in the MEDIUM risk band. When designing to upgrade the existing facilities, the pedestrian/cycle facilities should be improved to achieve a Low or Medium-Low level of risk.

The recommendations encompass improvements to the existing facilities including:

- Upgrading the footpath over the level crossing to comply with Part 9 of the Traffic Control Devices Manual.
- Installing Level Crossing warning signs for pedestrians so that both approach directions are covered.
- Providing a level and even path surface free of trip hazards and obstacles.
- Re-marking the cross hatched zone to extend over the railway tracks.
- Installing rail X markings on both approaches.

1.3.2 Safety Review of Proposed Designs

The proposed designs have been reviewed for safety and the following issues and comments identified:

- Signs/Markings are needed to clarify how cyclists and pedestrians are intended to use the maze area (i.e. whether or not to dismount, direction of travel, shared areas) and to minimise conflicts.

- If cyclists or pedestrians do not follow the intended direction of travel in the maze they may miss the flashing lights/warning signs which are located with the assumption that users will be approaching on the left side of each crossing.
- The footpath does not follow the pedestrian desire line – a more user-friendly layout should be considered.

2 Introduction

Tauranga City Council (TCC) commissioned Opus to complete a Level Crossing Safety Impact Assessment (LCSIA) of two existing road/rail grade crossings on Totara Street in Mount Maunganui. An initial assessment of the existing crossings was completed in August 2017 which incorporated a safety review of the existing crossings layout. The safety issues identified in the assessment are included in this report.

Designs for the pedestrian crossings upgrade were provided to the reviewers in November 2017 and this report has subsequently been updated to include an assessment of the design proposals. No changes to the road crossings are proposed.

Sample traffic, pedestrian and cyclist counts were undertaken during the site visits to assist in evaluating the Level Crossing Safety Scores. Where more complete data was available (i.e. cyclist counts), this was used for the calculations.

This report covers both road and pedestrian grade crossings at the two crossing locations on Totara Street. The report is structured to cover:

Section 3 – Grade Crossings Information

Section 4 – Traffic Data

Section 5 – LCSIA Assessment, Safety Review and Conclusions/Recommendations

Appendices – Including Crash and Incident Data, Site Survey Data, LXM Data, Site Photographs, Proposed Designs

Section 5 has been updated in this November issue of the report to include the evaluation of the proposed designs for the pedestrian crossings.

Section 5.4 covers the LCSIA Evaluation of the Proposed Design of Pedestrian Crossing 1927 and Section 5.5 covers the Proposed Design Safety Assessment.

Section 5.8 covers the LCSIA Evaluation of the Proposed Design of Pedestrian Crossing 1591 and Section 5.9 covers the Proposed Design Safety Assessment.

3 Grade Crossings – Background Information

The two level crossings being reviewed intersect with Totara Street in Mt Maunganui. Totara Street runs North-South and is in the Port area of Tauranga City. The surrounding land is zoned Port Industry/Industry and KiwiRail land, with the Mount Maunganui Branch Railway terminating opposite Blake Park, north of Hull Road.

Totara Street currently has on-road marked cycle lanes and a narrow footpath on the eastern side of the road corridor.

3.1 ALCAM Level Crossings 1926/1927

The ALCAM Level Crossing #1926 (Road) and #1927 (Pedestrian Down) is "Totara Street Number 3 Siding Mt Maunganui", and is located approximately 200 metres south of Astrolabe Street.

The crossings are public crossings and are on the Mt Maunganui Branch Line at KM 6.51.

The branch line is an active freight line with two operational tracks. The longest train that uses the crossing is 436 metres long. The road is 8.9m wide at the crossing, with 1 lane in each direction and the tracks are 4.6m wide. The rail line is straight and level.

The road crossing is controlled with Half Boom Flashing Lights, which are the only control for the pedestrian crossing. The maximum rail line speed is 25km/h and the daily rail traffic 20 trains per day.

3.2 ALCAM Level Crossings 1590/1591

The ALCAM Level Crossing #1590 (Road) and #1591 (Pedestrian Up) is "Totara Street, Tauranga", located approximately 100 metres north of Hull Road roundabout.

The crossings are public crossings on the Mt Maunganui Branch Line at KM 5.21.

The branch line is an active freight line with two operational tracks and is 25m from a shunting yard. The longest train that uses the crossing is 436 metres long. The road is 3.4m wide on each side at the crossing with traffic islands in the centre of the road. There is 1 traffic lane in each direction and the tracks are 5.07m wide at the crossing. The rail line is straight and level.

The road crossing is controlled with Half Boom Flashing Lights and Bells (FLB), with one additional set of FLB in the median facing northbound traffic. The road controls are the only controls which apply to the pedestrian crossing. The maximum rail line speed is 70km/h and the daily rail traffic is 25 trains per day.

4 Traffic Data

Data from a variety of sources, including sample counts from site, is tabulated below. We anticipate during the design phase full traffic counts will be undertaken on site.

4.1 Site Surveys

Sample surveys were undertaken at both level crossings to record vehicle, pedestrian and cyclist numbers during peak traffic periods. A summary of count data is below:

4.1.1 Crossing 1926/1927 (south of Astrolabe Street)

Surveys were undertaken between 2:30 and 6pm on Tuesday 8 August and 7:45-8:45am on Wednesday 9 August 2017. There was an average of 902 vehicles per hour recorded, including an average of 22 heavy vehicles per hour. Nine pedestrians were recorded in the 4 hours surveyed and 34 cyclists, the majority of which were riding on the road. All cyclists were adults. Two of the pedestrians were teenagers.

4.1.2 Crossing 1590/1591 (north of Hull Road)

A survey was undertaken between 9 and 10:30am on Wednesday 9 August 2017. There was an average of 1292 vehicles per hour recorded, including an average of 141 heavy vehicles per hour. Four pedestrians were recorded in the 1.5 hours surveyed and 4 cyclists, all of which were riding on the road. All pedestrians and cyclists were adults.

Refer to Appendix B: Pedestrian and Cyclist Counts for full details of counts undertaken.

4.2 Mobile Road

- Totara Street (Waimarie Street to Hewletts Road (LHS)): ADT 15,000 (est.) 31/12/2004, 0% heavy vehicles. (count site is south of crossing 1926/1927)
- Totara Street, Kawaka Street to Hull Road RAB: ADT 10,000 (est.) 31/12/2004 (count site is within the road section for crossing 1590/1591)

4.3 Abley TrafficCounts.co.nz

- Site M28-03: Totara Street, approximately 220m north of Hewletts Road – Mt Maunganui, Date: 15/05/2013; 7-day: 17,870; 5-day: 19,032 (count site is south of crossing 1926/1927)
- Site M28-05: Totara Street, approximately 150m south of Kawaka Street– Mt Maunganui, Date: 13/05/2013; 7-day: 10,817; 5-day: 10,689 (count site is within the road section for crossing 1590/1591)

4.4 Tauranga City Council Data

Tauranga City Council have provided the following graph of Cyclists Counts on Totara Street. They estimate 67,369 cycle trips per annum are completed on the Totara Street route. The 5-day cyclist average is 209 cyclists per day, and the 7-day average is 212 cyclists per day for Totara Street. No dates of counts were supplied. This data has been used in the LCSIA assessment as a basis for the future cyclist volumes using the separated cycle facility.

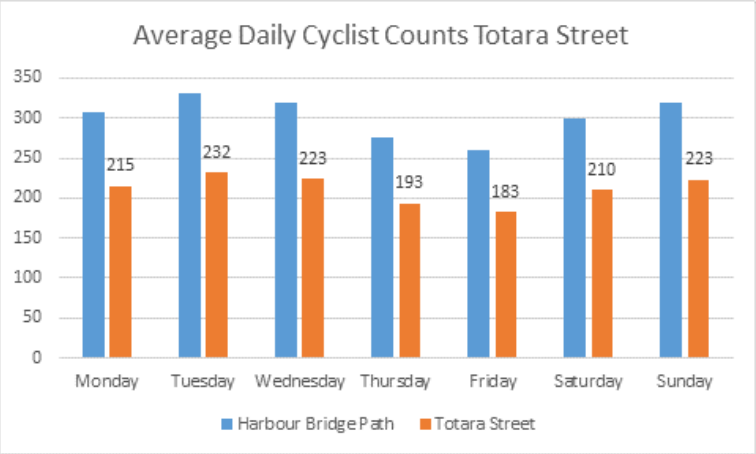


Figure 1: Totara Street Daily Averages – Cyclists

In terms of future growth on the network, the Tauranga Traffic Model was used in the Tauranga City Stress Test report to look at the ability of the network to accommodate future traffic volumes. A scenario of 20% growth between 2016 and 2046 was determined to be a reasonable level of growth for the network, which equates to <1% growth per annum. Assuming for the new cycle facility 2% growth per annum should be a reasonable assumption for the future scenario. The average daily cycle count on Totara Street below is 212 cyclists per day. In 10-years, with 2% growth per annum, that is a future volume of 260 cyclists per day.

4.5 KiwiRail Design Commentary

KiwiRail have provided some commentary regarding the future proposed cycleway design, which is intended to include an on-road 2-way cycle facility.

[redacted] KiwiRail, Project Manager – Urban Cycleway Projects

The position of any separate cycleway level crossing facilities are not permitted through the body of a turnout (where two sets of rail separate). It must be located on plain line track.

I assume this means the separated cycleway will be on road and will use the road arm barriers (although may need more width in the road and therefore longer barriers), rather than setting up separate cycleway level crossing facilities? The surfacing will need improvement and widening too (this will come out of the LCISA assessment).

[redacted] KiwiRail, Project Engineer Level Crossings

The widest width for the road barriers is 8.0m.

There are some 10m barriers around but they are not preferred due to ongoing maintenance problems.

5 LCSIA Risk Assessment

5.1 Team

The LCSIA team incorporated the following Opus staff:

- [redacted], Team Leader Traffic Engineering and Safety, Auckland, LCSIA Accredited - Site Survey and Reporting.
- [redacted] Senior Road Safety Consultant, Whakatane, ALCAM Surveyor - Site Survey and Reporting, Site Safety Assessments.
- [redacted] Network Safety Manager, Nelson, LCSIA Accredited, ALCAM Surveyor - Peer Review of Stage 1 report
- [redacted] Lane, Senior Transportation Engineer, Christchurch, LCSIA Accredited – Peer Review of Stage 2 report.

The assessors have had no involvement with any of the design prior to the LCSIA.

Crossing designs received are included in the appendices and incorporate on-road segregated cycling facilities through the existing crossings to replace existing on-road cycle lanes. As a guide for the design review, KiwiRail specifies when upgrading an existing facility, the LCSIA Criteria is as follows[1]:

"Where changes to an existing facility are proposed the revised crossing should meet Criteria 1. Where the modifications required to meet criteria 1 are not reasonably practicable then a documented risk assessment discussion between KiwiRail and the client shall be undertaken to agree on the required crossing treatment. In this case the level of treatment applied must meet or exceed Criteria 2."

- **Criteria 1**: *the proposed design / upgrade of a crossing to achieve a "Low" or "Medium-Low" level of risk as determined by the LCSS.*
- **Criteria 2**: *the proposed design / upgrade of a level crossing to achieve a LCSS lower than the existing LCSS.*

KiwiRail provides the following guidance regarding the meaning of the Level Crossing Safety Score Risk Bands.

[1] Criteria are as specified by KiwiRail and issued on 14/08/17

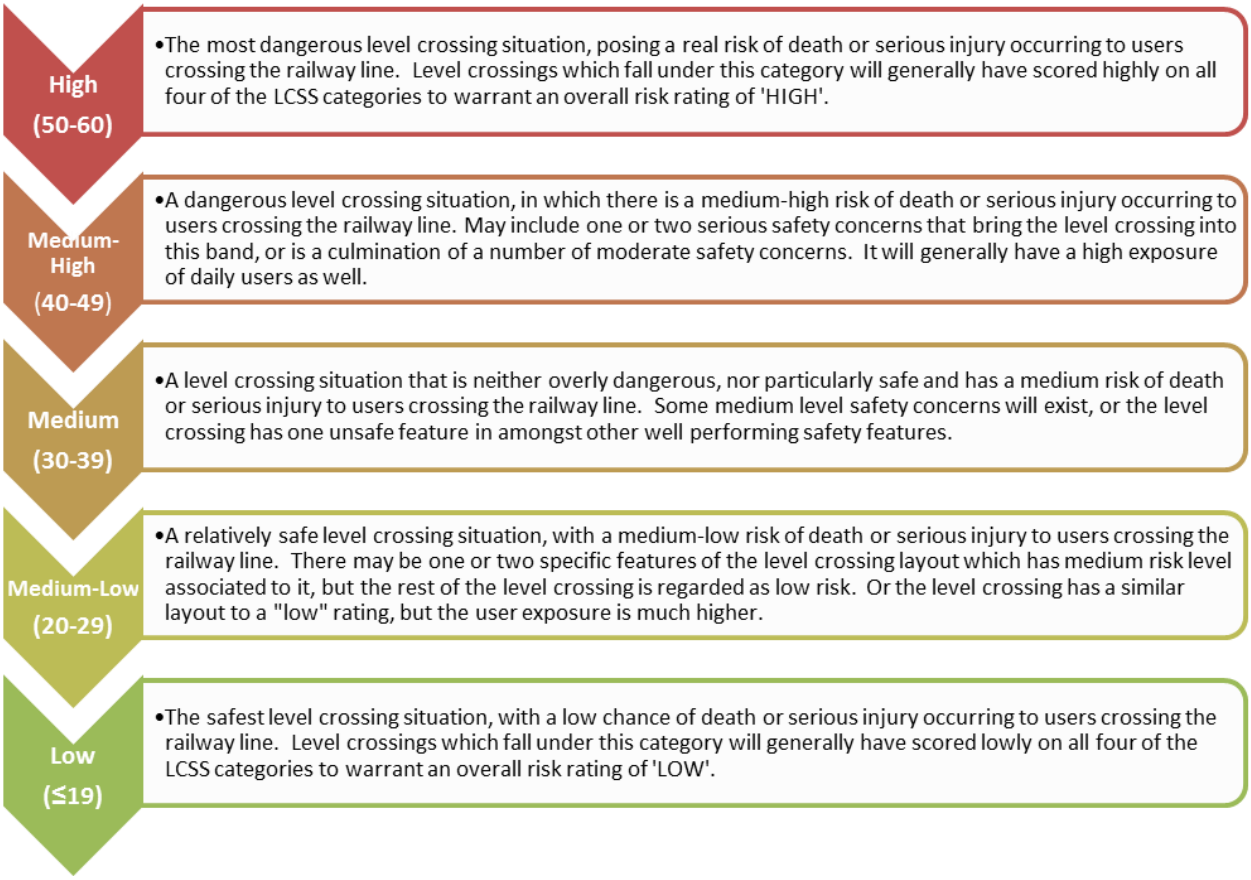


Figure 2: KiwiRail LC Risk Assessment Guide – Figure 5: Level Crossing Safety Score Risk Bands

5.2 Site Assessment – Crossing 1926/1927 (South of Astrolabe Street)

5.2.1 Existing Conditions at the Level Crossing

The Road/Rail at Grade crossing (1926/1927) is located approximately 200 metres south of Astrolabe Street on Totara Street. The road has one lane in each direction with traffic islands in the median, marked on-road cycle lanes and a narrow footpath on the eastern side of the road. A location plan identifying the crossing within the KiwiRail Network is below, along with an aerial photograph of the crossing.

Figure 3: Location diagram

Figure 4: Aerial Photo of current site

5.2.2 Current traffic, pedestrian, cyclist and train volumes

The most recent traffic counts were uploaded into the LXM database earlier this year by KiwiRail.

The current AADT in the database is 13,000vpd.

Tauranga City Council have provided daily cyclist counts for Totara Street (unknown date) of an average of 212 cyclists per day.

Pedestrian sample counts were undertaken at the crossing during peak periods, an average of 2-3 pedestrians an hour were counted using the crossing over the survey period.

The majority of pedestrians and cyclists observed during the counts were fully mobile adults, however we understand that the Totara Street cycleway is a recreational cycle route so we anticipate child cyclists/pedestrians will use the route on the weekend.

5.2.3 Proposed Changes Pedestrian Crossing 1927, KM 6.51

The proposed design for crossing 1927 at KM6.51 is included in the appendices.

The layout plan shows a proposed bi-directional cycleway off road on the eastern side of Totara Street with an adjacent footpath running east and parallel to the cycleway until approximately 17m north of the railway tracks and 12m south of the railway tracks. At these locations the footpath terminates at a ramp which connects to the bi-directional cycle path. The cycle paths then turn east towards the existing pedestrian/rail crossing. Then a fenced concrete pad 5m long by 8.1m wide forms the landing area between the cycleway and the rail crossing on each side. Between the

end of the footpath on each side of the crossing, cyclists and pedestrians use the same facilities to cross the railway line. On the northern side of the crossing the footpath terminates at a driveway, where the vehicle crossing is reduced in width to accommodate the landing pad.

There is a fence around the outside and forming a maze on each landing pad, requiring pedestrians and cyclists to go around the fence before they reach the TGSI (tactile ground surface indicator) pavers at the entrance to the hatched area marking out the pedestrian/cycle crossing of the railway line. Additional signage is provided at the maze; back to back PW-59 'look for trains' signs (600mm x 600mm). On the left side of each approach to the crossing is a mast fitted with one pair of flashing lights and a bell, facing approaching pedestrians/cyclists approaching on the left side of the path. These lights include PW-14a 'Railway Crossing' and PW-15 '2-tracks' signs and mounted on the fence in front of these signs are additional PW-59 'look for trains' signs.

The landing pads are separated from the traffic lanes by traffic islands. The crossing surface is hatched and the paving replaced with veloSRAIL rubber mat.

5.2.4 Existing Level Crossing Safety Score

The LCSS for the road and pedestrian level crossings are tabulated below with each assessed item detailed in the following sections. The proposed design evaluation follows in section 5.4.

Table 4: Road Level Crossing #1926

Assessed Item	Score	Comments
ALCAM Score	9/30	The ALCAM Risk Band is Medium-Low and the Risk score is 4.1, which scores an ALCAM LCSS score of 9.
Crash and Incident History Score	2/10	The KiwiRap Collective and Personal Risk Scores are Low and there are 2 IRIS incidents.
Site Specific Safety Score	1/10	No opportunities for queuing, no major commercial accessways, no short stacking/grounding out, high level of compliance.
Locomotive Engineer and RCA Engineer Risk Score	4/10	Assessed LE score to be low due to low reporting/observation of poor driver behaviour. RCA Score the same as LE score.
LCSS Score	16/60	**Low** Risk Band Rating

This score places the road crossing in the **LOW** risk band, which implies a low chance of death or serious injury occurring to road users crossing the railway line.

Table 5: Pedestrian Level Crossing #1927

Assessed Item	Score	Comments
ALCAM Score	22/30	The ALCAM Risk Band is Medium-High, and the Risk Score 489,606, which scores an ALCAM LCSS Score of 22.

Assessed Item	Score	Comments
Crash and Incident History Score	0/10	There are no incidents related to the pedestrian facility.
Site Specific Safety Score	5/10	Good visibility with flashing lights in one direction, bad flange gaps, important cycle route with high volumes (as supplied by TCC).
Locomotive Engineer and RCA Engineer Risk Score	6/10	Assessed LE score to be medium due to poor crossing facilities and observations of distracted pedestrians. RCA Score the same as LE score.
LCSS Score	33/60	**Medium** Risk Band Rating

This score places the pedestrian crossing in the **MEDIUM** risk band, which implies the pedestrian level crossing is neither overly dangerous, nor particularly safe and has a medium risk of death or serious injury to pedestrian/cyclist users crossing the railway line.

5.2.5 ALCAM Risk Score

The Road AADT for Crossing 1926 was updated in the LXM database in to 13,000vpd (2004 count) by KiwiRail in March 2017, so the ALCAM scores are based on a revised AADT. The pedestrian counts have not been updated for the scores below. They are currently recorded as a daily volume of 100 pedestrians with a peak hourly volume of 20 pedestrians. Sample site surveys recorded very low pedestrian volumes, however we understand the route is a high volume recreational cycle route, so pedestrian volumes may change significantly on the weekend. As such no changes to the pedestrian volumes have been made at this stage. We presume during design development additional counts may be completed and the existing conditions further reviewed.

The Jurisdiction Risk Band across All Control Classes for the Road Crossing is **Medium-Low** and the Risk Score is 4.1. This equates to a LCSS score of 9[2] (from a range of 7-12).

The Jurisdiction Risk Band across All Control Classes for the Pedestrian Crossing is **Medium-High** and the risk score is 489,606, (the ALCAM database includes a daily volume of 100 pedestrians with a peak hourly volume of 20 pedestrians). This equates to a LCSS score of 22[3] (from a range of 19-24).

[2] Table 11: Level Crossing Risk Assessment Guide - Final
[3] Table 12: Level Crossing Risk Assessment Guide - Final

5.2.6 Crash and Incident History Score

Table 6: Pedestrian and Roadway Crash and Incident Score

Scenario	IRIS Data[4]	CAS Data	KiwiRAP Data	Total Score
Shared path /Pedestrian Xing	0 100% weighting	N/A	N/A	0/10
Road Score	2 incidents, 2 points/10 50% weighting	0 crashes, 0 points/5 25% weighting	Low, 1 point/5 25% weighting	2/10 (rounded from 1.5)

For CAS, IRIS and KiwiRAP data see the appendices.

5.2.7 Site Specific Safety Score

Totara Street has a posted speed limit of 60km/h so can be assessed as a peri-urban roadway crossing.

Table 7: Urban Roadway Crossing Scoring, Crossing 1926

Score	Narrative/Scenario
Category 1: Queuing	
0/10	There is no bisecting intersection nearby, therefore no queues can develop.
Category 2: Adjoining Major Commercial Accessways/Side Roads and Bisecting Intersections	
1/10	There are adjacent entrances to the crossing for a Bulk Storage terminal, North Island Forklifts and Ports of Auckland BOP Freight Entry One. None are a major commercial accessway as observed on site and only one is on the departure side. There is the potential for large vehicles to queue back on the departure side when entering the North Island forklifts site, but this has a low chance of happening. Assessed score is 0-1, so scored 1.
Category 3: Short Stacking/Grounding Out	
0/10	There are no intersections in close proximity to the level crossing and no evidence of grounding out visible.
Category 4: Observed non-compliance with level crossing signs and warning systems	
1/5	No non-compliance observed whilst on site or reported to surveyors by TCC. IRIS data includes 2 incidents in 2010-2016 where truck and trailer unit failed to stop for active warning devices. Some issues with visibility of approaching trains due to buildings adjacent to the track, but no issues with visibility of the crossing.

[4] IRIS Data supplied from 2010 to June 2016

Score	Narrative/Scenario
2/35	**Total Score (equivalent to Roadway SSSS of 1/10)**

Table 8: Pedestrian/Cyclist Crossing Scoring, Crossing 1927

Score	Narrative/Scenario
Category 1: Crossing Type	
6/10	Acceptable visibility with flashing lights not facing all approaches. No maze or chicane, pedestrian facilities on one side of the road only. No 'Look for Trains' signs. Additional FLB assembly in the median is facing northbound traffic only.
	
Category 2: Flange Gap wheel entrapment	
5/5	Flange gaps up to 8cm present on both tracks. Assessed as 'bad' flange gaps that a wheeled pedestrian could become trapped. Low pedestrian numbers who could otherwise assist them to safety or to be freed.

Score	Narrative/Scenario
	
Category 3: Proportion of vulnerable users	
2/10	Low pedestrian numbers observed on site. This is predominantly an industrial area. Two school children (teenagers) observed during site visit with 6+ hours spent on site surveys and site visits. We understand this is a major cycle route with surveyed counts supplied of 212 cyclists/day and will have child users on the weekends.
Category 4: Distraction/Inattention	
2/5	Peri-urban with crossings provided. We understand this is a major cycle route for training and recreational cycling and counts provided by TCC indicate a 7-day average of 212 cyclists per day. We presume distraction attention/must occur from time to time.
Category 5: Cycle Patronage	
4/5	Although observed cycle numbers did not match counts provided by TCC, we understand this is a major cycle route. We have scored <5/5 based on observed use on a weekday, with the proviso weekend use is higher.
19/35	**Total Score (equivalent to Pedestrian SSSS of 5/10)**

5.2.8 Locomotive Engineer and RCA Engineer Risk Score

Due to the short project turnaround, a site meeting with the relevant Locomotive Engineer was not possible, so a score has been derived from the data in the TrackSafe Worst Level Crossing Survey Report (December 2014).

The 2014 report did not identify the Totara Street crossings in the list of worst crossings in the region. The most common reasons given for selecting crossings as 'worst' in this region were impatient and complacent motorists. Nationally this was repeated in selecting 'worst' crossings – the behaviour of motorists due to impatience or complacency. As no behaviour of this type was observed on road and the IRIS database includes 2 incidents of drivers not obeying the FLB in the 2010-2016 record, our assessed score for the locomotive engineer is 2.

For the pedestrian crossing, the current facilities are likely to have a higher incidence of poor behaviour due to the lack of warning and barriers. During the site observations two pedestrians were observed to be distracted when crossing a Totara Street crossing – one was a jogger wearing headphones and the second a walker who had their head down putting a drink bottle in their backpack as they walked across the crossing.

Table 9: Locomotive Score and RCA Score, Crossing 1926 (Road)

Scored By	Score
The Locomotive Engineer Score (assessed score)	2/5
The RCA Engineer Score is the same as the LE score	2/5
Total Score	4/10

Table 10: Locomotive Engineer and RCA Score Crossing 1927 (Pedestrian)

Scored By	Score
The Locomotive Engineer Score (assessed score)	3/5
The RCA Engineer Score is the same as the LE score	3/5
Total Score	6/10

5.2.9 General Safety Review

A safety review of the crossing has been completed and the following issues have been identified for the current crossing layout.

5.2.10 Pedestrian Crossing Layout

While the road crossing has half-arm barriers, flashing lights and bells there are no warning or protection devices specifically for pedestrians. While pedestrians would be able to see the flashing lights on one approach and hear the bells, there is nothing to prevent them from walking in front of an oncoming train. There are also no hold lines marked on the footpath to indicate safe waiting points if trains are approaching.

Recommendation:

i. Upgrade footpath over the level crossing to comply with Part 9 of the Traffic Control Devices Manual.
ii. Install Level Crossing warning signs for pedestrians so that both approach directions are covered

5.2.11 Uneven Surface at Level Crossing

The surface of the footpath at the level crossings is uneven and create trip or trap hazards for pedestrians.

Recommendation:

Provide a level and even path surface free of trip hazards and obstacles.

5.2.12 Advance Warning Road Marking

There is no 'RAIL X' road marking in advance of the level crossing.

Recommendation:

Install 'RAIL X' road marking on both approaches to the level crossing to provide better advance warning to oncoming motorists.

5.2.13 Proximity of Railway Points to Level Crossing

There is a set of railway points on the western side of the existing road level crossing. This could complicate any future design to install a path on this side of the road as the moving parts of the points will need to be kept free so that they can operate.

5.3 Conclusions/Recommendations

The LCSIA scores place the road in the LOW risk band and the pedestrian crossing in the MEDIUM risk band. As such, when upgrading the existing facilities, KiwiRail specifies the pedestrian/cycle facilities should be improved to achieve a Low or Medium-Low level of risk.

The most effective improvements to the existing crossing can be made in relation to adequate warning for pedestrians and cyclists through signs and markings, provision of specific facilities and controls for pedestrians/cyclists rather than adjacent controls, improvements to the condition of the crossing surface and the flange gap, and the addition of mazes/gates to reduce the likelihood of distraction/inattention.

5.4 Proposed Design Evaluation

The evaluation of the existing crossing was completed in August 2017. A proposed design for the pedestrian crossing was provided in November 2017 and is evaluated in the sections below. No changes are proposed to the road crossing.

5.4.1 ALCAM Risk Score

The Road AADT for Crossing 1926 was updated in the LXM database in to 13,000vpd (2004 count) by KiwiRail in March 2017, so the base ALCAM scores are based on a revised AADT. The pedestrian counts have been updated in ALCAM from the currently recorded daily volume of 100 pedestrians with a peak hourly volume of 20 pedestrians, to 212 cyclists per day at opening and for the future scenario a daily volume of 260 cyclists per day.

Changes due to the proposed design reduce the pedestrian risk score to 454,476, with a Jurisdiction Risk Band of Medium High. This equates to an ALCAM LCSS Score of 21, which is a reduction from the existing score of 22. The changes have significantly reduced the infrastructure score, but the increase in pedestrian numbers has significantly increased the exposure factor.

The changes introduced and evaluated in ALCAM include the addition of:

- Updated cyclist/ped counts (increased from 100 ped/cyclists per day to 212)
- Maze gates
- Visual/Audible Alarm
- Delineation
- Tactile Ground Surface Indicators
- Adjacent Corridor Fencing
- Pathway alignment change
- Flange Gap Filler
- Increase in Path width and Trafficability

Table 11: ALCAM Score – Pedestrian Crossing

ALCAM Score	Updated Existing	Proposed Design	SRT Modified	Comments
Pedestrian	22	21	10	The proposed design has lowered the safety risk for pedestrians due to a reduction in the infrastructure factor. However, the increased pedestrian/cyclist numbers have increased the exposure factor.

In order to reach the 'Low' category, the ALCAM score needs to reduce to 14 or lower, which is an ALCAM Risk Score of 239,999 or less.

The most significant design changes to reduce the ALCAM risk score further are the addition of:

- Active Sign 'Another Train Coming' warning
- Manual Gates with Latch

This reduces the Risk Score to 150,605, which is an ALCAM LCSS Score of 10.

5.4.2 Crash and Incident History Score

The current pedestrian crossing score is 0. The crossing will improve safety for pedestrians and cyclists, however no further reduction in the score is possible.

5.4.3 Site Specific Safety Score

Totara Street has a posted speed limit of 60km/h so can be assessed as a peri-urban roadway crossing.

Table 12: SSSS Assessment of the pedestrian level crossing 1927

Assessed Item	Updated Existing	Proposed Design	SRT Modified	Comments
Crossing Type	6/10	1/10	1/10	SRT Modified design includes manual gates and maze.
Flange Gap Wheel Entrapment	5/5	0/5	0/5	Flange gap eliminated through use of rubber surfacing.
Proportion of vulnerable users	2/10	2/10	2/10	Proportion of vulnerable users does not change in proposal scenarios
Distraction/ Inattention	2/5	2/5	2/5	Level of distraction/inattention expected does not change due to high cyclist volumes.
Cycle Patronage	4/5	5/5	5/5	Cyclist patronage very high due to use as a major cycle route.
TOTAL SCORE	**19/35**	**10/35**	**10/35**	
SSSS	**5/10**	**3/10**	**3/10**	
MODIFIED SCORE				

Table 13: Pedestrian/Cyclist Crossing Scoring, Proposed Design Crossing 1927

Score	Narrative/Scenario
Category 1: Crossing Type	
1/10	Good visibility with flashing lights facing all approaches (scores 2). Maze or chicane provided (scores -1). Additional signs.

Score	Narrative/Scenario
Category 2: Flange Gap wheel entrapment	
0/5	No flange gaps due to installation of veloSRAIL rubber mat on rail crossing. Crossing is perpendicular to tracks.
Category 3: Proportion of vulnerable users	
2/10	This is a major cycle route and will have child users on the weekends.
Category 4: Distraction/Inattention	
2/5	Peri-urban with crossings provided. We understand this is a major cycle route for training and recreational cycling and counts provided by TCC indicate a 7-day average of 212 cyclists per day. We presume distraction attention/must occur from time to time.
Category 5: Cycle Patronage	
5/5	Although observed cycle numbers did not match counts provided by TCC, we understand this is a major cycle route. Daily cyclists >200 per day
10/35	**Total Score (equivalent to Pedestrian SSSS of 3/10)**

5.4.4 Locomotive Engineer and RCA Engineer Risk Score

The design has not been evaluated by the Locomotive Engineer and RCA Engineer at this stage.

The original score was derived from the data in the TrackSafe Worst Level Crossing Survey Report (December 2014), which did not identify the Totara Street crossings in the list of worst crossings in the region. For the pedestrian crossing, the design addresses the lack of warning and barriers and the potential for distraction by requiring users to turn off their direct path of travel and to travel around a maze. As such, our assessment is the crossing will be one of the best on the route and we have reduced the score to 1 for each party.

Table 14: Locomotive Engineer and RCA Score Crossing 1927, Pedestrian

Scored By	Score
The Locomotive Engineer Score (assessed score)	1/5
The RCA Engineer Score is the same as the LE score	1/5
Total Score	2/10

5.4.5 LCSS Results Pedestrian Crossing 1927

Table 15: Level Crossing Safety Score Results

Scored Items	Updated Existing	Proposed Design	SRT Modified	Future	Comments
ALCAM Score	22/30	21/30	10/30	ALCAM Risk Score 557,377 23	Future assessment based on Option 1 (original proposed design) with 260 users/day
Crash and incident history score	0/10	0/10	0/10	0/10	The current pedestrian crossing score is 0. The crossing will improve safety for pedestrians and cyclists, however no further reduction in the score is possible.
Site Specific Safety Score	5/10	3/10	3/10	3/10	Improvements include path realignment, maze gates and additional signs and lights.
Locomotive & RCA Engineer Risk Score	6/10	2/10	2/10	2/10	The features have been assessed to make this crossing one of the best on the route.
LCSS Score	**33/60**	**26/60**	**15/60**	**28/60**	
LCSS Risk Band	**Medium**	**Medium-Low**	**Low**	**Medium-Low**	

The proposed design has a Medium-Low Level Crossing Safety Score which implies it is a relatively safe level crossing situation, with a medium-low risk of death or serious injury to users crossing the railway line. The level crossing has a similar layout to a 'low' rating but the user exposure is much higher.

The proposed design meets Criteria 1 and Criteria 2 in that the proposed design achieves a Medium Low Level of risk and the level of risk is lower than the existing LCSS.

In order to reach the 'Low' category, the ALCAM score needs to reduce to 14 or lower, which is an ALCAM Risk Score of 239,999 or less.

The most significant design changes to reduce the ALCAM risk score further are the addition of:

- Active Sign 'Another Train Coming' warning
- Manual Gates with Latch

This reduces the Risk Score to 150,605, which is an ALCAM LCSS Score of 10.

5.5 Proposed Design Safety Assessment Pedestrian Crossing #1927

Simon James, Road Safety Auditor has completed a safety review of the proposed design of the pedestrian crossing treatment. His safety issues and recommendations are below.

5.5.1 Approach of Cycleway to Level Crossing Maze – Minor Issue

The approach of the Copenhagen style cycleway to the level crossing maze requires cyclists to slow down and navigate a confined environment. While this is the purpose of the maze design it is unclear if cyclists are expected to dismount on order to get though the level crossing maze.

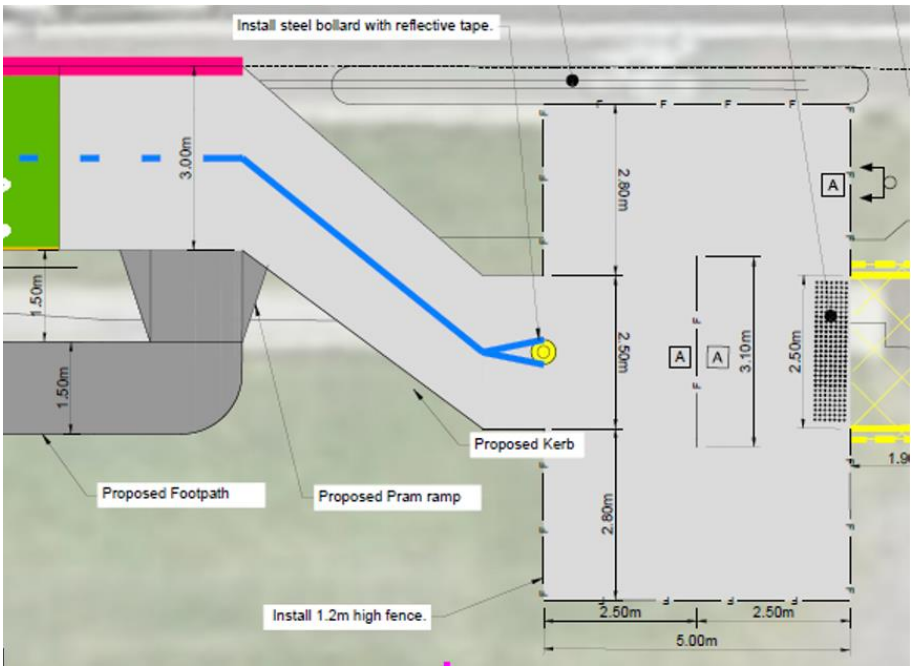


Figure 5: Showing the approach of the cycleway to the level crossing maze

Recommendations:

a. Consider adding signage telling cyclists to dismount before they use the level crossing.
b. Consider how manage the approach speed of bicycles to the maze to reduce the potential of conflict between pedestrians and cyclists.

5.5.2 Connection of Footpath and Cycleway – Minor Issue

The footpath connects to the cycleway prior to the level crossing maze with a right-angle bend. This forces pedestrians to merge with cyclists and does not follow the pedestrian desire line, which would be straight ahead to the level crossing maze.

The combination of the footpath and cycleway across the level crossing would make this section of the facility a shared path. There is no shared path signage shown on the drawings to warn either cyclists or pedestrians of the need to look for and be aware of the other users.

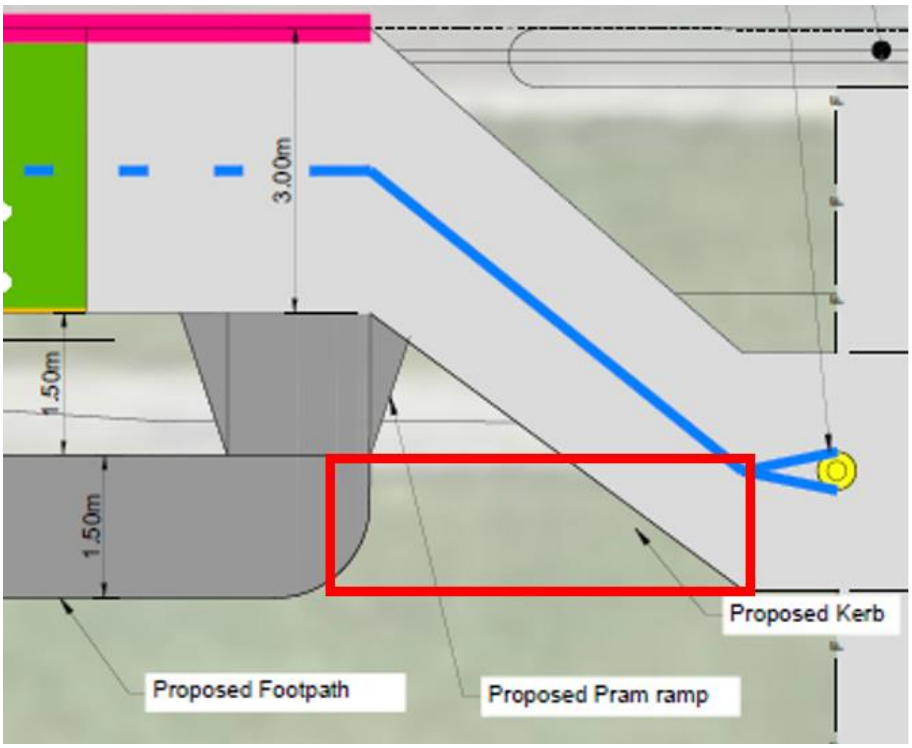


Figure 6: Showing the connection of the footpath to the cycleway prior to the level crossing maze. Pedestrian desire line is shown by the red rectangle.

Recommendations:

a. Reconsider the layout of the tie-in between the footpath and cycleway to provide a more user-friendly layout.
b. Install shared path warning signs for pedestrians and cyclists so that both approach directions are covered.

5.5.3 Navigation through the Maze – Minor Issue

The maze at either end of the pedestrian and cycle crossing has been designed as a double-sided maze. The intent of the design is for approaching cyclists and pedestrians to keep left and circulate around the central fence in a clockwise direction, however, there is no guidance to users to reinforce this. As such, it is possible to go around the central fence in an anti-clockwise direction (as shown in by the red arrow in the figure below). If users go that way then they could miss seeing the flashing lights and warning signage.

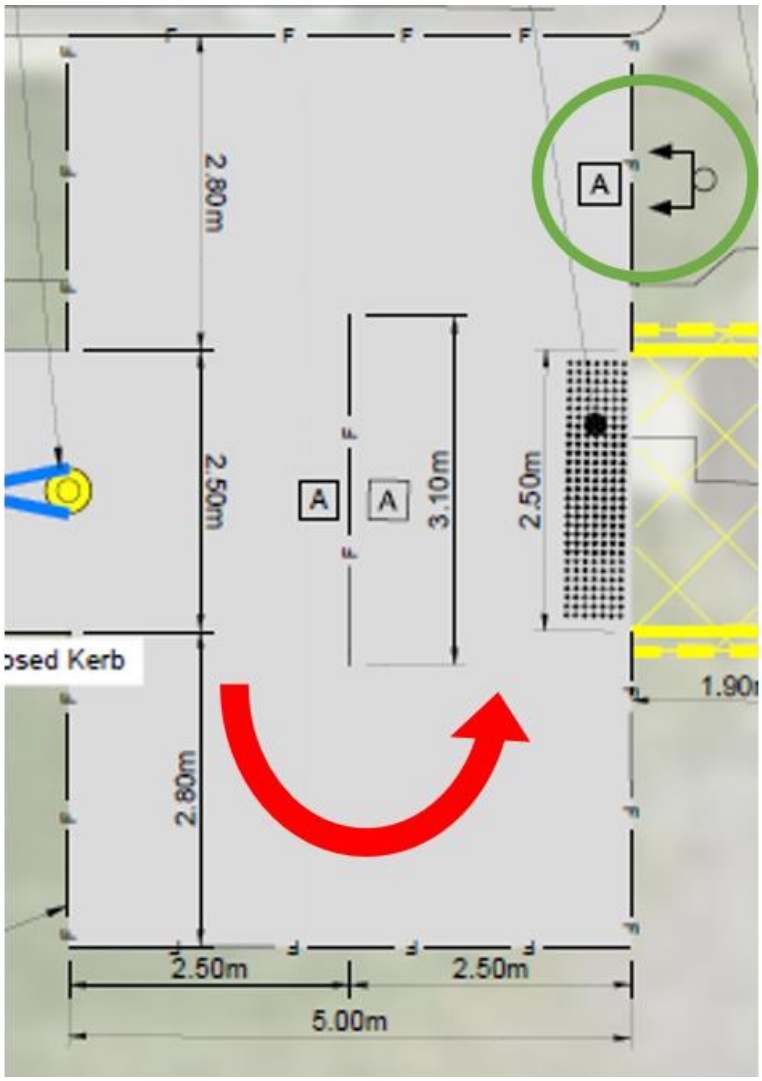


Figure 7: Proposed layout of maze with red arrow showing possible approach that avoids active warning lights/signage (in green circle).

Recommendation:

Provide directional guidance for users and/or double up flashing lights and warning signs on both sides of the maze.

5.5.4 Location of Maze over Vehicle Access – Moderate Issue

The maze on the eastern side of the level crossing encroaches on an existing vehicle access. This reduces the usable width of the vehicle access as well as possibly obscuring the sight distance to the left of the access due to the position of the maze fences.

There is also the potential for conflict between heavy vehicles using the access and pedestrians and cyclists entering and exiting the level crossing maze.

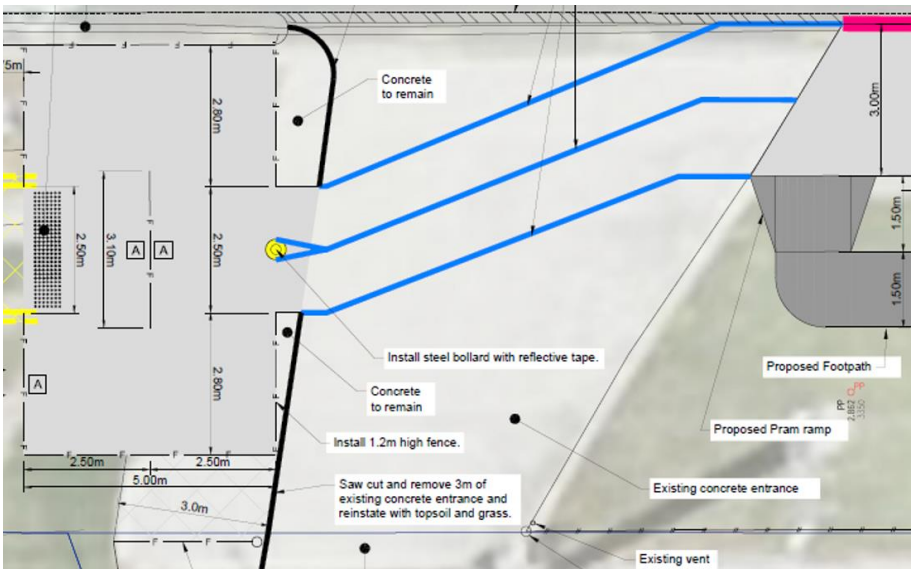


Figure 8: Showing location of maze over existing vehicle access.

Recommendation:

Relocate the maze so that it does not encroach over the vehicle access.

5.6 Site Assessment – Crossing 1590/1591 (north of Hull Road)

5.6.1 Existing Conditions at the Level Crossing

The Road/Rail at Grade crossing (1590/1591) is located approximately 100m north of Hull Road on Totara Street. The road has one lane in each direction and a narrow footpath is provided on the eastern side of the road. The crossing is in close proximity to the major Mt Maunganui freight yard servicing the Mt Maunganui Port. A location plan identifying the crossing within the KiwiRail Network is below, along with an aerial photograph of the crossing.

Figure 9: Location diagram

Figure 10: Aerial Photo of current site

5.6.2 Current traffic, pedestrian, cyclist and train volumes

The most recent traffic counts were uploaded into the LXM database earlier this year by KiwiRail.

The current AADT in the database is 10,000vpd.

Tauranga City Council have provided daily cyclist counts for Totara Street (unknown date) of an average of 212 cyclists per day.

Pedestrian sample counts were undertaken at the crossing during peak periods, an average of 1-2 pedestrians an hour were counted using the crossing over the survey period.

The majority of pedestrians and cyclists observed during the counts were fully mobile adults, however we understand that the Totara Street cycleway is a recreational cycle route so we anticipate child cyclists/pedestrians will use the route on the weekend.

5.6.3 Proposed Changes Pedestrian Crossing 1591, KM 5.21

The proposed design for crossing 1591 at KM 5.21 is included in the appendices.

The layout plan shows a proposed bi-directional cycleway off road on the eastern side of Totara Street with an adjacent footpath running east and parallel to the cycleway until approximately 13m north of the railway tracks and 16m south of the railway tracks. At these locations the footpath terminates at a ramp which connects to the bi-directional cycle path. The cycle paths then turn east towards the existing pedestrian/rail crossing. Then a fenced concrete pad 5m long by 8.1m wide forms the landing area between the cycleway and the rail crossing on each side. Between the end of the footpath on each side of the crossing, cyclists and pedestrians use the same facilities to cross the railway line. On the southern side of the crossing the footpath terminates at a vehicle crossing.

There is a fence around the outside and forming a maze on each landing pad, requiring pedestrians and cyclists to go around the fence before they reach the TGSI pavers at the entrance to the hatched area marking out the pedestrian/cycle crossing of the railway line. Additional signage is provided at the maze; back to back PW-59 'look for trains' signs (600mm x 600mm). On the left side of each approach to the crossing is a mast fitted with one pair of flashing lights and a bell, facing approaching pedestrians/cyclists approaching on the left side of the path. These lights include PW-14a 'Railway Crossing' and PW-15 '2-tracks' signs and mounted on the fence in front of these signs are additional PW-59 'look for trains' signs.

The landing pads are separated from the traffic lanes by traffic islands. The crossing surface is hatched and the paving replaced with veloSRAIL rubber mat.

5.6.4 Level Crossing Safety Score

The LCSS Scores for the road and pedestrian level crossings are tabulated below, with each assessed item detailed in the following sections.

Table 16: Road Level Crossing #1590

Assessed Item	Score	Comments
ALCAM Score	22/30	The ALCAM Risk Band is Medium-High, and the Risk Score 17.2, which scores an ALCAM LCSS Score of 22.
Crash and Incident History Score	3/10	There are 3 IRIS incidents, 2 non-DSI crashes and the KiwiRAP Collective and Personal Risk scores are Low.
Site Specific Safety Score	2/10	Queuing across crossing occurs for short period of PM Peak, no major accessways nearby, no short stacking/grounding out, non-compliance issues in IRIS history.
Locomotive Engineer and RCA Engineer Risk Score	4/10	Assessed LE score to be low due to low reporting/observation of poor driver behaviour. RCA Score the same as LE score.
LCSS Score	31/60	Medium Risk Band Rating

This score places the road crossing in the MEDIUM risk band, which implies the road crossing is neither overly dangerous nor particularly safe and has a medium risk of death or serious injury to road users.

Table 17: Pedestrian Level Crossing #1591

Assessed Item	Score	Comments
ALCAM Score	25/30	The ALCAM Risk Band is High, and the Risk Score 652,575, which scores and ALCAM LCSS Score of 25.

Assessed Item	Score	Comments
Crash and Incident History Score	0/10	There are no incidents related to the pedestrian facility.
Site Specific Safety Score	5/10	Good visibility with flashing lights in one direction, bad flange gaps, important cycle route with high volumes (as supplied by TCC).
Locomotive Engineer and RCA Engineer Risk Score	6/10	Assessed LE score to be medium due to poor crossing facilities and observations of distracted pedestrians. RCA Score the same as LE score.
LCSS Score	36/60	Medium Risk Band Rating

This score places the pedestrian crossing in the MEDIUM risk band, which implies level crossing situation that is neither overly dangerous nor particularly safe and has a medium risk of death or serious injury occurring to users crossing the railway line.

5.6.5 ALCAM Risk Score

The Road AADT for Crossing 1590 was updated in the LXM database in to 10,000vpd (2004 count) by KiwiRail in March 2017, so the ALCAM scores are based on a revised road AADT.

The pedestrian counts have not been updated for the scores below. They are currently recorded as a daily volume of 100 pedestrians with a peak hourly volume of 20 pedestrians. Sample site surveys recorded very low pedestrian volumes, however we understand the route is a high volume recreational cycle route, so pedestrian volumes may change significantly on the weekend. As such no changes to the pedestrian volumes have been made at this stage. We presume during design development additional counts may be completed and the existing conditions further reviewed.

The Jurisdiction Risk Band across All Control Classes for the Road Crossing is **Medium-High,** and the risk score is 17.2. This equates to a LCSS score of 22 (from a range of 19-24).

The Jurisdiction Risk Band across All Control Classes for the Pedestrian Crossing is **High**, and the Risk Score is 652,575 (the ALCAM database includes a daily volume of 100 pedestrians with a peak hourly volume of 20 pedestrians), this equates to a LCSS score of 25 (from a range of 25-30).

5.6.6 Crash and Incident History Score

Table 18: Crash and Incident History Score

Scenario	IRIS Data[5]	CAS Data	KiwiRAP Data	Total Score
Shared path /Pedestrian Xing	0 100% weighting	N/A	N/A	0/10

[5] IRIS Data supplied from 2010 to June 2016, *appears 1 incident reported twice, but 3 incidents used in calculations.

Scenario	IRIS Data[5]	CAS Data	KiwiRAP Data	Total Score
Road Score	*3 incidents, 3 points/10	2 non-DSI, 2 points/5	Low, 1 point/5	3/10
	50% weighting	25% weighting	25% weighting	

For CAS, IRIS and KiwiRAP data see the appendices.

5.6.7 Site Specific Safety Score

Totara Street has a posted speed limit of 60km/h so can be assessed as a per-urban roadway crossing.

Table 19: Urban Roadway Crossing Scoring, Crossing #1590

Score	Narrative/Scenario
Category 1: Queuing	
2/10	There is one bisecting intersection nearby, Hull Road, which is ~100m south of the level crossing. Queues were observed to develop across the level crossing for 5 minutes of the evening peak traffic period and up to the level crossing at other times when Hull Road roundabout was congested by slow moving heavy vehicles.
Category 2: Adjoining Major Commercial Accessways/Side Roads and Bisecting Intersections	
0/10	There are entrances immediately adjacent to the crossing on the southwestern side (upstream) – KiwiRail, and the south eastern side (downstream), Woodland Management Ltd. The Woodland Management entrance was not used, with the main property entrance on Hull Road. Approximately 85m north of the crossing was another KiwiRail entrance (downstream) and 60m north was the Dominion Salt entrance (upstream). None of the entrances were a major commercial access and there was a low chance of any creating queues that form back to the crossing.
Category 3: Short Stacking/Grounding Out	
0/10	There are no intersections in close proximity to the level crossing in terms of short stacking and no evidence of grounding out visible.
Category 4: Observed non-compliance with level crossing signs and warning systems	
2/5	No non-compliance observed whilst on site or reported to surveyors by TCC. IRIS data includes 3 incidents in 2010-2016 where cars stopped for active warning devices, then proceeded around the barriers in front of trains. Visibility is good-moderate due to adjacent buildings.
4/35	**Total Score (equivalent to Roadway SSSS of 2/10 (rounded up from 1.1)**

Table 20: Pedestrian/Cyclist Crossing Scoring, Crossing #1591

Score	Narrative/Scenario
Category 1: Crossing Type	
5/10	Good visibility with flashing lights not facing all approaches. No maze or chicane, pedestrian facilities on one side of the road only.
	
Category 2: Flange Gap wheel entrapment	
5/5	Flange gaps up to 12cm present on both tracks. Assessed as 'bad' flange gaps that a wheeled pedestrian could become trapped. Low pedestrian numbers who could otherwise assist them to safety or to be freed.

Score	Narrative/Scenario
	
Category 3: Proportion of vulnerable users	
2/10	Low pedestrian numbers observed on site. This is predominantly an industrial area. Two school children (teenagers) observed during site visit with 6+ hours spent on site surveys and site visits. We understand this is a major cycle route and will have child users on the weekends.
Category 4: Distraction/Inattention	
2/5	Peri-urban with crossings provided. We understand this is a major cycle route for training and recreational cycling and counts provided by TCC indicate a 7-day average of 212 cyclists per day. We presume distraction attention/must occur from time to time.
Category 5: Cycle Patronage	
4/5	Although observed cycle numbers did not match counts provided by TCC, we understand this is a major cycle route. We have scored <5/5 based on observed use on a weekday, with the proviso weekend use is higher.
18/35	**Total Score (equivalent to Pedestrian SSSS of 5/10)**

5.6.8 Locomotive Engineer and RCA Engineer Risk Score

Due to the short project turnaround, a site meeting with the relevant Locomotive Engineer was not possible, so a score has been derived from the data in the TrackSafe Worst Level Crossing Survey Report (December 2014).

The 2014 report did not identify the Totara Street crossings in the list of worst crossings in the region. The most common reasons given for selecting crossings as 'worst' in this region were impatient and complacent motorists. Nationally this was repeated in selecting 'worst' crossings – the behaviour of motorists due to impatience or complacency. As no behaviour of this type was observed on road and the IRIS database includes 3 incidents of drivers not obeying the FLB in the 2010-2016 record, our assessed score for the locomotive engineer is 2.

For the pedestrian crossing, the current facilities are likely to have a higher incidence of poor behaviour due to the lack of warning and barriers. During the site observations at the crossing 1926/1927 South of Astrolabe Street two pedestrians were observed to be distracted when crossing the rail line – one was a jogger wearing headphones and the second a walker distracted by a drink bottle. We presume, although not observed, similar behaviour would occur at this crossing

Table 21: Locomotive Score and RCA Score, Crossing 1590 (Road)

Scored By	Score
The Locomotive Engineer Score (assessed score)	2/5
The RCA Engineer Score is the same as the LE score	2/5
Total Score	4/10

Table 22: Locomotive Engineer and RCA Score Crossing 1591 (Pedestrian)

Scored By	Score
The Locomotive Engineer Score (assessed score)	3/5
The RCA Engineer Score is the same as the LE score	3/5
Total Score	6/10

5.6.9 General Safety Review

A safety review of the crossing has been completed and the following issues have been identified for the current crossing layout.

5.6.10 Pedestrian Crossing Alignment and Layout

The alignment of the footpath across the two railway tracks does not appear to completely straight. This could cause issues for pedestrian with visual impairments.

While the road crossing has half-arm barriers, flashing lights and bells there are no warning or protection devices specifically for pedestrians. While pedestrians would be able to see the flashing lights on one approach and hear the bells, there is nothing to prevent them from walking in front of an oncoming train. There are also no hold lines marked on the footpath to indicate safe waiting points if trains are approaching.

Recommendation:

i. Upgrade footpath over the level crossing to comply with Part 9 of the Traffic Control Devices Manual.
ii. Install Level Crossing warning signs for pedestrians so that both approach directions are covered.

5.6.11 Uneven surface at level crossing

The surface of the footpath at the level crossings is uneven and creates trip or trap hazards for pedestrians.

Recommendation:

Provide a level and even path surface free of trip hazards and obstacles.

5.6.12 Cross-hatch Clear Zone Marking

The cross hatching at the level crossing is marked between the two railway tracks. However, there is no cross hatch marking over the railway tracks themselves.

Recommendation:

That cross-hatch clear zone marking be marked over the railway tracks as per Figure A12 in Part 9 of the Traffic Control Devices Manual.

5.6.13 Advance Warning Road Marking

There is no 'RAIL X' road marking in advance of the level crossing.

Recommendation:

Install 'RAIL X' road marking on both approaches to the level crossing to provide better advance warning to oncoming motorists.

5.7 Conclusions/Recommendations

The LCSIA scores place the road in the MEDIUM risk band and the pedestrian crossing in the MEDIUM-HIGH risk band. As such, when upgrading the existing facilities, KiwiRail specifies the pedestrian/cycle facilities should be improved to achieve a Low or Medium-Low level of risk.

The most effective improvements can be made in relation to adequate warning for pedestrians and cyclists including signs and markings, with specific warning facilities for pedestrians/cyclists rather than adjacent controls, improvements to the condition of the crossing surface and the flange gap, and the addition of mazes/gates to reduce the likelihood of distraction/inattention.

5.8 Proposed Design Evaluation

The evaluation of the existing crossing was completed in August 2017. A proposed design for the pedestrian crossing was provided in November 2017 and is evaluated in the sections below. No changes are proposed to the road crossing.

5.8.1 ALCAM Risk Score

The Road AADT for Crossing 1591 was updated in the LXM database in to 10,000vpd (2004 count) by KiwiRail in March 2017, so the base ALCAM scores are based on a revised AADT. The pedestrian counts have been updated in ALCAM from the currently recorded daily volume of 100 pedestrians with a peak hourly volume of 20 pedestrians, to 212 cyclists per day at opening and for the future scenario a daily volume of 260 cyclists per day.

Changes due to the proposed design reduce the pedestrian risk score to 657,325, with a Jurisdiction Risk Band of High. This equates to an ALCAM LCSS Score of 25, which is the same as the existing score. The changes have significantly reduced the infrastructure score, but the increase in pedestrian numbers has significantly increased the exposure factor.

The changes introduced and evaluated in ALCAM include the addition of:

- Updated cyclist/ped counts (increased from 100 ped/cyclists per day to 212)
- Maze gates
- Visual/Audible Alarm
- Delineation
- Tactile Ground Surface Indicators
- Adjacent Corridor Fencing
- Pathway alignment change
- Flange Gap Filler
- Increase in Path width and Trafficability

Table 23: ALCAM Score – Pedestrian Crossing 1591

ALCAM Score	Updated Existing	Proposed Design	SRT Modified	Comments
Pedestrian	25	25	23	The proposed design has lowered the safety risk for pedestrians due to a reduction in the infrastructure factor. However, the increased pedestrian/cyclist numbers have increased the exposure factor.

In order to reach the 'Medium Low' category, the ALCAM score needs to reduce to 24 or lower, which is an ALCAM Risk Score of 624,237 or less (current design score is 657,325).

The modified score of 23 was reached through adding into the crossing a manual gated with a latch.

This reduces the ALCAM Risk score to 569,645, which is an ALCAM LCSS Score of 23.

5.8.2 Crash and Incident History Score

The current pedestrian crossing score is 0. The crossing will improve safety for pedestrians and cyclists, however no further reduction in the score is possible.

5.8.3 Site Specific Safety Score

Totara Street has a posted speed limit of 60km/h so can be assessed as a peri-urban roadway crossing.

Table 1: SSSS Assessment of the pedestrian level crossing 1591

Assessed Item	Updated Existing	Proposed Design	SRT Modified	Comments
Crossing Type	5/10	1/10	1/10	SRT Modified design includes manual gates and maze.
Flange Gap Wheel Entrapment	5/5	0/5	0/5	Flange gap eliminated through use of rubber surfacing.
Proportion of vulnerable users	2/10	2/10	2/10	Proportion of vulnerable users does not change in proposal scenarios
Distraction/ Inattention	2/5	2/5	2/5	Level of distraction/inattention expected does not change due to high cyclist volumes.
Cycle Patronage	4/5	5/5	5/5	Cyclist patronage very high due to use as a major cycle route.
TOTAL SCORE	**18/35**	**10/35**	**10/35**	
SSSS	**5/10**	**3/10**	**3/10**	
MODIFIED SCORE				

Table 2: Pedestrian/Cyclist Crossing #1591 Scoring Proposed Design

Score	Narrative/Scenario
Category 1: Crossing Type	
1/10	Good visibility with flashing lights facing all approaches (score 2). Maze gates present (score -1).
Category 2: Flange Gap wheel entrapment	
0/5	No flange gap present. VeloSRail rubber mat installed.
Category 3: Proportion of vulnerable users	
2/10	We understand this is a major cycle route and will have child users on the weekends.

Score	Narrative/Scenario
Category 4: Distraction/Inattention	
2/5	Peri-urban with crossings provided. We presume distraction attention/must occur from time to time.
Category 5: Cycle Patronage	
5/5	Although observed cycle numbers did not match counts provided by TCC, we understand this is a major cycle route. Daily cyclists >200 per day
10/35	**Total Score (equivalent to Pedestrian SSSS of 3/10)**

5.8.4 Locomotive Engineer and RCA Engineer Risk Score

The design has not been evaluated by the Locomotive Engineer and RCA Engineer at this stage.

The original score was derived from the data in the TrackSafe Worst Level Crossing Survey Report (December 2014), which did not identify the Totara Street crossings in the list of worst crossings in the region. For the pedestrian crossing, the design addresses the lack of warning and barriers and the potential for distraction by requiring users to turn off their direct path of travel and to travel around a maze. As such, our assessment is the crossing will be one of the best on the route and we have reduced the score to 1 for each party.

Table 3: Locomotive Engineer and RCA Score Crossing 1591, Pedestrian

Scored By	Score
The Locomotive Engineer Score (assessed score)	1/5
The RCA Engineer Score is the same as the LE score	1/5
Total Score	2/10

5.8.5 LCSS Results Pedestrian Crossing 1591

Scored Items	Updated Existing	Proposed Design	SRT Modified	Future	Comments
ALCAM Score	25	25	23	ALCAM Risk Score 698,621 25	Future assessment based on Option 2 (SRT proposed design) with 260 users/day
Crash and incident history score	0/10	0/10	0/10	0/10	The current pedestrian crossing score is 0. This crossing will improve safety, however no further reduction in the score is possible.

Scored Items	Updated Existing	Proposed Design	SRT Modified	Future	Comments
Site Specific Safety Score	5/10	3/10	3/10	3/10	Improvements include path realignment, maze gates and additional signs and lights.
Locomotive & RCA Engineer Risk Score	6/10	2/10	2/10	2/10	The features have been assessed to make this crossing one of the best on the route.
LCSS Score	**36/60**	**30/60**	**28/60**	**30/60**	
LCSS Risk Band	**Medium**	**Medium**	**Medium-Low**	**Medium**	

The proposed design has a Medium Level Crossing Safety Score which implies it is a level crossing that is neither overly dangerous, nor particularly safe and has a medium risk of death and serious injury to users. This does not meet Criteria 1 or Criteria 2 in that the crossing design does not achieve a Medium Low or Low Level of risk and the level of risk for the design is not lower than the existing LCSS.

To reduce the ALCAM risk score further, the addition of manual gates reduces the risk score to 569,645 which is an ALCAM LCSS Score of 23.

5.9 Proposed Design Safety Assessment Pedestrian Crossing #1591

Simon James, Road Safety Auditor has completed a safety review of the proposed design of the crossing treatment. His safety issues and recommendations are below.

5.9.1 Approach of Cycleway to Level Crossing Maze – Minor Issue

The approach of the Copenhagen style cycleway to the level crossing maze requires cyclists to slow down and navigate a confined environment. While this is the purpose of the maze design it is unclear if cyclists are expected to dismount on order to get though the level crossing maze.

Recommendations:

a. Consider adding signage telling cyclists to dismount before they use the level crossing.
b. Consider how manage the approach speed of bicycles to the maze to reduce the potential of conflict between pedestrians and cyclists.

5.9.2 Connection of Footpath and Cycleway – Minor Issue

The footpath connects to the cycleway prior to the level crossing maze with a right-angle bend. This forces pedestrians to merge with cyclists and does not follow the pedestrian desire line, which would be straight ahead to the level crossing maze.

The combination of the footpath and cycleway across the level crossing would make this section of the facility a shared path. There is no shared path signage shown on the drawings to warn either cyclists or pedestrians of the need to look for and be aware of the other users.

Recommendations:

a. Reconsider the layout of the tie-in between the footpath and cycleway to provide a more user-friendly layout.
b. Install shared path warning signs for pedestrians and cyclists so that both approach directions are covered.

5.9.3 Navigation Through Maze – Minor Issue

The maze at either end of the pedestrian and cycle crossing has been designed as a double-sided maze. The intent of the design is for approaching cyclists and pedestrians to keep left and circulate around the central fence in a clockwise direction, however, there is no guidance to users to reinforce this. As such, it is possible to go around the central fence in an anti-clockwise direction (as shown in by the red arrow in Figure 4). If users go that way then they could miss seeing the flashing lights and warning signage.

Recommendation:

Provide directional guidance for users and/or double up flashing lights and warning signs on both sides of maze.

Appendix A: Crash and Incident Data

c. ALCAM Level Crossing #1926 (Road) and #1927 (Pedestrian): Totara Street Number 3 Siding Mt Maunganui (South of Astrolabe Street)

LX Incidents 2010 - June 2016

No pedestrian incidents recorded.

Incident No	Incident Date	Date Entered	Severity	Code	Sub Code	Sub Code Definition	Location Type	Line	Meterage	ALCAM ID	ALCAM NAME	Protection
112192	30/05/2011	31/05/2011	3	LX	NCHV	NCHV - Near Collision Heavy Road Vehicle	LXG	MTMNG	6.504	1926	Totara Street Number 3 Siding	Half Boom Flashing Lights
104154	26/08/2010	26/08/2010	4	LX	NCHV	NCHV - Near Collision Heavy Road Vehicle	LXG	MTMNG	6.504	1926	Totara Street Number 3 Siding	Half Boom Flashing Lights

Protection Type	Council	Region	Train Traffic	Location	STATIONFROM	STATIONTO	Fatal	Serious	Description
HAB	Tauranga City Council	Bay of Plenty	20	TASMAN QUAY (WHARF GATES) LX	MTMNG	MTMNG			Truck and Trailer Unit failed to stop for warning devices and the passage of a shunt movement on Tasman Quay Level Crossing Port of Tauranga Mount Maunganui.
HAB	Tauranga City Council	Bay of Plenty	20	TASMAN QUAY (WHARF GATES) LX	MTMNG	MTMNG			Near hit on level crossing - Tasman Quay Crossing on Mount Maunganui Wharf (Port of Tauranga) when truck and trailer unit passed over crossing ahead of a shunting movement, with all warning devices activated.

CAS Data

All crashes recorded in the vicinity relate to traffic queues – not sure whether any relate to queues at the crossing or adjacent roads.

d. ALCAM Level Crossing #1590 (Road) and #1591 (Pedestrian): Totara Street (north of Hull Road)

LX Incidents 2010 - June 2016

No pedestrian incidents recorded.

Incident No	Incident Date	Date Entered	Severity	Code	Sub Code	Sub Code Definition	Location Type	Line	Meterage	ALCAM ID	ALCAM NAME	Protection
115377	10/12/2011	12/12/2011	4	LX	NCLV	NCLV - Near Collision Light Road Vehicle	LXG	MTMNG	5.21	1591	Totara Street Ped Up	Adjacent boom gates and audio
104197	27/08/2010	30/08/2010	4	LX	NCLV	NCLV - Near Collision Light Road Vehicle	LXG	MTMNG	5.21	1591	Totara Street Ped Up	Adjacent boom gates and audio
104198	27/08/2010	30/08/2010	4	LX	NCLV	NCLV - Near Collision Light Road Vehicle	LXG	MTMNG	5.21	1591	Totara Street Ped Up	Adjacent boom gates and audio

Protection Type	Council	Region	Train Traffic	Location	STATIONFROM	STATIONTO	Fatal	Serious	Description
HAB	Tauranga City Council	Bay of Plenty	25	TOTARA STREET LX	MTMNG	MTMNG			Rail Level Complaint on Totara Street Level Crossing at Mount Maunganui On Saturday the 10 December the Mount Shunt was heading towards shed 22 with 14 wagons, The shunt stopped at Totara Street level crossing and after talking to Kiwi Rail personnel who were installing the new Barrier alarms the Rail Opt activated the alarms and noticed a Nissan Pulsar stopped at the Level Crossing and as the Train approached the crossing the driver then decided to drive through the crossing Reg No. of the car was CTE310
HAB	Tauranga City Council	Bay of Plenty	25	TOTARA STREET LX	MTMNG	MTMNG			Motor Vehicle had stopped for warning devices but then proceeded across the level Crossing in front of the oncoming shunt movement.
HAB	Tauranga City Council	Bay of Plenty	25	TOTARA STREET LX	MTMNG	MTMNG			Near miss - Motor vehicle had stopped for warning devices but then proceeded over crossing in front of approaching shunt movement

CAS Data

Crash Road	Crash Distance	Crash Direction	Side Road	Crash Id	Crash Date	Crash Day	Crash Time	Movement Description
TOTARA St		A	RAIL XING	2837036	2/06/2008	Mon	1425	CAR1 SBD on TOTARA ST hit rear end of CAR2 stop/slow for signals

Causes	Mvmt	Vehicles	Causes	Objects Struck	Road Curve
CAR1 failed to notice car slowing	FE	CSIC	331A		R

Road Wet	Light	Weather	Junction Type	Traffic Control	Road Markings	Speed Limit	Fatal Injury	Serious Injury	Minor Injury
Dry	Bright Sun	Fine	Unknown	Traffic Signals	L	70	0	0	0

Person Age1	Person Age2	Easting	Northing	Latitude	Longitude
		1881167	5827793	-37.65400237	176.18711663

Crash Road	Crash Distance	Crash Direction	Side Road	Crash Id	Crash Date	Crash Day	Crash Time	Movement Description
TOTARA ST		A	RAIL XING	201238768	29/09/2012	Sat	1300	CAR1 SBD on TOTARA ST hit rear end of SUV2 stop/slow for signals

Causes	Mvmt	Vehicles	Causes	Objects Struck	Road Curve
CAR1 failed to notice car slowing, attention diverted by driver dazzled by sun/lights	FE	CS14	331A 363A		R

Road Wet	Light	Weather	Junction Type	Traffic Control	Road Markings	Speed Limit	Fatal Injury	Serious Injury	Minor Injury
Dry	Bright Sun	Fine	Unknown	Traffic Signal	C	60	0	0	0

Person Age1	Person Age2	Easting	Northing	Latitude	Longitude
		1881167	5827793	-37.65400237	176.1871166

KiwiRAP

The Collective Risk and Personal Risk Scores for Totara Street from the Urban KiwiRAP website are both Low.

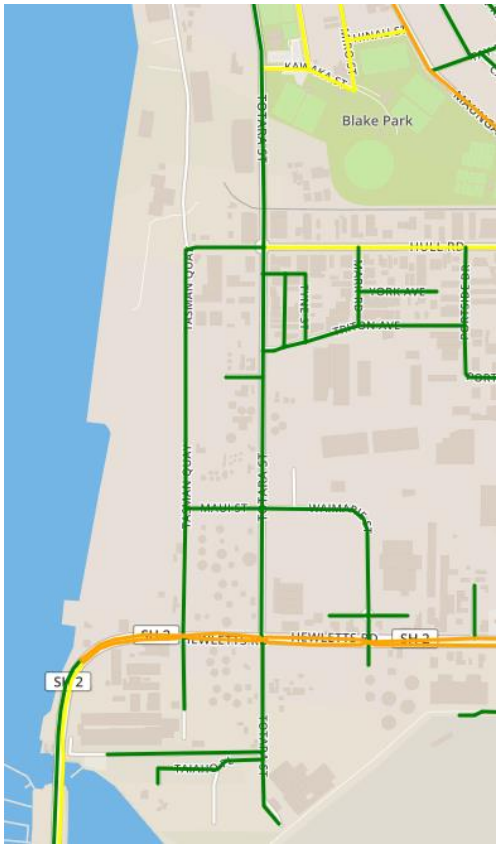


Figure 11: Collective Risk

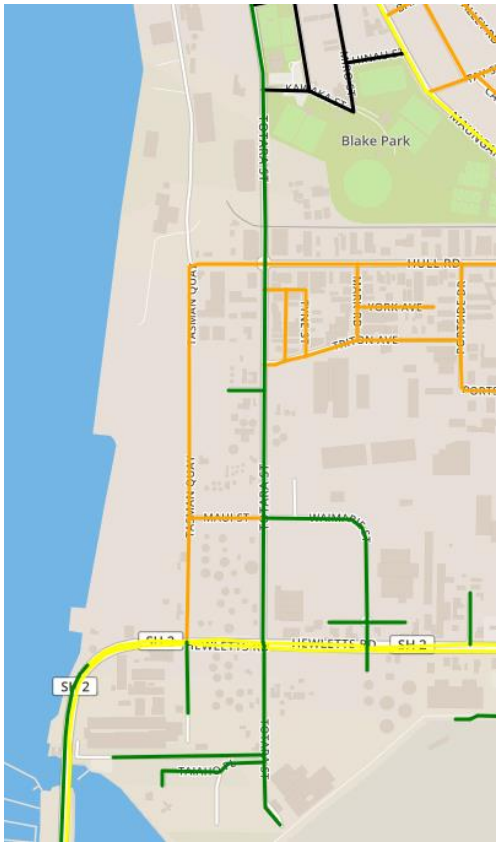


Figure 12: Personal Risk

Appendix B: Pedestrian and Cyclist Counts

Totara Street Crossing - Pedestrian, Vehicle and Cyclist count **Date:** **8/08/2017** **L = west, R = east** **Location:** **North of Hull Road, Crossings 1590/1591** **Weather:** **Fine, Dry**

		Vehicle					Adult Pedestrian					Child Pedestrian						Adult Cyclist					Child Cyclist					
		Car/ Light Vehicle		Heavy Vehicle		Total Vehicles	d = distracted, i = impaired, w = wheeled										Total Peds	f=footpath, r=road										Total cyclists
Time Start	Time End	Nbd	Sbd	Nbd	Sbd		Nbd	Side L/R	Sbd	Side L/R	Total	Nbd	Side L/R	Sbd	Side L/R	Total		Nbd	Side L/R	Sbd	Side L/R	Total	Nbd	Side L/R	Sbd	Side L/R	Total	
14:30	14:45	83	112	1	4	200					0					0	0					0					0	0
14:45	15:00	95	88	4	4	191					0					0	0	2	RfRf			2					0	2
15:00	15:15	95	91	2	10	198					0					0	0	1	Lr			1					0	1
15:15	15:30	96	89	2	3	190					0					0	0					0					0	0
	Totals	**369**	**380**	**9**	**21**	**779**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**3**
16:00	16:15	108	119	1	2	230					0					0	0			1	Rr	1					0	1
16:15	16:30	152	102	4	2	260					0					0	0	1	Lr			1					0	1
16:30	16:45	132	120	1	3	256					0					0	0	2	LrLr	3	RrRrRr	5					0	5
16:45	17:00	150	85	1	2	238	1	dL	1	dR	2					0	2	2	LrLr	4	RrRrRrRr	6					0	6
	Totals	**542**	**426**	**7**	**9**	**984**	**1**	**0**	**1**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**2**	**5**	**0**	**8**	**0**	**13**	**0**	**0**	**0**	**0**	**0**	**13**
17:00	17:15	138	129	0	2	269					0	2	Rf (teenagers)			2	2	4	LrLrRfRf	3	RrRrRr	7					0	7
17:15	17:30	173	109	3	2	287					0					0	0			2	RrRr	2	1	Lr			1	3
17:30	17:45	129	75	0	0	204	1	R			1					0	1	3	LrLrLR	1	Rr	4					0	4
17:45	18:00	112	74			186			1	L	1					0	1			1	Rr	1					0	1
	Totals	**552**	**387**	**3**	**4**	**946**	**1**	**0**	**1**	**0**	**2**	**2**	**0**	**0**	**0**	**2**	**4**	**7**	**0**	**7**	**0**	**14**	**1**	**0**	**0**	**0**	**1**	**15**

Comments: Drivers slow to cross the level crossing due to the obvious undulations in the road surface. High proportion of SUV's and Utes in the traffic stream. Queues form across the level crossing of Sbd traffic when Hull Roundabout is congested - due to downstream congestion or slow trucks turning at the roundabout. Trains observed 14:51 (west to east) - travelling slowly, a queue of Nbd traffic formed to the roundabout. 15:20 Train (west to east) very long and travelling slowly, a Nbd queue of 12 vehicles formed to the roundabout. 16:10 train (east to west). No issues with drivers driving around barriers or racing through the crossing when the bells and lights started. One pedestrian observed jogging with headphones on.
History of rear end crashes may be related to vehicles slowing suddenly at the level crossing due to the undulating surface.
5:10 Traffic queue extended for Sbd traffic across the level crossing due to queues south of the Hull Roundabout. Queue cleared completely by 5:16pm

Totara Street Crossing - Pedestrian, Vehicle and Cyclist count **Date:** **9/08/2017** **L = west, R = east** **Location:** **North of Hull Road, Crossings 1590/1591** **Weather:** **Wet, occasional rain**

		Vehicle					Adult Pedestrian					Child Pedestrian						Adult Cyclist					Child Cyclist					
		Car/ Light Vehicle		Heavy Vehicle		Total Vehicles	d = distracted, i = impaired, w = wheeled										Total Peds	f=footpath, r=road										Total cyclists
Time Start	Time End	Nbd	Sbd	Nbd	Sbd		Nbd	Side L/R	Sbd	Side L/R	Total	Nbd	Side L/R	Sbd	Side L/R	Total		Nbd	Side L/R	Sbd	Side L/R	Total	Nbd	Side L/R	Sbd	Side L/R	Total	
7:45	8:00	104	107	2	4	**217**			1	R	**1**					**0**	**1**					**0**					**0**	**0**
8:00	8:15	122	114	4	1	**241**	1	R			**1**					**0**	**1**	2	LrLr	1	Rr	**3**					**0**	**3**
8:15	8:30	131	83	5	3	**222**					**0**					**0**	**0**					**0**					**0**	**0**
8:30	8:45	122	83	6	9	**220**			1	L	**1**					**0**	**1**					**0**					**0**	**0**
	Totals	**479**	**387**	**17**	**17**	**900**	**1**	**0**	**2**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**3**	**2**	**0**	**1**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**3**
Comments:																												

Totara Street Crossing - Pedestrian, Vehicle and Cyclist count **Date:** **9/08/2017** **L = west, R = east** **Location:** **South of Astrolabe, Crossings 1926/1927** **Weather:** **Wet, occasional rain**

		Vehicle					Adult Pedestrian					Child Pedestrian						Adult Cyclist					Child Cyclist					
		Car/ Light Vehicle		Heavy Vehicle		Total Vehicles	d = distracted, i = impaired, w = wheeled										Total Peds	f=footpath, r=road										Total cyclists
Time Start	Time End	Nbd	Sbd	Nbd	Sbd		Nbd	Side L/R	Sbd	Side L/R	Total	Nbd	Side L/R	Sbd	Side L/R	Total		Nbd	Side L/R	Sbd	Side L/R	Total	Nbd	Side L/R	Sbd	Side L/R	Total	
9:00	9:15	158	130	17	20	**325**					**0**					**0**	**0**					**0**					**0**	**0**
9:15	9:30	124	132	20	15	**291**			1	R	**1**					**0**	**1**			1		**1**					**0**	**1**
9:30	9:45	149	154	18	25	**346**					**0**					**0**	**0**	1	Lr			**1**					**0**	**1**
9:45	10:00	177	125	19	16	**337**	1	R			**1**					**0**	**1**					**0**					**0**	**0**
	Totals	**608**	**541**	**74**	**76**	**1299**	**1**	**0**	**1**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**2**	**1**	**0**	**1**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**2**
10:00	10:15	150	133	11	20	**314**					**0**					**0**	**0**					**0**					**0**	**0**
10:15	10:30	175	119	18	13	**325**					**0**					**0**	**0**					**0**					**0**	**0**
	Totals	**325**	**252**	**29**	**33**	**639**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Comments: Some vehicles slow for the crossing, but the surfacing is good for the road crossing (concrete). Train 10:21 west to east (engine only, short closure), train 10:29 east to west, preceded by ute.																												

Appendix C: ALCAM LXM Data

5.10 ALCAM Level Crossing #1926 (Road) and #1927 (Pedestrian): Totara Street Number 3 Siding Mt Maunganui (South of Astrolabe Street).

Figure 13: Road Crossing 1926 – Existing ALCAM Risk Score

1926 **Totara Street Number 3 Siding** **6.510 Mount Maunganui Branch**

Tauranga Existing Road

Characteristics	Condition	Points	Score	% of total
CONTROL DETAILS				
11. Effectiveness of equipment inspection and maintenance	Good	0	0	0%
12. Longest approach warning time	20 to <30 secs	2	7	5%
ROAD GEOMETRY				
21. Proximity to intersection/control point	50 to 200m	1	1	1%
22. Proximity to siding/shunting yard	<50m	5	7	5%
23. Proximity to station	>200m	0	0	0%
24. Possibility of short stacking	Low	0	0	0%
25. Number of lanes (number of lines of traffic)	1 lane(s)	0	0	0%
26. Vulnerability to road user fatigue	Medium	3	6	4%
ROAD TRAFFIC CONTROL				
31. Presence of adjacent distractions	Low	0	0	0%
32. Condition of traffic control at crossing	Good	0	0	0%
33. Visibility of traffic control at crossing	Good	0	0	0%
34. Distance from advance warning to crossing	Average	3	17	12%
35. Conformance with AS 1742.7 and NZTA Part 9	Partly	3	13	9%
36. Likelihood of vandalism to controls	Low	0	0	0%
ROAD VEHICLES				
41. Heavy vehicle proportion	<5%	0	0	0%
42. Level of service (vehicle congestion)	Lvl A - Free Flow	0	0	0%
43. Queueing from adjacent intersections	None	0	0	0%
44. Road traffic speed (approach speed 85%ile)	>60 to 80 kph	3	1	1%
RAIL VEHICLES				
51. Seasonal/Infrequent train patterns	Regular trains	0	0	0%
52. Slowest train speed at crossing (typical)	<20 kph	5	17	12%
53. Longest train length (typical)	>300 to 1000m	3	11	8%
54. High train speed	<=60 kph	0	0	0%
CROSSING GEOMETRY				
61. Number of operational rail tracks	2 tracks	3	1	1%
62. Road surface on approach/departure (not Xing panel)	Good	0	0	0%
63. Is the crossing on a hump, dip or rough surface?	No	0	0	0%
VISIBILITY				
71. SSD - advance visibility of crossing from road	50 to <80%	4	55	40%
72. S2 - approach visibility to train (vehicle approaching crossing)	<50%	5	0	0%
73. S3 - visibility to train (vehicle stopped at crossing)	50 to <80%	4	0	0%
74. Possible sun glare sighting crossing on road approach	Known sunglare issue	5	1	1%
75. Possible sun glare sighting train	Known sunglare issue	5	0	0%
76. Temporary visual impediments - sighting of crossing	1 day/month	3	0	0%
77. Temporary visual impediments - sighting of train	1 day/month	3	0	0%
			137	

Surveyed: 25/06/2011 12:00:00 AM Rating Last Updated: 31/03/2017 Rating Model: ALCAM Rd 2a.1.1.1

Printed: 11/08/2017, 06:12 AM 2 of 4

Controls

Controls at Crossing	Half Boom Flashing Lights
Advance Warning	SINGLE Standard Advance Warning (W7-4, W7-7, NZ WX1 OR NZ WX3)
Crossing Environment	Maintenance programme for vegetation etc (Road)

Crossing Volume (AADT) Road: 13000 Rail: 20

Outputs

Raw Infrastructure Factor:	**137**		
Infrastructure Factor:	**1.06267**		
Exposure Factor:	**0.02203**		
Likelihood Factor:	**0.02341**	Years Between Collisions:	**43**
Consequence Factor:	**0.01761**		
Risk Score:	**0.00041**	Years Between Fatalities:	**2426**

Risk / Likelihood Bands

Across Control Classes

Risk Band All:	**Medium**	Likelihood Band All:	**High**
Risk Band Jurisdiction:	**Medium Low**	Likelihood Band Jurisdiction:	**High**

Within Boom Barrier Control Class

Risk Band All:	**Medium Low**	Likelihood Band All:	**Medium High**
Risk Band Jurisdiction:	**Medium Low**	Likelihood Band Jurisdiction :	**High**

Flags:

Multiple Tracks
Sighting S1
Sun Glare Sighting Crossing on Road

Surveyed: 25/06/2011 12:00:00 AM Rating Last Updated: 31/03/2017 Rating Model: ALCAM Rd 2a.1.1.1

Printed: 11/08/2017, 06:12 AM 3 of 4

Mechanisms

UNABLE TO AVOID	
Unable to stop in time	82
Stuck on tracks	0
Stopped on tracks	1
UNAWARE	
Distracted	1
Could not see control	3
Could not see train from road approach (S2)	0
Could not see train from at crossing (S3)	0
Assumes train will stop	0
Does not expect second train	0
Finds crossing protection is ambiguous	0
Is fatigued	7
Mislead by Controls	0
UNWILLING TO RECOGNISE	
Queued on tracks	0
Overhangs on tracks	0
Racing train or misjudged train speed	9
Driving through passive warning without looking	0
Driving through flashing lights	0
Driving around boom gates	32
	137

Surveyed: 25/06/2011 12:00:00 AM Rating Last Updated: 31/03/2017 Rating Model: ALCAM Rd 2a.1.1.1

Printed: 11/08/2017, 06:12 AM 4 of 4

Figure 14: Pedestrian Crossing 1927 Existing ALCAM Risk Score

01927-1 **Totara Street Number 3 Siding Ped Dn** **6.510 Mount Maunganui Branch**

Mt Maunganui

Existing Pedestrian

Characteristics	*Condition*	*Points*	*Score*	*% of total*
CONTROL DETAILS				
11. Effectiveness of equipment inspection and maintenance	High	0	0	0%
12. Shortest approach warning time from start of flashing lights to train	<20 secs	5	0	0%
13. Longest approach warning time from start of flashing lights to train	<20 secs	0	0	0%
ADJACENT ACTIVITY				
21. Presence of adjacent distractions (visual)	Some	3	11	4%
22. Proximity to passenger station	>500m	0	0	0%
23. Proximity to siding / shunting yard	<100m	5	34	14%
24. Proximity to licensed / special event venue (eg. pub, club, sports	>500m	0	0	0%
25. Proximity to school playground or aged facilities	>500m	0	0	0%
26. Ambient noise level / audibility of alarm	Medium	3	12	5%
27. Adjacent road traffic activity	Quiet	0	0	0%
PEDESTRIAN TRAFFIC CONTROL				
31. Conspicuity of pedestrian control	Poor	5	13	5%
32. Visibility of pedestrian control	Poor	5	3	1%
33. Likelihood of vandalism to control	No History	0	0	0%
PEDESTRIAN TRAFFIC				
41. Volume of pedestrians (peak flow)	>5 to 20 pedestrians per hour	2	3	1%
42. Type of pedestrians (children)	Medium Risk	3	45	18%
43. Type of pedestrians (physically disabled)	Low Risk	0	0	0%
44. Type of pedestrians (sensory disabled)	Low Risk	0	0	0%
45. Type of pedestrians (intellectually disabled)	Low Risk	0	0	0%
46. Type of pedestrians (cyclists, wheelchairs, prams etc)	Low Risk	0	0	0%
47. Type of pedestrians elderly	Low Risk	0	0	0%
RAIL VEHICLES				
51. Train volume (high is bad) (if high then greater probability of	>10 to 60 trains per day	4	22	9%
52. Infrequent / seasonal movements / special trains	Low	0	0	0%
53. Highest train speed at crossing (typical)	<=60 kph	0	0	0%
54. Longest train length (typical)	>300 to 1000m	3	7	3%
CROSSING GEOMETRY				
61. Number of operational rail tracks (including sidings)	2 tracks	3	23	9%
62. Angle of crossing & condition / width of flange gap	70-90deg	0	0	0%
63. Condition of crossing (fencing/path surface etc)	Good	0	0	0%
64. Freight trains stand across crossing	Rarely	0	0	0%
65. Gradients, widths and manoeuvring space of pathway/maze	Fully meets DDA	0	0	0%
66. Change of path alignment between pedestrian maze and track	Adequate	0	0	0%
67. Crossing to Australian/NZ Standards (signage & path marking)	Does not meet AS	5	7	3%
VISIBILITY				
71. Visibility from crossing to train (from pedestrian holding point)	50 to 80%	4	23	9%
72. Sun glare issues at crossing	Yes	5	12	5%
73. Temporary visual impediments	Yes	5	4	2%
74. Masking of trains (moving or stationary) timetabling etc	Occasionally	3	27	11%

Surveyed: 14/07/2011 12:00:00 AM Rating Last Updated: 25/03/2017 Rating Model: ALCAM Ped 1a.0.1.0

Printed: 11/08/2017, 06:16 AM 2 of 4

245

Controls

Physical Controls	Path
Adjacent Controls	Adjacent boom gates and lights
Crossing Environment	Maintenance of vegetation
Operational	Train lights

Crossing Volume (AADT) Pedestrian: 100 Rail: 20

Outputs

Infrastructure Factor:	**244.8032**	Exposure Factor:	**2,000**
		Risk Score:	**489,606**

Risk Bands

Across Control Classes		**Within Passive with Adjacent Road Controls Control Class**	
Risk Band All:	**Medium**	Risk Band All:	**Medium High**
Risk Band Jurisdiction:	**Medium High**	Risk Band Jurisdiction:	**High**

Surveyed: 14/07/2011 12:00:00 AM Rating Last Updated: 25/03/2017 Rating Model: ALCAM Ped 1a.0.1.0

Printed: 11/08/2017, 06:16 AM 3 of 4

Mechanisms

UNABLE TO AVOID	
Unable to stop in time, late recognition of danger	0
Caught in tracks (stuck, slip, trip, fall)	3
Unable to cross quickly enough	2
Trapped by controls (if no gates then all values are zero)	0
Unable to determine the orientation of the crossing	0
UNAWARE	
Distracted	26
Did not see train or visual warning signals	42
Did not hear train or audio warning signals	11
Has limited capacity to recognise danger and react	3
Under the influence of alchohol	1
Does not recognise crossing	14
Does not expect second train	73
Assumes train would stop	0
Misjudges train speed	19
Does not expect train	5
Does not expect train movement(s)	23
Mislead by infrastructure	0
Mislead by controls	0
UNWILLING TO RECOGNISE	
Deliberately ignored control	6
Bypassing active control	0
Crawling under wagons (if no trains stopping then all values are zero)	0
Skylarking	17
	245

Surveyed: 14/07/2011 12:00:00 AM Rating Last Updated: 25/03/2017 Rating Model: ALCAM Ped 1a.0.1.0

Printed: 11/08/2017, 06:16 AM 4 of 4

Figure 15: Pedestrian Crossing 1927 Proposed Design ALCAM Risk Score

01927-1 **Totara Street Number 3 Siding Ped Dn** **KM:6.510** **Mount Maunganui Branch**

Mt Maunganui Proposal (Ped)

Proposal Name: Design Option 1 Proposal Updated Date: 07/11/2017 11:41:58 AM

Proposal Type: Treatment Option Proposal Modifier: bridget.feary@opus.co.nz

Proposal Status: Active

Proposal Description: Maze gates, rubber surfacing, fencing, signage, additional flashing lights and bells for pedestrians/cyclists. Copenhagen cycle path.

Characteristics	*Condition*	*Points*	*Score*	*% of total*
CONTROL DETAILS				
11. Effectiveness of equipment inspection and maintenance	High	0	0	0%
12. Shortest approach warning time from start of flashing lights to train	<20 secs	5	0	0%
13. Longest approach warning time from start of flashing lights to train	<20 secs	0	0	0%
ADJACENT ACTIVITY				
21. Presence of adjacent distractions (visual)	Some	3	3	3%
22. Proximity to passenger station	>500m	0	0	0%
23. Proximity to siding / shunting yard	<100m	5	17	16%
24. Proximity to licensed / special event venue (eg. pub, club, sports	>500m	0	0	0%
25. Proximity to school playground or aged facilities	>500m	0	0	0%
26. Ambient noise level / audibility of alarm	Medium	3	3	3%
27. Adjacent road traffic activity	Quiet	0	0	0%
PEDESTRIAN TRAFFIC CONTROL				
31. Conspicuity of pedestrian control	Poor	5	5	5%
32. Visibility of pedestrian control	Poor	5	0	0%
33. Likelihood of vandalism to control	No History	0	0	0%
PEDESTRIAN TRAFFIC				
41. Volume of pedestrians (peak flow)	>5 to 20 pedestrians per hour	2	2	2%
42. Type of pedestrians (children)	Medium Risk	3	21	19%
43. Type of pedestrians (physically disabled)	Low Risk	0	0	0%
44. Type of pedestrians (sensory disabled)	Low Risk	0	0	0%
45. Type of pedestrians (intellectually disabled)	Low Risk	0	0	0%
46. Type of pedestrians (cyclists, wheelchairs, prams etc)	Low Risk	0	0	0%
47. Type of pedestrians elderly	Low Risk	0	0	0%
RAIL VEHICLES				
51. Train volume (high is bad) (if high then greater probability of	>10 to 60 trains per day	4	14	13%
52. Infrequent / seasonal movements / special trains	Low	0	0	0%
53. Highest train speed at crossing (typical)	<=60 kph	0	0	0%
54. Longest train length (typical)	>300 to 1000m	3	5	5%
CROSSING GEOMETRY				
61. Number of operational rail tracks (including sidings)	2 tracks	3	14	13%
62. Angle of crossing & condition / width of flange gap	70-90deg	0	0	0%

Surveyed: 14/07/2011 Rating Last Updated: 7/11/2017 Rating Model: ALCAM Ped 1a.0.1.0

Printed: 08/11/2017, 09:40 AM 11 of 16

63. Condition of crossing (fencing/path surface etc)	Good	0	0	0%
64. Freight trains stand across crossing	Rarely	0	0	0%
65. Gradients, widths and manoeuvring space of pathway/maze	Fully meets DDA	0	0	0%
66. Change of path alignment between pedestrian maze and track	Adequate	0	0	0%
67. Crossing to Australian/NZ Standards (signage & path marking)	Does not meet AS	5	1	1%
VISIBILITY				
71. Visibility from crossing to train (from pedestrian holding point)	50 to 80%	4	5	5%
72. Sun glare issues at crossing	Yes	5	3	3%
73. Temporary visual impediments	Yes	5	1	1%
74. Masking of trains (moving or stationary) timetabling etc	Occasionally	3	15	14%
			107.18779	100%

Controls

Physical Controls	Maze
Physical Controls	Path
Audio Visual Controls	Visual and audible alarm
Adjacent Controls	Adjacent boom gates and lights
Pedestrian Signage / Path Marking	Delineation line marking (painted only)
Pedestrian Signage / Path Marking	Tactile ground surface indicators
Crossing Environment	Maintenance of vegetation
Crossing Environment	Adjacent corridor fencing
Pathway Works	Change pathway alignment
Pathway Works	Flange Gap Filler?
Pathway Works	Increase path width and traffic ability
Operational	Train lights

Crossing Volume (AADT) Pedestrian: 212 Rail: 20

Outputs

Infrastructure Factor:	107.18779	Exposure Factor:	4,240
		Risk Score:	454,476

Risk Bands

Across Control Classes		Within Train Activated Lights / Audio Control Class	
Risk Band All:	Medium	Risk Band All:	Medium
Risk Band Jurisdiction:	Medium High	Risk Band Jurisdiction:	Medium Low

Mechanisms

UNABLE TO AVOID

Unable to stop in time, late recognition of danger	0
Caught in tracks (stuck, slip, trip, fall)	1

Surveyed: 14/07/2011 Rating Last Updated: 7/11/2017 Rating Model: ALCAM Ped 1a.0.1.0

Printed: 08/11/2017, 09:40 AM 12 of 16

Unable to cross quickly enough	1
Trapped by controls (if no gates then all values are zero)	0
Unable to determine the orientation of the crossing	0
UNAWARE	
Distracted	7
Did not see train or visual warning signals	8
Did not hear train or audio warning signals	3
Has limited capacity to recognise danger and react	1
Under the influence of alcohol	1
Does not recognise crossing	0
Does not expect second train	47
Assumes train would stop	0
Misjudges train speed	7
Does not expect train	1
Does not expect train movement(s)	15
Mislead by infrastructure	0
Mislead by controls	0
UNWILLING TO RECOGNISE	
Deliberately ignored control	6
Bypassing active control	0
Crawling under wagons (if no trains stopping then all values are zero)	0
Skylarking	10
	107

Figure 16: Pedestrian Crossing 1927 SRT Modified ALCAM Risk Score

01927-1 **Totara Street Number 3 Siding Ped Dn** **KM:6.510** **Mount Maunganui Branch**

Mt Maunganui Proposal (Ped)

Proposal Name: Copy of Design Option 1 Proposal Updated Date: 08/11/2017 05:41:33 AM

Proposal Type: Treatment Option Proposal Modifier: bridget.feary@opus.co.nz

Proposal Status: Active

Proposal Description: Maze gates, rubber surfacing, fencing, signage, additional flashing lights and bells for pedestrians/cyclists. Copenhagen cycle path.

Characteristics	*Condition*	*Points*	*Score*	*% of total*
CONTROL DETAILS				
11. Effectiveness of equipment inspection and maintenance	High	0	0	0%
12. Shortest approach warning time from start of flashing lights to train	<20 secs	5	0	0%
13. Longest approach warning time from start of flashing lights to train	<20 secs	0	0	0%
ADJACENT ACTIVITY				
21. Presence of adjacent distractions (visual)	Some	3	1	3%
22. Proximity to passenger station	>500m	0	0	0%
23. Proximity to siding / shunting yard	<100m	5	7	20%
24. Proximity to licensed / special event venue (eg. pub, club, sports	>500m	0	0	0%
25. Proximity to school playground or aged facilities	>500m	0	0	0%
26. Ambient noise level / audibility of alarm	Medium	3	2	6%
27. Adjacent road traffic activity	Quiet	0	0	0%
PEDESTRIAN TRAFFIC CONTROL				
31. Conspicuity of pedestrian control	Poor	5	1	3%
32. Visibility of pedestrian control	Poor	5	0	0%
33. Likelihood of vandalism to control	No History	0	0	0%
PEDESTRIAN TRAFFIC				
41. Volume of pedestrians (peak flow)	>5 to 20 pedestrians per hour	2	1	3%
42. Type of pedestrians (children)	Medium Risk	3	8	23%
43. Type of pedestrians (physically disabled)	Low Risk	0	0	0%
44. Type of pedestrians (sensory disabled)	Low Risk	0	0	0%
45. Type of pedestrians (intellectually disabled)	Low Risk	0	0	0%
46. Type of pedestrians (cyclists, wheelchairs, prams etc)	Low Risk	0	0	0%
47. Type of pedestrians elderly	Low Risk	0	0	0%
RAIL VEHICLES				
51. Train volume (high is bad) (if high then greater probability of	>10 to 60 trains per day	4	3	9%
52. Infrequent / seasonal movements / special trains	Low	0	0	0%
53. Highest train speed at crossing (typical)	<=60 kph	0	0	0%
54. Longest train length (typical)	>300 to 1000m	3	1	3%
CROSSING GEOMETRY				
61. Number of operational rail tracks (including sidings)	2 tracks	3	4	11%
62. Angle of crossing & condition / width of flange gap	70-90deg	0	0	0%

Surveyed: 14/07/2011 Rating Last Updated: 8/11/2017 Rating Model: ALCAM Ped 1a.0.1.0

Printed: 08/11/2017, 09:40 AM 5 of 16

63. Condition of crossing (fencing/path surface etc)	Good	0	0	0%
64. Freight trains stand across crossing	Rarely	0	0	0%
65. Gradients, widths and manoeuvring space of pathway/maze	Fully meets DDA	0	0	0%
66. Change of path alignment between pedestrian maze and track	Adequate	0	0	0%
67. Crossing to Australian/NZ Standards (signage & path marking)	Does not meet AS	5	0	0%
VISIBILITY				
71. Visibility from crossing to train (from pedestrian holding point)	50 to 80%	4	2	6%
72. Sun glare issues at crossing	Yes	5	1	3%
73. Temporary visual impediments	Yes	5	0	0%
74. Masking of trains (moving or stationary) timetabling etc	Occasionally	3	4	11%
			35.52008	100%

Controls

Physical Controls	Manual Gates
Physical Controls	Maze
Physical Controls	Path
Audio Visual Controls	Visual and audible alarm
Adjacent Controls	Adjacent boom gates and lights
Emergency Egress	With latch (including holding enclosure)
Pedestrian Signage / Path Marking	Active sign "another train coming" warning
Pedestrian Signage / Path Marking	Delineation line marking (painted only)
Pedestrian Signage / Path Marking	Tactile ground surface indicators
Crossing Environment	Maintenance of vegetation
Crossing Environment	Adjacent corridor fencing
Pathway Works	Change pathway alignment
Pathway Works	Flange Gap Filler?
Pathway Works	Increase path width and traffic ability
Operational	Train lights

Crossing Volume (AADT) Pedestrian: 212 Rail: 20

Outputs

Infrastructure Factor:	35.52008	Exposure Factor:	4,240
		Risk Score:	150,605

Risk Bands

Across Control Classes		**Within Train Activated Lights / Audio Control Class**	
Risk Band All:	**Medium Low**	Risk Band All:	**Medium Low**
Risk Band Jurisdiction:	**Medium Low**	Risk Band Jurisdiction:	**Low**

Mechanisms

Surveyed: 14/07/2011 Rating Last Updated: 8/11/2017 Rating Model: ALCAM Ped 1a.0.1.0

Printed: 08/11/2017, 09:40 AM 6 of 16

UNABLE TO AVOID	
Unable to stop in time, late recognition of danger	0
Caught in tracks (stuck, slip, trip, fall)	1
Unable to cross quickly enough	1
Trapped by controls (if no gates then all values are zero)	0
Unable to determine the orientation of the crossing	0
UNAWARE	
Distracted	1
Did not see train or visual warning signals	4
Did not hear train or audio warning signals	2
Has limited capacity to recognise danger and react	0
Under the influence of alcohol	0
Does not recognise crossing	0
Does not expect second train	9
Assumes train would stop	0
Misjudges train speed	3
Does not expect train	0
Does not expect train movement(s)	7
Mislead by infrastructure	0
Mislead by controls	0
UNWILLING TO RECOGNISE	
Deliberately ignored control	1
Bypassing active control	0
Crawling under wagons (if no trains stopping then all values are zero)	0
Skylarking	3
	36

Figure 17: Pedestrian Crossing 1927 Future – ALCAM Risk Score

01927-1 **Totara Street Number 3 Siding Ped Dn** **KM:6.510** **Mount Maunganui Branch**

Mt Maunganui Proposal (Ped)

Proposal Name: Future Option 1 with 260 peds/cyclists

Proposal Updated Date: 08/11/2017 09:40:38 AM

Proposal Type: Treatment Option

Proposal Modifier: bridget.feary@opus.co.nz

Proposal Status: Active

Proposal Description: Maze gates, rubber surfacing, fencing, signage, additional flashing lights and bells for pedestrians/cyclists. Copenhagen cycle path.

Characteristics	*Condition*	*Points*	*Score*	*% of total*
CONTROL DETAILS				
11. Effectiveness of equipment inspection and maintenance	High	0	0	0%
12. Shortest approach warning time from start of flashing lights to train	<20 secs	5	0	0%
13. Longest approach warning time from start of flashing lights to train	<20 secs	0	0	0%
ADJACENT ACTIVITY				
21. Presence of adjacent distractions (visual)	Some	3	3	3%
22. Proximity to passenger station	>500m	0	0	0%
23. Proximity to siding / shunting yard	<100m	5	17	16%
24. Proximity to licensed / special event venue (eg. pub, club, sports	>500m	0	0	0%
25. Proximity to school playground or aged facilities	>500m	0	0	0%
26. Ambient noise level / audibility of alarm	Medium	3	3	3%
27. Adjacent road traffic activity	Quiet	0	0	0%
PEDESTRIAN TRAFFIC CONTROL				
31. Conspicuity of pedestrian control	Poor	5	5	5%
32. Visibility of pedestrian control	Poor	5	0	0%
33. Likelihood of vandalism to control	No History	0	0	0%
PEDESTRIAN TRAFFIC				
41. Volume of pedestrians (peak flow)	>5 to 20 pedestrians per hour	2	2	2%
42. Type of pedestrians (children)	Medium Risk	3	21	19%
43. Type of pedestrians (physically disabled)	Low Risk	0	0	0%
44. Type of pedestrians (sensory disabled)	Low Risk	0	0	0%
45. Type of pedestrians (intellectually disabled)	Low Risk	0	0	0%
46. Type of pedestrians (cyclists, wheelchairs, prams etc)	Low Risk	0	0	0%
47. Type of pedestrians elderly	Low Risk	0	0	0%
RAIL VEHICLES				
51. Train volume (high is bad) (if high then greater probability of	>10 to 60 trains per day	4	14	13%
52. Infrequent / seasonal movements / special trains	Low	0	0	0%
53. Highest train speed at crossing (typical)	<=60 kph	0	0	0%
54. Longest train length (typical)	>300 to 1000m	3	5	5%
CROSSING GEOMETRY				
61. Number of operational rail tracks (including sidings)	2 tracks	3	14	13%

Surveyed: 14/07/2011 Rating Last Updated: 8/11/2017 Rating Model: ALCAM Ped 1a.0.1.0

Printed: 08/11/2017, 09:40 AM 2 of 16

62. Angle of crossing & condition / width of flange gap	70-90deg	0	0	0%
63. Condition of crossing (fencing/path surface etc)	Good	0	0	0%
64. Freight trains stand across crossing	Rarely	0	0	0%
65. Gradients, widths and manoeuvring space of pathway/maze	Fully meets DDA	0	0	0%
66. Change of path alignment between pedestrian maze and track	Adequate	0	0	0%
67. Crossing to Australian/NZ Standards (signage & path marking)	Does not meet AS	5	1	1%
VISIBILITY				
71. Visibility from crossing to train (from pedestrian holding point)	50 to 80%	4	5	5%
72. Sun glare issues at crossing	Yes	5	3	3%
73. Temporary visual impediments	Yes	5	1	1%
74. Masking of trains (moving or stationary) timetabling etc	Occasionally	3	15	14%
			107.18779	100%

Controls

Physical Controls	Maze
Physical Controls	Path
Audio Visual Controls	Visual and audible alarm
Adjacent Controls	Adjacent boom gates and lights
Pedestrian Signage / Path Marking	Delineation line marking (painted only)
Pedestrian Signage / Path Marking	Tactile ground surface indicators
Crossing Environment	Maintenance of vegetation
Crossing Environment	Adjacent corridor fencing
Pathway Works	Change pathway alignment
Pathway Works	Flange Gap Filler?
Pathway Works	Increase path width and traffic ability
Operational	Train lights

Crossing Volume (AADT) Pedestrian: 260 Rail: 20

Outputs

Infrastructure Factor:	107.18779	Exposure Factor:	5,200
		Risk Score:	557,377

Risk Bands

Across Control Classes		**Within Train Activated Lights / Audio Control Class**	
Risk Band All:	**Medium**	Risk Band All:	**Medium**
Risk Band Jurisdiction:	**Medium High**	Risk Band Jurisdiction:	**Medium Low**

Mechanisms

UNABLE TO AVOID

Unable to stop in time, late recognition of danger	0

Surveyed: 14/07/2011 Rating Last Updated: 8/11/2017 Rating Model: ALCAM Ped 1a.0.1.0

Printed: 08/11/2017, 09:40 AM 3 of 16

Caught in tracks (stuck, slip, trip, fall)	1
Unable to cross quickly enough	1
Trapped by controls (if no gates then all values are zero)	0
Unable to determine the orientation of the crossing	0
UNAWARE	
Distracted	7
Did not see train or visual warning signals	8
Did not hear train or audio warning signals	3
Has limited capacity to recognise danger and react	1
Under the influence of alcohol	1
Does not recognise crossing	0
Does not expect second train	47
Assumes train would stop	0
Misjudges train speed	7
Does not expect train	1
Does not expect train movement(s)	15
Mislead by infrastructure	0
Mislead by controls	0
UNWILLING TO RECOGNISE	
Deliberately ignored control	6
Bypassing active control	0
Crawling under wagons (if no trains stopping then all values are zero)	0
Skylarking	10
	107

5.11 ALCAM Level Crossing #1590 (Road) and #1591 (Pedestrian): Totara Street (north of Hull Road)

Figure 18: Road Crossing 1590 – Existing ALCAM Risk Score

1590 **Totara Street** **5.210 Mount Maunganui Branch**

Tauranga Existing Road

Characteristics	*Condition*	*Points*	*Score*	*% of total*
CONTROL DETAILS				
11. Effectiveness of equipment inspection and maintenance	Good	0	0	0%
12. Longest approach warning time	20 to <30 secs	2	7	8%
ROAD GEOMETRY				
21. Proximity to intersection/control point	50 to 200m	1	1	1%
22. Proximity to siding/shunting yard	<50m	5	7	8%
23. Proximity to station	<50m	5	8	9%
24. Possibility of short stacking	Low	0	0	0%
25. Number of lanes (number of lines of traffic)	1 lane(s)	0	0	0%
26. Vulnerability to road user fatigue	Low	0	0	0%
ROAD TRAFFIC CONTROL				
31. Presence of adjacent distractions	Low	0	0	0%
32. Condition of traffic control at crossing	Good	0	0	0%
33. Visibility of traffic control at crossing	Good	0	0	0%
34. Distance from advance warning to crossing	Average	3	16	19%
35. Conformance with AS 1742.7 and NZTA Part 9	Partly	3	13	15%
36. Likelihood of vandalism to controls	Low	0	0	0%
ROAD VEHICLES				
41. Heavy vehicle proportion	<5%	0	0	0%
42. Level of service (vehicle congestion)	Lvl C - Stable Restricted Flow	2	3	3%
43. Queueing from adjacent intersections	None	0	0	0%
44. Road traffic speed (approach speed 85%ile)	<=60 kph	0	0	0%
RAIL VEHICLES				
51. Seasonal/Infrequent train patterns	Regular trains	0	0	0%
52. Slowest train speed at crossing (typical)	<20 kph	5	17	20%
53. Longest train length (typical)	>300 to 1000m	3	11	13%
54. High train speed	>60 to 80 kph	1	1	1%
CROSSING GEOMETRY				
61. Number of operational rail tracks	2 tracks	3	1	1%
62. Road surface on approach/departure (not Xing panel)	Good	0	0	0%
63. Is the crossing on a hump, dip or rough surface?	No	0	0	0%
VISIBILITY				
71. SSD - advance visibility of crossing from road	>100%	0	0	0%
72. S2 - approach visibility to train (vehicle approaching crossing)	<50%	5	0	0%
73. S3 - visibility to train (vehicle stopped at crossing)	<50%	5	0	0%
74. Possible sun glare sighting crossing on road approach	Known sunglare issue	5	1	1%
75. Possible sun glare sighting train	Known sunglare issue	5	0	0%
76. Temporary visual impediments - sighting of crossing	1 day/month	3	0	0%
77. Temporary visual impediments - sighting of train	1 day/month	3	0	0%
			85	

Surveyed: 26/11/2009 12:00:00 AM Rating Last Updated: 31/03/2017 Rating Model: ALCAM Rd 2a.1.1.1

Printed: 11/08/2017, 06:18 AM 2 of 4

Controls

Controls at Crossing	Half Boom Flashing Lights
Advance Warning	SINGLE Standard Advance Warning (W7-4, W7-7, NZ WX1 OR NZ WX3)
Human Factors	Public response phone number
Crossing Environment	Maintenance programme for vegetation etc (Road)

Crossing Volume (AADT) Road: 10000 Rail: 25

Outputs

Raw Infrastructure Factor:	**85**		
Infrastructure Factor:	**0.9907**		
Exposure Factor:	**0.02118**		
Likelihood Factor:	**0.02099**	Years Between Collisions:	**48**
Consequence Factor:	**0.08183**		
Risk Score:	**0.00172**	Years Between Fatalities:	**582**

Risk / Likelihood Bands

Across Control Classes

Risk Band All:	**High**	Likelihood Band All:	**High**
Risk Band Jurisdiction:	**Medium High**	Likelihood Band Jurisdiction:	**High**

Within Boom Barrier Control Class

Risk Band All:	**Medium High**	Likelihood Band All:	**Medium High**
Risk Band Jurisdiction:	**Medium**	Likelihood Band Jurisdiction	**High**

Flags:

Multiple Tracks

Sun Glare Sighting Crossing on Road

Surveyed: 26/11/2009 12:00:00 AM Rating Last Updated: 31/03/2017 Rating Model: ALCAM Rd 2a.1.1.1

Printed: 11/08/2017, 06:18 AM 3 of 4

Mechanisms

UNABLE TO AVOID	
Unable to stop in time	28
Stuck on tracks	0
Stopped on tracks	2
UNAWARE	
Distracted	2
Could not see control	3
Could not see train from road approach (S2)	0
Could not see train from at crossing (S3)	0
Assumes train will stop	0
Does not expect second train	0
Finds crossing protection is ambiguous	0
Is fatigued	0
Mislead by Controls	0
UNWILLING TO RECOGNISE	
Queued on tracks	0
Overhangs on tracks	0
Racing train or misjudged train speed	11
Driving through passive warning without looking	0
Driving through flashing lights	0
Driving around boom gates	40
	85

Surveyed: 26/11/2009 12:00:00 AM Rating Last Updated: 31/03/2017 Rating Model: ALCAM Rd 2a.1.1.1

Printed: 11/08/2017, 06:18 AM 4 of 4

Figure 19: Pedestrian Crossing 1591 – Existing ALCAM Risk Score

01591-1 **Totara Street Ped Up** **5.210 Mount Maunganui Branch**

Tauranga

Existing Pedestrian

Characteristics	*Condition*	*Points*	*Score*	*% of total*
CONTROL DETAILS				
11. Effectiveness of equipment inspection and maintenance	High	0	0	0%
12. Shortest approach warning time from start of flashing lights to train	<20 secs	5	0	0%
13. Longest approach warning time from start of flashing lights to train	<20 secs	0	0	0%
ADJACENT ACTIVITY				
21. Presence of adjacent distractions (visual)	Few	0	0	0%
22. Proximity to passenger station	>500m	0	0	0%
23. Proximity to siding / shunting yard	<100m	5	33	13%
24. Proximity to licensed / special event venue (eg. pub, club, sports	>500m	0	0	0%
25. Proximity to school playground or aged facilities	>500m	0	0	0%
26. Ambient noise level / audibility of alarm	Low	0	0	0%
27. Adjacent road traffic activity	Quiet	0	0	0%
PEDESTRIAN TRAFFIC CONTROL				
31. Conspicuity of pedestrian control	Good	0	0	0%
32. Visibility of pedestrian control	Good	0	0	0%
33. Likelihood of vandalism to control	No History	0	0	0%
PEDESTRIAN TRAFFIC				
41. Volume of pedestrians (peak flow)	>5 to 20 pedestrians per hour	2	3	1%
42. Type of pedestrians (children)	Medium Risk	3	43	16%
43. Type of pedestrians (physically disabled)	Low Risk	0	0	0%
44. Type of pedestrians (sensory disabled)	Low Risk	0	0	0%
45. Type of pedestrians (intellectually disabled)	Low Risk	0	0	0%
46. Type of pedestrians (cyclists, wheelchairs, prams etc)	Medium Risk	3	46	18%
47. Type of pedestrians elderly	Low Risk	0	0	0%
RAIL VEHICLES				
51. Train volume (high is bad) (if high then greater probability of	>10 to 60 trains per day	4	22	8%
52. Infrequent / seasonal movements / special trains	Low	0	0	0%
53. Highest train speed at crossing (typical)	>60 to 80 kph	1	11	4%
54. Longest train length (typical)	>300 to 1000m	3	7	3%
CROSSING GEOMETRY				
61. Number of operational rail tracks (including sidings)	2 tracks	3	23	9%
62. Angle of crossing & condition / width of flange gap	70-90deg	0	0	0%
63. Condition of crossing (fencing/path surface etc)	Good	0	0	0%
64. Freight trains stand across crossing	Rarely	0	0	0%
65. Gradients, widths and manoeuvring space of pathway/maze	Fully meets DDA	0	0	0%
66. Change of path alignment between pedestrian maze and track	Adequate	0	0	0%
67. Crossing to Australian/NZ Standards (signage & path marking)	Does not meet AS	5	6	2%
VISIBILITY				
71. Visibility from crossing to train (from pedestrian holding point)	<50%	5	26	10%
72. Sun glare issues at crossing	Yes	5	11	4%
73. Temporary visual impediments	Yes	5	4	2%
74. Masking of trains (moving or stationary) timetabling etc	Occasionally	3	27	10%
			261	

Surveyed: 26/11/2009 12:00:00 AM Rating Last Updated: 13/06/2017 Rating Model: ALCAM Ped 1a.0.1.0

Printed: 11/08/2017, 06:20 AM 2 of 4

Controls

Physical Controls	Path
Adjacent Controls	Adjacent boom gates and audio
Human Factors	Fault reporting number
Crossing Environment	Maintenance of vegetation
Crossing Environment	Funnel pathway
Operational	Train lights

Crossing Volume (AADT) Pedestrian: 100 Rail: 25

Outputs

Infrastructure Factor:	**261.02983**	Exposure Factor:	**2,500**
		Risk Score:	**652,575**

Risk Bands

Across Control Classes		**Within Passive with Adjacent Road Controls Control Class**	
Risk Band All:	**Medium**	Risk Band All:	**Medium High**
Risk Band Jurisdiction:	**High**	Risk Band Jurisdiction:	**High**

Surveyed: 26/11/2009 12:00:00 AM Rating Last Updated: 13/06/2017 Rating Model: ALCAM Ped 1a.0.1.0

Printed: 11/08/2017, 06:20 AM 3 of 4

Mechanisms

UNABLE TO AVOID	
Unable to stop in time, late recognition of danger	18
Caught in tracks (stuck, slip, trip, fall)	19
Unable to cross quickly enough	10
Trapped by controls (if no gates then all values are zero)	0
Unable to determine the orientation of the crossing	0
UNAWARE	
Distracted	10
Did not see train or visual warning signals	44
Did not hear train or audio warning signals	1
Has limited capacity to recognise danger and react	5
Under the influence of alcohol	1
Does not recognise crossing	4
Does not expect second train	67
Assumes train would stop	0
Misjudges train speed	27
Does not expect train	5
Does not expect train movement(s)	23
Mislead by infrastructure	0
Mislead by controls	0
UNWILLING TO RECOGNISE	
Deliberately ignored control	7
Bypassing active control	0
Crawling under wagons (if no trains stopping then all values are zero)	0
Skylarking	17
	261

Surveyed: 26/11/2009 12:00:00 AM Rating Last Updated: 13/06/2017 Rating Model: ALCAM Ped 1a.0.1.0

Printed: 11/08/2017, 06:20 AM 4 of 4

Figure 20: Pedestrian Crossing 1951 Proposed Design ALCAM Risk Score

01591-1 **Totara Street Ped Up** **KM:5.210** **Mount Maunganui Branch**

Tauranga Proposal (Ped)

Proposal Name: Option 1 Pedestrian Facilities Upgrade

Proposal Updated Date: 07/11/2017 12:55:56 PM

Proposal Type: Treatment Option

Proposal Modifier: bridget.feary@opus.co.nz

Proposal Status: Active

Proposal Description: Copenhagen cycle path, fencing and maze, signs, markings, additional flashing lights, rubber surfacing, tactile pavers.

Characteristics	*Condition*	*Points*	*Score*	*% of total*
CONTROL DETAILS				
11. Effectiveness of equipment inspection and maintenance	High	0	0	0%
12. Shortest approach warning time from start of flashing lights to train	<20 secs	5	0	0%
13. Longest approach warning time from start of flashing lights to train	<20 secs	0	0	0%
ADJACENT ACTIVITY				
21. Presence of adjacent distractions (visual)	Few	0	0	0%
22. Proximity to passenger station	>500m	0	0	0%
23. Proximity to siding / shunting yard	<100m	5	17	14%
24. Proximity to licensed / special event venue (eg. pub, club, sports	>500m	0	0	0%
25. Proximity to school playground or aged facilities	>500m	0	0	0%
26. Ambient noise level / audibility of alarm	Low	0	0	0%
27. Adjacent road traffic activity	Quiet	0	0	0%
PEDESTRIAN TRAFFIC CONTROL				
31. Conspicuity of pedestrian control	Good	0	0	0%
32. Visibility of pedestrian control	Good	0	0	0%
33. Likelihood of vandalism to control	No History	0	0	0%
PEDESTRIAN TRAFFIC				
41. Volume of pedestrians (peak flow)	>5 to 20 pedestrians per hour	2	2	2%
42. Type of pedestrians (children)	Medium Risk	3	22	18%
43. Type of pedestrians (physically disabled)	Low Risk	0	0	0%
44. Type of pedestrians (sensory disabled)	Low Risk	0	0	0%
45. Type of pedestrians (intellectually disabled)	Low Risk	0	0	0%
46. Type of pedestrians (cyclists, wheelchairs, prams etc)	Medium Risk	3	22	18%
47. Type of pedestrians elderly	Low Risk	0	0	0%
RAIL VEHICLES				
51. Train volume (high is bad) (if high then greater probability of	>10 to 60 trains per day	4	14	11%
52. Infrequent / seasonal movements / special trains	Low	0	0	0%
53. Highest train speed at crossing (typical)	>60 to 80 kph	1	4	3%
54. Longest train length (typical)	>300 to 1000m	3	5	4%
CROSSING GEOMETRY				
61. Number of operational rail tracks (including sidings)	2 tracks	3	13	10%
62. Angle of crossing & condition / width of flange gap	70-90deg	0	0	0%

Surveyed: 26/11/2009 Rating Last Updated: 7/11/2017 Rating Model: ALCAM Ped 1a.0.1.0

Printed: 07/11/2017, 12:56 PM 2 of 7

63. Condition of crossing (fencing/path surface etc)	Good	0	0	0%
64. Freight trains stand across crossing	Rarely	0	0	0%
65. Gradients, widths and manoeuvring space of pathway/maze	Fully meets DDA	0	0	0%
66. Change of path alignment between pedestrian maze and track	Adequate	0	0	0%
67. Crossing to Australian/NZ Standards (signage & path marking)	Does not meet AS	5	1	1%
VISIBILITY				
71. Visibility from crossing to train (from pedestrian holding point)	<50%	5	5	4%
72. Sun glare issues at crossing	Yes	5	3	2%
73. Temporary visual impediments	Yes	5	1	1%
74. Masking of trains (moving or stationary) timetabling etc	Occasionally	3	15	12%
			124.02372	100%

Controls

Physical Controls	Maze
Physical Controls	Path
Audio Visual Controls	Visual and audible alarm
Adjacent Controls	Adjacent boom gates and audio
Human Factors	Fault reporting number
Pedestrian Signage / Path Marking	Delineation line marking (painted only)
Pedestrian Signage / Path Marking	Tactile ground surface indicators
Crossing Environment	Maintenance of vegetation
Crossing Environment	Funnel pathway
Pathway Works	Change pathway alignment
Pathway Works	Flange Gap Filler?
Pathway Works	Increase path width and traffic ability
Operational	Train lights

Crossing Volume (AADT) Pedestrian: 212 Rail: 25

Outputs

Infrastructure Factor:	**124.02372**	Exposure Factor:	5,300
		Risk Score:	657,326

Risk Bands

Across Control Classes		Within Train Activated Lights / Audio Control Class	
Risk Band All:	**Medium**	Risk Band All:	**Medium**
Risk Band Jurisdiction:	**High**	Risk Band Jurisdiction:	**Medium Low**

Mechanisms

UNABLE TO AVOID

Unable to stop in time, late recognition of danger 9

Surveyed: 26/11/2009 Rating Last Updated: 7/11/2017 Rating Model: ALCAM Ped 1a.0.1.0

Printed: 07/11/2017, 12:56 PM 3 of 7

Caught in tracks (stuck, slip, trip, fall)	7
Unable to cross quickly enough	7
Trapped by controls (if no gates then all values are zero)	0
Unable to determine the orientation of the crossing	0
UNAWARE	
Distracted	3
Did not see train or visual warning signals	9
Did not hear train or audio warning signals	0
Has limited capacity to recognise danger and react	1
Under the influence of alcohol	1
Does not recognise crossing	0
Does not expect second train	43
Assumes train would stop	0
Misjudges train speed	10
Does not expect train	1
Does not expect train movement(s)	15
Mislead by infrastructure	0
Mislead by controls	0
UNWILLING TO RECOGNISE	
Deliberately ignored control	7
Bypassing active control	0
Crawling under wagons (if no trains stopping then all values are zero)	0
Skylarking	11
	124

Figure 21: Pedestrian Crossing 1951 SRT Modified ALCAM Risk Score

01591-1 **Totara Street Ped Up** **KM:5.210** **Mount Maunganui Branch**

Tauranga Proposal (Ped)

Proposal Name: Copy of Option 1 Pedestrian Facilities Upgrade

Proposal Updated Date: 08/11/2017 08:56:51 AM

Proposal Type: Treatment Option

Proposal Modifier: bridget.feary@opus.co.nz

Proposal Status: Active

Proposal Description: Copenhagen cycle path, fencing and maze, signs, markings, additional flashing lights, rubber surfacing, tactile pavers.

Characteristics	*Condition*	*Points*	*Score*	*% of total*
CONTROL DETAILS				
11. Effectiveness of equipment inspection and maintenance	High	0	0	0%
12. Shortest approach warning time from start of flashing lights to train	<20 secs	5	0	0%
13. Longest approach warning time from start of flashing lights to train	<20 secs	0	0	0%
ADJACENT ACTIVITY				
21. Presence of adjacent distractions (visual)	Few	0	0	0%
22. Proximity to passenger station	>500m	0	0	0%
23. Proximity to siding / shunting yard	<100m	5	17	16%
24. Proximity to licensed / special event venue (eg. pub, club, sports	>500m	0	0	0%
25. Proximity to school playground or aged facilities	>500m	0	0	0%
26. Ambient noise level / audibility of alarm	Low	0	0	0%
27. Adjacent road traffic activity	Quiet	0	0	0%
PEDESTRIAN TRAFFIC CONTROL				
31. Conspicuity of pedestrian control	Good	0	0	0%
32. Visibility of pedestrian control	Good	0	0	0%
33. Likelihood of vandalism to control	No History	0	0	0%
PEDESTRIAN TRAFFIC				
41. Volume of pedestrians (peak flow)	>5 to 20 pedestrians per hour	2	1	1%
42. Type of pedestrians (children)	Medium Risk	3	17	16%
43. Type of pedestrians (physically disabled)	Low Risk	0	0	0%
44. Type of pedestrians (sensory disabled)	Low Risk	0	0	0%
45. Type of pedestrians (intellectually disabled)	Low Risk	0	0	0%
46. Type of pedestrians (cyclists, wheelchairs, prams etc)	Medium Risk	3	13	12%
47. Type of pedestrians elderly	Low Risk	0	0	0%
RAIL VEHICLES				
51. Train volume (high is bad) (if high then greater probability of	>10 to 60 trains per day	4	14	13%
52. Infrequent / seasonal movements / special trains	Low	0	0	0%
53. Highest train speed at crossing (typical)	>60 to 80 kph	1	4	4%
54. Longest train length (typical)	>300 to 1000m	3	5	5%
CROSSING GEOMETRY				
61. Number of operational rail tracks (including sidings)	2 tracks	3	13	12%
62. Angle of crossing & condition / width of flange gap	70-90deg	0	0	0%

Surveyed: 26/11/2009 Rating Last Updated: 8/11/2017 Rating Model: ALCAM Ped 1a.0.1.0

Printed: 08/11/2017, 09:29 AM 5 of 13

63. Condition of crossing (fencing/path surface etc)	Good	0	0	0%
64. Freight trains stand across crossing	Rarely	0	0	0%
65. Gradients, widths and manoeuvring space of pathway/maze	Fully meets DDA	0	0	0%
66. Change of path alignment between pedestrian maze and track	Adequate	0	0	0%
67. Crossing to Australian/NZ Standards (signage & path marking)	Does not meet AS	5	1	1%
VISIBILITY				
71. Visibility from crossing to train (from pedestrian holding point)	<50%	5	5	5%
72. Sun glare issues at crossing	Yes	5	2	2%
73. Temporary visual impediments	Yes	5	1	1%
74. Masking of trains (moving or stationary) timetabling etc	Occasionally	3	15	14%
			107.48012	100%

Controls

Physical Controls	Manual Gates
Physical Controls	Maze
Physical Controls	Path
Audio Visual Controls	Visual and audible alarm
Adjacent Controls	Adjacent boom gates and audio
Emergency Egress	Without latch
Human Factors	Fault reporting number
Pedestrian Signage / Path Marking	Delineation line marking (painted only)
Pedestrian Signage / Path Marking	Tactile ground surface indicators
Crossing Environment	Maintenance of vegetation
Crossing Environment	Funnel pathway
Pathway Works	Change pathway alignment
Pathway Works	Flange Gap Filler?
Pathway Works	Increase path width and traffic ability
Operational	Train lights

Crossing Volume (AADT) Pedestrian: 212 Rail: 25

Outputs

Infrastructure Factor:	107.48012	Exposure Factor:	5,300
		Risk Score:	569,645

Risk Bands

Across Control Classes		Within Train Activated Lights / Audio Control Class	
Risk Band All:	Medium	Risk Band All:	Medium
Risk Band Jurisdiction:	Medium High	Risk Band Jurisdiction:	Medium Low

Mechanisms

Surveyed: 26/11/2009 Rating Last Updated: 8/11/2017 Rating Model: ALCAM Ped 1a.0.1.0

Printed: 08/11/2017, 09:29 AM 6 of 13

UNABLE TO AVOID	
Unable to stop in time, late recognition of danger	0
Caught in tracks (stuck, slip, trip, fall)	7
Unable to cross quickly enough	7
Trapped by controls (if no gates then all values are zero)	0
Unable to determine the orientation of the crossing	0
UNAWARE	
Distracted	1
Did not see train or visual warning signals	8
Did not hear train or audio warning signals	0
Has limited capacity to recognise danger and react	1
Under the influence of alcohol	1
Does not recognise crossing	0
Does not expect second train	43
Assumes train would stop	0
Misjudges train speed	10
Does not expect train	1
Does not expect train movement(s)	15
Mislead by infrastructure	0
Mislead by controls	0
UNWILLING TO RECOGNISE	
Deliberately ignored control	7
Bypassing active control	0
Crawling under wagons (if no trains stopping then all values are zero)	0
Skylarking	8
	107

Figure 22: Pedestrian Crossing 1951 Future ALCAM Risk Score

01591-1 **Totara Street Ped Up** **KM:5.210** **Mount Maunganui Branch**

Tauranga Proposal (Ped)

Proposal Name: SRT Option 2 Pedestrian Facilities Upgrade Future

Proposal Updated Date: 08/11/2017 09:36:29 AM

Proposal Type: Treatment Option

Proposal Modifier: bridget.feary@opus.co.nz

Proposal Status: Active

Proposal Description: Copenhagen cycle path, fencing and maze, signs, markings, additional flashing lights, rubber surfacing, tactile pavers.

Characteristics	*Condition*	*Points*	*Score*	*% of total*
CONTROL DETAILS				
11. Effectiveness of equipment inspection and maintenance	High	0	0	0%
12. Shortest approach warning time from start of flashing lights to train	<20 secs	5	0	0%
13. Longest approach warning time from start of flashing lights to train	<20 secs	0	0	0%
ADJACENT ACTIVITY				
21. Presence of adjacent distractions (visual)	Few	0	0	0%
22. Proximity to passenger station	>500m	0	0	0%
23. Proximity to siding / shunting yard	<100m	5	17	16%
24. Proximity to licensed / special event venue (eg. pub, club, sports	>500m	0	0	0%
25. Proximity to school playground or aged facilities	>500m	0	0	0%
26. Ambient noise level / audibility of alarm	Low	0	0	0%
27. Adjacent road traffic activity	Quiet	0	0	0%
PEDESTRIAN TRAFFIC CONTROL				
31. Conspicuity of pedestrian control	Good	0	0	0%
32. Visibility of pedestrian control	Good	0	0	0%
33. Likelihood of vandalism to control	No History	0	0	0%
PEDESTRIAN TRAFFIC				
41. Volume of pedestrians (peak flow)	>5 to 20 pedestrians per hour	2	1	1%
42. Type of pedestrians (children)	Medium Risk	3	17	16%
43. Type of pedestrians (physically disabled)	Low Risk	0	0	0%
44. Type of pedestrians (sensory disabled)	Low Risk	0	0	0%
45. Type of pedestrians (intellectually disabled)	Low Risk	0	0	0%
46. Type of pedestrians (cyclists, wheelchairs, prams etc)	Medium Risk	3	13	12%
47. Type of pedestrians elderly	Low Risk	0	0	0%
RAIL VEHICLES				
51. Train volume (high is bad) (if high then greater probability of	>10 to 60 trains per day	4	14	13%
52. Infrequent / seasonal movements / special trains	Low	0	0	0%
53. Highest train speed at crossing (typical)	>60 to 80 kph	1	4	4%
54. Longest train length (typical)	>300 to 1000m	3	5	5%
CROSSING GEOMETRY				
61. Number of operational rail tracks (including sidings)	2 tracks	3	13	12%
62. Angle of crossing & condition / width of flange gap	70-90deg	0	0	0%

Surveyed: 26/11/2009 Rating Last Updated: 8/11/2017 Rating Model: ALCAM Ped 1a.0.1.0

Printed: 10/11/2017, 12:41 PM 2 of 13

63. Condition of crossing (fencing/path surface etc)	Good	0	0	0%
64. Freight trains stand across crossing	Rarely	0	0	0%
65. Gradients, widths and manoeuvring space of pathway/maze	Fully meets DDA	0	0	0%
66. Change of path alignment between pedestrian maze and track	Adequate	0	0	0%
67. Crossing to Australian/NZ Standards (signage & path marking)	Does not meet AS	5	1	1%
VISIBILITY				
71. Visibility from crossing to train (from pedestrian holding point)	<50%	5	5	5%
72. Sun glare issues at crossing	Yes	5	2	2%
73. Temporary visual impediments	Yes	5	1	1%
74. Masking of trains (moving or stationary) timetabling etc	Occasionally	3	15	14%
			107.48012	100%

Controls

Physical Controls	Manual Gates
Physical Controls	Maze
Physical Controls	Path
Audio Visual Controls	Visual and audible alarm
Adjacent Controls	Adjacent boom gates and audio
Emergency Egress	Without latch
Human Factors	Fault reporting number
Pedestrian Signage / Path Marking	Delineation line marking (painted only)
Pedestrian Signage / Path Marking	Tactile ground surface indicators
Crossing Environment	Maintenance of vegetation
Crossing Environment	Funnel pathway
Pathway Works	Change pathway alignment
Pathway Works	Flange Gap Filler?
Pathway Works	Increase path width and traffic ability
Operational	Train lights

Crossing Volume (AADT) Pedestrian: 260 Rail: 25

Outputs

Infrastructure Factor:	**107.48012**	Exposure Factor:	**6,500**
		Risk Score:	**698,621**

Risk Bands

Across Control Classes		Within Train Activated Lights / Audio Control Class	
Risk Band All:	**Medium**	Risk Band All:	**Medium**
Risk Band Jurisdiction:	**High**	Risk Band Jurisdiction:	**Medium Low**

Mechanisms

Surveyed: 26/11/2009 Rating Last Updated: 8/11/2017 Rating Model: ALCAM Ped 1a.0.1.0

Printed: 10/11/2017, 12:41 PM 3 of 13

UNABLE TO AVOID	
Unable to stop in time, late recognition of danger	0
Caught in tracks (stuck, slip, trip, fall)	7
Unable to cross quickly enough	7
Trapped by controls (if no gates then all values are zero)	0
Unable to determine the orientation of the crossing	0
UNAWARE	
Distracted	1
Did not see train or visual warning signals	8
Did not hear train or audio warning signals	0
Has limited capacity to recognise danger and react	1
Under the influence of alcohol	1
Does not recognise crossing	0
Does not expect second train	43
Assumes train would stop	0
Misjudges train speed	10
Does not expect train	1
Does not expect train movement(s)	15
Mislead by infrastructure	0
Mislead by controls	0
UNWILLING TO RECOGNISE	
Deliberately ignored control	7
Bypassing active control	0
Crawling under wagons (if no trains stopping then all values are zero)	0
Skylarking	8
	107

Appendix D: Site Photographs

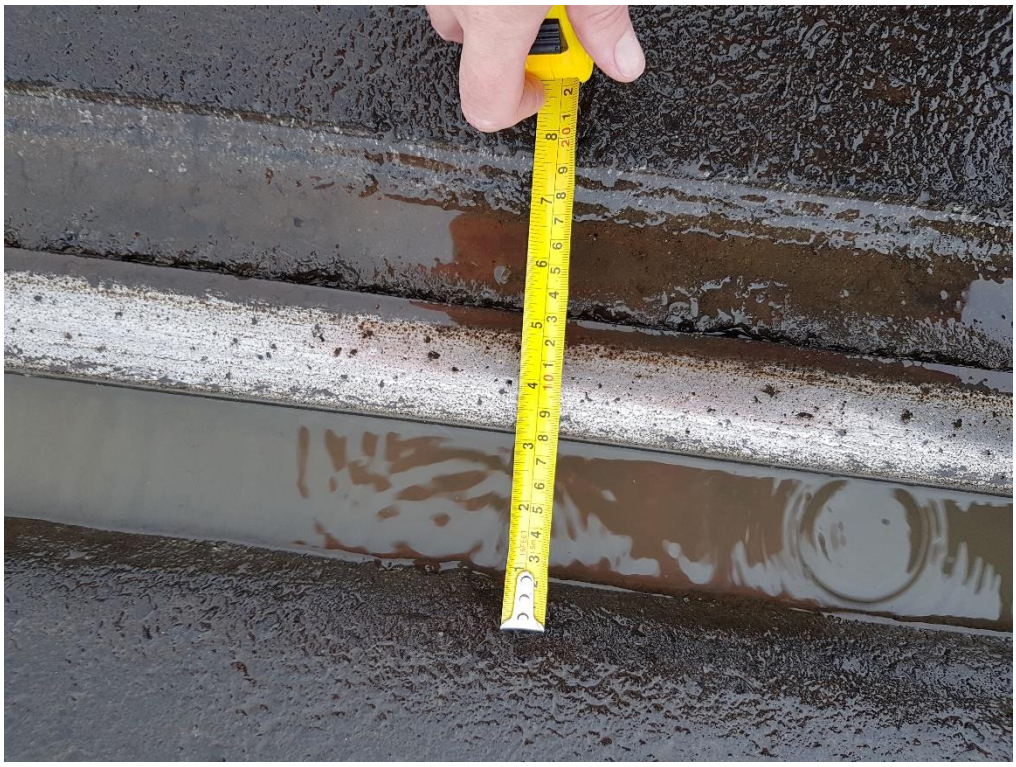
Crossings 1926/1927, South of Astrolabe Street

Crossing Layout – looking north

Crossing Layout – looking south

Northbound Approach

Southbound Approach



Typical Flange Gaps

Footpath – looking North from the east side

Track configuration – looking west

Crossings 1590/1591, North of Hull Road

Crossing Layout – looking north

Crossing Layout – looking south

Northbound Approach

Southbound Approach

Typical Flange Gaps

Footpath – looking south from east side

Appendix E: Proposed Designs

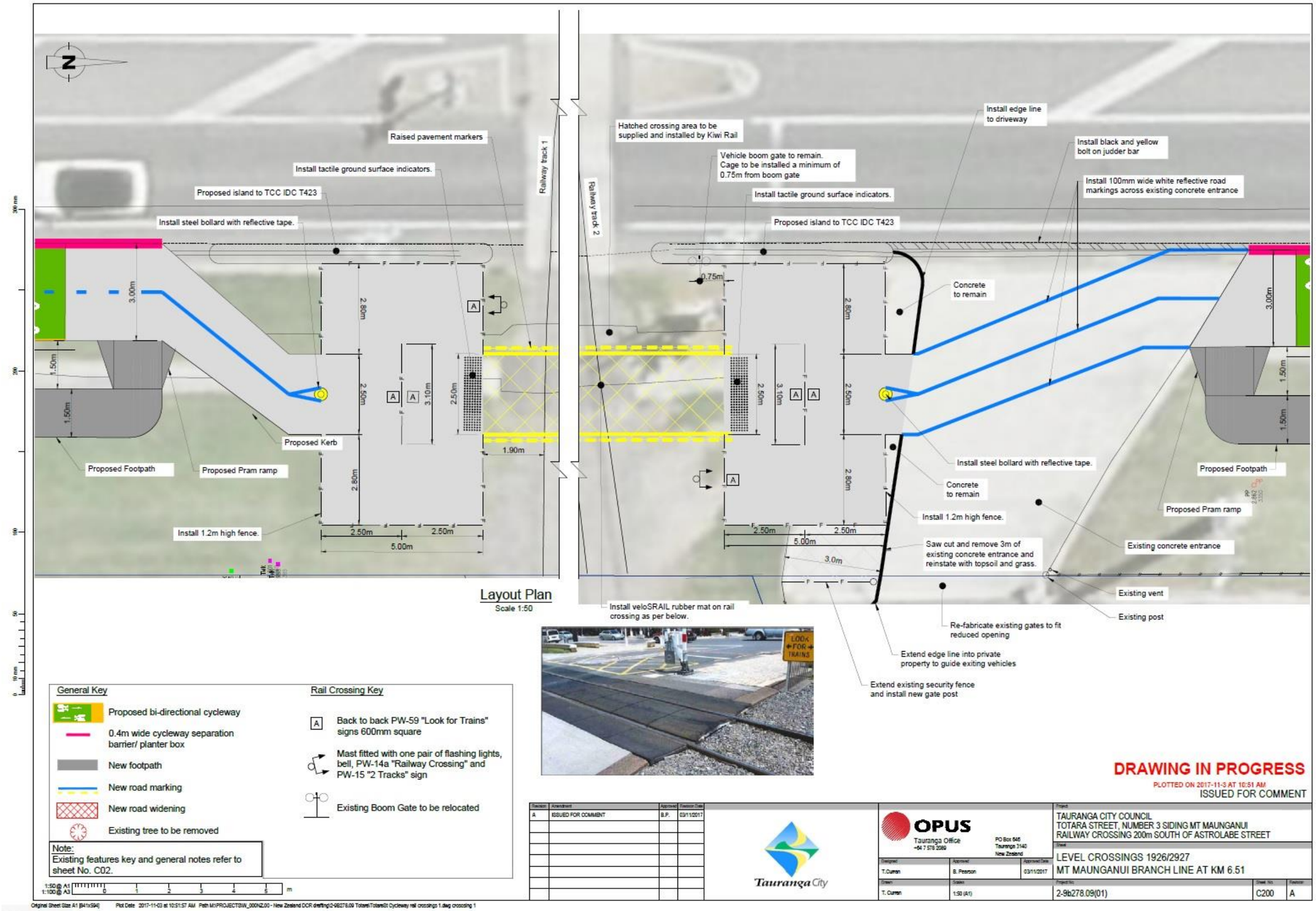


Figure 23: Proposed Design for Pedestrian Crossing 1927, Mt Maunganui Branch Line KM 6.51, south of Astrolabe Street

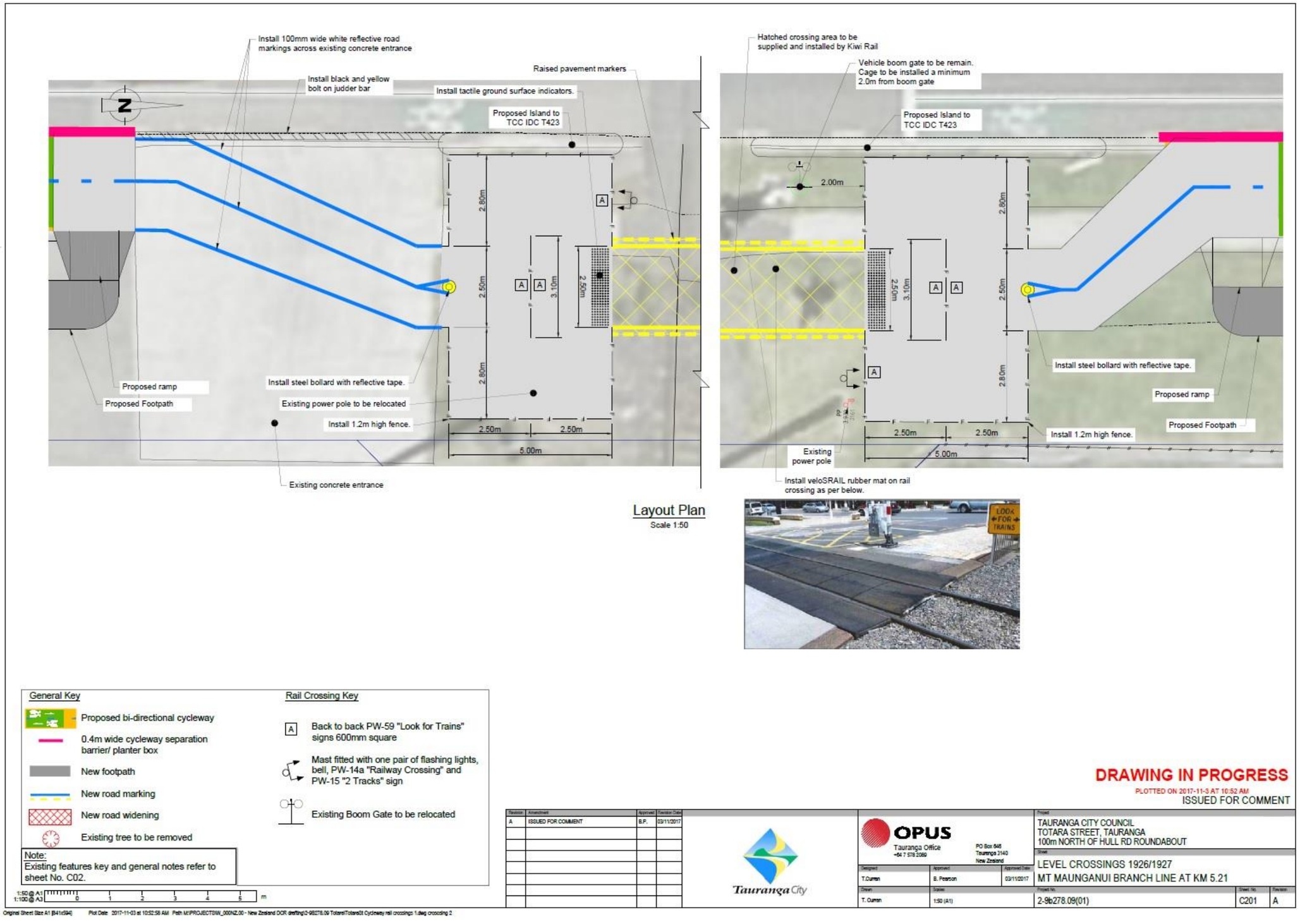


Figure 24: Proposed Design for Pedestrian Crossing 1591, Mt Maunganui Branch Line KM5.21, north of Hull Road

Opus International Consultants Ltd
The Westhaven, 100 Beaumont St
PO Box 5848, Auckland 1141
New Zealand

t: +64 9 355 9500
f:
w: www.opus.co.nz