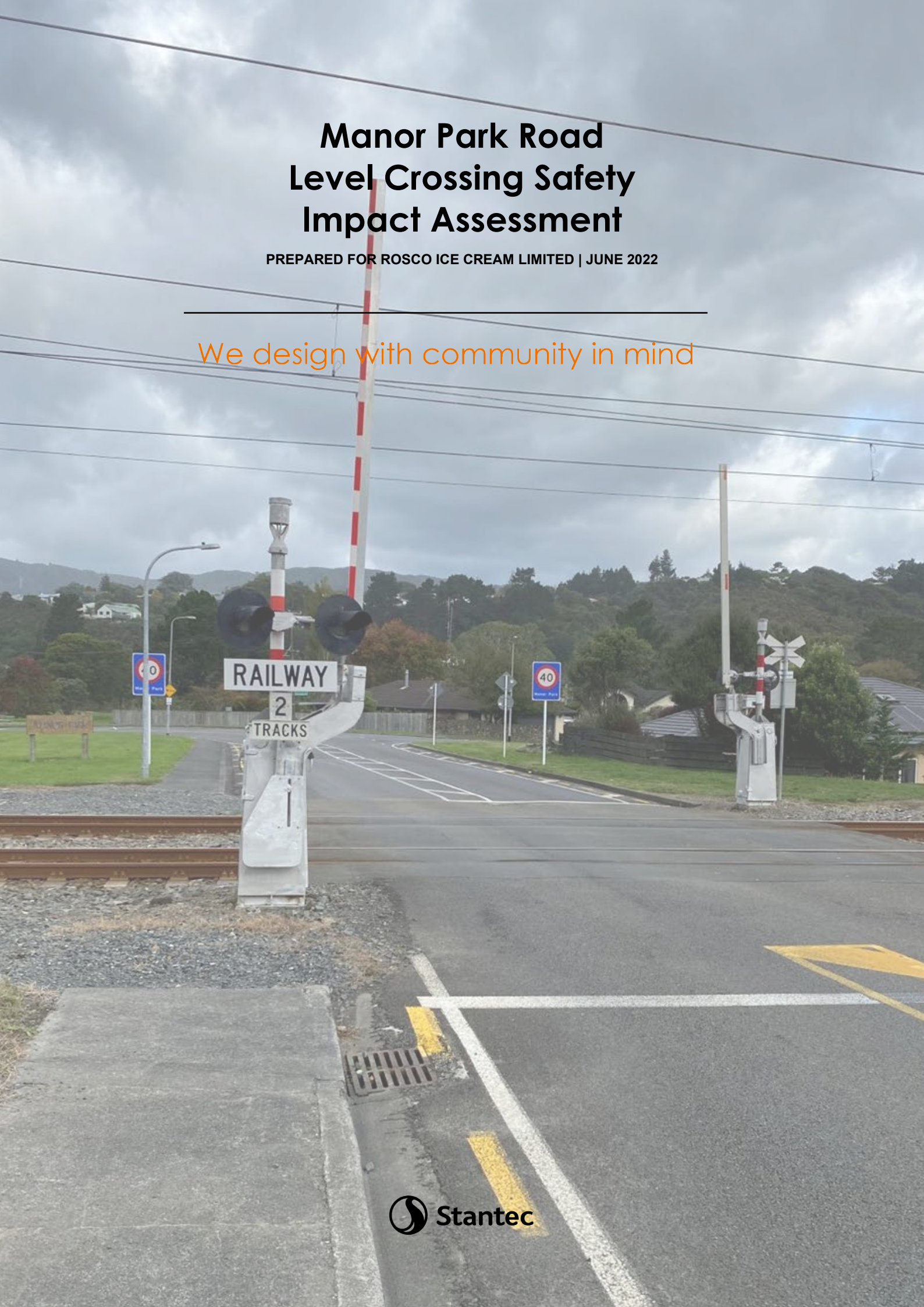
Manor Park Road Level Crossing Safety Impact Assessment

PREPARED FOR ROSCO ICE CREAM LIMITED | JUNE 2022

We design with community in mind



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Executive Summary

Rosco Ice Cream Limited are proposing to develop a new industrial park on land between State Highway 2 (SH2) and the Wairarapa railway line (Hutt Valley section). The initial stage of the development process is to change the current "Rural" zoning of the land parcel to "General Business", which would enable the later development of a mix of commercial and industrial activities. Access to the site would be via Benmore Crescent, which connects with Manor Park Road at a priority controlled "T" intersection.

While there will be no direct access to the subject site via crossing over the railway line, there is an existing level crossing over Manor Park Road 10m to east of the Manor Park Road / Benmore Crescent intersection.

Development of the site may result in some small traffic increases over this level crossing, and potential pedestrian movements to or from the nearby Manor Park Train Station (approximately 800m walking distance from Benmore Crescent).

The Manor Park Road level crossing is in the suburb of Manor Park and crosses over the Wairarapa Line. No pedestrian crossing is provided at this location. This Level Crossing Safety Impact Assessment (LCSIA) considers the potential impact on the Manor Park Road level crossing from potential increases in road and pedestrian traffic. Separate to the proposed development it is noted that there will be background increases in train and traffic volumes. Indeed, for the road crossing these increases are more substantive and have a bigger impact than the change due to the proposed development.

As no scenario achieves Criterion 1[1], the upgrade recommendations for the level crossing should be considered by way of a "So Far As Is Reasonably Practical" (SFAIRP) analysis.

Without pre-empting the SFAIRP process, it is noted that Manor Park Road provides the only access between the wider road network and the suburb of Manor Park and hence closure of the level crossing would not be a practical option. The road network was upgraded within the last five years as part of the SH2/SH58 Haywards Hill interchange project and this presented the key opportunity to grade separate the level crossing. The fact that grade separation was not pursued at that time indicates that grade-separation is not feasible.

Accordingly, recommendations 2 to 8 are considered the most feasible and it is noted, achieve Criterion 2, maintaining the current risk profile. No definitive date for the development of the site has been set, thus for purpose of this assessment the Proposed Design year has been set as 2022 to provide a direct comparison with the Updated Exiting 2022 scenario. Consequently, the Change in Use and Future Score year is 2032.

The Level Crossing Safety Score (LCSS) procedure consists of four categories and scores the risk of the level crossing at four different assessment stages of the project. These assessment stages are:

- Updated Existing. The existing (2022) level crossing controls and condition, with the current train and traffic (vehicle, cyclist or pedestrian volumes)
- Change in Use (2032). A "Do Nothing" scenario that tests the effect the proposed development with the 2032 forecast increases in train volumes, speeds and traffic volumes against the current crossing condition and control.
- Proposed Design (2022). Assesses the effect of proposed design upgrades against the current train volumes, speeds and traffic volumes against the current crossing condition and control.
- Future Score (2032). Assesses the effect of proposed design upgrades against the 2032 forecast increases in train volumes, speeds and traffic volumes.

The following tables detail the progression of the LCSS for first the road level crossing and secondly for the pedestrian level crossing, through the stages of the LCSIA.

[1] A design that achieves an LCSS of Low or Medium-Low for the Proposed Design and/or Future Score. Note Criterion 2 aims to achieve an LCSS number lower, or equal to, the Updated Existing LCSS number for the Proposed Design and/or Future Score.

Manor Park Road Level Crossing LCSS

Summary of LCSS Changes at Manor Park Road Level Crossing

	Updated Existing	Change in Use	Proposed Design	Future Score
LCSS	**32/60**	**37/60**	**31/60**	**32/60**
LCSS Band	**Medium**	**Medium**	**Medium**	**Medium**
Criterion Met	**FAIL**	**FAIL**	**C2**	**C2**
Form of Control	**HAB / FLBs**	**HAB / FLBs**	**HAB / FLBs**	**HAB / FLBs**

There were eight recommendations made by the LCSIA Assessor to reduce the LCSS at the road level crossing to attempt to achieve Criterion 1.

Summary of Recommendations at the Road Level Crossing

No.	Recommendation	Infrastructure Affected	When is it Required?	Level of Necessity
1.	As the crossing does not achieve Criterion 1 in any scenario consideration needs to be given to grade separation of the level crossing. This was deemed to not be feasible at the time of planning for and constructing the SH2/SH58 interchange.	Rail Corridor	ASAP	Criterion 1
2.	Install a median island to stop vehicles driving around the lowered HAB	Rail Corridor	Proposed Design	Criterion 2
3.	Replace the HABs due to age	Rail Corridor	ASAP	Criterion 1
4.	Reconfigure signalling at Manor Park Station to reduce barrier down times	Rail Corridor	ASAP	Criterion 2
5.	Install a second WX31 sign on the western approach	Local Road	ASAP	Criterion 2
6.	Repair the crossing panel within the next 10 years	Rail Corridor	Future	Maintenance
7.	Refresh all road markings	Local Road	Proposed Design	Maintenance
8.	Replace incorrect / missing road signage on Manor Park Road and Benmore Crescent	Local Road	Proposed Design	TCD Pt.9

The Updated Existing LCSS is Medium, and the Change in Use LCSS increases to the top of the Medium threshold. The Proposed Design achieves Criterion 2. Grade separation would be required to achieve Criterion 1 for the Future Score. Due to the road network, closure is not seen as a practical possibility as this would cut Manor Park off from the wider road network.

Manor Park Road Level Crossing ALCAM Summary

Scored Items	Updated Existing	Change in Use	Proposed Design	Future Score
ALCAM risk band	High	High	High	High
ALCAM risk score % change	N/A	27%	-7%	+15%
Fatal return period	404 years	319 years	434 years	350 years

The Updated Existing ALCAM risk band was High and remained High for the Change in Use score, which increased the ALCAM risk score by 29% and increased the likelihood of fatal crash occurring. The Proposed Design and Future Score are still in the High ALCAM risk band with the ALCAM risk score reducing by 7% and increasing by 15% respectively. The return period for predicted fatal crashes has increased by 30 years and reduced by 54 years respectively, meaning fatal crashes are more likely than the Updated Existing – driven largely by the forecast increase in train volumes.]

Red Flags

There were no Red Flag issues identified during the Site Specific Safety Score assessment at this road crossing for any of the four assessment stages.

Manor Park Road Pedestrian Crossing LCSS

Summary of LCSS Changes at Manor Park Road Pedestrian Crossing

Crossing Name		Updated Existing	Change in Use	Proposed Design	Future Score
Manor Park Road Down pedestrian crossing	LCSS	35/60	46/60	15/60	17/60
	LCSS Band	Medium	Medium High	Low	Low
	Criterion Met	FAIL	FAIL	C1 & C2	C1 & C2
	Form of Control	BELLS ONLY	BELLS ONLY	AUTO GATES	AUTO GATES

There were seven recommendations made by the LCSIA Assessor for the pedestrian crossings to reduce the LCSS to achieve Criterion 1.

Summary of Recommendations at the Pedestrian Crossing

No.	Recommendation	Infrastructure Affected	When is it Required?	Level of Necessity
1.	Install automatic gates at pedestrian crossing due to metro network and multiple tracks	Rail Corridor	ASAP	Active level crossings standard
2.	Install a pedestrian focused FLB on the western approach	Rail Corridor	ASAP	Active level crossings standard
3.	Install a firm all-weather crossing panel.	Rail Corridor	ASAP	Criterion 1
4.	Install corridor and guide fencing.	Rail Corridor	ASAP	Criterion 1
5.	Install / extend footpaths along the southern side of Manor Park Road	Local Road	Proposed Design	Criterion 1
6.	Install path lighting	Local Road	Proposed Design	Criterion 1
7.	Consider the location of a pedestrian crossing point over Manor Park Road.	Local Road	Future	Criterion 1

The Updated Existing LCSS is Medium, and the Change in Use LCSS increases into the Medium-High risk band. The Proposed Design and Future Score both achieve Criterion 1 and Criterion 2.

Manor Park Road Down Pedestrian Crossing ALCAM Summary

Scored Items	Updated Existing	Change in Use	Proposed Design		Future Score
ALCAM risk band	Medium High	High	Low		Medium Low
ALCAM risk score % change	N/A	529%	-89%		--85%

The Updated Existing ALCAM risk band was Medium-High and increased to High for the Change in Use score. The Proposed Design and Future Score reduced the ALCAM risk band to Low and Medium-Low respectively, with the ALCAM risk score reducing by 89% and 85% respectively.

Recommended Updates in LXM

To assist KiwiRail with improvements to the ALCAM database, the following data should be considered to update the existing level crossings in LXM.

Manor Park Road Crossing # 424
• Increased daily passenger multiple units from 81.7 to 85.7 • Increased daily locomotive hauled passenger trains from 4 to 5.7 • Increased loco hauled passenger train length from 120m to 200m • Increased freight trains to 4 per day • Increased freight train length to 570m • Reduced freight train speed to 80km/h • Increased AADT to 1,500 vpd • Increased Heavy Vehicle percentage from 1% to 2% • Immediate approach – added T-intersection at 120m for left approach, deleted T-intersection right approach at 69m. • Added overbridge at 390m and platform at 400m to Up track. • Changed panel surface condition to Fair from Good. • Selected “an inspection programme exists but maintenance follow up is inadequate” • Selected “some wear and tear, but the message is understandable” for condition of traffic control. • Selected partly obscured but visible from a safe stopping distance for crossing controls” – (west approach) • Set maximum warning time for Hutt Valley Line trains to 180s • Deselected LED backing boards. • Deselected CCTV

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Abbreviations

Abbreviation	Full Name
ALCAM	**Australian Level Crossing Assessment Model** – a safety assessment tool used to help prioritise treatment of level crossings according to their comparative safety risk.
CAS	Crash Analysis System: NZTA's national database for reported road crashes.
DDA	**Disability Discrimination Act (1992)** – an Australian piece of legislation that is accounted for within the ALCAM model. Whilst not applicable for New Zealand pedestrian level crossings, it requires the LCSIA Assessor to consider the appropriateness of the crossing with regards to users with a disability.
FLBs	Flashing lights and bells.
IRIS	**Incident Recording Information System**; KiwiRail's national database for recording train collisions and near-misses.
LCSIA	**Level Crossing Safety Impact Assessment** – a process developed in parallel with this guidance to assess the level of crash risk of existing and new/upgraded level crossings (for road and/or path users).
LCSS	**Level Crossing Safety Score** – the risk of crashes occurring at a level crossing, as used in the LCSIA.
LXM	The database which hosts all the level crossing ALCAM surveys for New Zealand (and Australia).

Glossary

Term	Definition
Active controls	traffic control devices that are actuated when a train is approaching the crossing point to warn road/path users not to enter the level crossing. They are generally fixed in place at the crossing point e.g. bells, lights, and barriers.
Applicant	The organisation that triggered a 'change in use' activity at a level crossing.
Change in use	When an existing level crossing is upgraded because of mitigating factors. Examples of a change in use are large increases in traffic volume, large increases in heavy commercial vehicle use, a new shared path, a new cycleway crossing etc.
Passive controls	Traffic control devices that are static, constant, and present all the time, e.g. regardless of whether a train is present/approaching, or no trains are present (compare with active warning controls, which do distinguish between these two situations). For example, warning signs, path markings and rumble strips.

1 Introduction

1.1 Level Crossing Safety Impact Assessment (LCSIA)

There are approximately 1,355 road, 740 pedestrian and many private level crossings in New Zealand. While there are relatively few vehicle and pedestrian crashes at level crossings (compared with the rest of the road network), the consequence of a crash at a level crossing is often severe (serious injury or fatality). Given the high consequences of level crossing crashes, it is important that any changes around level crossings go through a thorough risk assessment process.

The Level Crossing Safety Impact Assessment (LCSIA) process was developed to assess the level of crash risk of existing and new / upgraded level crossings designs. The risk of pedestrian and motor vehicle crashes is assessed using the Level Crossing Safety Score (LCSS). This is a score out of 60 and consists of:

- ALCAM[2] score (30 points)
- Crash and Incident History score (10 points)
- Site Specific Safety Score (10 points), and
- Engineer Risk score (10 points).

The assessment is undertaken separately for vehicle and pedestrian crossings. Based on these scores, the crossing is placed into the following risk bands in Figure 1-1.

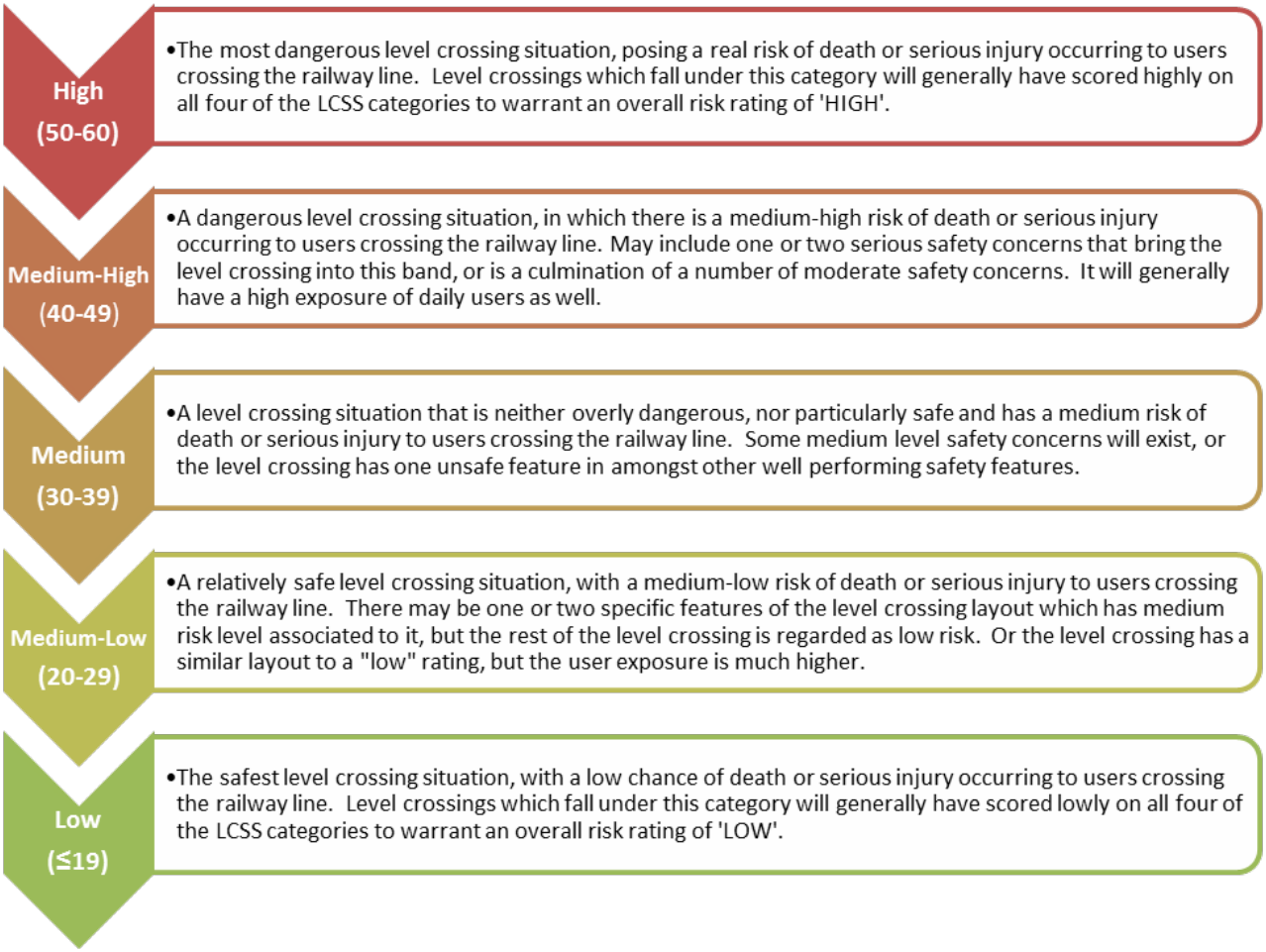

Figure 1-1: Level Crossing Safety Score Risk Bands

[2] Australian Level Crossing Assessment Model (ALCAM) is a tool used to identify key potential risks at level crossings and to assist in the prioritisation of crossings for upgrades. The risk model is used to support a decision making process for both road and pedestrian level crossings and to help determine the most effective treatments.

1.2 LCSIA Criteria

There are two criteria applicable to level crossings, which differ depending on whether the crossing is a new crossing facility or an upgrade to an existing crossing facility.

- **Criterion 1:** requires the ***Proposed Design*** and ***Future Score*** of a level crossing to achieve a '***Low'*** or '***Medium-Low***' level of risk as determined by the LCSS.
- **Criterion 2:** requires the ***Proposed Design*** and ***Future Score*** of a level crossing to achieve an LCSS number (out of 60) lower than, or equal to, the ***Updated Existing*** LCSS number.

New proposed facility:

Where a new facility is proposed, the new crossing must meet ***Criterion 1***. This ensures any new infrastructure constructed over/within the railway corridor is safe for all users and the risk of death or serious injury is low. Where user exposure is high, then it may not be possible to achieve a "Low" or "Medium-Low" risk without grade separation.

Existing facility upgrade:

Where changes to an existing facility are proposed the revised crossing must meet ***Criterion 1***. Where the modifications required to meet Criterion 1 are not ***reasonably practicable***[3]***,*** 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 ***Criterion 2***.

1.3 Signals and Telecommunication Standard: Active Level Crossings (S-ST-LC-2103)

Section 5 of KiwiRail's Signals and Telecommunication Standard: Active Level Crossings (S-ST-LC-2103) takes precedence for at grade recommendations, irrespective if the LCSIA process determines a lower form of control is required than the minimum required. The standard states the minimum protection provided for pedestrians is automatic gates when metro trains and/or multiple tracks are present, due to the second train risk and higher train volumes. Half-arm barriers are required for all road new level crossings or upgrades to existing level crossings. Refer to Figure 1-2 for a except from the Standard that outlines where automatic gates are the default installation.

5. Minimum Protection Provided

Not-withstanding all preceding risk assessments the following minimum protections will be pr ovided at active level crossings by Signals and Telecommunications Engineering for new or upgraded level crossings.

Railway Type	Multi Track*		Single Track	
	Road	Ped/cycle	Road	Ped/cycle
Metro	Barriers	Gates	Barriers	Gates
Non-metro	Barriers	Gates	Barriers	FLB

FLB = Flashing Lights and Bells *** Second Train Risk**

Figure 1-2: Section 5 of the Signals and Telecommunication Standard: Active Level Crossings (S-ST-LC-2103)

[3] Refer to section 1.3.1 of the Level Crossing Risk Assessment Guidance v4 (January 2021).

1.4 Structure of the Report

This report outlines the site observations and subsequent analysis undertaken to the level crossings being upgraded. The elements of the report consist of:

1. The change in use at the level crossing or rail corridor.
2. Site visit observations by the LCSIA Assessor.
3. The key existing issues that need to be addressed at the crossings.
4. An assessment of the proposed upgrade.
5. Recommended modifications for the proposed upgrade to further reduce the risk of crashes.
6. The LCSS assessment is then conducted, consisting of; ALCAM, Crash and Incident History, Site Specific Safety Score and Engineer risk. The LCSS is assessed for the following four stages.
    a. **UPDATED EXISTING:** an LCSS of the existing level crossings conditions as found on site.
    b. **CHANGE IN USE:** an LCSS of the forecast ten-year user volumes[4] over the crossing in its Updated Existing state. This permits KiwiRail to understand the 'raw' effect the change in use would have on the crossing with no treatments in place, and hence better understand the scale of safety improvement the Proposed Design sets out to achieve[5].
    c. **PROPOSED DESIGN:** An LCSS of the change in use that aims to achieve Criterion 1. Allows for an initial increase of users attracted to the new facility.
    d. **FUTURE SCORE:** An LCSS that aims to achieve Criterion 1 ten years post opening. Includes a forecast increase in user numbers which may require a further increase in the form of control.

1.5 LCSIA Assessor Independence

The LCSIA Assessor has had no prior involvement with the change in use project at the Manor Park level crossing location. This LCSIA has been conducted prior to the design phase.

1.6 Site Visit

On Wednesday 13th April at 2pm the site visit was conducted by the LCSIA Assessors Alasdair McGeachie and Chris Hendrickson to assess the Site Specific Safety Score and meet with Hutt City Council representatives to discuss the change in use and the history of the level crossing.

Those present at the site visit were:

- Hutt City Council (HCC): Ravi Soni and Anita Manda
- Stantec: Alasdair McGeachie and Chris Hendrickson

No KiwiRail staff attended the site visit but an online meeting with KiwiRail staff occurred on Friday 13th May. Alasdair McGeachie, Walter Escott (Signals Engineer) and Tony Evans (Locomotive Engineer Team Leader) to discuss the crossing.

1.7 Disclaimer

This report is based on the best available factual and estimated knowledge at the time of writing. Estimates of future scenarios are based on the LCSIA Assessor's educated expectations of what may be likely to occur.

Please note an LCSIA report is not a substitute for a design safety audit, which should occur for any proposed designs that are generated or modified after this report was finalised.

[4] Includes change in demographic percentage of pedestrians or heavy vehicles in ALCAM
[5] If the proposed project is a transformational change to the crossing location, then assessing the 'Change in Use' risk of increased volumes over the Updated Existing pedestrian crossing situation may not be relevant, e.g. an existing double track pedestrian crossing where a new central platform train station is proposed between the tracks. This would change a single ALCAM crossing point over two tracks into multiple crossing points over two ALCAM crossings.

2 The Change in Use

2.1 Project Outline

Rosco Ice Cream Limited are proposing a new industrial park development on land between State Highway 2 (SH2) and the Wairarapa railway line (Hutt Valley section). The total area of the site is 13.5 hectares extending on either side of Benmore Crescent from just south of Manor Park Road to the Hutt River. The northern and southern boundaries of the site are defined by SH2 and the railway corridor.

The initial stage of the development process is to change the current "General Rural" zoning of the land parcel to "General Business", which would enable the later development of a mix of industrial and commercial activities.

At this early stage there is not detailed information as to the specific occupiers of the site. However, based on the potential developable area and studies of similar established developments elsewhere, forecasts have been made of the potential development scale and traffic generation.

Access to the site would be via an upgrade of Benmore Crescent. Benmore Crescent connects to the wider road network via a priority controlled "T" intersection with Manor Park Road. Manor Park Road forms the head of the intersection and movements on Manor Park Road have priority over those on Benmore Crescent.

While there will be no direct access to the subject site via the railway, there is an existing level crossing over Manor Park Road 10m to east of the Manor Park Road / Benmore Crescent intersection. Development of the site could result in increased traffic and pedestrian movements over this level crossing, and upgrade of the adjacent intersection in the manner proposed is such that there will be knock-on design effects at the level crossing.

Consequently, it has been requested by KiwiRail to undertake a LCSIA assessment to gauge the possible effect on the Manor Park Road level crossings and potential mitigation or management.

2.2 Documents Provided

The following documents have been provided:

- Report "Te Rangihaeata Business Park Transport Summary Report" December 2021 (Stantec)
- Memo "Wairarapa Line Train Info" 9 September 2021 (KiwiRail)
- Projection of future Hutt Valley Line train timetable / usage 3 May 2022 (RS1 Timetable Upgrade)
- Email on current Wairarapa line train timetable / usage 10 November 2021 (KiwiRail)

3 Manor Park Road LCSIA

3.1 Level Crossing Details

The Manor Park Road level crossing is in the suburb of Manor Park and crosses over the Wairarapa Line. The road level crossing is currently controlled by flashing lights and bells (FLBs). No pedestrian crossing is provided at this location. Figure 3-1 shows the level crossing location in relation to nearby land uses. In addition to the housing activities of the suburb, within close walking distance to the level crossing are the following:

- Hutt River Trail (entry point 100m)
- Manor Park Golf Sanctuary (150m)
- Manor Park Private Hospital (300m / 5minutes). It is noted that this is a resthome / care facility aimed at high dependency patients and hence not likely to generate external walking trips by residents.
- Thunderball Paintball (600m / 8 minutes),
- Manor Park Train Station (800m / 11 minutes)

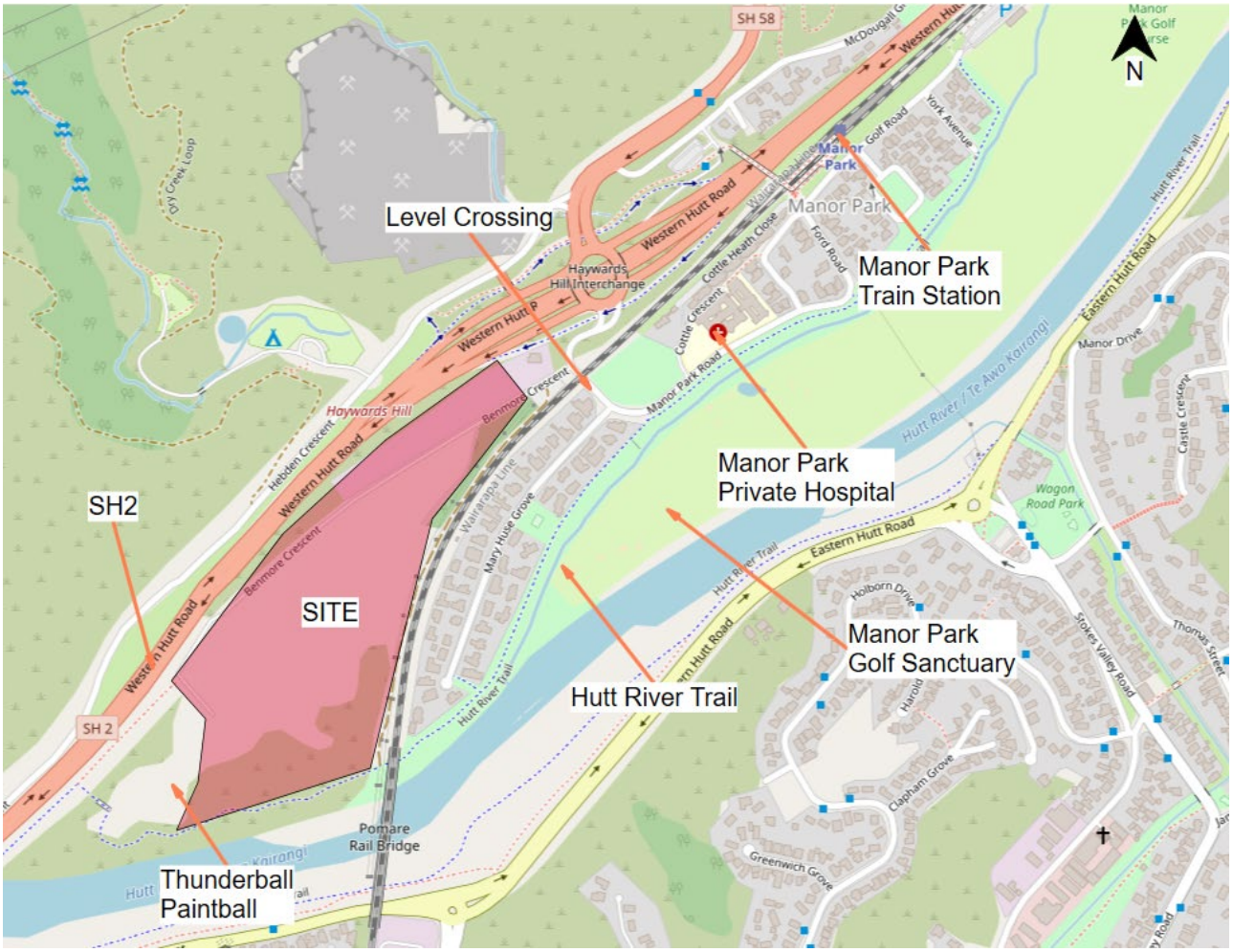

Figure 3-1: Manor Park Road Level Crossing Location (Source: Argonaut Roadrunner)

Figure 3-2 shows the aerial view of the level crossing and identifies some of the key features. Between the SH2/SH58 interchange and 15m east of the level crossing Manor Park Road has a speed limit of 50km/h. Further east, Manor Park Road changes to a 40km/h speed limit. The speed limit on Benmore Crescent is 50km/h.

Figure 3-2: Manor Park Road Level Crossing Aerial (Source: Hutt City GIS)

3.1.1 Existing Traffic Volumes

ALCAM has an AADT of 732 vehicles estimated in 2020, and the Mobile Road website also has the same estimated AADT of 732 vehicles from 2021. A traffic count undertaken by Stantec as part of the preliminary assessment for the Plan Change application has indicated a daily traffic volume of 1,500 vpd (measured in July 2021). The higher value of 1,500 vpd AADT from July 2021 has been adopted for this assessment.

3.1.2 Existing Pedestrian and Cyclist Volumes

There is no existing pedestrian crossing facility at this location. While it is considered there is limited current demand for pedestrians to cross at Manor Park Road during the site visit a single pedestrian and their dog were observed crossing on the down track side of the road crossing. A base volume of 10 pedestrians per day using the downtrack side of the level crossing has been adopted. Although there is a short section of footpath on the uptrack side of Manor Park Road west of the crossing, from a pedestrian connectivity aspect, use of the downtrack side currently, and in the future is considered more probable and practical.

3.1.3 Existing Train Volumes and Speeds

There are three types of train service which pass over the Manor Park Road level crossing.

- Metro trains: this section of line is part of the “Hutt Valley Line” with frequent services between Upper Hutt and Wellington operated by “Matangi” class Electric Multiple Units (EMUs)
- Long-distance commuter trains: Locomotive hauled passenger trains between Masterton and Wellington
- Freight: Freight trains operate between Wellington and Waingawa / Masterton

Table 3-1 summarises the typical weekly operation of these services.

Table 3-1: Existing Train Volumes

Day Service	Weekday (excl Fri)	Friday	Saturday	Sunday	Average
Hutt Valley Line EMU	95	98	65	57	85.7
Wairarapa Passenger	6	8	4	4	5.7
Freight	4	4	4	4	4
Total	**105**	**110**	**73**	**65**	**95.4**

The table is based on the current Metlink timetables and information provided by KiwiRail for the Wairarapa Line Stage 6 Upgrade project.

Based on the information provided an average daily train volume of 95 trains per day was adopted.

The EMUs and locomotive passenger trains have a maximum speed of 90km/h passing through the crossing, and the freight trains 80km/h.

3.2 Existing Conditions at Site Visit

3.2.1 Site Observations

An overview of the level crossing from the eastern approach is shown in Figure 3-3, while a closer view from the western approach is provided in Figure 3-4.

Figure 3-3: Manor Park Level Crossing View From East

Figure 3-4: Manor Park Level Crossing View From West

The level crossing is controlled by FLBs and HABs. A single FLB / HAB assembly is provided on each approach. The FLB and HABs are of considerable age and were installed in the 1960s (Figure 3-5). Stantec has been advised by KiwiRail that they are due for replacement with new equipment in the next one-to-two years.

Figure 3-5: 1960's HAB Assembly

It is noted that FLBs and HABs are activated when southbound trains are stopped at Manor Park Station, which is 800m away. This increases the duration of the barrier down time because the barriers are down for the time the train is waiting at in the station, plus the approach time from station (around three minutes in total). This situation is shown Figure 3-6.

Figure 3-6: FLBs, HABs in Operation, Circle Shows Train at the Manor Park Station

On both Manor Park Road approaches, advance warning is provided by "Rail X" markings, an overhead electrification sign, a combined WX6 "Railway Crossing" crossbuck and "2" tracks sign.

For the western approach (from the SH2/ SH58 interchange) additional warning is provided by an active warning WX31 sign (Figure 3-7) while on the eastern approach there is a single WX1L sign.

Figure 3-7: Active Warning Signage on Western Approach

The active warning sign provides additional warning of the level crossing and the potential need to stop. Due to the curved alignment when a driver is at the position of the WX31 sign neither the crossing nor the FLBs are visible (the start of the “Rail X” marking is just visible) as seen in Figure 3-8.

Figure 3-8: Curved Approach Limiting Forward Visibility of Crossing

On Benmore Crescent warning is provided by “Rail X” markings and WX1L/R signage. However, it is noted that the WX1L/R has been installed incorrectly, instead of showing the train heading towards the centre of the road from the left and right sides, instead the trains are moving away from the road. The sign on the right-hand side is also tilted away from the road (Figure 3-9). Technically WX1L/R signage should not be installed on Benmore Crescent as the level crossing is on a side road – inside the correct sign would be a WXR5.

Figure 3-9: Incorrect Benmore Crescent Signage

The crossing panel is constructed of asphalt, and while showing some signs of wear is generally in fair condition, refer to Figure 3-10 and Figure 3-11. However, it is probable that an upgrade or repairs to the crossing panel will be required in the next ten years

Figure 3-10: Crossing Panel

Figure 3-11: Minor Defects Circled

The are no pedestrian crossing facilities at the level crossing currently, although on the uptrack side footpaths extend up to the edge of the rail corridor on both approaches. From the site visit, a single pedestrian and dog were witnessed crossing on the downtrack side, having come from Benmore Crescent and continued to the residential area of Manor Park. On the downtrack side the nearest footpath stops by the Manor Park Road / Mary Huse Grove intersection some 50m before the level crossing. Wear on the grass berm at the corner of Benmore Crescent suggests some pedestrian usage on the downtrack side (refer to Figure 3-4). It was also observed on-site that along Benmore Crescent the rail corridor is open (Figure 3-12), and pedestrian shortcutting/ trespass could occur.

Figure 3-12: Benmore Crescent, Showing Lack of Rail Corridor Fencing

Sight lines for drivers and pedestrians at the level crossing extend towards the Manor Park train station approximately 400m to the north, but are constrained to approximately 200m to the south by the curvature of the track. Figure 3-13 to Figure 3-16 show the some of the available sightlines.

Figure 3-13: East Carriageway Approach Uptrack Sightline, also Showing Footpath Stopping Short of Rail Corridor

Figure 3-14: East Carriageway Approach Downtrack Sightline

Figure 3-15: West Carriageway Approach Uptrack Sightline

Figure 3-16: West Carriageway approach Downtrack sightline

3.3 Key Existing Safety Issues

There are some key existing safety issues which need to be addressed by the upgrade of this level crossing and its interaction with the rail corridor. The following list is in order of most significant to least.

ROAD CROSSING

1. **Drivers can drive around the crossing controls.** There is no median island to prevent an impatient driver (see issue 2) from easily driving around the lowered barrier arms. The one reported incident at this level crossing was such an event.
2. **Long barrier down times and driver frustration.** Southbound trains activate the FLB/HAB whilst stopped at the Manor Park station. This creates a barrier down time of approximately three minutes. An impatient of frustrated driver could decide to evade the crossing controls to avoid waiting this long. However, at the same time a northbound train could be approaching the level crossing and this would be the train that poses the greater risk to a vehicle crash.
3. **Curvilinear approach to the level crossing from the west approach (SH2/ SH58**). Drivers approaching the level crossing notwithstanding the active warning signage have limited forward visibility to the level crossing.
4. **Incorrect signage on Benmore Crescent**. The signage in Benmore Crescent is incorrectly placed (the signs are transposed) and the right-hand sign is askew. Consequently, the incorrect information is provided to the driver (the crossing is in fact on a side road and the incorrect placement / skew means less warning is provided.
5. **Age of the HAB/ FLB apparatus**. The HAB/ FLB apparatus is approximately 50 years old and approaching obsolescence. This raises the potential of equipment failure which would reduce the warning provided to crossing users.

PEDESTRIAN CROSSING

1. **No existing pedestrian facilities**. While demand is low / negligible, the LSCIA assessors did observe a pedestrian and dog crossing in this location. The absence of any crossing path or controls, mean a pedestrian may make a poor decision as when to cross or trip / slip as they cross.
2. **Open rail corridor on Benmore Crescent**. The rail corridor along Benmore Crescent is unfenced and pedestrians could shortcut through the rail corridor.

3.4 Future Changes

It is proposed to develop the subject site for use as an “industrial park” containing commercial (e.g. warehousing) and industrial activities. Approximately 20,000m^2 of land is proposed to be established as buildings, with the majority of tenant lots expect to be developed as external yard spaces.

The Manor Park Road / Benmore Crescent intersection would be upgraded to provide a right turn bay for interchange traffic turning right into Benmore Crescent.

3.4.1 Pedestrian Volumes

Based on recent New Zealand and Australian data[6], it is estimated that a commercial / industrial development such as the proposal, may have a staff density in the order of 1 person per 70-80m^2 of gross floor area (GFA). With a forecast 20,000m^2 of building floor GFA this indicates a potential staffing of approximately 250-300 persons.

Recent census data indicates that approximately 13-14% of people working in Lower Hutt use the train as their primary mode of transport to or from work. Allowing for the Manor Park Station at 800m+ walking distance is at the upper end of desirable walking distance for a public transport mode and noting the industrial type of development will be heavily oriented towards car and truck based activity, it has been conservatively decided to adopt a mode share of 10% (of 300 persons) for train travel for the potential business park employees.

Assuming that all persons using the “train” mode of transport for the trip to and from work and allowing for some local pedestrian movements then there is potentially up to 50 pedestrians per day to use the crossing in the future. This volume has also been adopted for the Proposed Design.

For these volumes, and given the “metro” train environment, a formalised high standard pedestrian crossing should be provided.

3.4.2 Traffic Volumes

Manor Park suburb is experiencing steady residential development. The construction and occupation of new housing is likely to generate new trips, and the only connection to the wider road network is via Manor Park Road and over the level crossing. This new residential growth would generate new traffic over the level crossing.

A conservative 2% per annum growth rate for 10 years has been applied to the current Manor Park Road traffic volume, resulting in a 2032 AADT of 1,830 vehicles per day (vpd).

There is a relatively constrained residential catchment and limited services (e.g. lack of shops) to the east of the level crossing. Accordingly, it is considered there would be limited generation of trips between the development and the Manor Park area east of the level crossing.

In the event local residents were employees of activities at the site, they would be captured in the traffic growth assessment detailed above.

3.4.3 Train Volumes and Speed

Information provided by KiwiRail indicates that all three train types will likely increase over the next ten years. For the Hutt Valley line, service frequency will increase to 10-15 minutes around 2032, and off-peak frequencies may also improve. For the Wairarapa Line, the Wairarapa Line upgrade will allow improved service frequencies and the introduction of new trains. Freight services are also forecast to experience a modest increase.

The following average daily train volumes have been used for the Change in Use and Future Score scenarios

- 110 EMU Hutt Valley line trains
- 15.1 Wairarapa line trains
- 6 freight trains

It is understood that there are no plans to increase the train speeds through the crossing, as operating speed is governed in part by the nearby rail bridge over the Hutt River.

3.4.4 Queuing

Current traffic demands on Manor Park Road and Benmore Crescent (in particular) are low. Thus, when the HAB are activated only short queues form (2-3 vehicles or less). The proposed development while likely to only marginally increase traffic volumes over the level crossing, will result in a significant increase in traffic using the section of Manor Park Road between Benmore Crescent and the SH2 interchange. Although traffic turning right into Benmore Crescent

[6] Table 2.5 Based on the Manufacturing, Wholesale and Transport/ Storage classifications. Upper North Island Industrial Land Demand study BERL Economics February 2015.

does not need to go over the level crossing, and nominally is not impacted by the operation of the HAB, arguably access to Benmore Crescent could be more efficient when there is no opposing traffic for this right turn movement due to the HAB being lowered. Conversely, eastbound traffic queues from through movements on Manor Park Road could block access to the right turn bay. The design of the right turn bay / intersection upgrade is still to be finalised, and these queuing considerations should be taken into account in the next design iteration.

3.4.5 Crossing Panel

Whilst the crossing panel is generally in fair condition, there are observable defects and cracks. Without maintenance, it is likely that those cracks and defects will extend and increase in scale. Consequently, water could enter the underlying structure of the road and further accelerate damage or the creation of potholes. Such defects would be hazardous to cyclists or users of small, wheeled devices (e.g. scooters).

3.5 Safety Recommendations

The recommendations to improve safety at the level crossing are outlined in Table 3-2, while recommendations for the pedestrian crossing/s are outlined in Table 3-3. Figure 3-17 and Figure 3-18 show how these changes would look in an aerial view. The columns on the right state the type of infrastructure involved, when the recommendation should occur and the level of necessity of the recommendation:

- To meet KiwiRail's Signals and Telecommunication '**Standard: Active Level Crossings**' (S-ST-LC-2103)
- To achieve **'Criterion 1'** and/or **'Criterion 2'**
- To meet **'TCD Pt. 9'** conditions, or
- For **'Maintenance'** issues.

3.5.1 Road Crossing Safety Recommendations

Table 3-2: Safety Recommendations for the Road Level Crossing

Safety Recommendation	Infrastructure Affected	When is it Required?	Level of Necessity
1. Grade separate the road level crossing			
As the crossing does not meet Criterion 1, the solution is to grade separate the crossing if viable. It is noted that the construction of the new SH2 / SH58 interchange undertaken approximately five years ago probably represented the best chance for grade separation. The fact that grade separation was not undertaken at that time would suggest it is of limited feasibility. As Manor Park Road is the sole road connection between Manor Park and the wider road network closure is not seen as practical.	Rail Corridor	ASAP	Criterion 1
2. Install a median island			
Install a median island to prevent vehicles driving around the barrier arm when lowered.	Local Road	Proposed Design	Criterion 2
3. Replace the HABs			
Replace the existing old HABs, which were first installed in the 1960's. KiwiRail note this is scheduled to occur within the next 1-2 years.	Rail Corridor	ASAP	Maintenance
4. Reconfigure signalling at Manor Park Station to reduce barrier down times			
Reconfigure the signalling at Manor Park station so that stopped trains do not activate the HABs creating long barrier down times and driver frustration.	Rail Corridor	ASAP	Criterion 2
5. Install a second WX31 on western approach			
Install a second WX31 sign on the right hand side of the western approach to provide further warning to road users.	Local Road	ASAP	Criterion 1
6. Repair the crossing panel defects			
Repair the crossing panel to address minor surfacing and pavement defects	Rail Corridor	Future	Maintenance

Safety Recommendation	Infrastructure Affected	When is it Required?	Level of Necessity
7. Refresh all road markings			
Refresh all road markings	Local Road	Proposed Design	Maintenance
8. **Replace incorrectly installed road signage**			
Install WX1R sign on Manor Park Road east approach. Replace signage on Benmore Crescent with correct sign WXR5 sign.	Local Road	Proposed Design	TCD Pt.9

3.5.2 Pedestrian Crossing Safety Recommendations

Table 3-3: Safety Recommendations for the Pedestrian Level Crossing

Safety Recommendation	Infrastructure Affected	When is it Required?	Level of Necessity
1. Install automatic gates at the pedestrian level crossing due to multiple rail tracks			
As multiple tracks are located at this level crossing, Section 5 of KiwiRail's Signals and Telecommunication Standard: Active Level Crossings (S-ST-LC-2103) takes precedence. This states the minimum protection provided when multiple tracks as present is automatic gates due to the second train risk. This is also classified as a "Metro" rail corridor which also has an automatic gate requirement	Rail Corridor	ASAP	Active Level Crossings Standard
2. Install pedestrian focused FLBs			
Install a pedestrian focused FLBs so that they are visible to pedestrians.	Rail Corridor	ASAP	Active Level Crossings Standard
3. Install a firm all weather crossing surface			
Install a firm suitable all weather crossing surface. Given the metro and double track environment it is recommended that a Pedstrail or Velostrail solution is utliised.	Rail Corridor	ASAP	Active Level Crossings Standard
4. Install corridor and funnel fencing to guide pedestrians to use the automatic gates and not trespass rail corridor			
Install corridor and funnel fencing adjacent to the level crossing location to guide pedestrians to cross via the official level crossing, and to limit the potential for trespass into the rail corridor. Corridor fencing should be installed up and down track of the crossing.	Rail Corridor	ASAP	Criterion 1
5. Install / extend footpaths			
Construct a footpath between the Benmore Crescent and the level crossing on the downtrack side. Extend the footpath on the southern side of Manor Park Road between the level crossing and Mary Huse Grove and between Mary Huse Grove and the Hutt River Trail path. Remove the footpath west of level crossing on the northern side of Manor Park Road. (It is understood that when the development occurs footpaths would extend along Benmore Crescent into the development).	Rail Corridor	ASAP	Criterion 1
6. Install path lighting			
Install path lighting for pedestrian safety in the vicinity of the pedestrian, link to existing street lighting	Local Road	Proposed Design	Criterion 1
7. Consider the location of a pedestrian (road) crossing point on Manor Park Road			
Consider the installation of a pedestrian crossing point on Manor Park Road east of Mary Huse Grove.	Local Road	Proposed Design	Criterion 1

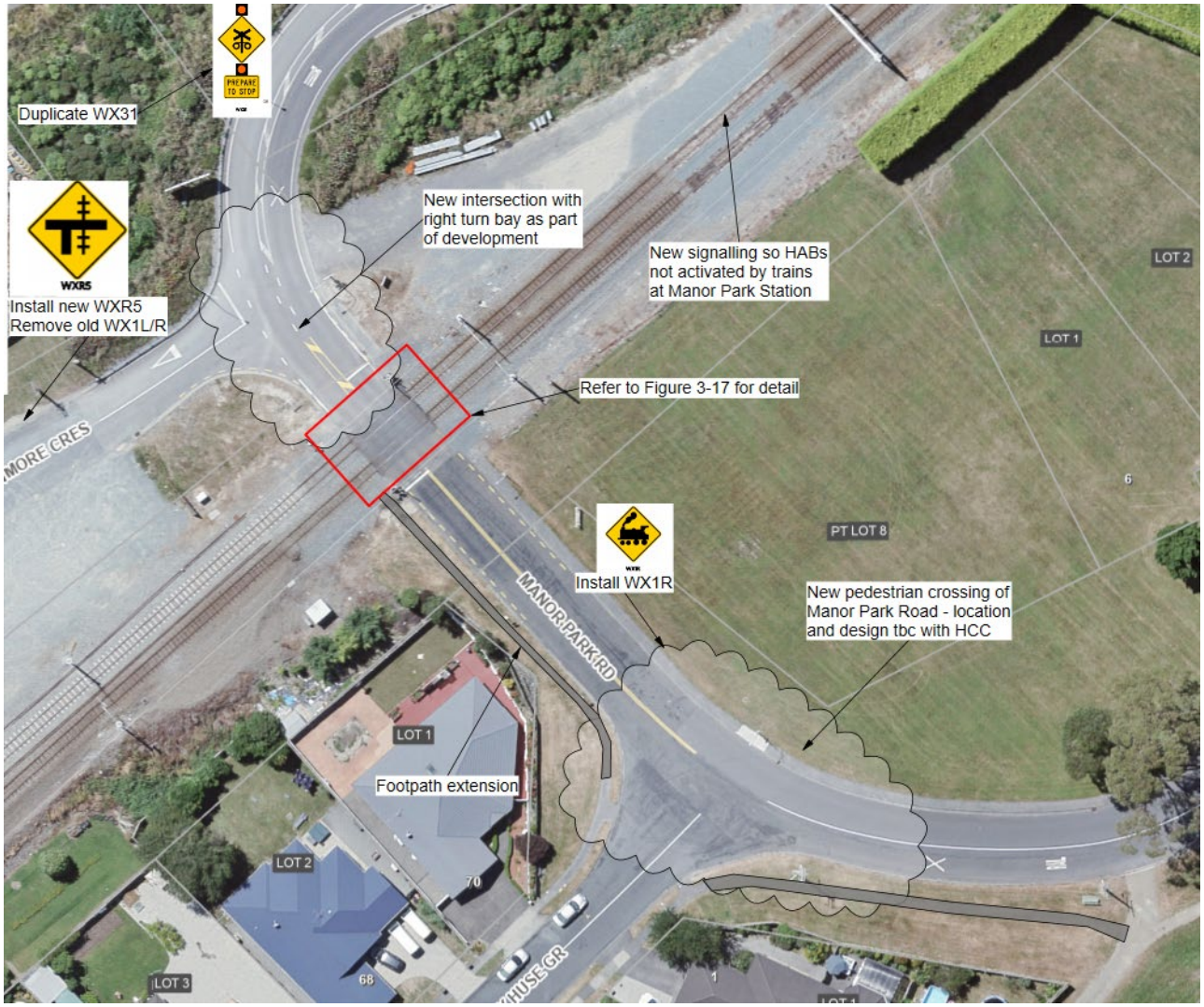

Figure 3-17: Recommendations for the Manor Park Road Level Crossing

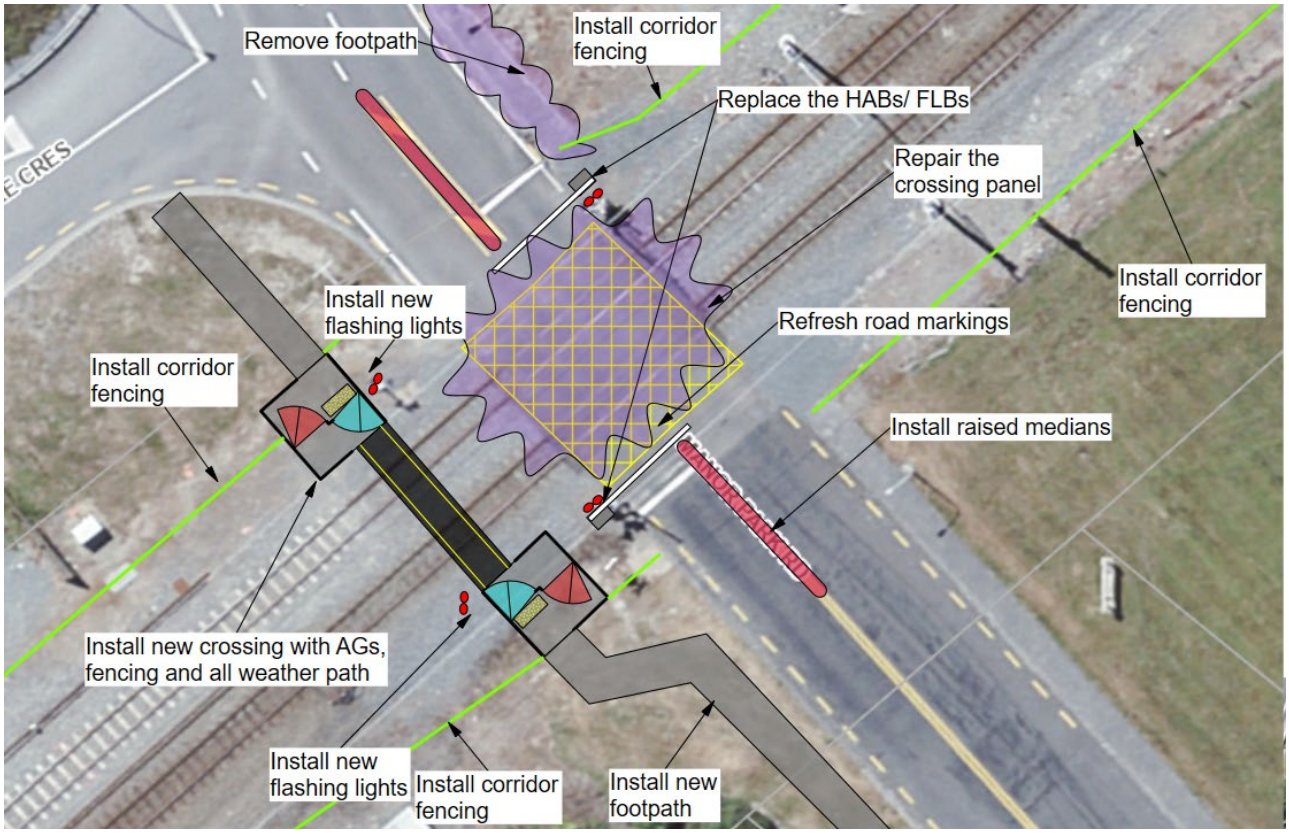

Figure 3-18: Recommendations for the Manor Park Road Level Crossing

3.6 Level Crossing Safety Score (LCSS)

The following four sections calculate the risk scores of the categories that make up the 60-point LCSS.

3.6.1 ALCAM Score

ALCAM scores are assessed in 'Proposals' mode in the LXM database[7] and forecast the possible risk scenario due to the change in use and for the future, ten years after the proposed change to the crossing.

3.6.1.1 Manor Park Road Level Crossing Assessment

Updates to the traffic count data were made, as these can have a large impact on the ALCAM score. The return period for fatalities is reported for the road score for each stage. The road ALCAM assessment is presented in Table 3-4.

Table 3-4: ALCAM ID 424 - Manor Park Road Level Crossing ALCAM Score

Stage	Score	Fatality Return	Risk % Change	Comments
Updated Existing	**25/30**	**404 years**	-	The following changes were made based on conditions found on site. • Increased daily passenger multiple units from 81.7 to 85.7 • Increased daily locomotive hauled passenger trains from 4 to 5.7 • Increased loco hauled passenger train length from 120m to 200m • Increased freight trains to 4 per day • Increased freight train length to 570m • Reduced freight train speed to 80km/h • Increased AADT to 1,500 vpd • Increased HV % to 2% (from 1%) • Immediate approach – added T-intersection at 120m for left approach, deleted T-intersection right approach at 69m. • Added overbridge at 390m and platform at 400m to Up track. • Changed panel surface condition to Fair from Good. • Selected "an inspection programme exists but maintenance follow up is inadequate" • Selected "some wear and tear, but the message is understandable" for condition of traffic control. • Selected partly obscured but visible from a safe stopping distance for crossing controls" – (west approach) • Set maximum warning time for HV Line trains to 180s • Deselected LED backing boards. **ALCAM risk score is 24.8 and the risk band is High.**
Change in Use (2032)	**27/30**	**319 years**	27%	The predicted change to the road crossing volume is: • Increased AADT to 1830 vpd • Increased freight trains to 6 per day • Increased Wairarapa train services to 15.1 per day • Changed Wairarapa trains services from Locomotive Hauled to Multiple Unit • Increased Hutt Valley trains services to 110 per day. **ALCAM risk score is 31.4 and the risk band is High.**
Proposed Design	**25/30**	**434 years**	-7%	Changes to the road crossing are stated below: • Changed track panel condition to good • Selected central median • Selected duplicated train activated warning (flashing lights)

[7] Note that the LCSIA Assessor is not ALCAM accredited, so uses best engineering judgement when scoring ALCAM.

Stage	Score	Fatality Return	Risk % Change	Comments
				Alcam risk score is 23 and the risk band is High.
Future Score (2032)	**26/30**	**350 years**	+15%	The predicted changes to the road crossing are stated below: • Increased AADT to 1830 vpd • Increased freight trains to 6 per day • Increased Wairarapa train services to 15.1 per day • Changed Wairarapa trains services from Locomotive Hauled to Multiple Unit • Increased Hutt Valley trains services to 110 per day. **ALCAM risk score is 28.6 and the risk band is High.**

Table 3-4 shows the Future Score ALCAM score has increased by 15% and the return period of a fatal collision has reduced by 54 years to 350 years.

3.6.1.2 Manor Park Road Pedestrian Level Crossing Assessment

The overall pedestrian volume and percentage of vulnerable pedestrians (disabled, elderly, school children etc.) and cyclists is important for the pedestrian crossing risk profiling. The Manor Park Road Down pedestrian ALCAM assessment is presented in Table 3-5.

Table 3-5: ALCAM ID 4717- Manor Park Road Down pedestrian crossing ALCAM score

Stage	Score	Risk % Change	Comments
Updated Existing	**20/30**	**-**	The following changes were made based on conditions found on site. • Lat 41° 9'34.24"S Long 174°58'28.00"E • Left Up Sight distance 400m, Left Down Sight Distance 250m • Right Up Sight distance 400m, Right Down Sight Distance 200m • Left and Right approaches, poor condition, unsealed, dirt surface material, poor (no) maze • Path over tracks, poor condition, unformed, surface material ballast • Daily passenger multiple units set to 85.7 per day • Daily locomotive hauled passenger trains set to 5.7 per day • Passenger train speed 90km/h • Passenger train length 200m • 4 Freight trains per day • Freight train speed 80km/h • Freight train length 570m • Increased freight train length to 570m • Pedestrian crossing distance set to 9.3m • 10 Pedestrians per day, 2 per peak hour • No defined path • Unmarked crossing • Adjacent boom gates and audio • No inspection and maintenance programme exists **ALCAM risk score is 417,828 and the risk band is Medium High.**
Change in Use (2032)	**28/30**	529%	The predicted change to pedestrian volume and user demographics are: • Increased pedestrians to 100 per day and 20 per peak hour. • Increased freight trains to 6 per day • Increased Wairarapa train services to 15.1 per day • Changed Wairarapa trains services from Locomotive Hauled to Multiple Unit • Increased Hutt Valley trains services to 110 per day. **ALCAM risk score is 2,893,213 and the risk band is High.**

Stage	Score	Risk % Change	Comments
Proposed Design	**6/30**	-89%	Changes to the pedestrian crossing are stated below: • Increased pedestrians to 50 per day, 10 per peak hour • Set minimum warning time to 20s, and maximum warning time to 25s • Select surface condition of left and right approaches and path over tracks to “good” • Select surface treatment of left and right approaches as “sealed” • Select surface material of left and right approaches as “concrete” • Select surface treatment of path over tracks as “removable panels” • Selected surface material of path over tracks as “rubber” • Selected maze condition as “good” • Selected “An effective inspection and maintenance programme is evident” • Selected “complete and in good condition” for conspicuity of pedestrian control • Selected “easily observed from the approach” for visibility of pedestrian control • Selected ‘maze and adjacent fencing is in good condition, path is in good condition” for condition of crossing • Selected “adequate path alignment” • Selected “crossing fully meets TCD part 9” • Selected “ crossing fully meets DDA requirements” • Selected “Automatic Gates” with Emergency Egress latc • Selected path. • Selected visual and audible alarms • Selected tactile grounds surface indicators • Selected funnel pathway • Selected adjacent corridor fencing **ALCAM risk score is 46,290 and the risk band is Low.**
Future score (2032)	**8/30**	--85%	Changes to the pedestrian crossing are stated below: • Increased pedestrians to 50 per day and 10 per peak hour. • Increased freight trains to 6 per day • Increased Wairarapa train services to 15.1 per day • Changed Wairarapa trains services from Locomotive Hauled to Multiple Unit • Increased Hutt Valley trains services to 110 per day. **ALCAM risk score is 61,161 and the risk band is Medium Low.**

Table 3-5 shows the Future Score ALCAM score has reduced by less than 85% compared to the Updated Existing score. However, the number of pedestrians is five times greater.

3.6.2 Crash and Incident History Score

The ten-year ORA[8] and CAS data for 2012 to 2021 was analysed (including any incidents from 2021) with the history presented in Table 3-6. Where the total score is greater than 10 points, only a maximum of 10 points can be adopted.

Only one incident has been reported for this crossing.

Table 3-6: Crash and Incident History

Database	Incident Type	No.	Comments	Score
ROAD CROSSING				
IRIS	NCLV – Near Collision Light Road Vehicle	1	One reported incident when a ute travelling in the eastbound direction drove around the barrier arms to pass in front of a train.	1 x 1
			TOTAL	**1**
PEDESTRIAN CROSSING				
IRIS		0	No incidents reported.	
			TOTAL	**0**

There are newspaper reports of a fatal pedestrian incident in Manor Park in May 2016 – further research confirmed that this incident occurred at the Pomare Bridge about 600m south of the level crossing and is not related to the crossing.

Table 3-7 summarises the change in the LCSS through the assessment stages, with commentary on how reductions or increases in score were forecast for the hypothetical scenarios.

Table 3-7: Summary of Crash and Incident History LCSS

Crossing	Updated Existing	Change in Use	Proposed Design	Future Score	Comments
Manor Park Road level crossing	1/10	2/10	1/10	1/10	Updated Existing. One incident has been reported. Change in Use. It is plausible that the increased train and traffic volumes will result in an increased incident potential. The installation of a median island would limit the opportunity for a vehicle to drive around a lowered HAB in the Proposed Design and Future Score.
Manor Park Road Down pedestrian crossing	0/10	3/10	1/10	1/10	Updated Existing. No incidents reported currently. Change in Use. Increased pedestrian (and train volumes) without provision of suitable facilities will result in potential incidents. Proposed Design and Future Score. Installation of automatic gates and other upgrades will be beneficial in safe pedestrian management.

[8] ORA is the KiwiRail database that records incidents and near misses as reported by the locomotive engineers.

3.6.3 Site Specific Safety Score (SSSS)

This site-based score aims to analyse some elements of the level crossing layout. The two crossings are assessed in Table 3-8 and Table 3-9.

If the level crossing triggers a red flag scenario, the SSSS is automatically scored as 24/30 (or 8/10). If the LCSIA Assessor is not satisfied the calculated SSSS adequately portrays the risk of the level crossing (it has over or understated the risk), they are able to provide a 'Modified' SSSS total score.

Table 3-8: Manor Park Road Level Crossing SSSS – ID 424

Assessed Item	Updated Existing	Change in Use	Proposed Design	Future Score	Comments
Crossing Controls	2/5	2/5	1/5	1/5	Low score in all scenarios due to HAB and then raised median reduces score further for Proposed Design and Future Score.
Queuing	0/6	0/6	0/6	0/6	No bisecting intersection to generate queues across the level crossing however see modified LCSS score for discussion of wider network effect.
Short stacking / grounding out	0/10	0/10	0/10	0/10	Crossing surface is level. No issue with grounding out. No issue with short stacking.
Accessways / side roads and bisecting intersections	0/6	0/6	0/6	0/6	No bisecting accessways or side roads on right hand side likely to generate queues across the level crossing.
Observed non-compliance	1/3	2/3	0/3	0/3	One incident relating to non-compliance reporting. Long HAB down times likely to generate further issues with higher train and traffic volumes. Proposed Design and Future Score assume signalling system modified to reduce HAB down times.
TOTAL SCORE	**3/30**	**4/30**	**1/30**	**1/30**	
SSSS	**1/10**	**3/10**	**1/10**	**1/10**	Score to take forward to LCSS
Red Flag Scenario	**N/A**	**N/A**	**N/A**	**N/A**	
MODIFIED SSSS	**N/A**	**3/10**	**N/A**	**N/A**	Change in Use. Notwithstanding the limited potential for queuing across the level crossing the proximity of intersection, potential for queuing towards the interchange would give an SSSS environment higher than 1/10. Therefore, it has been scored as a 3/10.

Table 3-9: Manor Park Road Down Pedestrian Crossing SSSS – ID 4717

Assessed Item	Updated Existing	Change in Use	Proposed Design	Future Score	Comments
Crossing type and visibility	10/10	10/10	1/10	1/10	Updated Existing & Change in Use. Good to poor visibility in the down track direction. Warning bells and some signs but no crossing path or other facilities. Proposed Design & Future Score Automatic gates and FLBs on each approach. Firm path and crossing panel.
Distraction / Inattention	3/5	3/5	3/5	3/5	Updated Existing & Change in Use. Lack of path and warning increases potential for distraction.

Assessed Item	Updated Existing	Change in Use	Proposed Design	Future Score	Comments
					Proposed Design & Future Score. Improved warning and fencing reduces potential for distraction but with higher pedestrian numbers.
Flange gap wheel entrapment	5/5	5/5	1/5	1/5	Updated Existing & Change in Use. No path and wide flange gaps. Proposed Design & Future Score. Small flange gaps.
Volume of vulnerable users	1/6	1/6	2/6	2/6	Updated Existing very low number of vulnerable users. All other scenarios. Crossing mainly used by persons working 800m+ to / from train station and development. Low number of vulnerable users.
Cycle Patronage	1/4	1/4	1/4	1/4	Low number of cyclists in all scenarios.
TOTAL SCORE	**20/30**	**20/30**	**8/30**	**8/30**	
SSSS	**7/10**	**7/10**	**3/10**	**3/10**	Score to take forward to LCSS

3.6.4 Engineer Risk Score

The Engineer risk score is a combination of Locomotive Engineer and Road Controlling Authority (RCA) Engineer opinion of the crash risk at the level crossing, with a weighting of 2:1 in favour of the Locomotive Engineer. Opinions for this level crossing site were provided by the following people:

- Locomotive Engineer: Tony Evans
- RCA Engineer: Ravi Soni

Additionally commentary was provided by Walter Escott (KiwiRail Signals Engineer) The risk score for the two level crossings are presented in Table 3-10 and Table 3-11. Any specific comments provided by either Engineer are recorded in the appropriate comments section.

Table 3-10: Manor Park Road Level Crossing Engineer Risk Score

Engineers Opinion	Updated Existing	Change in Use	Proposed Design	Future Score	Comments
Locomotive Engineer	5/10	4/10	2/10	2/10	Updated Existing. Few concerns relating to existing crossing, although long barrier down time for southbound stopping trains could frustration/ non-compliance. Change in Use – increased traffic & train volumes would somewhat heighten concerns without upgrade. See below for Signal Engineer concerns
Roading Engineer	3/5	3/5	4/5	4/5	Concerned about the increased train and traffic volumes.
TOTAL SCORE	**8/15**	**7/15**	**6/15**	**6/15**	
Risk Score	**5/10**	**5/10**	**4/10**	**4/10**	

The KiwiRail Signals Engineer expressed a high-level of concern about the old / outdated crossing equipment, and long barrier down times. While noting that HAB equipment was due for replacement a delay in replacement could increase the potential for failure due to age. He proposed a notably higher risk rating for the crossing than the Locomotive Engineer and the score reported above is thus a weighted reflection of both KiwiRail engineer's inputs.

Both the Locomotive and Signal Engineers, noted that further congestion in the area, whilst not directly impacting / queuing over the level crossing may become a distraction issue or cause an increase in driver frustration (coupled with long barrier down times).

The Signals Engineer noted that it would be feasible to adjust the barrier activation so that it was not triggered by southbound trains stopping at the Manor Park Station.

Table 3-11: Manor Park Road Down Pedestrian Crossing Engineer Risk Score

Engineers Opinion	Updated Existing	Change in Use	Proposed Design	Future Score	Comments
Locomotive Engineer	7/10	7/10	2/10	2/10	Supporting the use of automatic gates. Noted that there is already pedestrian usage.
Roading Engineer	5/5	5/5	5/5	5/5	Concerned about where pedestrians could cross Manor Park Road safely. Suggested a formal crossing point needed to be installed.
TOTAL SCORE	**12/15**	**12/15**	**7/15**	**7/15**	
Risk Score	**8/10**	**8/10**	**5/10**	**5/10**	

3.7 LCSS Results

This section calculates the overall LCSS rating for each level crossing. A brief discussion on the progression of the LCSS and ALCAM risk score through the assessment stages is also provided.

3.7.1 Manor Park Road Level Crossing - ID: 424

Table 3-12 presents the results of the road LCSS.

Table 3-12: Manor Park Road Level Crossing LCSS

Scored Items	Updated Existing	Change in Use	Proposed Design	Future Score	Comments
ALCAM score	**25/30**	**27/30**	**25/30**	**26/30**	High ALCAM risk score in all scenarios driven by volume of trains and line speed.
Crash & incident history score	1/10	2/10	1/10	1/10	Only one incident reported. Potential for increased risk with no upgrades and increased traffic. Proposed Design and Future Score. Upgrades reduce incident potential.
Site specific safety score	**1/10**	**3/10**	**1/10**	**1/10**	Low site specific score in all scenarios
Engineer risk score	**5/10**	**5/10**	**4/10**	**4/10**	Concerns about the potential for congestion and age of the level crossing equipment.
LCSS	**32/60**	**37/60**	**31/60**	**32/60**	
LCSS RISK BAND	**Medium**	**Medium**	**Medium**	**Medium**	
CRITERION MET	**FAIL**	**FAIL**	**C2**	**C2**	
FORM OF CONTROL	**HAB / FLBs**	**HAB / FLBs**	**HAB / FLBs**	**HAB / FLBs**	

The Updated Existing LCSS is Medium, and the Change in Use LCSS increases to the top of the Medium threshold. The Proposed Design and Future Score both achieve Criterion 2. The recommendations presented are considered the most feasible, and maintain the current risk profile.

A summary of the changes to the ALCAM risk band are presented in Table 3-13.

Table 3-13: Manor Park Road Level Crossing ALCAM Changes

Scored Items	Updated Existing	Change in Use	Proposed Design	Future Score
ALCAM risk band	High	High	High	High
ALCAM risk score % change	N/A	27%	-7%	+15%
Fatal return period	404 years	319 years	434 years	350 years

The Updated Existing ALCAM risk band was High and remained High for the Change in Use score, which increased the ALCAM risk score by 29% and increased the likelihood of fatal crash occurring. The Proposed Design and Future Score were still in the High ALCAM risk band with the ALCAM risk score reducing by 7% and increasing by 15% respectively. The return period for predicted fatal crashes increased by 30 years for the Proposed Design, but reduced by 54 years for the Future Score, meaning fatal crashes are more likely than the Updated Existing. This is largely driven by the increase in train volumes.

There were no Red Flag issues raised at this road crossing for any of the assessment stages.

3.7.2 Manor Park Road Down Pedestrian Crossing – ID: 4717

Table 3-14 presents the results of the Manor Park Road Down pedestrian LCSS.

Table 3-14: Manor Park Road Down Pedestrian Crossing LCSS

Scored Items	Updated Existing	Change in Use	Proposed Design	Future Score	Comments
ALCAM score	**20/30**	**28/30**	**6/30**	**8/30**	High Existing ALCAM score due to lack of facilities. In the Change in Use and Future Score ALCAM score is driven by high pedestrian and train volumes.
Crash & incident history score	0/10	3/10	1/10	1/10	Although no incidents currently, with no pedestrian infrastructure any increased pedestrian numbers likely to increase risk. Automatic gates and other upgrades help to address risk.
Site specific safety score	**7/10**	**7/10**	**3/10**	**3/10**	Very high SSSS in Updated Existing and Change in Use due to lack of infrastructure. Reduces with installation of automatic gates.
Engineer risk score	**8/10**	**8/10**	**5/10**	**5/10**	High concern due to current lack of infrastructure.
LCSS	**35/60**	**46/60**	**15/60**	**17/60**	
LCSS RISK BAND	**Medium**	**Medium High**	**Low**	**Low**	
CRITERION MET	**FAIL**	**FAIL**	**C1 & C2**	**C1 & C2**	
FORM OF CONTROL	**BELLS ONLY**	**BELLS ONLY**	**AUTO GATES**	**AUTO GATES**	

The Updated Existing LCSS is Medium, and the Change in Use LCSS increases into the Medium-High risk band. The Proposed Design and Future Score both achieve Criterion 1 and Criterion 2.

A summary of the changes to the ALCAM risk band are presented in Table 3-15.

Table 3-15: Manor Park Road Down Pedestrian Crossing ALCAM Changes

Scored Items	Updated Existing	Change in Use	Proposed Design	Future Score
ALCAM risk band	Medium High	High	Low	Medium Low
ALCAM risk score % change	N/A	529%	-89%	--85%

The Updated Existing ALCAM risk band was Medium-High and increased to High for the Change in Use score, which increased the ALCAM risk score by over 500%. The Proposed Design and Future Score reduced the ALCAM risk band to Low and Medium-Low respectively, with the ALCAM risk score reducing by 89% and 85% respectively.

4 ALCAM Improvements

4.1 Recommended ALCAM Updates

To assist KiwiRail with improvements to the ALCAM database, the following data in Table 4-1 should be considered for update the existing level crossings in LXM.

Table 4-1: ALCAM updates for KiwiRail consideration

Manor Park Road Crossing # 424
• Increased daily passenger multiple units from 81.7 to 85.7 • Increased daily locomotive hauled passenger trains from 4 to 5.7 • Increased loco hauled passenger train length from 120m to 200m • Increased freight trains to 4 per day • Increased freight train length to 570m • Reduced freight train speed to 80km/h • Increased AADT to 1,500 vpd • Increased HV % to 2% (from 1%) • Immediate approach – added T-intersection at 120m for left approach, deleted T-intersection right approach at 69m. • Added overbridge at 390m and platform at 400m to Up track. • Changed panel surface condition to Fair from Good. • Selected “an inspection programme exists but maintenance follow up is inadequate” • Selected “some wear and tear, but the message is understandable” for condition of traffic control. • Selected partly obscured but visible from a safe stopping distance for crossing controls” – (west approach) • Set maximum warning time for HV Line trains to 180s • Deselected LED backing boards. • Deselected CCTV

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