Railway Crossing Risk Assessment Report

CANTERBURY ROAD EAST LEVEL CROSSING IN RELATION TO AMENDMENTS C444GGEE AND C453GGEE TO THE GREATER GEELONG PLANNING SCHEME

29 Mar 2026

1. BACKGROUND

Lara Farms Pty Ltd (**Lara Farms**) are proposing to develop an area of rural farmland to the southeast of the town of Lara for residential and business purposes (the **Development**). Figure 1 and Figure 2 show the location of these proposed development areas. The areas are bounded by Canterbury Road East to the north, Rennie Road to the east and the Werribee – Geelong rail corridor to the west. These amendments are known as Amendment C444ggee (**Residential Amendment**) and C453ggee (**Business Park Amendment**) (together, **Amendments**).

As shown in Figure 3, Canterbury Road East crosses the rail line at a level crossing (marked with an X). A proportion of the road and pedestrian traffic generated from these developments and travelling to and from the Lara township will cross this crossing.

Increasing the road traffic over a level crossing has the effect of increasing the risk of rail vs road collisions. Additional pedestrian movements also create a greater risk of rail vs pedestrian collisions.

The Australian Level Crossing Assessment Model (**ALCAM**) is used to evaluate and compare risk at road and pedestrian railway crossings across Victoria and (Australian Standard, 2016) nationally. Head, Transport for Victoria (**HTfV**) has requested that a level crossing risk assessment be provided based on ALCAM for the purposes of determining the impacts of the Development on the safety of the Canterbury Road East crossing and to evaluate the need for any safety improvements which may be necessary.

Nelson-Furnell Pty Ltd (**Nelson-Furnell**) are commissioned to provide this risk assessment and have attended the site to undertake an ALCAM site assessment which forms the basis of this report.

Traffix Group have undertaken traffic modelling of road traffic originating from the Development[1] which will be used to inform the analysis in this report.

[1] (Traffix Group, 2026)

Figure 1 Residential Amendment Land

Figure 2 Business Park Amendment Land

Figure 3 Site Plan

Amendment C444ggee (**Residential Amendment**) and C453ggee (**Business Park Amendment**) (together, **Amendments**) propose to facilitate the transition of the Land for urban purposes.

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REFERENCES

Australian Standard. (2016). *AS1742 part 7 Manual of Uniform Traffic Control Devices Part 7: Railway Crossings.* Standards Australia.

Traffix Group. (2026). *Transport Impact Assessment for Amendments C444ggee and C453ggee (G37968R-02A).*

2. EXECUTIVE SUMMARY

The Amendment C444ggee (Residential Amendment) and C453ggee (Business Park Amendment) will allow the development of the rural land bounded by the Werribee to Geelong rail corridor, Canterbury Road East and Rennie Road.

The northern section is proposed to be residential and recreational facilities while the southern section will be a business park.

Both of these developments will generate road traffic and the residential development will also create pedestrian and cycle traffic. A proportion of these additional traffic movements will pass over the Canterbury Road East railway level crossing.

The rail corridor in this area incorporates the VLine and ARTC rail networks. VLine operate freight and passenger services which include high speed rail cars travelling at up to 160kph. ARTC operate both passenger and freight services. There are three rail lines, all carrying regular rail traffic, so train movements are complex.

The road crossing at this site is appropriately controlled by train activated flashing lights and boom barriers, the highest level of control available for Victorian road crossings. All warning signage and line marking meet the AS1742 part 7 standard.

There are some minor existing condition issues including some deep potholes in the ARTC track panel and collision damage to one of the secondary warning signs.

Road traffic will increase by 73% by the completion of the Development which will increase the risk due to train collisions by 38%. This increased traffic is adequately accommodated by the existing crossing infrastructure.

No additional control upgrades to the road crossing are recommended.

There is only minimal existing pedestrian and cycle traffic currently using the crossing. Currently such users cross the tracks on the roadway, using the road signals as warnings when trains are approaching. As there are no pedestrian paths they are at risk of collision with road vehicles.

The Development will increase this traffic to 483 crossing users per day. This means that pedestrians cannot safely use the roadway. **A formal pedestrian crossing facility is required on the southern side of the roadway.**

Given the number and mixed speeds of the trains crossing it is not possible for pedestrians or cyclists to judge whether it is safe to cross. **An active pedestrian crossing with automatic gates and latched egress escape gates is recommended** to properly regulate pedestrians and prevent them from bypassing the controls.

Wing and corridor fencing is required to prevent users from easily bypassing the pedestrian crossing.

3. DESCRIPTIVE CONVENTIONS

The following descriptive conventions are used in this report. They are based on those applied as a national standard for assessments under the ALCAM model. In some cases they may vary from those used by individual railways.

Up and Down Track direction
The Up track direction is the direction from the crossing facing toward the origin of the rail network. For Victoria this is generally toward Melbourne. The Down track direction is facing away from the origin, or in the direction of increasing running distance.

Left and Right road approaches
The left or right side of the crossing is determined as viewed when standing at the crossing facing in the Up track direction.

Up and Down train traffic
An Up train is a train traveling in the Up direction, a Down train traveling in the Down direction. When describing train speed, for example, the Down train speed is the speed of trains approaching the crossing from the Up direction (the origin) and traveling down.

Active controls
Primary crossing controls which provide train activated flashing light warning of approaching trains.

Passive controls
Primary crossing controls which warn of the danger of trains but require vehicle drivers to view approaching trains and assess whether it is safe to cross.

AS1742-7[2]
Australian Standard AS1742 part 7:2016 Manual of Uniform Traffic Control Devices is the standard which applies to public road and pedestrian crossings in Australia, describing (among other things) signage appearance and placement. It includes the definition of the requirements for sighting distances which are used in ALCAM surveys.

SSD Sighting
Stopping Sight Distance. The distance needed at any crossing in order to see the crossing's controls and stop in time.

S2 Sighting
The approach sighting distance required at give way sign controls to see a train while approaching the crossing in time to judge whether to stop and give way or continue through the crossing.

S3 Sighting
The sighting distance required at passive crossings in order to see trains when stopped at the stop bar in sufficient time to start the vehicle, cross and clear the crossing before it arrives.

RIM
Under Rail Safety National Law Rail Infrastructure Managers (RIM) are the rail organisations responsible for the

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[2] (Australian Standard, 2016)

management of the rail infrastructure (the track, signalling and communications systems and train control functions). This crossing traverses three rail tracks operated by two RIMs. ARTC are a national operator providing interstate operation   The RIM at the crossings in this report is understood to be ..RIM…

SFAIRP
An acronym for "So Far As Is Reasonably Practical", a common term used in legislation related to the management of risk and applied in risk assessments.

3.1. RAIL SAFETY NATIONAL LAW

Australian public railways are regulated under Rail Safety National Law. This Act provides for a national system of rail safety regulation. The core legislation is the Rail Safety National Law (South Australia) Act 2012 which is enacted in each state by enabling legislation. In Victoria this enabling legislation is the Rail Safety National Law Application Act 2013.

In respect to the management of risks at level crossings it is important to understand the obligations placed on both rail and road authorities by the Act. These obligations will be relevant to the recommendations in this report.

The following sections are extracted from the Rail Safety National Law (South Australia) Act 2012:

46—Management of risks

A duty imposed on a person under this Law to ensure, so far as is reasonably practicable, safety requires the person—

(a) to eliminate risks to safety so far as is reasonably practicable; and

(b) if it is not reasonably practicable to eliminate risks to safety, to minimise those risks so far as is reasonably practicable.

47—Meaning of reasonably practicable

In this Part—

reasonably practicable, in relation to a duty to ensure safety, means that which is (or was at a particular time) reasonably able to be done in relation to ensuring safety, taking into account and weighing up all relevant matters, including—

(a) the likelihood of the hazard or the risk concerned occurring; and

(b) the degree of harm that might result from the hazard or the risk; and

c) what the person concerned knows, or ought reasonably to know, about—

(i) the hazard or the risk; and

(ii) ways of eliminating or minimising the risk; and

(d) the availability and suitability of ways to eliminate or minimise the risk; and

e) after assessing the extent of the risk and the available ways of eliminating or minimising the risk—the cost associated with available ways of eliminating or minimising the risk (including whether the cost is grossly disproportionate to the risk).

107—Interface coordination—rail infrastructure and public roads

(1) A rail infrastructure manager must—

(a) identify and assess, so far as is reasonably practicable, risks to safety that may arise from railway operations carried out on or in relation to the manager's rail infrastructure because of, or partly because of—

(i) the existence of road infrastructure of a prescribed public road; or

(ii) the existence or use of any rail or road crossing that is part of the road infrastructure of a public road; and

(b) determine measures to manage, so far as is reasonably practicable, those risks; and

c) for the purpose of managing those risks—seek to enter into an interface agreement with the road manager of that road.

(2) The road manager of a public road must—

(a) identify and assess, so far as is reasonably practicable, risks to safety that may arise from the existence or use of any rail or road crossing that is part of the road infrastructure of the road because of, or partly because of—

(i) the existence of road infrastructure of a prescribed public road; or

(ii) the existence or use of any rail or road crossing that is part of the road infrastructure of a public road; and

(b) determine measures to manage, so far as is reasonably practicable, those risks; and

c) for the purpose of managing those risks—seek to enter into an interface agreement with the rail infrastructure manager of the rail infrastructure.

<u>Application to this Report</u>

A joint responsibility exists for ARTC and VLine (the RIMs) and Greater Geelong City Council (the Road Manager) to manage the mitigation of risks at the Canterbury Road East level crossing. Ultimately these stakeholders must be satisfied that risks which are increased by the Development leave the crossing adequately controlled, with or without appropriate mitigations such as equipment upgrades or repairs to infrastructure.

Rail Safety National Law is regulated by the Office of the National Rail Safety Regulator (ONRSR). ONRSR may require remedial actions if they are not satisfied that risks are adequately mitigated.

4. ALCAM

The Australian Level Crossing Assessment Model (ALCAM) is a system of risk modelling for railway crossings used across Australia and New Zealand.

The models describe the risk to human life posed by collisions between trains and motor vehicles or pedestrians.

ALCAM is widely accepted as a comprehensive risk identification tool which is used by rail and road organisations as part of risk assessment activities at level crossings as required in Australia under Rail Safety National Law.

There are two ALCAM risk models. The ALCAM Road Model is used to model risks at road crossings with the ALCAM Pedestrian Model covering the risks of pedestrian collisions with trains at crossings

4.1. ALCAM ROAD MODEL

The ALCAM Road Model is applied to road crossing risk. It describes Risk as the product of Likelihood of a level crossing collision and the Consequence of a collision should it occur.

While there are other costs and consequences to level crossing collisions such as damage to railway rolling stock or motor vehicles, as a personal risk model ALCAM only takes into account human consequences of level crossing collisions.

Likelihood is expressed as the probable number of collisions per year while Consequence is the likely number of fatalities (or equivalent fatalities) per collision.

Risk is therefore the likely number of equivalent fatalities per year.

Likelihood can be inverted to show a return period - the probable number of years between collisions. Risk can also be inverted to show the probable number of years between fatalities. This can give a more easily understood number, similar to the familiar "1 in 100 year flood".

This Road Model calculates Likelihood of collision by considering the exposure to train and road traffic, the type of controls present as well as the local characteristics and environment of the site which can influence driver behaviours and likely causes of error.

Local risk factors are modelled within the Raw Infrastructure Model. Raw infrastructure points are allocated to crossing characteristics with those scoring higher being those which are more likely to contribute to collisions. These can be used to analyse the nature of risk at the crossing and identify treatments which are likely to be most effective in reducing risk.

Collision consequence is calculated based on factors which may lead to loss of life. These include train and vehicle speed, the number of passengers on trains, the likelihood of heavy vehicles being involved and the presence of obstacles or trackwork which may cause secondary collisions or overturned trains.

4.2. RISK AND LIKELIHOOD BANDS

The ALCAM models do not specify limits as to when a crossing might be considered as “unsafe” and requiring action or “safe enough”. Any railway crossing has risks and even crossings with a low overall model score may still have attributes which in themselves require attention and may lead to collisions and fatalities.

The ALCAM model scoring therefore is a rating of risk which can be compared to that of other crossings or used to analyse a range of risks at the site, but does not give a pass/fail indication.

To assist users of the data to understand whether a score is high or low a range of Bands are provided as part of the ALCAM outputs. These bands compare the score to that of the population of other crossings divided into 10 equal bands ranging from the highest 10% of risk to the least risky 10%.

Different bands are provided as follows:

1. By both Likelihood and Risk score;

2. Compared against crossings of the particular class of control present (eg. a stop sign controlled crossing will be compared against other stop sign controlled crossings) or against crossings of any control;

3. Compered against crossings in the jurisdiction they are within (eg. all crossings in Victoria) or with all crossings in the ALCAM data set (Australia and New Zealand).

Comparing the different bands can give insights into how the different components of the score vary. A high Likelihood Band but a low Risk Band, for example would show that the site and its traffic pose many risks making collision more likely than most crossings but that the human consequence is relatively low if a collision occurs due to slow trains or few train or vehicle passengers etc.

5. ROAD CROSSING

LX1351 CANTERBURY RD EAST, LARA

59.275km WERRIBEE - GEELONG line

Location (lat/long): -38.034853, 144.402457 Click here to view in Google Maps

Figure 4 Site Overview

Primary controls: Half boom, flashing lights

Rail Infrastructure Managers: ARTC and VLine

Road Manager: Greater Geelong City Council

Status: Public road / path - Public access

This crossing is on a relatively lightly used access to the town of Lara. It crosses a rail line carrying a variety of train types including a high proportion of high-speed passenger services.

5.1. ROAD AND RAIL TRAFFIC SUMMARY

Average Daily Rail Traffic: 114.650

Average Daily Road Traffic: 1,922
Road traffic has been recently counted as part of the Traffic group report[3].

ALCAM uses Average Annualised Daily Traffic (AADT) counts which is the daily average traffic over the entire year. This same counting method is used for rail traffic.

While traffic levels may spike above this level during some days (for example during weekdays) the AADT is used as the measure of risk per day. The effective equivalent to AADT traffic in (Traffix Group, 2026) is the 7 day average which has been used here.

Percentage of Heavy Vehicles: 5%

Last ALCAM Survey: 20/03/2026

5.2. TRAFFIC DETAIL

Highest Train Speeds

Up Direction: 160kph

Down Direction: 160kph

Types of trains using the crossing

Freight, Passenger (locomotive hauled), Passenger (motorised units)

Road Vehicle Speeds

Signposted: 60kph

Vehicle Operating Speed – Left (east bound) Approach: 61kph

Vehicle Operating Speed - Right (west bound) Approach: 75kph

Largest Road Vehicles using the crossing

Level 1 - Semi Trailer (20m/50t)

5.3. CROSSING GEOMETRY AND SIGHTING

The relative geometry of road and rail alignments and obstructions caused by buildings, terrain or vegetation may impede sighting of the crossing or approaching trains by vehicle drivers. Where the crossing is provided with train activated warning (in this case flashing lights and boom barriers) there is limited need for drivers to be able to see trains approaching.

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[3] P114 (Traffix Group, 2026)

This is due to:

- The controls providing a reliable warning of approaching trains which in most cases exceeds the warning time available by visual observation. Active control systems are often provided precisely because sighting distances are not adequate for passive controls;
- Drivers may not look for trains when such controls are in place as they believe that they will be warned by the controls.
- Where very high speed trains operate through the crossing the required sighting distances may be very large. Research has been undertaken into the ability of drivers to discern train speeds and to see trains[4]. It indicated that drivers cannot reliably estimate train speeds above 100kph and may not always identify an approaching train beyond 750m.

  As VLine passenger trains pass the crossing at speeds up to 160kph it would not be possible for drivers to adequately respond to passive (eg stop sign) controls. The flashing light and boom barrier controls are therefore necessary to provide an appropriate level of warning which does not require drivers to see approaching trains.

5.4. RISKY CHARACTERISTICS

The following characteristics of the crossing have been identified as adding to the risk of collision.

While characteristics which induce risk and are recorded within the ALCAM model are specific to each site, many of them are properties of the rail or road traffic itself. Often they cannot be mitigated and form part of the background risk environment.

5.4.1. TRAIN RELATED

All of the high risk Characteristics at this site are train related.

A feature of train traffic on the Werribee to Geelong line is that there is a variety of rolling stock. For example:

- There are high speed (160kph), relatively short (145m) VLocity passenger trains which pass the crossing quickly;
- Lower speed (100kph) locomotive hauled passenger trains and;
- Much slower speed (80kph) and much longer (up to 1,800m) freight trains operating on the ARTC and VLine network.

This variety of train behaviour makes it difficult for drivers to clearly understand how fast the train may be traveling and how long it will take to pass the crossing. This can lead to misjudgements.

Longest Train Length (Typical)

Rated as 5, 18 Raw Infrastructure Points

More than 1,000m

[4] P60 (Australian Standard, 2016)

As freight trains use this line the train length is longer with trains taking some time to pass over the crossing, delaying vehicles for longer than for the more common fast passenger trains.

This may lead some drivers who have been delayed by the trains before to wish to get over the crossing before the train by racing it and disobeying the controls.

This can lead to misjudgements and collisions.

Longest Approach Warning Time

Rated as 3, 11 Raw Infrastructure Points

Long - 30 to 45 seconds

The warning time for the active controls at this crossing has been assessed as longer than the standard design duration. When the crossing is closed for longer periods there is a greater chance that drivers will cross against the controls, believing them to be faulty or that the train is slow or not coming. If a driver believes the train will be a long time they may weave around the gates to get across. This can lead to misjudgement with the vehicle being caught on the crossing.

Long warning times are often related to variable train speeds in combination with the design of train detection and signalling systems. With fixed track detection circuits the warning time is set by the fastest train so there is a longer warning time for slower trains.

This is less of an issue at this site as the majority of trains are fast passenger services. There are only 2 slow freight trains per day, so most drivers will expect fast trains and respect the controls.

Proximity to Siding/Shunting Yard

Rated as 5, 6 Raw Infrastructure Points

Less than 50m

There is a siding on the ARTC main line within close proximity to this crossing. As this is a bidirectional line, trains may be placed into the siding to wait for another train to pass.

Trains in sidings waiting for others to pass will stop for long periods and may also hide the trains which are passing.

This train behaviour may be hazardous in itself as a driver believes the train to be stopped when it is moving, but it is also likely to lead drivers who have observed it to be complacent about the risks, believing from past experience that the train is benign or will not cross the crossing. Sometimes this is not the case, leading to a collision.

High Train Speed

Rated as 5, 5 Raw Infrastructure Points

Very high-speed trains: greater than 120 km/h

This crossing has been identified as having a high maximum train speed. Higher speed trains make it more difficult for drivers to see them coming or identify how quickly they are approaching.

Most vehicle-train collisions occur because drivers make mistakes. The faster the train approaches the less time is available to recover from an error and identify the danger, leading to a collision.

Faster trains also mean higher speed impacts and consequently greater collision consequence. The high proportion of high speed passenger trains at this site means that if a collision occurs it is likely to be with such a train, exposing many train passengers and the road vehicle a heavy impact and significant injury risk.

5.4.2. ROAD CONDITION ON TRACK PANEL

The condition of the bitumen surface on the track panel is poor. The chip seal on the edges of the track panels is pushed up by traffic (Figure 5) and there is a deep hole next to the rail in the westbound lane (Figure 6) which makes drivers cross cautiously. Cars were observed to slow almost to a stop while crossing the ARTC track to avoid this hole beside the western line. This hole is capable of causing severe damage to vehicles with smaller wheels.

Slower crossing times and even possibly disabled cars on the track could potentially lead to a vehicle to train collision.

Figure 5 Road Condition Eastbound

Figure 6 Deep Holes in ARTC track panel

5.4.3. SUNGLARE

The potential for the rising or setting sun to reduce the visibility of the level crossing controls has been identified due to the orientation of the road.

Figure 7 of the eastbound view of the crossing shows that the surrounding land is flat and there are no trees or other structures which might provide a backdrop or screen behind the crossing. At particular times of the year the sun could therefore rise on the horizon in a position which could interfere with the drivers view of the controls. This could potentially lead to a driver not being aware of the crossing or see the flashing lights operating.

Figure 7 East bound crossing approach

This following measures have been used to counteract this potential:

- **Use of R6-25 cross buck sign on the crossing controls.**
  This sign (upper sign in Figure 8) was added to level crossing controls to provide better visibility of the RAILWAY CROSSING messaging in cases where sun glare exists.

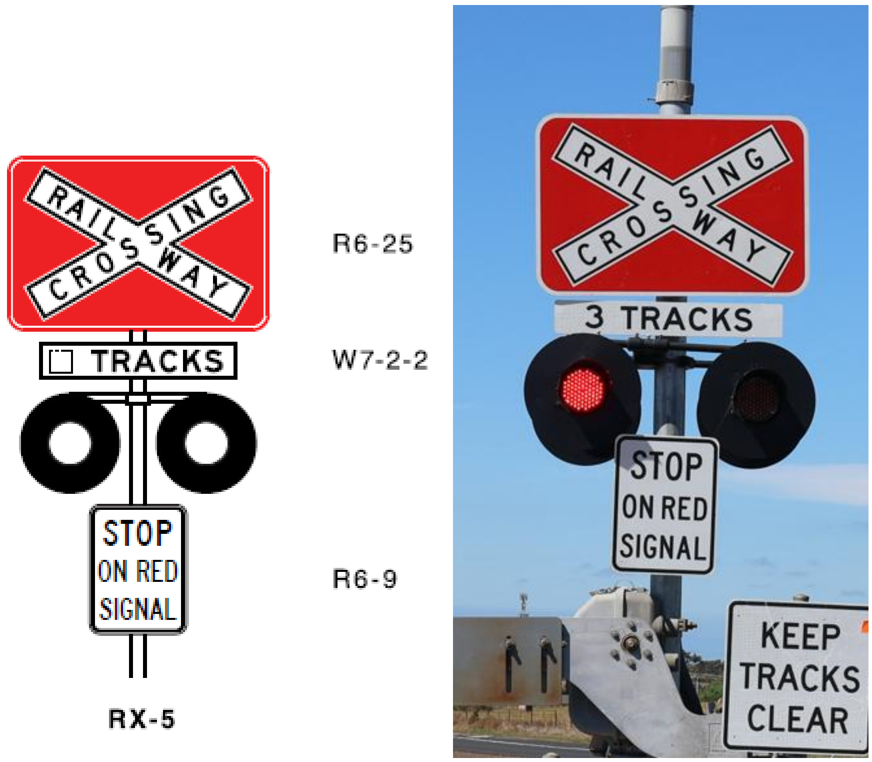

Figure 8 RX-5 flashing signal assembly [5]

- **Use of LED flashing lights**
  The lights used in RX-5 signals are now LED arrays which provide very bright and visible indications, even when viewed against a bright sky. They are surrounded by shields which obscure the sky around the light, enhancing its visibility.

- **Boom Barriers**
  The boom gates (shown in Figure 9) stand across the roadway when the crossing is active providing a strong visual barrier which can be seen by motorists.

[5] P16 (Australian Standard, 2016)

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Figure 9 Boom barrier controls on eastern crossing approach

The potential for sun glare has therefore been mitigated.

5.5. ALCAM ROAD MODEL OUTPUTS FOR THIS CROSSING

Likelihood

Exposure Factor: 0.01362

Raw Infrastructure Factor: 50

Infrastructure Factor: 0.99292

Likelihood Factor

0.01353 probable collisions per year (74 years between collisions).

Within Victoria this places the site in the Top 10% Likelihood Band for all crossings and in the Top 30% Likelihood band for crossings with boom barrier type controls.

Across all public crossings in the ALCAM system the site is in the Top 10% Likelihood Band for crossings of all control types and in the Top 30% Likelihood band for crossings with boom barrier controls.

Consequence

Consequence Factor is 0.23284 probable equivalent fatalities per collision

Risk

Risk Factor is 0.00315 probable equivalent fatalities per year (318 years between fatalities).

Within Victoria this places the site in the Top 10% Risk Band for all crossings and in the Top 20% Risk Band for crossings with boom barrier type controls.

Across all public crossings in the ALCAM system the site is in the Top 10% Risk Band for crossings of all control types and in the Top 20% Risk Band for crossings with boom barrier controls.

5.6. EXISTING CROSSING - COMMENTS AND RECOMMENDATIONS

This road crossing is well controlled and constructed to meet Australian Standards. While the rail traffic is moderately heavy and consists mainly of high-speed passenger trains, the boom barrier controls provide adequate warning and impose a visual barrier which is effective in minimising the risk of drivers crossing against the controls.

The only significant local infrastructure risk is created by the poor track panel condition, particularly the pot holes around the rails shown in Figure 6.

It is recommended that repairs be prioritised by ARTC.

6. PROPOSED DEVELOPMENT IMPACTS ON ROAD CROSSING

The Development will increase the level of road traffic over the crossing as residents and business park operations travel to and from Lara.

The weekday traffic level when the development is fully completed is estimated to be 3,687[6].

(Traffix Group, 2026)[7] have used a 90% ratio of 7 day vs weekday traffic numbers on the basis of observed traffic counts. If this ratio is applied to the final design the 7 day estimate (equivalent to AADT) would be 3,318vpd.

The current proportion of heavy vehicles on Canterbury Road East has been counted as 5%. This concurs with site observations where nearly all traffic was light vehicles.

While the business park will generate truck traffic, this is not anticipated to use Canterbury Road East. It is assumed that this traffic will directly access the Princess Freeway[8]. Only a minimal proportion of the traffic generated from the residential Development area will be heavy vehicles. It is therefore proposed that the 5% heavy vehicle proportion is likely to remain for the completed Development.

6.1. ALCAM ROAD MODEL OUTPUTS FOR THE PROPOSED CROSSING TRAFFIC

The following ALCAM road model outputs are likely to apply to the crossing at the conclusion of the Development.

Likelihood

Exposure Factor: 0.018750

Raw Infrastructure Factor: 50

Infrastructure Factor: 0.99270

Likelihood Factor

0.018613 probable collisions per year (54 years between collisions).

Consequence

Consequence Factor is 0.23284 probable equivalent fatalities per collision

Risk

Risk Factor is 0.004334 probable equivalent fatalities per year (230 years between fatalities).

The comparison between the ALCAM scoring for the existing and proposed Development is shown in Table 1 below.

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[6] P70 (Traffix Group, 2026)

[7] P114 (Traffix Group, 2026)

[8] P51 (Traffix Group, 2026)

	Exposure Factor		Infrastructure Factor		Likelihood			Consequence		Risk		
	Collisions/ Year	% of baseline	Factor	% of baseline	Collisions/ Year	Years/ Collision	% of baseline	Factor	% of baseline	Fatalities/ Year	Years/ Fatality	% of baseline
Baseline (Existing)	0.01362	100.0%	0.99292	100.0%	0.01351	74	100.0%	0.2328	100.0%	0.003145	318	100.0%
Full Development traffic	0.01875	137.7%	0.9927	100.0%	0.01852	54	137.0%	0.2328	100.0%	0.004348	230	138.3%

Table 1 Comparison of road crossing risks

The 73% increase in road traffic will therefore result in a 38% increase in level crossing collision risk.

Traffix Group have suggested that the existing road crossing controls and environment are adequate for the level of traffic increase[9]. We agree with this view based on the following:

- While the level of train traffic at the site is relatively high and poses hazards relating to the speed of the trains, these risks are well controlled by the crossing infrastructure.
- There are no significant factors related to the road environment, nearby intersections or other control points which might lead to vehicle congestion in the vicinity of the crossing, even with the proposed traffic increase.
- The crossing has the highest level of control applied to level crossings in Australia and would not benefit from any additional secondary controls.
- The final proposed traffic levels and the ALCAM risk score are not extreme for boom-barrier controlled crossings. They fall well short of any known threshold for upgrading to grade separation.

[9] P71 (Traffix Group, 2026)

7. PEDESTRIAN CROSSING FACILITIES

The existing Canterbury Road East level crossing does not have any pedestrian crossing facilities to assist pedestrians or cyclists to cross safely. This is primarily because there is very little existing pedestrian use.

If such users cross the rail corridor at the crossing they do so on the roadway and have the benefit of the flashing lights and audible warnings.

The Development will house families who will need to access Lara for purposes including shopping, school and recreation. Some of these will travel on foot or by bicycle as the town is quite close.

It is anticipated that once the Development is complete there will be an estimated average of 483 pedestrians and cyclists using the crossing per day[10].

It is unsafe for this quantity of pedestrians to continue to use the roadway when road traffic will also increase. A formal pedestrian crossing facility must be constructed as part of the Development.

As the Development will be located on the southern side of Canterbury Road East it is suggested that pedestrian and cycle traffic only need to operate on the southern side of the road and use existing pedestrian paths and crossing points once within the town. There appears no benefit to residents to cross Canterbury Road East from the estate on the higher speed eastern approach to the crossing in order to cross the rail line on the northern side.

Figure 10 shows the suggested pedestrian route in red. It connects with the suburban footpath on the southern side of the road.

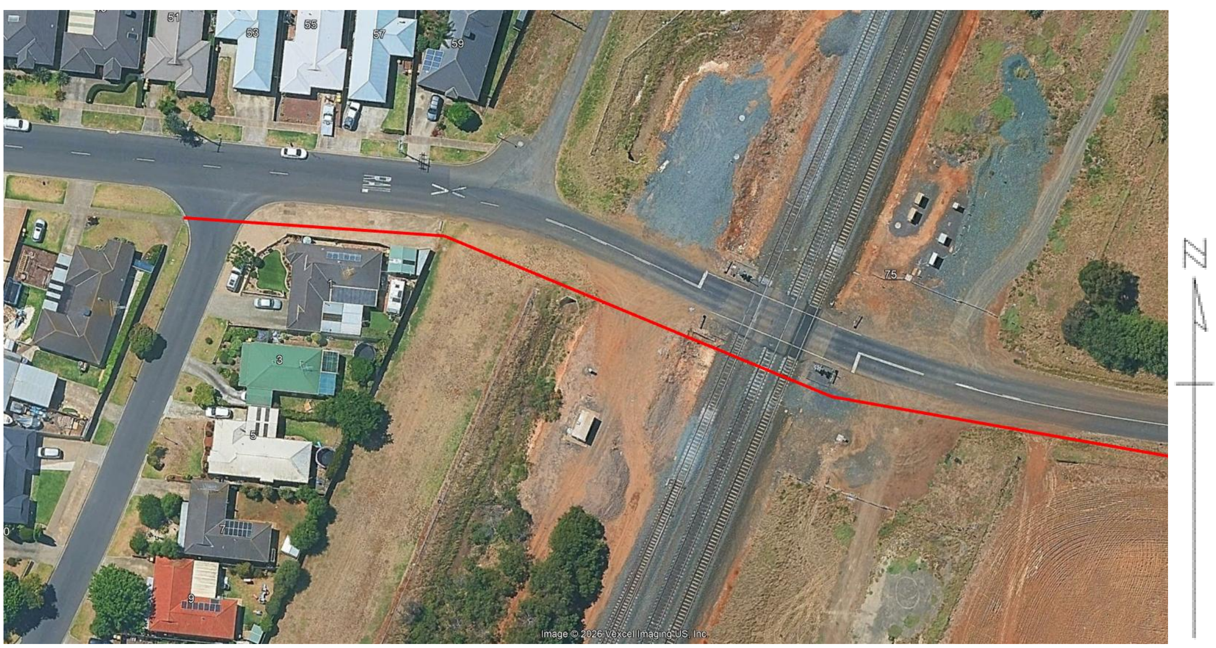


Figure 10 Pedestrian route

There is no footpath beyond the Lara residential area. Figure 11 shows the route of the western approach.

[10] P77 (Traffix Group, 2026)

Figure 11 Western approach route

Figure 12 shows the view across the rail lines where the crossing would need to be created.

Figure 12 Proposed path view

As can be seen in Figure 12 the pedestrian crossing approach path would need to span the deep open drain in the south western quadrant of the crossing, extending the existing culvert which runs under the western side of the road crossing.

7.1. PEDESTRIAN CONTROLS

Possible primary pedestrian crossing controls include:

- Passive maze (which requires the pedestrians to see approaching trains and judge whether they will be able to cross).
  In this case there will also be adjacent train activated warnings from the road crossing, both flashing lights and audible.
- Active pedestrian gates (which activate with the road crossing and provide enough warning time for pedestrians to cross).
- Active pedestrian gates with latched emergency egress.
  Emergency egress is a fenced area which provides a safe place to wait if a pedestrian is trapped inside the gates. The exits for these gates can be electromagnetically or mechanically locked to prevent the egress gates being used to bypass the closed crossing gate.

  Active gates with latches are now the industry standard in Victoria as they provide better levels of pedestrian control and less opportunity for deliberate bypass.

Pedestrian use of this crossing is subject to the following hazards:

- Three tracks operate over the crossing, all of which potentially can have a train approaching. Trains could be approaching from both directions simultaneously. It is very difficult for people to focus on multiple approaching vehicles. It is also possible that a train is hidden behind another train and is not visible to a pedestrian seeking to cross (known as masking). In this scenario it is likely that a crossing user will be unaware of the danger.
- The pedestrian crossing distance will be approximately 14.7m. Pedestrian walking speeds vary, so some pedestrians may take longer than others to cross, or may underestimate the time to cross all tracks. A long crossing distance coupled with very fast trains means that pedestrians need to be able to see trains a long way away (in this case 724m). Such sighting distances ae not available at this crossing, with two of the quadrants having only 300-400m of available sighting distance.
- As discussed in section 5.3, people have difficulty in accurately perceiving the speed of approaching trains above 100kph. As trains operate up to 160kph at this crossing it will be unlikely that pedestrians will be able to see these fast approaching trains and be able to accurately judge their ability to cross in front of them on foot.

Any kind of passive pedestrian control is therefore unsuitable at this crossing.

Active pedestrian crossings constructed across the Victorian networks now generally incorporate latched emergency egress systems. This is particularly the case on high risk crossings such as Canterbury Road East.

Pedestrian behaviour must be limited as much as possible to prevent wilful bypassing of active controls. Train activated swing gates pose a high physical barrier when closed which is difficult to climb. Similarly, latched egress gates prevent pedestrians seeking to bypass the main gate using the egress area.

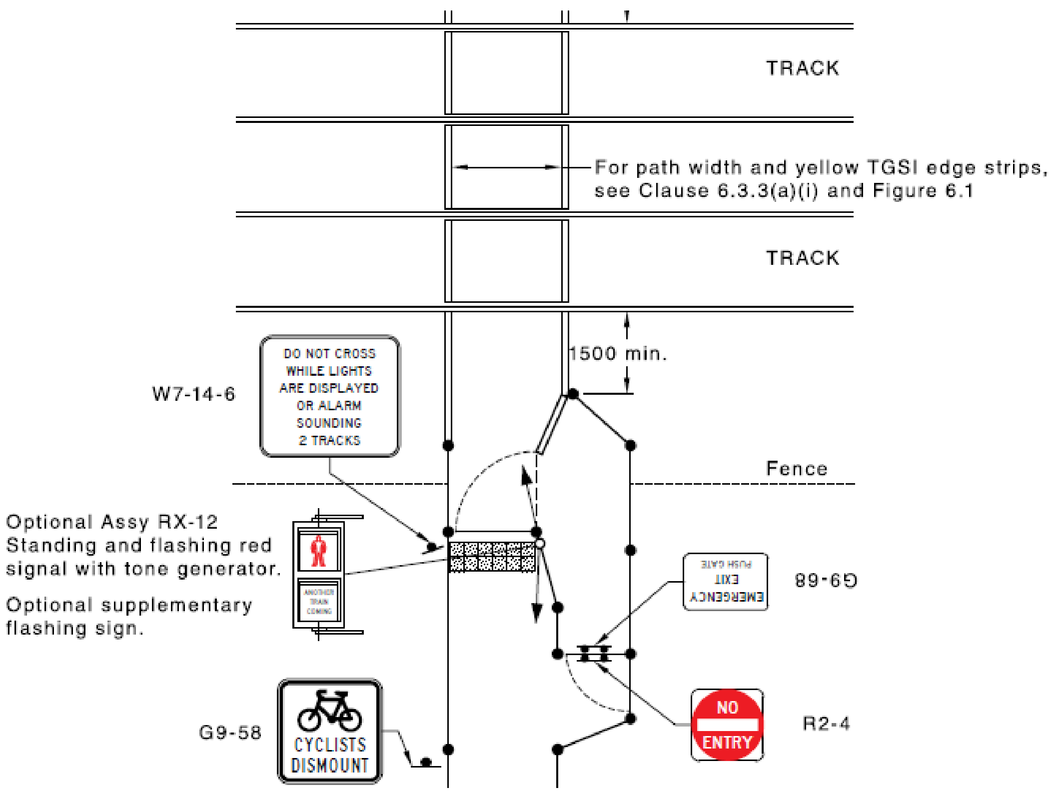
It is therefore recommended that active gates with latched emergency egress are provided at this pedestrian crossing.

It is recommended that corridor fencing be provided running from the eastern pedestrian maze back along the rail corridor for sufficient distance that it is easier for users to use the crossing than it is to attempt to bypass it and climb over the tracks. This fencing must be high enough and of the type of construction that it is difficult to climb. Typically this is 1.8m pool style mesh fencing.

It is also recommended that wing fencing be provided on the southern side of the western access path to keep pedestrians from straying into the rail corridor. Figure 11 shows this area.

7.2. CYCLISTS

It has been assumed in the calculation of likely pedestrian traffic[11] that cyclists will dismount in order to use the pedestrian crossing as pedestrians. This is how pedestrian crossings on shared paths are designed to work, with G9-58 "cyclist dismount' signage part of the standard warnings displayed (see Figure 13).



NOTE: Requirements for the use of the CYCLISTS DISMOUNT sign are specified in Clause 6.5.4.

DIMENSIONS IN MILLIMETRES

FIGURE F6 GATED CROSSING—SITE LAYOUT (2 TRACKS)

Figure 13 Active pedestrian crossing layout Fig F6 (Australian Standard, 2016)

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[11] P77 (Traffix Group, 2026)

In practice cyclists have been observed to seldom dismount at active gated pedestrian crossings which allow the user to proceed straight across without having to navigate a maze. This is despite the signage, which is advisory only[12]. This can cause disruptions and risks to pedestrians and other cyclists if the path width is insufficient and there is enough traffic to induce frequent conflicts on the crossing path.

It is recommended that the width of the crossing enclosure and path be constructed to the maximum practical in order to minimise the effects of cyclists passing pedestrians while on the tracks.

The predicted cyclist and pedestrian volume for this crossing is low, so conflicts are less likely to occur than at busy urban crossings.

Cyclists also have the right to travel on the roadway and use the road crossing. In this case the cyclist is considered to be a road vehicle and is subject to Road Rules, including obeying the level crossing signals.

7.3. ALCAM PEDESTRIAN RISK SCORING

The following ALCAM pedestrian model outputs are likely to apply to the crossing at the conclusion of the Development.

Likelihood

Likelihood Factor is 0.000384 probable collisions per year (2,607 years between collisions).

Consequence

Consequence Factor is 0.999992 probable equivalent fatalities per collision

Unlike vehicle collisions which can be survivable, pedestrian collisions with high speed trains are almost universally fatal, hence the high consequence factor. This also leads to the Risk Factor being virtually the same as the Likelihood Factor.

Risk

Risk Factor is 0.000384 probable fatalities per year (2,607 years between fatalities).

It can be seen that, with appropriate controls, the risk to pedestrians can be managed to a reasonably practical level.

[12] Section 6.5.4, P52 (Australian Standard, 2016)

8. THE AUTHOR

Peter Nelson-Furnell

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Peter;

1. Has been employed in the rail industry since 1980 when he commenced working as a track surveyor and designer for Australian National.
2. Was the chair of the national ALCAM committee from 2008 to 2017 and developed the software supporting this system. He led the development and enhancement of both the ALCAM road and pedestrian crossing models.
3. Worked for the South Australian Rail Safety Regulator prior to the formation of the Office of the National Rail Safety Regulator (ONRSR) and developed incident reporting protocols for the national rail incident classification system.
4. Was the Manager Railway Crossing Safety for Public Transport Victoria from 2009 to 2017. This role included responsibility for oversight over the Victorian level crossing safety upgrade programs and providing advice to the Victorian government and Minister of Transport on railway crossing safety policy and programs in Victoria.
5. Was secretary of the Victorian Railway Crossing Safety Steering Committee which discussed and decided on issues involving railway crossing safety. I also acted as industry lead on a number of national research projects involving railway crossing technologies.
6. Since 2017 has contributed to many railway crossing risk evaluations and authored expert reports on behalf of Nelson Furnell Pty Ltd for a range of clients including rail transport operators (both main line and heritage), Departments of Transport and road authorities across the eastern States and Western Australia.
7. Has appeared as an expert witness in Coroners enquiries into a number of fatal level crossing crashes and in a heritage matter relating to the Lydiard Street Ballart level crossing.

Nelson-Furnell Pty Ltd provides expert consulting, field survey services and training for the ALCAM community, including stakeholder rail and road organisations and interested parties such as Lara Farms, as well as government and other bodies concerned with level crossing risk.

9. APPENDIX A - ALCAM RATING REPORTS

The full rating detail as produced by the ALCAM risk models and used in this report is included below.