Millerton Road Ngakawau LCSIA

Bathurst Resources Limited

Project Number 310206316

August 2026

Stantec New Zealand

Rev	Description	Author	Quality Check	Independent Review	Date
0	Draft for comment	S. Jayasinghe	S. Bosher	M. Muirson	13/12/2024
1	Issue 1	S Jayasinghe	S Bosher	M Muirson	04/08/2026

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Table of Contents

List of Tables

List of Figures

Executive Summary

Bathurst Resources Limited ("Bathurst") are planning to progress their development and mining of coal resources across the Buller Plateau which will increase the number of heavy commercial vehicle (HCV) movements on SH67 by approximately 180 heavy vehicle movements per day on SH67 to haul coal from Denniston to Stockton for processing, before being placed on the coal train. This constitutes as a change in use. The increased HCV movements will operate for a period of 18-24 months, whilst a new haul road is constructed connecting Denniston and Stockton mining sites. When complete, the HCV movements will cease to use SH67 and travel via the haul road.

This Level Crossing Safety Impact Assessment (LCSIA) has been prepared, to assess the safety impact the change in use has to the level crossing. The Level Crossing Safety Score (LCSS) procedure consists of four categories and scores the risk of each crossing point at four different assessment stages of the project. The tables below detail the progression of the scoring for the level crossing through the stages of the LCSS.

The Future Score assessment in this LCSIA shows the level crossing after the HCV traffic movements have diverted to the new haul road between the two mines

Summary of LCSS changes at Millerton Road Ngakawau [1410] level crossing

	Updated Existing	Change in Use	Proposed Design	Future Score
LCSS	**20**	**25**	**19**	**17**
LCSS Band	**Medium Low**	**Medium Low**	**Low**	**Low**
Criterion Met	C1	C1	C1 & C2	C1 & C2
Form of Control	FLBs	FLBs	FLBs	FLBs
ALCAM risk band	Medium Low	Medium Low	Medium Low	Medium Low
ALCAM % change	N/A	73%	49%	-13%
Fatal return period	9,401 years	5,463 years	6,338 years	10,814 years

The Updated Existing LCSS risk band is Medium Low, and the Change in Use LCSS increases the Medium Low LCSS risk band threshold. The Proposed Design and Future score both achieve both Criterion 1 and Criterion 2. Therefore, half-arm barriers are not required to achieve Criterion 1 for the Proposed Design and Future Score.

The following recommendations were made by the LCSIA Assessor to reduce the LCSS at the road level crossing to achieve Criterion 1.

Summary of recommendations

No.	Recommendation	Level of Necessity
1.	Implement a left-in, left-out restriction on the HCV haul at the SH67 / Millerton Road intersection to reduce short stacking risk and improve traffic flow for the intersection	
2.	Trim vegetation along northeast quadrant to improve sightlines, and to improve visibility of advanced warning sign on SH67 southern approach	Maintenance
3.	Investigate adding traffic signals (linked to the level crossing) to stop HCV traffic meeting each other at the narrow locations of the level crossing and up the hill along Millerton Road.	
4.	Investigate widening level crossing if traffic signals are not viable.	
5.	Renew all old, damaged and ineffective road signage	Maintenance

No.	Recommendation	Level of Necessity
6.	Investigate reducing the hump over the level crossing to stop possibility of heavy vehicles grounding out	
7.	Monitor pavement issues over the level crossing	Maintenance
8.	Install missing advanced warning signage on Millerton Road as per TCD Pt.9	Maintenance
9.	Seal the private accessway back to the boundary to stop detritus onto Millerton Road and the level crossing	Maintenance
10.	Investigate adding street lighting over level crossing	
11.	Investigate installing an additional set of FLBs on the existing primary FLBs post that face the oncoming downhill traffic	
12.	Paint yellow cross hatching over level crossing to reduce likelihood of queuing on the tracks	TCD Pt.9
13.	Conduct drainage improvements where water is ponding near the level crossing and at the SH67 / Millerton Road intersection	Maintenance

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

1 Introduction

1.1 Level Crossing Safety Impact Assessment (LCSIA)

There are approximately 1355 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[1] 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 level crossing is placed into the following risk bands in Figure 1-1.

Figure 1-1: Level crossing safety score risk bands

1.2 LCSIA Criteria

There are two criteria applicable to level crossings, which differ depending on whether the level crossing is a new crossing facility or an upgrade to an existing level 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 level 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 level crossing must meet ***Criterion 1***. Where the modifications required to meet Criterion 1 are not ***reasonably practicable***[2]***,*** 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] 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.
[2] Refer to section 1.3.1 of the Level Crossing Risk Assessment Guidance v5 (April 2022).

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 an excerpt 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)

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 existing and future issues that need to be addressed at the crossings.
4. Recommendations to improve safety at the level crossing to achieve, or attempt to achieve, Criterion 1.
5. 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 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.
   c. **PROPOSED DESIGN:** An LCSS of the change in use that aims to achieve Criterion 1. Allows for an initial increase of heavy commercial vehicles (HCV) to the level crossing.
   d. **FUTURE SCORE:** An LCSS that aims to achieve Criterion 1 when the HCV are using the newly constructed haul route between the two mines.

1.5 LCSIA Assessor Independence

The LCSIA Assessor has had no prior involvement with the change in use project at the Millerton Road Ngakawau level crossing location. This LCSIA has been conducted prior to the consent application phase.

1.6 Site Visit

On Wednesday 6th November 2024 at 11am the site visit was conducted by the LCSIA Assessor (Sayuni Jayasinghe). Those present at the site visit were:

- Stantec: Sayuni Jayasinghe and Chris Rossiter (Observer)

On Friday 29th November 2024, an online meeting was held to assess the Engineer's Risk Scores and meet with KiwiRail, Buller District Council (BDC) and NZTA representatives to discuss the change in use and the history of the level crossing. Those present on the online meeting were:

- Stantec: [redacted]
- KiwiRail: [redacted]
- BDC: [redacted]
- NZTA: [redacted]

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 Stantec'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.

2 The Change in Use and Top down, Hierarchy of Controls Assessment

2.1 The Change in Use

Bathurst Resources Limited ("Bathurst") is seeking to progress the development and mining of coal resources across the Buller Plateau. The aim is to retain the existing infrastructure and mining operations on SH67 as well as to provide access to additional mining areas across the Buller Coal Plateau via Denniston Road.

For an 18 to 24 month period of time there will be an increase of approximately 180 heavy vehicle movements per day on SH67 to haul coal from Denniston to Stockton for processing, before being placed on the coal train. This will occur while a new haul road is constructed connecting Denniston and Stockton mining sites. When complete, the HCV movements will cease to use SH67 and travel via the haul road.

Therefore, this LCSIA is being completed for the existing level crossing to assess the existing situation of the level crossing and its safety. Buller District Council also asked for an assessment of whether the existing situation should be improved with safety interventions, other than increasing the form of control.

2.2 Top down, Hierarchy of Controls Assessment

The closure of Millerton Road level crossing is unlikely as it provides the only access to the Millerton settlement.

Grade separation would be highly unlikely due to the significant cost for a relatively low volume of traffic and that it would be out of context with the surrounding road environment. There would likely be other level crossings in the South Island that would get grade separated before this one ever was. There would be a significant impact to neighbouring properties and require significant changes to SH67.

Based on the above reasoning, grade separation and closure of the level crossing would not appear to be viable.

3 Millerton Road Ngakawau LCSIA

3.1 Level Crossing Details

The Millerton Road Ngakawau level crossing is located within the settlement of Granity as seen in Figure 3-1 and crosses over the Stillwater - Ngakawau Line. The road level crossing is currently controlled by a set of duplicated flashing light and bells FLBs on each approach. Figure 3-2 shows the aerial view of the level crossing layout and how it interacts with other aspects of the transport network.

Within close walking distance to the level crossing are the following vulnerable users.

- Granity School (10 minutes walk)

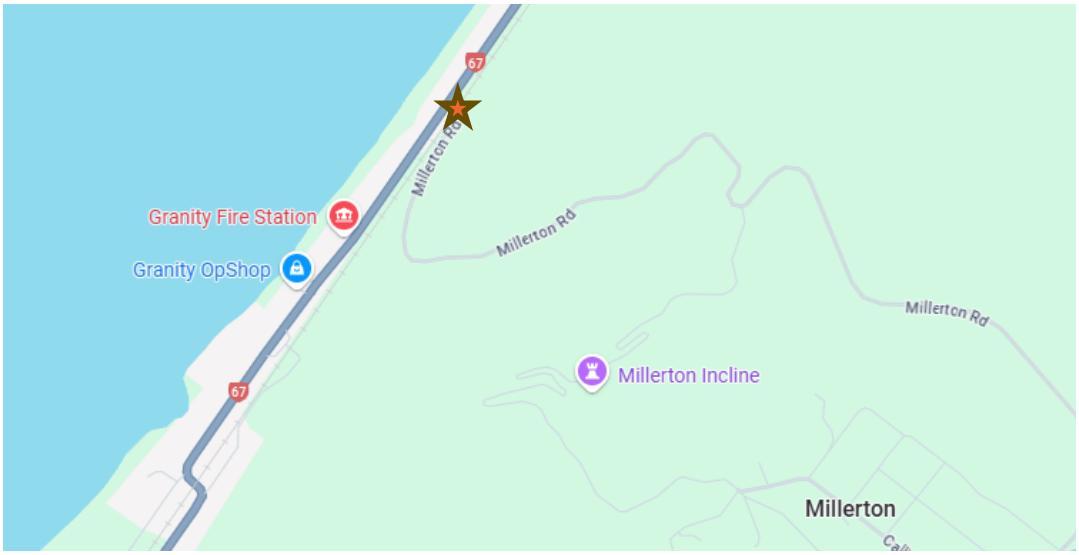

Figure 3-1: Millerton Road Ngakawau level crossing location (Source: Google Maps)

[redacted]

3.2 Existing and Future User Volumes

Over the last 10 years, the growth rate within the region has been decreasing by 5% annually. Therefore, a 0% growth rate is assumed.

In the short term, traffic volumes are expected to increase by approximately 180 heavy vehicles per day for the next 18-24 months. After this period, traffic volumes are anticipated to return to existing levels or potentially decrease further, as the haul road will be used to transport coal. All user data is presented in Table 3-1.

Table 3-1: Existing and Future Level Crossing User volumes

Level Crossing Characteristics		Updated Existing	Proposed Design	Change in Use / Future Score
Vehicle AADT		240	390	240
HCV (%)		18%	53%	18%
Posted Speed Limit		70km/h	70km/h	70km/h
FRIEGHT Trains	No. per day	8	8	8
	Line Speed	50 km/h	50 km/h	50 km/h
	Operating Speed UP	50 km/h	50 km/h	50 km/h
	Operating Speed DOWN	50 km/h	50 km/h	50 km/h
Operational Tracks		1	1	1

3.3 Existing Conditions at Site Visit

The level crossing is controlled by duplicated FLBs on both approaches to the level crossing as shown in Figure 3-3 and Figure 3-4. Of interest on the eastern approach, is the primary FLBs are facing a private accessway and the secondary FLBs are facing the oncoming Millerton Road traffic. This is not of particular concern as there is a set of FLBs facing the approaching traffic, it is just noted as being unique. We also note that KiwiRail have informed in the past that they do not install FLBs to face private accessways, therefore it makes this situation even more unique.

Figure 3-3: Western approach to level crossing from SH67

Figure 3-4: Eastern approach to level crossing from Millerton Road

There are 'no parking' lines painted in all four quadrants of the level crossing and other line marking is generally in a good condition. The carriageway through the level crossing is quite narrow with no sealed shoulders on either side. Additionally, there is no street lighting at or near the level crossing.

The sightlines from the western approach both up and down track have good visibility with no vegetation obstruction as shown in Figure 3-5 and Figure 3-6. However, it is possible to envisage the vegetation in both directions could grow higher and become a sight distance restriction in the future.

Figure 3-5: UP track sightline on western approach

Figure 3-6: DOWN track sightline on western approach

The sightlines up track from the eastern approach has an obstructed view of oncoming trains (UP track) due to vegetation as shown in Figure 3-7. There is good sightline visibility down track from the western approach as shown in Figure 3-8. However, there is a possibility that the vegetation around could grow and become a sight distance restriction in the future.

Figure 3-7: UP track sightline on eastern approach

Figure 3-8: DOWN track sightline on western approach

Figure 3-9 shows the condition of the crossing panel to be in a bad condition with some parts breaking up. There is also some ponding occurring around the tracks which could accelerate pavement failures. This image also shows the narrow width of the crossing, which is exacerbated by the sharp bend in the road, that will have HCV already tracking over the centreline to negotiate the bend. There is some tracking of gravel from the adjacent private entrance onto the road surface which impacts skid resistance and reduces effective width further.

There are gouge marks on the road over the crossing panel, possibly caused by heavy vehicles grounding out on the hump at the level crossing, as shown in Figure 3-10.

Figure 3-9: Track panel is breaking up

Figure 3-10: Small hump over crossing with gouge marks

There is additional water ponding occurring near the level crossing on the downtrack side and at the SH67 intersection as seen in Figure 3-11 and in Figure 3-12 respectively.

Figure 3-11: Water ponding on left side of road from eastern approach

Figure 3-12: Water ponding on eastern side of road exiting into SH67

There is a private accessway approximately 6m from the level crossing on the eastern departure side of the level crossing as shown in Figure 3-13. The secondary FLB faces the oncoming Millerton Road traffic, while the primary FLBs face the accessway, as shown in Figure 3-14. Both FLBs are in good condition.

[redacted]

The FLBs facing traffic approaching the level crossing from SH67 are on slight angles to provide better visibility for turning traffic off SH67. There is a short stacking length of 20m between the tracks and GIVE WAY limit line for the SH67 intersection as shown in Figure 3-15. Note there is no right turn bay into Millerton Road on SH67. The short length steepens the gradient of the western approach as see in Figure 3-16.

Figure 3-15: Short stacking to limit line of SH67 intersection

Figure 3-16: Steep gradient on western approach

The WXR2 advanced warning sign on the southern approach of SH67 is shown in Figure 3-17. The sign is hidden to road users by vegetation. The sign is also in average to poor condition, with lichen growing on the post and possible loss of night-time reflectivity due to it being installed in October 1999. The same sign on the northern approach is also 25 years old and in a poor state.

Figure 3-17: WXR2 sign on approach from south of SH67 hidden behind vegetation

Figure 3-18 shows the 'Rail X' road marking on the eastern approach via Millerton Road to be in a good condition. There are no other advanced warning signs from this approach. As can be seen, the road is very narrow at this point and two HCVs would not be able to pass each other in opposite directions safely.

Figure 3-19 shows the FLBs can be seen from the 'X' road marking closer to the level crossing.

Figure 3-18: 'Rail X' road marking on Millerton Road

Figure 3-19: Visibility of FLBs from 'Rail X' marking

3.4 Existing Safety Issues

There are 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.

1. **No half-arm barriers at level crossing.** Therefore, the risk of drivers driving through the activated level crossing are higher. This could lead to a train versus vehicle crash, if the motorist had not clearly observed the activated FLBs due to distraction, inattention, or wilful behaviour.
2. **Short stacking of heavy commercial vehicles (HCV)**. The available stacking length between the tracks and SH67 is insufficient for longer heavy vehicles placing them over the level crossing while waiting to turn into SH67.
3. **Vegetation obscuring up track sightlines**. The visibility for motorists approaching from the east is significantly reduced due to vegetation obscuring the line of sight, presenting a hazard from oncoming southbound trains.

4. **Hump over level crossing causing some gouge marks on the western side of crossing panel.** The hump over the level crossing on Millerton Road has gauge marks indicating the possibility of heavy vehicles grounding out due to the gradient of the road. There are no signs to warn motorists of this. The eastern side of less of a concern due to the gradient of the road.
5. **Damaged crossing panel.** Areas of the crossing panel are showing some signs of wear / deterioration with failure at the joint of the crossing panel and pavement approach. Some ponding is also occurring near the tracks. Renewal of the crossing panel may be required in the coming years.
6. **Vegetation obstructing view of WXR2 sign on approach from south of SH67.** The sign is not visible for motorists travelling north on SH67 as vegetation blocks it.
7. **Narrow road width on Millerton Road.** The width of Millerton Road is quite narrow in places where two HCV could not safely pass each other in opposing directions.
8. **Missing advanced warning signage on Millerton Road.** There is no advanced warning signs on Millerton Road which goes against TCD requirements.
9. **Damaged, non-reflective and old signage.** Majority of the signage for the level crossing dates to 1999, has lichen growing on both the sign and the pole, have lost their night-time reflectivity as well as being damaged.
10. **No street lighting of level crossing.** There is no street lighting provision at, or near, the level crossing.
11. **Ponding occurring around the level crossing.** Ponding was occurring around the south-east quadrant at the intersection of SH67 and Millerton Road between the highway and the level crossing and on the south eastern side of the level crossing which could accelerate pavement failures.
12. **Primary FLB on Millerton Road approach to level crossing is not facing oncoming traffic**. The primary FLBs on Millerton Road approach does not face oncoming traffic from the road but rather faces the nearby private accessway which is not typical. However, this is mitigated by the secondary FLBs facing the oncoming traffic, so the risk is rather low.

3.5 Future Issues

Bathurst Resources plans to increase heavy vehicle volumes over the level crossing by approximately 180 movements per day for approximately 18-24 months until an alternative haul route is constructed. This will increase the likelihood of two HCVs passing each other at the level crossing and on the hill section of Millerton Road which becomes very narrow in places and is not two full lanes. It will also increase the number of short-stacking HCVs at the SH67 / Millerton Road intersection.

An investigation of where laden trucks can wait is part of the integrated transport assessment (ITA), but it could be that trucks wait on the side of SH67, north of the Millerton Road / SH67 intersection – at a place that will not unsafely obscure traffic sightlines at the intersection.

To limit interference at the SH67 / Millerton Road intersection, the ITA is recommending that haul trucks will only be left-in, left-out only. Therefore, the need for a right-turning traffic is shifted up to Bathurst owned land up at the Ngakawau railway station. Haul vehicles will right turn onto Tyler Road, complete a turnaround just beyond Dole Street (on Bathurst land) and then exit Tyler Street via SH67. This will also stop HCV travelling down the residential area on Dole Street.

Train volumes are expected to remain the same over the next 10 years.

3.6 Safety Recommendations

The recommendations to improve safety at the road level crossing are outlined in Table 3-2. Figure 3-20 shows how these changes would look in an aerial view. The column on the right states the level of necessity of the recommendation from the following list:

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

Table 3-2: Safety recommendations for the road level crossing

Safety Recommendation	Necessity
1. Implement a left-in, left-out restriction on the HCV haul at the SH67 / Millerton Road intersection to reduce short stacking risk and improve traffic flow for the intersection	
To reduce the potential queuing and short-stacking over the level crossing, implement a restriction on right turn exit movements for haul HCV's exiting Millerton Road onto SH67. This would exclude shorter rigid trucks and light vehicles which do not short stack over the level crossing. To improve the flow of the intersection and any potential queueing on SH67 for right turning HCV, enforce a left-in, left-out arrangement for haul HCV traffic. As recommended by the ITA report, right turn HCV will instead turn around at Ngakawau railway station (to the north) and then a left-turn in movement onto Millerton Road.	
2. Trim vegetation along northeast quadrant to improve sightlines, and to improve visibility of advanced warning sign on SH67 southern approach	Maintenance
Trim trees and hedge along northeast quadrant to improve sightlines up track on Millerton Road. And around advanced warning sign on the southern approach from SH67 as the sign is hidden behind overgrown vegetation.	
3. Investigate adding traffic signals (linked to the level crossing) to stop HCV traffic meeting each other at the narrow locations of the level crossing and up the hill along Millerton Road.	
Installing traffic signals at the level crossing and the top of the hill on Millerton Road to manage the flow of HCV traveling in opposing directions. As Millerton Road is narrow going up the hill, it would be challenging for two HCVs to safely pass each other simultaneously.	
4. Investigate widening level crossing if traffic signals are not viable.	
Widening the level crossing might reduce the occurrences of HCVs crossing the centreline when traversing the level crossing. Due to the steep incline immediately on the eastern side of the level crossing this may not be possible to complete without major earthworks and retaining walls. Therefore, other methods of controlling haul traffic may be investigated in parallel.	
5. Renew all old, damaged and ineffective road signage	Maintenance
Many signs are past their best and need to be replaced with new signs that meet current NZTA standards.	
6. Investigate reducing the hump over the level crossing to stop possibility of heavy vehicles grounding out	
The gouge marks present indicated some low lying vehicles or trailers are catching the crossing panel. The western approach to the level crossing is already steep, so further investigation needs to occur to determine whether the hump can be reduced.	
7. Monitor pavement issues over the level crossing	Maintenance
Review pavement integrity and repair any minor effects across the level crossing, repair failure at joint of the crossing panel and pavement approach, and issues of ponding by the tracks. With increased HCV movements deterioration could happen at a faster rate.	

Safety Recommendation	Necessity
8. Install missing advanced warning signage on Millerton Road as per TCD Pt.9	TCD Pt.9
Install missing advanced warning signage as per TCD Pt.9, at a minimum a WX1L sign. It is accepted there is limited space available on the outside of Millerton Road due to the hill edge, and this could be difficult to implement in reality.	
9. Seal the private accessway back to the boundary to stop detritus onto Millerton Road and the level crossing	Maintenance
To better protect the eastern approach and the crossing panel, the private accessway should be sealed back to the road boundary	
10. Investigate adding street lighting over level crossing	
Adding street lighting over the level crossing will increase awareness of each other for motorists and locomotive engineers.	
11. Investigate installing an additional set of FLBs on the existing primary FLBs post that face the oncoming downhill traffic	
The primary FLBs on Millerton Road downhill approach face the nearby private accessway should be turned to face oncoming traffic from Millerton Road. Alternatively investigate whether another set FLBs to face oncoming traffic from Millerton Road while also keeping the existing FLB functioning as is.	
12. Paint yellow cross hatching over level crossing to reduce likelihood of queuing on the tracks	TCD Pt.9
Paint yellow cross hatching over the level crossing to increase user awareness of the crossing and reduce likelihood of queuing over the level crossing.	
13. Conduct drainage improvements where water is ponding near the level crossing and at the SH67 / Millerton Road intersection	Maintenance
There is a couple of locations in the vicinity of the level crossing where water is not draining away from the road properly. Conduct drainage improvements to move the water from the road pavement.	

3.7 Level Crossing Safety Score (LCSS)

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

3.7.1 ALCAM Score

ALCAM scores are assessed in 'Proposals' mode in the LXM database[3] 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.

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 3-3.

Table 3-3: ALCAM ID 1410 - Millerton Road Ngakawau level crossing ALCAM score

Stage	LCSS	Fatality return	Risk % change	Comments
Updated Existing	**8**	9,401 years	**-**	The following changes were made based on conditions found on site. • Decreased AADT from 490vpd to 240vpd • Increased HV% from 10% to 18% • Updated Road Panel width to be 8m (previously 5m) • Track panel: 'Poor' surface condition. • Added Rail-X pavement marking • Increased shortest and longest warning time from 0 s to 22 s due to FLBs • Changed slow train speeds to 10km/h • Changed road width to 5m and road clearance width to 6m. • Selected bells/audible devices • Changed Crossing Characteristics – 'Controls (signs and road markings" conform to NZTA TCD Pt 9 **ALCAM risk score is 1.06 and the risk band is Medium Low.**
Change in Use (2027)	**10**	5,463 years	73%	The predicted changes to the road crossing volume is: • Increased AADT from 240vpd to 420vpd • Increased HV% from 18% to 53% **ALCAM risk score is 1.83 and the risk band is Medium Low.**
Proposed Design	**9**	6,338 years	49%	Changes to the road crossing are stated below: • Increased AADT from 240vpd to 420vpd • Increased HV% from 18% to 53% • Selected "Keep tracks Clear sign and yellow cross hatching of crossing" • Selected "Short stacking sign" • Selected "Road traffic signals (active) – secondary control" • Selected "Street lighting at crossing" • Selected Track Panel Surface condition: Good • Selected Track Panel Surface Treatment: Sealed **ALCAM risk score is 1.58 and the risk band is Medium Low.**
Future Score (2030)	**7**	10,814 years	-13%	The predicted changes to the road crossing are stated below: • Decreased AADT from 420vpd to 240vpd • Decreased HV% from 53% to 18% **ALCAM risk score is 0.92 and the risk band is Medium Low.**

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

3.7.2 Crash and Incident History Score

The ten year ORA and CAS data for 2014 - 2023 was analysed (including any incidents from 2024) with the history presented in Table 3-4. Where the total score is greater than 10 points, only a maximum of 10 points can be adopted. There were no CAS crashes related to the level crossing within the search period.

Table 3-4: Crash and Incident History

Database	Incident Type	No.	Comments	Score
ROAD CROSSING				
ORA	NCLV – Near Collision Light Road Vehicle	2	On one instance the light van was only 40m in front of the train when it crossed. The other was a car which drove through FLBs as a train was approaching.	2 x 1 = 2
			TOTAL	**2**

Table 3-5 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 3-5: Summary of Crash and Incident History LCSS

Crossing	Updated Existing	Change in Use	Proposed Design	Future Score	Comments
Millerton Road Ngakawau level crossing	**2**	**2**	**1**	**1**	Adding traffic signals, renewing the signs, adding street lighting and yellow cross hatching will increase awareness of the level crossing and reduce the risk at the level crossing.

3.7.3 Site Specific Safety Score (SSSS)

This site based score aims to analyse some elements of the level crossing layout. The level crossing is assessed in Table 3-6.

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 3-6: Millerton Road Ngakawau level crossing SSSS – ID 1410

Assessed Item	Updated Existing	Change in Use	Proposed Design	Future Score
Crossing Controls ($x_{/5}$)	3	3	3	3
Queuing ($x_{/6}$)	2	2	1	1
Short stacking / grounding out ($x_{/10}$)	9	9	7	7
Accessways / side roads and bisecting intersections ($x_{/6}$)	1	1	1	1
Observed non-compliance ($x_{/3}$)	1	1	1	1
TOTAL SCORE ($X_{/30}$)	**16**	**16**	**13**	**13**
SSSS	**5**	**5**	**4**	**4**
Red Flag Scenario	**N/A**	**N/A**	**N/A**	**N/A**
MODIFIED SSSS				

The short stacking risk was assessed as a four and grounding out as a five for the level crossing, to calculate as nine points for the Updated Existing and Change in Use. If the western approach bans haul traffic from right turns and the hump at the crossing can be improved the score reduces by two points overall.

3.7.4 Engineer Risk Score

The Engineer risk score is a combination of Locomotive Engineer and BDC Engineer opinion of the crash risk at the level crossing, with a weighting of 2:1 in favour of the Locomotive Engineer. Opinions were provided by the following people:

Locomotive Engineer: [redacted]
BDC Engineer: [redacted]

The risk score for the level crossing is presented in Table 3-7.

Table 3-7: Engineer Risk Scores Millerton Road Ngakawau

Engineers Opinion	Updated Existing	Change in Use	Proposed Design	Future Score	Comments
Locomotive Engineer	5	8	6	6	Updated Existing – Quite good sightlines for Locomotive Engineer, but there is vegetation on Millerton Road side. If short stacking were to occur Locomotive Engineer's should see it from far away. Future Score – Still a contingency route for wet weather on Haul Road. Noted that adding HABs will lower the risk further.
Roading Engineer	2	4	2	2	Updated Existing – wet weather conditions can cause slips into train line. Future Score – Still a contingency route for wet weather on Haul Road. Noted they do not think HABs will make a big difference in scoring if implemented.
TOTAL SCORE	**7**	**12**	**8**	**8**	
LCSS	**5**	**8**	**5**	**5**	

Signals engineer has noted trucks travelling downhill in wet weather may lose surface friction when braking and bump into the side of passing trains. Noted that adding a set of traffic lights to the level crossing may help control movements of vehicles and mitigate short-stacking risks, and is an achievable outcome.

4 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. Table 4-1 presents the results of the road LCSS.

Table 4-1: Millerton Road Ngakawau level crossing LCSS [1410]

Scored Items	Updated Existing	Change in Use	Proposed Design	Future Score
ALCAM score	8	10	9	7
Crash & incident history	2	2	1	1
Site specific safety score	5	5	4	4
Engineer risk score	**5**	**8**	**5**	**5**
LCSS	**20**	**25**	**19**	**17**
LCSS Risk Band	**Medium Low**	**Medium Low**	**Low**	**Low**
Criterion Met	**C1**	**C1**	**C1 & C2**	**C1 & C2**
Form Of Control	**FLBs**	**FLBs**	**FLBs**	**FLBs**
ALCAM risk band	Medium Low	Medium Low	Medium Low	Medium Low
ALCAM risk % change	N/A	73%	49%	-13%
Fatal return period	9,401 years	5,463 years	6,338 years	10,814 years

The Updated Existing LCSS risk band is Medium Low, and the Change in Use LCSS increases the Medium Low LCSS risk band threshold. The Proposed Design and Future score both achieve both Criterion 1 and Criterion 2. Therefore, half-arm barriers are not required to achieve Criterion 1 for the Proposed Design and Future Score.

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

5 ALCAM Improvements

5.1 Recommended ALCAM updates

To assist KiwiRail with improvements to the ALCAM database, the following data in Table 5-1 should be considered for update the existing level crossings in LXM.

Table 5-1: ALCAM updates for KiwiRail consideration

Millerton Road crossing #1410
• Decreased AADT from 490vpd to 240vpd • Increased HV% from 10% to 18% • Updated Road Panel width to be 8m (previously 5m) • Track panel: 'Poor' surface condition. • Added Rail-X pavement marking • Increased shortest and longest warning time from 0 s to 22 s due to FLBs • Changed slow train speeds to 10km/h • Changed road width to 5m and road clearance width to 6m. • Selected bells/audible devices • Changed Crossing Characteristics – 'Controls (signs and road markings" conform to NZTA TCD Pt 9