Allanburg Area Whistle Cessation Study Report - Draft

City of Thorold

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

EXECUTIVE SUMMARY

R.V. Anderson Associates Limited (RVA) was retained by the City of Thorold to complete a detailed safety assessment to submit a Whistle Cessation request for five (5) rail crossing locations throughout the Allanburg community within the City of Thorold. The railway tracks within the study area operate under the authority of Canadian National Railway (CN). Detailed information for each grade crossing location including subdivision, road authority and number of tracks are summarized in Table ES.1.

Table ES.1 – Summary of Allanburg Community At-Grade Rail Crossings

Location	CN Subdivision	Road Authority	Number of Tracks
Lundy's Lane (RR 20) (Mile 23.9)	Stamford	Region of Niagara	1
Henderson Street (Mile 23.9)	Stamford	City of Thorold	1
Barron Road (West) (Mile 23.9)	Stamford	City of Thorold	1
Barron Road (East) (Mile 24.1)	Stamford	City of Thorold	1
Allanport Road (RR 82) (Mile 24.05)	Stamford	Region of Niagara	1

The purpose of the study was to determine any deficiencies at each rail crossing within the study area to identify what mitigation measures will need to be implemented in order to request exemption from the train whistling requirements.

Transport Canada's Grade Crossing (2019) Regulations and Standards were used to identify the design and safety requirements for at-grade rail crossings and the additional requirements to be fulfilled to obtain the exemption from train whistling requirements. Each crossing within the study area was assessed in accordance to meet these standards and regulations. Cost estimates containing 30% contingencies were determined to undertake the suggested improvements as shown in Table ES-2 for the crossings to be eligible for whistle cessation.

Table ES-2: Cost Estimate for Whistle Cessation

Location	Cost Estimate ($)
Lundy's Lane (RR 20)	$460,000
Henderson Street	$350,000
Barron Road (West)	$12,000
Barron Road (East)	$51,00
Allanport Road (RR 82)	$435,000
TOTAL	**$1,308,000**

1.0 INTRODUCTION

Train whistles are used as a safety device at railway crossings to alert road users of an incoming train; however, this whistle results in noise pollution for nearby residences. R.V. Anderson Associates Limited (RVA) was retained by the City of Thorold to complete a Whistle Cessation Study for five (5) crossings in the Allanburg Community of the City of Thorold, as shown in Figure 1.1.

The study will review each crossing utilizing the 2019 Transport Canada's Grade Crossing Standards (GCS), Grade Crossings Handbook, and 2014 Grade Crossings Regulations to identify any safety issues or deficiencies in a detailed Safety Assessment. In addition, the study will review the Whistle Cessation Impacts, as described in Appendix D of Transport Canada's GCS. As a result, this study will recommend and provide cost estimates for the implementation of mitigation measures to aid the City in determining the feasibility of whistle cessations in the Allanburg Community.

Figure 1.1 – At-Grade Crossing Study Locations

2.0 METHODOLOGY

At the existing public rail-road crossings, train whistles are sounded continuously or repeatedly from 400m (1/4 mile) away from crossings for trains exceeding 70km/h (44mph). For trains operating less than this speed, there must be 20 seconds of warning prior to entering the crossing.

Train whistles are a part of the overall safety package at public rail-road crossings. Prior to the elimination of regular train whistles, safety concerns at the crossings are to be identified and mitigated using appropriate countermeasures.

A field investigation was conducted in December 2022 to assess the existing conditions of the five (5) rail-road crossings. Information was collected regarding the proximity to intersections, road alignments and geometry, sightlines, crossing surfaces, warning systems, signage and pavement markings, and other notable observations, including parked car locations and queuing concerns from adjacent intersections. The Rail Crossings Existing Conditions Assessment Report is provided in Appendix 1.

As part of this report, the grade crossings are reviewed against the Canadian Grade Crossing Regulations and GC Standards described below to determine what is required to be able to cease the train whistle. Note that all crossings in this study have a single railway along public roadways. None of the crossings in this study feature dedicated active transportation facilities. As such, these topics were not included in this study.

2.1 Canadian Grade Crossing Regulations

To satisfy the whistle cessation requirements, the railway crossing must meet Sections 104 of the Canadian Grade Crossing Regulations.

Section 104 a) indicates that the area of study is within the rail right of way at a public grade crossing, including 400m from the edge of the crossing in each direction along the rail line.

Section 104 b) indicates that the public grade crossing must satisfy Sections 105 to 107, if applicable.

- Section 105 indicates that the crossing must satisfy the warning system requirements Table D-1 of the Grade Crossing Standards, as shown in Table 2.1 of this report. Additionally, gates must be implemented per the specifications in Section 9.2 of the GCS.
- Section 106 indicates the requirements for a separated sidewalk, path or trail at-grade crossing located a minimum of 3.6m from the edge of the roadway, which is not applicable to any of the crossings in this study.

- Section 107 indicates that for locations where railway equipment is required to stop before proceeding into the public grade crossing, a warning system with flashing lights and bells must be installed per the below Grade Crossing Standards. Additionally, the railway company must manually protect the grade crossings.

Section 104 c) indicates that the area 'must not have repeated incidents of unauthorized access to the line of railway'.

Finally, Section 104 d) indicates that within the study area as noted in Section 104 a), no other crossing must require a whistle.

2.1.1 Transport Canada's Grade Crossing Standards

Location

To satisfy the location requirements, the proximity of the site to adjacent roadways needs to satisfy GCS Section 11. This section indicates that where a railway design speed is more than 25km/h (15mph), the traveled way of the nearest intersecting road or access must be at least 30m away, measured stop-bar to stop-bar.

Grade Crossing Surface

To satisfy the grade crossing surface requirements, the crossing needs to satisfy GCS Section 5. Figure 2.1 indicates that the crossing surface should extend 0.5 metre past the edge of shoulder or traveled way.

A visual inspection of the grade crossing surface was conducted to ensure the crossing is smooth and continuous. The specific measurements of the flangeway and rail elevations were not measured during the site visit.

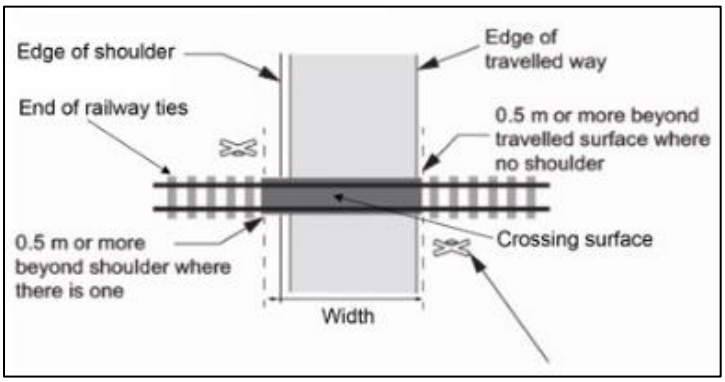

Figure 2.1 – Crossing Surface Dimensions, Transport Canada GCS Section 5

Road Geometry

To satisfy the road geometry requirements, the crossing needs to satisfy GCS Section 6. This section indicates that the maximum gradient of the roadway and the difference

between the roadway and the crossing slopes are minimal. Additionally, width of the traveled way and shoulder in the proximity of the rail crossing must be equal or greater than the traveled way along the road approaches. Finally, the grade crossing angle for railway speeds of 25km/h or more must be:

- not less than 70 and not greater than 110 degrees for grade crossings without a warning system; or
- not less than 30 and not greater than 150 degrees for grade crossings with a warning system.

Sightlines

To satisfy the sightline requirements, the crossing needs to satisfy GCS Section 7.

Sightlines were reviewed for vehicles stopped at a grade crossing using a minimum distance of $D_{Stopped}$ along the railway, which was calculated using the methodology outlined in the GCS Section 7.2.

For the at-grade crossing at Henderson Street, additional sightline criteria was also reviewed for vehicles approaching a grade crossing. This sight triangle is determined by the vehicular Stopping Sight Distance and railway D_{SSD}. Stopping Sight Distance for a vehicle was determined using TAC Geometric Design Guidelines Chapter 2 Table 2.5.2. The railway D_{SSD} was calculated using the methodology identified in GCS Section 7.2.

While at the field assessment, sightlines were measured generally from 1.05m above the road surface to a point approximately above the lowest rail and are shown in the Report provided in **Appendix 1.**

Signage

To satisfy the signage requirements, the crossing needs to satisfy GCS Section 8.

On the railway posts prior to the crossing, they need a railway crossing sign, a sign indicating the number of tracks (only if two or more railways) and an emergency notification sign per **Figure 2.2**.

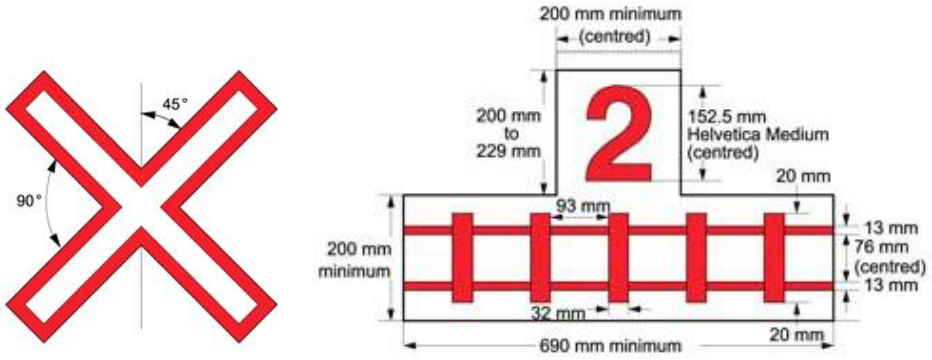

Figure 2.2 – Railway Signage, Transport Canada GCS Figure 8-1 a) and b)

Advance of the crossing, Railway Crossing Ahead sign, advisory speed sign and a stop ahead sign should be in place.

Additional requirements are necessary if a crossing does not have an active warning system. The signage post must be located between 2 and 4.5m from the edge of traveled way where there is no presence of curb or shoulder. If the roadway has a curb or edge of shoulder, the post must be 0.3 to 2.0m from it. The post must have retroreflective material on the front and back. Finally, the railway sign must have retroreflective strips on the back of the railway sign.

Warning System Specifications

To satisfy the warning system requirements, the crossing needs to satisfy GCS Section 9 for public crossing.

A crossing should have a warning system without gates if it meets the requirements as shown below in Table 2.1:

Table 2.1 – Whistling Cessation, Transport Canada GCS Table D-1

Railway Design Speed	Number of Tracks	
	1	2
1-25km/hr (15mph)	FLB	FLB
25-81 km/h (16-50mph)	FLB	FLB & G
Over 81 km/h (50mph)	FLB & G	FLB & G

FLB – Flashing Lights and Bells
FLB & G – Flashing Lights, Bells and Gates

Gates are required as part of the warning system if it meets one of the below requirements:

- Cross product of road AADT and daily number of trains is greater than 50,000. or
- Train speeds greater than 81km/h. or
- A stop sign or signalized intersection is located less than 30m or 60m measured stop-bar to stop-bar, respectively.

Gate arm clearance time was not reviewed during the site visit.

Whistle Cessation Impacts:

To satisfy the whistle cessation requirements as noted in Section 104 of the Canadian Grade Crossing Regulations, the railway crossing needs to have the warning system as shown in Table 2.1.

3.0 EXISITNG AT-GRADE RAIL CROSSINGS ASSESSMENT

Table 3.1 provides a summary of assessment for each crossing location within the study area. The study locations were examined through analysis and field visits and assessed based on Transport Canada's standards and regulations for at-grade rail crossings. The detailed existing conditions assessment of the rail crossings is provided in Appendix 1.

3.1 Lundy's Lane (Highway 20) Rail Crossing

The rail crossing along Lundy's Lane (Highway 20) is located approximately 250m, measured stop-bar to stop-bar, west of the intersection of Lundy's Lane (Highway 20) at Highway 58/82. This north-south rail crossing, consists of a two-lane east-west roadway (one lane in each direction) with one rail track operated by CN Rail. Posted speeds along the rail line and Lundy's Lane are 10 mph (17 km/h) and 50 km/h, respectively. It was assumed that the railway design speed is equal to the posted speed. The design speed along the roadway was assumed to be 70km/h. The surrounding land uses consist of low density residential, light industrial and commercial uses.

Based on the existing conditions summarized in Table 3.1, Lundy's Lane rail crossing will require the following to be considered for exemption from the train whistle:

- The crossing surface must be repaired and extended 0.5m beyond the road shoulder.
- Placement of advisory speed and stop ahead signs on each approach.
- Implementation of gates as part of the active warning system.
- Signal Pre-emption at the Allanport Road and Lundy's Lane Road intersection.

This will approximately be $460,000 based on the unrefined cost estimate in Appendix 2.

3.2 Henderson Street Rail Crossing

The rail crossing along Henderson Street is located approximately 170m (stop-bar to stop-bar) east of the intersection of Henderson Street at Centre Street. This north-south rail crossing consists of a two-lane east-west roadway (one lane in each direction) with one rail track operated by CN Rail. Posted speeds along the rail line and Henderson Street are 10 mph (17 km/h) and 50 km/h, respectively. It was assumed that the railway design speed is equal to the posted speed. The 85th percentile speed for the eastbound approach is 35 km/h. The curve in the road was examined for the westbound approach. The curve on the east leg within proximity to the crossing has a radius of 20m, resulting in a 20km/h design speed. The surrounding land uses consist of low density residential.

Based on the existing conditions summarized in **Table 3.1**, the Henderson Street rail crossing will require the following to be considered for exemption from the train whistle:

- Placement of crossing ahead, advisory speed, and stop ahead signs in each direction along the roadway.
- Implementation of an active warning system with lights and bells.
- Move the mailbox within close proximity to the at-grade crossing.

This will approximately be $350,000 based on the unrefined cost estimate in **Appendix 2.**

3.3 Barron Road (West) Crossing

The rail crossing along Barron Road is located approximately 60m east of the intersection of Barron Road at Centre Street. The crossing is located west of Allanport Road. This north-south rail crossing consists of a two-lane east-west roadway (one lane in each direction) with one rail track operated by CN Rail. Posted speeds along the rail line and Barron Road are 10 mph (17 km/h) and 50 km/h, respectively. It was assumed that the railway design speed is equal to the posted speed. The 85th percentile speed along Barron Road is 60 km/hr. The surrounding land uses consist of low density residential.

Based on the existing conditions summarized in **Table 3.1**, the Barron Road (W) rail crossing will require the following to be considered for exemption from the train whistle:

- Placement of crossing ahead, advisory speed, and stop ahead signs in each direction along the roadway.
- Repainting faded pavement marking

This will approximately be $12,000 based on the unrefined cost estimate in **Appendix 2.**

3.4 Barron Road (East) Crossing

The rail crossing along Barron Road is located approximately 45m east of the intersection of Barron Road at Allanport Road. This north-south rail crossing consists of a two-lane east-west roadway (one lane in each direction) with one rail track. operated by CN Rail. Posted speeds along the rail line and Barron Road are 50 mph (97 km/h) and 50 km/h, respectively. It was assumed that the railway design speed is equal to the posted speed. The design speed along the roadway was assumed to be 70km/h. The surrounding land uses consist of low density residential, commercial, and light industrial land uses.

Based on the existing conditions summarized in Table 3.1, the Barron Road (E) rail crossing will require the following to be considered for exemption from the train whistle:

- Signalize the Allanport Road and Barron Road Intersection with pre-emption.
- Placement of a crossing ahead sign in the eastbound direction along the roadway
- Placement of advisory speed, stop ahead, and Wc-104 signs in each direction along the roadway.
- Repainting faded pavement markings

This will approximately be $51,000 based on the unrefined cost estimate in Appendix 2.

3.5 Allanport Road Crossing

The rail crossing along Allanport Road is located approximately 20m south of the intersection of Barron Road at Allanport Road. This east-west rail crossing consists of a two-lane north-south roadway (one lane in each direction) with one rail track operated by CN Rail. Posted speeds along the rail line and Allanport Road are 60 mph (97 km/h) and 80 km/h, respectively. It was assumed that the railway design speed is equal to the posted speed. The design speed along the roadway was assumed to be 100km/h. The surrounding land uses consist of low density residential, commercial, and light industrial land uses.

Based on the existing conditions summarized in Table 3.1, Lundy's Lane will require the following to be considered for exemption from the train whistle:

- Signalize the Allanport Road and Barron Road Intersection with pre-emption.
- Placement of advisory speed, stop ahead, and Wc-104 signs in each direction along the roadway.
- Repainting faded pavement markings

This will approximately be $435,000 based on the unrefined cost estimate in Appendix 2.

Table 3.1 – Whistle Cessation Assessment Summary Table

Criteria	Lundy's Lane (RR 20) Rail Crossing	Henderson Street Rail Crossing	Barron Road (West) Rail Crossing	Barron Road (East) Rail Crossing	Allanport Road (RR 82) Rail Crossing
General Information	**Rail Authority:** CN **Number of Tracks:** 1 **Mile:** 23.9 **Subdivision:** Stamford **Road Authority:** Region of Niagara **Road name:** Lundy's Lane Road **Road Classification:** Rural Arterial **Roadway Design Speed:** 70km/h **Railway Maximum Speed:** 10mph **Daily Train Volume:** 1/day **AADT:** 5750 **Cross Product:** 5,750	**Rail Authority:** CN **Number of Tracks:** 1 **Mile:** 23.9 **Subdivision:** Stamford **Road Authority:** City of Thorold **Road name:** Henderson Street **Road Classification:** Local Road **Roadway Design Speed:** 40km/h (WB), 20km/h (EB) **Railway Maximum Speed:** 10mph **Daily Train Volume:** 1/day **AADT:** 400 **Cross Product:** 400	**Rail Authority:** CN **Number of Tracks:** 1 **Mile:** 23.9 **Subdivision:** Stamford **Road Authority:** City of Thorold **Road name:** Barron Road **Road Classification:** Local Road **Roadway Design Speed:** 60km/h **Railway Maximum Speed:** 10mph **Daily Train Volume:** 1/day **AADT:** 800 **Cross Product:** 800	**Rail Authority:** CN **Number of Tracks:** 1 **Mile:** 24.1 **Subdivision:** Stamford **Road Authority:** City of Thorold **Road name:** Barron Road **Road Classification:** Local Road **Roadway Design Speed:** 70km/h **Railway Maximum Speed:** 60mph **Daily Train Volume:** 12/day **AADT:** 1500 **Cross Product:** 18,000	**Rail Authority:** CN **Number of Tracks:** 1 **Mile:** 24.05 **Subdivision:** Stamford **Road Authority:** Region of Niagara **Road name:** Allanport Road **Road Classification:** Arterial Road **Roadway Design Speed:** 100km/h **Railway Maximum Speed:** 60mph **Daily Train Volume:** 12/day **AADT:** 4300 **Cross Product:** 51,600
Location	**Proximity to other intersections:** Allanport Road (Hwy 58/82) – 250m 13227 Lundy's Lane Driveway – 70m	**Proximity to other intersections:** Clifton Street – 60m Centre Street – 170m	**Proximity to other intersections:** Gainer Street – 175m Centre Street – 60m New Residential Development Access – 65m	**Proximity to other intersections:** Allanport Road – 45m	**Proximity to other intersections:** Barron Road – 20m
	Based on the proximity of adjacent intersections, this crossing meets the Location Requirement.	**Based on the proximity of adjacent intersections, this crossing meets the Location Requirement.**	**Based on the proximity of adjacent intersections, this crossing meets the Location Requirement.**	**Based on the proximity of adjacent intersections, this crossing meets the Location Requirement.**	**Based on the proximity of adjacent intersections, the intersection of Allanport Road and Barron Road should be signalized with pre-emption meet the Location Requirement.**
Grade Crossing Surface	**Material:** Wood planks / Asphalt Minimum extension of crossing surface beyond shoulder: 0.0m **Crossing Surface Condition:** Wooden planks sag when cars drive over.	**Material:** Wood planks Minimum extension of crossing surface beyond shoulder or travelled way: 1.2m **Crossing Surface Condition:** Wooden planks are sagging in the middle.	**Material:** Wood planks / Asphalt Minimum extension of crossing surface beyond shoulder or travelled way: 2.2m **Crossing Surface condition:** Smooth and in good condition.	**Material:** Wood planks/ Asphalt Minimum extension of crossing surface beyond shoulder or travelled way: 2.7m **Crossing Surface condition:** Smooth and in good condition.	**Material:** Asphalt Minimum extension of crossing surface beyond shoulder or travelled way: 2.1m **Crossing Surface condition:** Asphalt is in good condition. Slight raised section on the paved shoulder.
	Based on existing conditions, the crossing surface should be repaired and extended 0.5m beyond the shoulder edge to meet the Grade Crossing Surface Requirement.	**Based on existing conditions, the crossing surface should be repaired to meet the Grade Crossing Surface Requirement.**	**Based on existing conditions, this crossing meets the Grade Crossing Surface Requirement.**	**Based on existing conditions, this crossing meets the Grade Crossing Surface Requirement.**	**Based on existing conditions, this crossing meets the Grade Crossing Surface Requirement.**
Road Geometry	**Maximum Gradient between roadway and crossing:** Level with the roadway **Crossing Width:** Approximately equivalent to the roadway width. **Grade Crossing Angle:** Skew requirements are not applicable at this	**Maximum Gradient between roadway and crossing:** Level with the roadway **Crossing Width:** Approximately equivalent to the roadway width. **Grade Crossing Angle:** Skew requirements are not applicable at this crossing location as the railway speed is less than 25km/h.	**Maximum Gradient between roadway and crossing:** Level with the roadway **Crossing Width:** Approximately equivalent to the roadway width. **Grade Crossing Angle:** Skew requirements are not applicable at this crossing location as the railway speed is less than 25km/h.	**Maximum Gradient between roadway and crossing:** Level with the roadway **Crossing Width:** Approximately equivalent to the roadway width. **Grade Crossing Angle:** approximately 30 degrees	**Maximum Gradient between roadway and crossing:** Level with the roadway **Crossing Width:** Approximately equivalent to the roadway width. **Grade Crossing Angle:** approximately 30 degrees

Criteria	Lundy's Lane (RR 20) Rail Crossing	Henderson Street Rail Crossing	Barron Road (West) Rail Crossing	Barron Road (East) Rail Crossing	Allanport Road (RR 82) Rail Crossing
	crossing location as the railway speed is less than 25km/h.				
	Based on the crossing gradient, width, and angle, this crossing meets the Road Geometry Requirement.	**Based on the crossing gradient, width, and angle, this crossing meets the Road Geometry Requirement.**	**Based on the crossing gradient, width, and angle, this crossing meets the Road Geometry Requirement.**	**Based on the crossing gradient, width, and angle, this crossing meets the Road Geometry Requirement.**	**Based on the crossing gradient, width, and angle, this crossing meets the Road Geometry Requirement.**
Sightlines (SSD, Dstopped & Dssd)	**Stopping Sight Distance (SSD):** There are available sightlines exceeding the required SSD of 105m along the roadway in either direction. **DStopped:** There are available sightlines for eastbound vehicles exceeding the required DStopped of 55m in each direction. Of note, sightlines in the southern direction were somewhat obstructed by foliage; however due to its height, a train is likely to be seen. There are available sightlines for westbound vehicles exceeding the required DStopped of 55m in each direction. **DSSD:** Not Applicable since this location with equipped with the required warning system with flashing lights and bells.	**Stopping Sight Distance:** There are available vehicular sightlines exceeding the required SSD of 50m in eastbound direction. There are adequate vehicular sightlines exceeding the required SSD of 20m in westbound direction. **DStopped:** There are available sightlines exceeding the required DStoppped of 60m in both directions at each approach. **DSSD**: There are available sightlines for eastbound vehicles exceeding the required DSSD sightline triangle (50m SSD x 35m DSSD) in the north direction. In the south direction, there are not adequate available sightlines due to foliage on private property. There are available sightlines for westbound vehicles exceeding the required DSSD sightline triangle (20m SSD x 40m DSSD) in the south direction. In the north direction, there are not adequate available sightlines due to foliage on private property.	**Stopping Sight Distance:** There are available vehicular sightlines exceeding the required SSD of 85m along the roadway in either direction. However, trimming of seasonal foliage along rail line is recommended. **DStopped:** There are available sightlines exceeding the required DStoppped of 60m in both directions at each approach. **DSSD:** Not Applicable due to the current warning system.	**Stopping Sight Distance:** There are available vehicular sightlines exceeding the required SSD of 105m along the roadway in either direction. However, trimming of seasonal foliage along rail line is recommended. **DStopped:** Not Applicable due to the current warning system with gates. **DSSD:** Not Applicable due to the current warning system with flashing lights and bells.	**Stopping Sight Distance:** There are available vehicular sightlines exceeding the required SSD of 185m along the roadway in either direction. **DStopped:** Not Applicable due to the current warning system with gates. **DSSD:** Not Applicable due to the current warning system with flashing lights and bells.
	Based on the existing available sightlines, this crossing meets the Sightline Requirement.	**Based on the existing available sightlines, the installation of a warning system with flashing lights and bells is required to meet the Sightline Requirement. However, trimming of seasonal foliage along rail line is recommended.**	**Based on the existing available sightlines, this crossing meets the Sightline Requirement. However, trimming of seasonal foliage along rail line is recommended.**	**Based on the existing available sightlines, this crossing meets the Sightline Requirement.**	**Based on the existing available sightlines, this crossing meets the Sightline Requirement.**
Signage and Pavement Markings	**Railway Crossing Sign:** In compliance with GCS requirements. **Crossing Ahead Sign:** Yes **Advisory Speed Sign:** No **Stop Ahead Sign:** No **Pavement Marking Condition:** Stop bar and painted 'X's in good condition.	**Railway Crossing Sign:** the Railway Crossing Sign retroreflective material on the back of the signage. **Railway Crossing Sign:** In compliance with GCS **Crossing Ahead Sign:** No **Advisory Speed Sign:** No **Stop Ahead Sign:** No	**Railway Crossing Sign:** In compliance with GCS requirements. **Crossing Ahead Sign:** No **Advisory Speed Sign:** No **Stop Ahead Sign:** No **Pavement Marking Condition:** Stop bars are faded. Westbound painted 'X' in good	**Railway Crossing Sign:** In compliance with GCS requirements. **Advisory Speed Sign:** No **Stop Ahead Sign:** No **Eastbound:** **Crossing Ahead Sign:** No **Westbound:**	**Railway Crossing Sign:** In compliance with GCS requirements. **Crossing Ahead Sign:** Yes **Advisory Speed Sign:** No **Stop Ahead Sign:** No **Pavement Marking Condition: The** Road Centreline, painted 'X's, edge

Criteria	Lundy's Lane (RR 20) Rail Crossing	Henderson Street Rail Crossing	Barron Road (West) Rail Crossing	Barron Road (East) Rail Crossing	Allanport Road (RR 82) Rail Crossing
		Pavement Marking Condition: No Pavement Markings. **Location of railway crossing and stop sign control:** **South side** – 1.7m from edge of roadway; 4.0m from tracks **North side** – 2.4m from edge of roadway; 4.5m from tracks	condition. There is no painted 'X' in the eastbound direction. **Additional Signage:** **"Watch for Bumps"** Sign is turned away from road on the north side and hard for road users to read.	**Crossing Ahead Sign:** Yes **Pavement Marking Condition: The** Road Centreline and warning 'X's are in good condition. The westbound stop bar and edge markings are in good condition. The eastbound stop bars and edge markings are faded.	markings and stop bars are in good condition.
	Based on the existing available signage and pavement markings, this crossing requires the placement of stop ahead and advisory speed signs in each direction to meet the Signage and Pavement Markings Requirements.	**This crossing requires the placement of crossing ahead, stop ahead and advisory speed signs to be compliant with the signage and pavement markings requirements.** **If the crossing continues to have a passive crossing warning system, the westbound Railway Crossing Signage is required to be moved further from the road edge per GCS. Additionally, this type of signage required retroreflective strips on the back of the railway sign to be compliant with the pavement and signage requirements.**	**Based on the existing available signage and pavement markings, the following should be completed to meet the Signage and Pavement Markings Requirements.** • **Placement of crossing ahead, stop ahead and advisory speed signs along both approaches.** • **Re-position the 'Watch for Bumps' signs.** • **Repaint faded pavement markings.**	**Based on the existing available signage and pavement markings, the following should be completed to meet the Signage and Pavement Markings Requirements.** • **Placement of crossing ahead (eastbound only), stop ahead and advisory speed signs.** • **Repaint faded or missing pavement markings.** **It is also recommended to install the WC-104B sign to warn drivers of the railway crossing along the crossroad.**	**Based on the existing available signage and pavement markings, the following should be completed to meet the Signage and Pavement Markings Requirements.** • **Placement of stop ahead and advisory speed signs on both approaches.** • **Repaint faded or missing pavement markings.** **It is also recommended to install the WC-104B sign to warn drivers of the railway crossing along the crossroad.**
Warning System Specifications	This crossing consists of an active warning system, with flashing lights and lights and bells. Based on Table D-1 and the Gate requirements in Section 2.1.1, flashing lights and bells are required only.	This crossing consists of a passive warning system, with a stop sign traffic control. Based on Table D-1 and the Gate requirements in Section 2.1.1, flashing lights and bells are required only.	This crossing consists of an active warning system, with flashing lights and lights and bells. Based on Table D-1 and the Gate requirements in Section 2.1.1, flashing lights and bells are required only.	This crossing consists of an active warning system, with flashing lights, bells, and gates. Based on Table D-1 and the Gate requirements in Section 2.1.1, flashing lights, bells, and gates are required.	This crossing consists of an active warning system, with flashing lights, bells, and gates. Based on Table D-1 and the Gate requirements in Section 2.1.1, flashing lights, bells, and gates are required.
	Based on the railway speeds and number of tracks, this crossing meets the Warning System Specification Requirement.	**Based on the railway speeds and number of tracks, this crossing requires a warning system with flashing lights and bells to meet the Warning System Requirement.**	**Based on the railway speeds and number of tracks, this crossing meets the Warning System Specification Requirement.**	**Based on the railway speeds and number of tracks, this crossing meets the Warning System Specification Requirement.**	**Based on the railway speeds and number of tracks, this crossing meets the Warning System Specification Requirement.**
Whistle Cessation Regulations	The warning system is required per the section above. There are no signs of trespassing at this at-grade crossing. No other crossings are within 400m of this crossing.	The warning system is required per the section above. There are no signs of trespassing at this at-grade crossing. No other crossings are within 400m of this crossing.	The warning system is required per the section above. There are no signs of trespassing at this at-grade crossing. No other crossings are within 400m of this crossing.	The warning system is required per the section above. There are no signs of trespassing at this at-grade crossing. The Allanport Road grade crossing is within 400m of this crossing.	The warning system is required per the section above. There are no signs of trespassing at this at-grade crossing. The Barron Road grade crossing is within 400m of this crossing.

Criteria	Lundy's Lane (RR 20) Rail Crossing	Henderson Street Rail Crossing	Barron Road (West) Rail Crossing	Barron Road (East) Rail Crossing	Allanport Road (RR 82) Rail Crossing
	This crossing location meets the Whistle Cessation Regulation.	**This crossing location requires an active warning system with flashing lights and bells to meet the Whistle Cessation Regulation.**	**This crossing location meets the Whistle Cessation Regulation.**	**This crossing location meets the warning system and trespassing conditions. As the Allanport Crossing also meets these conditions, this crossing meets the requirements of the Whistle Cessation Regulation.**	**This crossing location meets the warning system and trespassing conditions. As the Barron Crossing also meets these conditions, this crossing meets the requirements of the Whistle Cessation Regulation**
Additional Comments from Site Review	The Allanburg bridge closes for 15 minutes at a time to allow for ship crossings. During this time, the queues extend beyond the Lundy's Lane at-grade crossing. Additionally, when the bridge closure is finished and the high volumes of eastbound traffic dispersing, the eastbound queues from the Allanport Road intersection extend into the crossing area once again. It is recommended that gates be implemented at the Lundy's Lane crossing to reduce the likely hood of a railway accident from drivers stopping on the railway tracks. Additionally, pre-emption is recommended at the Allanport Road intersection to give priority to eastbound Lundy's Lane traffic during a train crossing event.	The local mailbox is located approximately 12m west of the at-grade crossing. Vehicles are likely to park in front of the mail and block sightlines from the crossing. It is recommended to move the mailbox to where it will not impede these sightlines.	No additional comments.	No additional comments.	No additional comments.
Proposed Work by City	The City does not have any plans to complete upgrades to any crossings				

4.0 CONCLUSION

Table 3.1 displays findings of the field investigations and recommendations to meet the Transport Canada Standards and Regulations requirements for at-grade crossings. Table 4.1 is a summary of recommended improvement works and cost estimates (containing 30% contingencies) based on findings at each rail crossing location:

Table 4.1 – Summary of Compliance and Recommended Works

Location	Recommended Improvement	Cost ($)
Lundy's Lane (RR 20)	• Retrofit & extend the road crossing surface to 0.5m on either side of paved shoulder. • Placement of an advisory speed sign in each direction along the roadway. • Placement of a stop ahead sign in each direction along the roadway. • Installation of Gate and upgrading of the existing active warning system.	$460,000
Henderson Street	• Retrofit the road crossing surface. • Placement of crossing ahead signs in each direction along the roadway. • Placement of an advisory speed signs in each direction along the roadway. • Placement of a stop ahead signs in each direction along the roadway. • Installation of a complete warning system with lights and bells. • Relocation of the mailbox. • Trimming of seasonal foliage along rail line is recommended.	$350,000
Barron Road (West)	• Placement of crossing ahead signs in each direction along the roadway. • Placement of an advisory speed signs in each direction along the roadway. • Placement of a stop ahead signs in each direction along the roadway. • Repaint faded pavement marking. • Trimming of seasonal foliage along rail line is recommended.	$12,000
Barron Road (East)	• Pre-emption only with Signals of the Allanport Road and Barron Road intersection. • Placement of crossing ahead signs in the eastbound direction along the roadway.	$51,000

	• Placement of an advisory speed signs in each direction along the roadway. • Placement of a stop ahead signs in each direction along the roadway. • Repaint faded pavement markings.	
Allanport Road (RR 82)	• Signalization of the Allanport Road and Barron Road intersection with Pre-emption. • Placement of crossing ahead signs in the eastbound direction along the roadway • Placement of an advisory speed signs in each direction along the roadway • Placement of a stop ahead signs in each direction along the roadway. • Repaint faded pavement markings	$435,000
	TOTAL	**$1,308,000**

APPENDIX 1

Rail Crossings Existing Conditions Assessment

Whistle Cessation Study

Rail Crossing Existing Condition Assessment

Draft

Prepared for:
City of Thorold

RVA 215701

February 17, 2023

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

RVA has been retained to complete a Whistle Cessation Study for the Allanburg Area in the City of Thorold. The study is being completed in conjunction with the Allanburg Area Transportation Planning Study. Five locations were examined within the community to determine the existing conditions of the at-grade crossings in the area.

The field investigations took place between December 2022 and February 2023. Grade Crossing data was collected from Transport Canada's Grade Crossings Inventory. The data was used to determine the AADT, road operating speed, train frequency and maximum train speed for each location within the study area.

1.1 Study Area Locations

The five at-grade rail crossing study locations that were examined throughout Allanburg include (as shown in **Figure 1.1**):

- Lundy's Lane (Regional Road 20) – West of Highway 58/RR 82
- Henderson Street – East of Clifton Street
- Barron Road (West) – East of Centre Street
- Barron Road (East) – East of Allanport Road
- Allanport Road – South of Barron Road

Figure 1.1 – Study Area Locations

1.2 Study Parameters

During the field visits, a variety of parameters were examined to document the characteristics of each crossing location. The study parameters included:

Sightline Review

- Vehicular sightlines determined by the roadway Stopping Sight Distance (SSD).
- Vehicular sightlines determined by $D_{Stopped}$. This sightline is used to determine if a vehicle can see an oncoming train from a stopped position in advance of the crossing.
- Vehicular sightlines determined by D_{SSD} and the roadway SSD. This sightline is used to determine if both the train and vehicle have adequate stopping distances while both traveling towards the rail crossing at their design speeds.
- Visibility of warning devices from nearby intersection/accesses.

Signage and Pavement Markings

- Inventory and condition of existing warning signage.
- Inventory and condition of pavement markings, including stop bars.

Fencing

- Fencing within 400m of the crossing.
- Evidence of trespassing.

Location of Crossing

- Other rail crossings within 400m.
- Nearby intersections or accesses.
- Surrounding land uses.

Road Geometry

- Grade differences between the railway crossing surface and the road approach.
- Active Transportation facilities.
- Roadway and shoulder widths.
- Crossing Angle.

Grade Crossing Warning System

- Presence and location of gates, flashing lights, and bells.

Grade Surface Crossing

- Crossing surface material and condition.
- The condition of the roadway asphalt adjacent to the crossing surface.
- The width of the crossing surface beyond the road edge or shoulder.

2.0 METHODOLOGY

2.1 Stopping Sight Distance (SSD)

The Transportation Association of Canada (TAC) Geometric Design Guidelines have indicated Stopping Sight Distances as shown below in **Figure 2.1** based on the roadway design speeds. The purpose of this sightline analysis is to determine the distance needed to stop safely upon viewing a train while approaching a rail crossing.

Design speed (km/h)	Brake reaction distance (m)	Braking distance on level (m)	Stopping sight distance	
			Calculated (m)	Design (m)
20	13.9	4.6	18.5	20
30	20.9	10.3	31.2	35
40	27.8	18.4	46.2	50
50	34.8	28.7	63.5	65
60	41.7	41.3	83.0	85
70	48.7	56.2	104.9	105
80	55.6	73.4	129.0	130
90	62.6	92.9	155.5	160
100	69.5	114.7	184.2	185
110	76.5	138.8	215.3	220
120	83.4	165.2	248.6	250
130	90.4	193.8	284.2	285

Figure 2.1 – Stopping Sight Distance, TAC Table 2.2.1

2.2 Minimum Sightline for Drivers Stopped at Rail Crossing ($D_{Stopped}$)

As shown below in **Figure 2.2,** $D_{Stopped}$ is the distance in which a driver can see a train approaching while being stopped at the stop bar or 5m from the crossing surface. $D_{Stopped}$ was calculated using the methodology in the Grade Crossing Standards Section 7.2. As set out in 21 (1) of Section 19 in the Grade Crossing Regulations, crossings with active warning systems with gates are not required to accommodate the $D_{Stopped}$ sightline requirements.

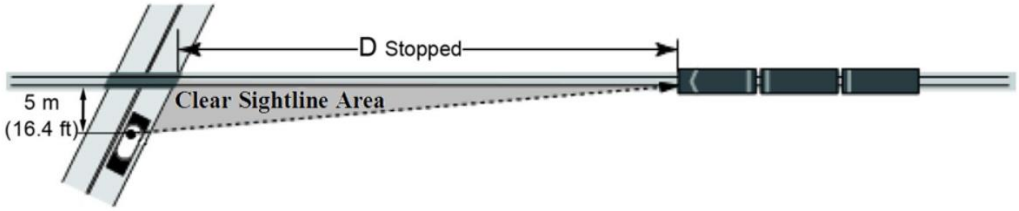

Figure 2.2 – $D_{Stopped}$ Diagram (Grade Crossing Standards Section 7.2.)

2.3 Minimum Sightline for Drivers Approaching Rail Crossing (D_{SSD})

As shown in **Figure 2.3**, the D_{SSD} is the minimum distance that a user must be able to see a train from the stopping sight distance from the rail line. The resulting sight triangle is required to be clear. The D_{SSD} was calculated using the methodology in the Grade Crossing Standards Section 7.2. As these crossings are in close proximity to emergency services, a vehicle length of 12 metres was used to represent emergency vehicles, such as firetrucks.

As set out in 21 (1) of Section 19 in the Grade Crossing Regulations, crossings with active warning systems with flashing lights and bells are not required to accommodate the D_{SSD} sightline requirements.

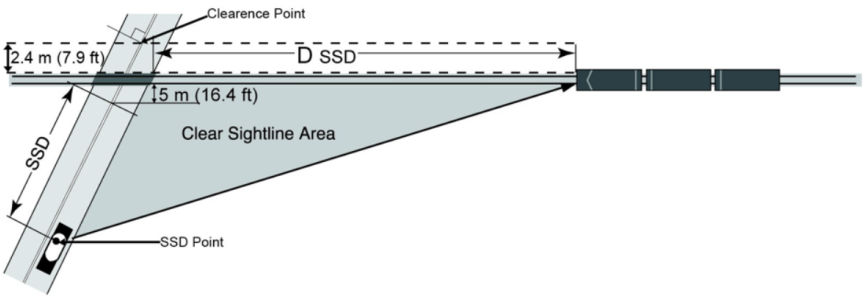

Figure 2.3 – D_{SSD} Diagram (Grade Crossing Standards Section 7.2.)

3.0 LOCATION 1: LUNDY'S LANE (RR 20) RAIL CROSSING

The rail crossing along Lundy's Lane (RR 82) is located approximately 250m west of the intersection of Lundy's Lane at Allanport Road (RR 82). The speed limit along the roadway at this location is 50km/hr and has an AADT of 5750. The maximum train speed at this location is 10 mph (17km/hr). There is approximately 1 train a day that passes through this crossing location. Lundy's Lane (RR 20) is classified as a Rural Arterial Road. **Figure 3.1** is an arial view of the subject crossing, indicated one rail track and a two-lane roadway (one lane in each direction).

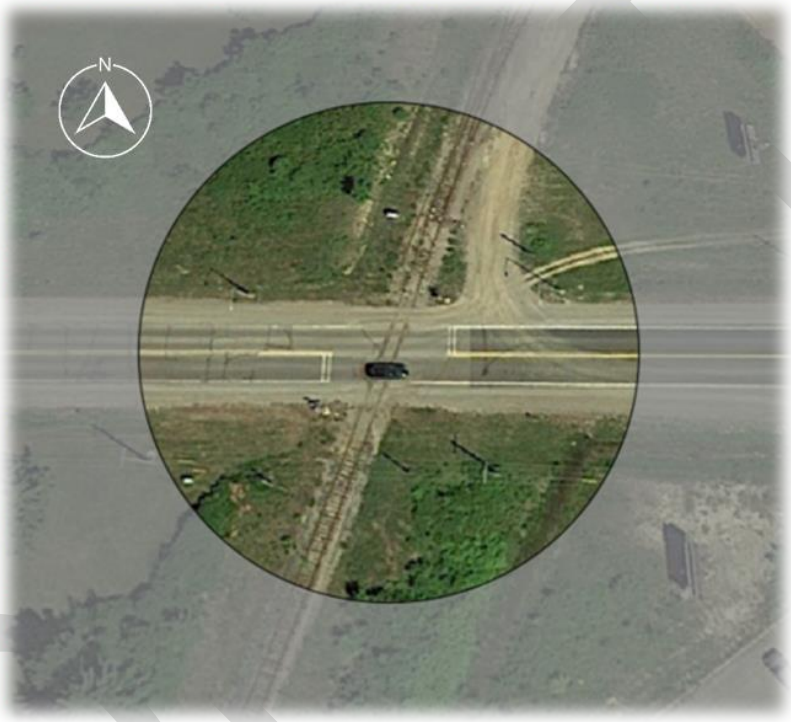

Figure 3.1 – Lundy's Lane Rail Crossing

The posted speed along this roadway is 50km/hr. The assumed operating speed along this roadway was assumed to be 70km/h due to understood speeding concerns in the area. The required SSD at this location was determined to be 105m. **Figure 3.2** shows the resulting SSD sight triangle with the warning system at the crossing.

The $D_{Stopped}$ was calculated at 55m as per Section 7 of the Grade Crossing Standards (2019).**Figure 3.3** shows the resulting $D_{Stopped}$ sight triangle along the train line.

As indicated in 21 (1) of Section 19 in the Grade Crossing Regulations, this crossing is not subjected to D_{SSD} requirements as it has an active warning system with flashing lights, and bells.

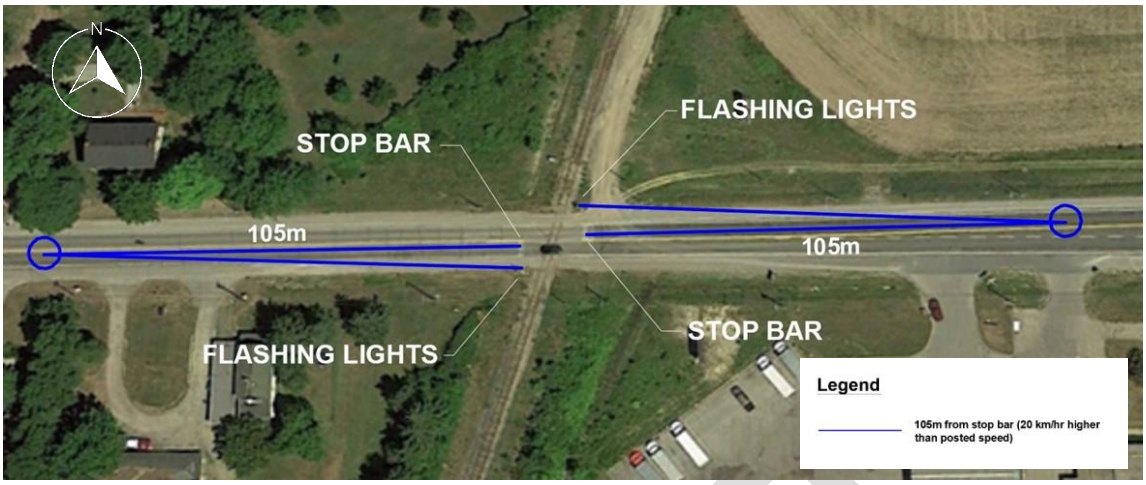

Figure 3.2 – Lundy's Lane Rail Crossing SSD

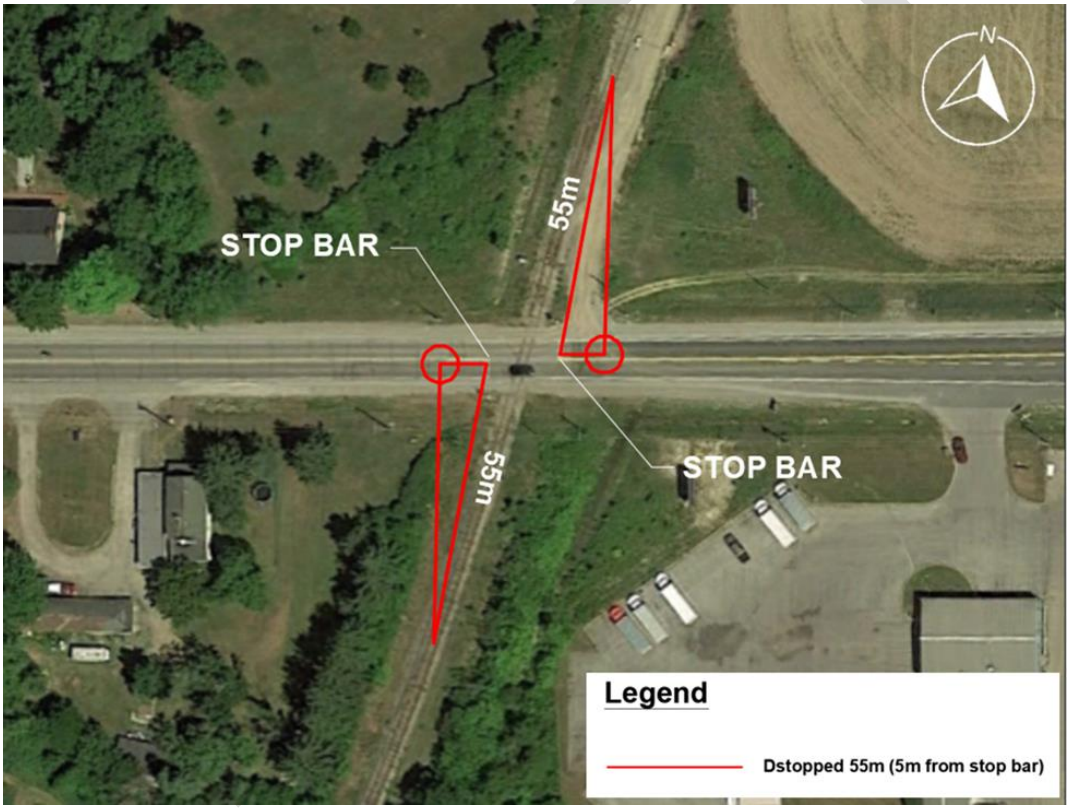

Figure 3.3 – Lundy's Lane Rail Crossing $D_{Stopped}$

Below is summary of findings for the rail crossing at Lundy's Lane.

Table 3.1 – Lundy's Lane Crossing Existing Conditions

Criteria	Requirement	Lundy's Lane Existing Conditions
Location	Rail Crossings within 400m	• None
	Nearby Intersections and Accesses • measured stop bar to stop bar • not including railway access	• Lundy's Lane and Allanport Road intersection – 250m • Driveway at 13227 Lundy's Lane – 70m
	Surrounding Land Uses	• Commercial, Light Industrial, Residential
Grade Crossing Surface	Crossing Material & Condition	• Wood planks and Asphalt • Poor condition, planks sag as vehicle drive over, **Figure A-1**
	Condition of Roadway Asphalt	• Good Condition
	Width of Crossing Surface	• Distance between Tracks: 2.4m • Distance between east and west stop bars (clearance distance): 12.4m
	Extension of Crossing Surface beyond edge of road or shoulder	• 0.0m, **Figures A-2 and A-3**
Road Geometry	Difference in Railway slope and road gradient	• None
	Active Transportation Facilities	• None

Criteria	Requirement	Lundy's Lane Existing Conditions	
	Roadway Width	• 7.3m	
	Shoulder	Eastbound (Width Varies, **Figure A-4**) • North: 2.8m • South: 3.5m	Westbound • North: 2.9m
Sightlines	Calculation Parameters	• Clearance Distance: 12.4m • Railway Design Speed: 17km/h • Roadway Design Speed: 70km/h	
	SSD	• SSD = 105m • Eastbound and westbound sightlines exceed the required SSD, **Figure A-5** & **Figure A-6**	
	$D_{Stopped}$	• $D_{Stopped}$ = 55m **Westbound approach:** • There are available sightlines for westbound vehicles exceeding the required $D_{Stopped}$ in each direction. **(Figure A-7, Figure A-8)**	**Eastbound approach:** • There are available sightlines for eastbound vehicles exceeding the required the required $D_{Stopped}$. **(Figure A-9)** • Sightlines in the southern direction were somewhat obstructed by foliage; however due to its height, a train is likely to be seen. **(Figure A-10)**

Criteria	Requirement	Lundy's Lane Existing Conditions
	D_{SSD}	D_{SSD} = 35m • Not applicable due to the presence of a warning system with flashing lights and bells.
	Other	**Movable or Immovable objects** • None **Visibility of warning system** • Flashing lights are visible from 105m from the crossing along the eastbound and westbound approaches. • Warning system is visible from the Lundy's Lane at Highway 58/RR 82 intersection. **(Figure A-11)**
Signage and Pavement Markings	Warning Signage	• W-10a (Railway Ahead) › Good Condition › Westbound: 218m from stop bar **Figure A-12** › Eastbound: 203m from stop bar **Figure A-13**
	Pavement Markings	• Stop Bar › 5m from tracks in westbound direction, **Figure A-14** › 4.5m from tracks in eastbound direction, **Figure A-15** • Centreline on both approaches: Good condition • Roadway Edge: Good Condition • Painted 'X'

Criteria	Requirement	Lundy's Lane Existing Conditions	
		› Westbound: 213m from stop bar **Figure A-16** › Eastbound: 203m from stop bar **Figure A-17**	
Warning System	Warning System	• Flashing Lights and Bells, **Figure A-18**	
	Location of Warning System	Eastbound • 2.7m from the edge of the roadway • 4.1m from the edge of the rail tracks	Westbound • 3.1m from the edge of the roadway • 3.3m from the edge of the rail tracks
Fencing	Fencing	• None	
	Evidence of Trespassing	• None	
Additional Comments	Parking	• No parked cars within the vicinity of the crossing. • There is "No Parking" signage for the westbound approach (east of the tracks) only. •	
	Lift Bridge	• There are issues regarding queuing for both directions as a result of the nearby lift bridge (located approximately 850m west of the tracks). Queues for the westbound approach back up beyond the rail crossing when the lift bridge is in operation. When the lift bridge comes down, the eastbound queues back up beyond the rail crossing from the signal control at Lundy's Lane at Highway 58/RR 82.	

4.0 LOCATION 2: HENDERSON STREET RAIL CROSSING

The rail crossing along Henderson Street is located approximately 60m east of the intersection of Henderson Street at Clifton Street. The speed limit along the roadway at this location is 50km/hr and has an AADT of 400 vehicles per day. The maximum train speed at this location is 10 mph (17km/hr). There is approximately 1 train a day that passes through this crossing location. Henderson Street is classified as a Local Road. Below in **Figure 4.1** is an arial view of the subject crossing, indicating one rail track and a two-lane roadway (one lane in each direction).

Figure 4.1 – Henderson Street Rail Crossing

The speed limit along this roadway is 50km/h, however the operating speeds along this segment are expected to vary. The operating speeds were determined using the 85th percentile speeds based off a recent speed study that was completed in the Allanburg Area Transportation Planning Study by RVA.

The 85th percentile speed for the eastbound approach is 35 km/hr, thus the Stopping Sight Distance was examined at 40 km/hr. The resulting SSD in the eastbound direction is 50m.

The curve in the road was examined for the westbound approach. The curve has a radius of 20m, thus the design speed of the road approaching the crossing was calculated to be 20 km/hr. The resulting SSD in the westbound direction is 20m.

Figure 4.2 shows the resulting SSD sight triangles with the warning system at the crossing.

The $D_{Stopped}$ was calculated to be 50m in both directions. The D_{SSD} was calculated to be 31m and 40m in the eastbound and westbound directions, respectively. **Figure 4.3**, shows the resulting site triangles using the $D_{Stopped}$ and D_{SSD} values.

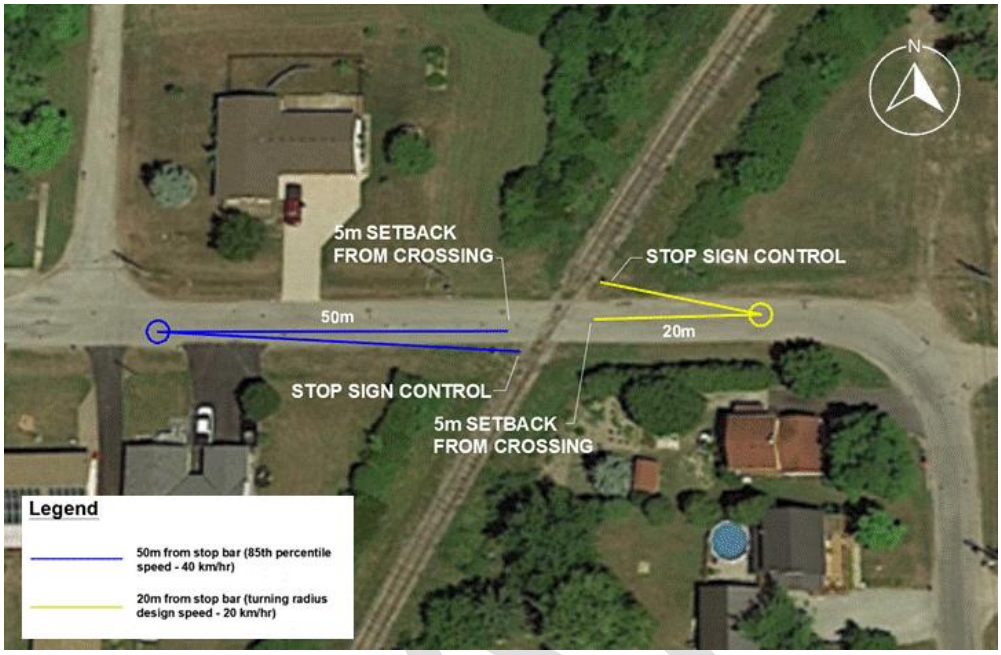

Figure 4.2 – Henderson Street Rail Crossing SSD

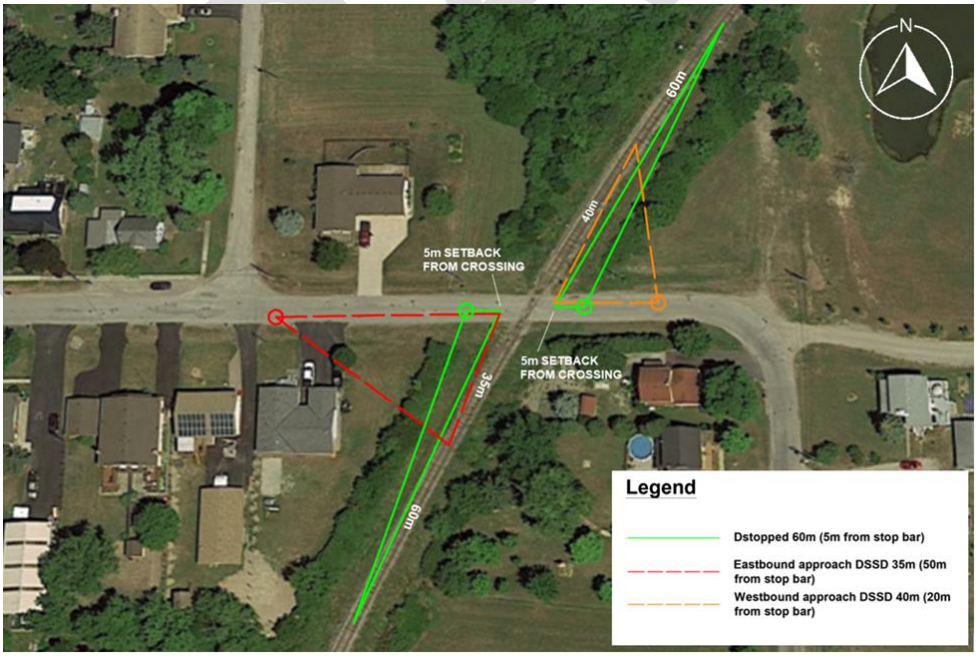

Figure 4.3 – Henderson Street Rail Crossing $D_{Stopped}$ and D_{SSD}

Below is summary of findings for the rail crossing at Henderson Street.

Table 4.1 – Henderson Street Crossing Existing Conditions

Criteria	Requirement	Henderson Street Existing Conditions
Location	Rail Crossings within 400m	• None
	Nearby Intersections and Accesses • measured stop bar to stop bar • not including railway access	• Henderson Street at Clifton Street - 60m • Henderson Street at Centre Street - 170m
	Surrounding Land Uses	• Residential, Institutional (Church)
Grade Crossing Surface	Crossing Material & Condition	• Wood planks and Asphalt • Poor condition, planks have sagged over time, **Figure B-1**
	Condition of Roadway Asphalt	• Good Condition
	Width of Crossing Surface	• Distance between Tracks: 2.4m • Clearance Distance: 15m
	Extension of Crossing Surface beyond edge of road or shoulder	• North Side – 2.7m • South Side – 2.2m
Road Geometry	Difference in Railway slope and road gradient	• None
	Active Transportation Facilities	• None

Criteria	Requirement	Henderson Street Existing Conditions	
	Roadway Width	• 5.7m	
	Shoulder	Eastbound (Width Varies, **Figure B-2**) • North: 0.8m • South: 0.6m	Westbound • North: 0.5m • South: 0.6m
Sightlines	Calculation Parameters	• Clearance Distance: 15m • Railway Design Speed: 17km/h • Roadway Design Speed: 40km/h (EB), 20km/h (WB)	
	SSD	• SSD = 50m (EB), 20m (WB) • Eastbound and westbound sightlines exceed the required SSD, **Figure B-3 & Figure B-4**	
	$D_{Stopped}$	**Eastbound approach:** • $D_{Stopped}$ = 58m • There are available sightlines for vehicles exceeding the required $D_{Stopped}$ in each direction. **(Figure B-5, Figure B-6)**	**Westbound approach:** • $D_{Stopped}$ = 58m • There are available sightlines for vehicles exceeding the required $D_{Stopped}$ in the southern direction. **(Figure B-7)** • Sightlines in the northern direction obstructed by foliage. **(Figure B-8)**
	D_{SSD}	**Eastbound approach:**	**Westbound approach:**

Criteria	Requirement	Henderson Street Existing Conditions	
		• D_{SSD} = 40m • There are obstructed sightlines for vehicles in each direction. **(Figure B-9, Figure B-10)**	• D_{SSD} = 35m • There are available sightlines for vehicles exceeding the required D_{SSD} in the southern direction. **(Figure B-11)** • There are obstructed sightlines for vehicles in the northern direction. **(Figure B-12)**
	Other	**Movable or Immovable objects** • Community Mailbox east of rail-crossing **Visibility of warning system** • Visible from the intersection of Henderson Street at Clifton Street (60m from crossing) **(Figure B-13)** • Intersection of Henderson Street at Centre Street (180m from crossing) **(Figure B-14)**	
Signage and Pavement Markings	Warning Signage	› None	
	Pavement Markings	› None	
Warning System	Warning System	• Stop Sign Controlled Crossing, **Figure B-15**	
	Location of Warning System	Eastbound	Westbound

Criteria	Requirement	Henderson Street Existing Conditions	
		• 1.7m from the edge of the roadway • 4.0m from the edge of the tracks	• 2.4m from the edge of the roadway • 4.5m from the edge of the rail tracks
Fencing	Fencing	• None	
	Evidence of Trespassing	• None	
Additional Comments	Parking	• No parked cars within the vicinity of the crossing during the site visit. • The mailbox is a potential generator of parked vehicles near the crossing. **(Figure B-16)**	

5.0 LOCATION 3: BARRON ROAD (W) RAIL CROSSING

The western rail crossing along Barron Road is located approximately 60m east of the T-intersection of Barron Road at Centre Street. The speed limit along the roadway at this location is 50km/hr and has a AADT of 800 vehicles per day. The maximum train speed at this location is 10 mph (17km/h). There is approximately 1 train a day that passes through this crossing location. Barron Road is classified as a Local Road. **Figure 5.1** is an arial view of the subject crossing, indicating one rail track and a two-lane roadway (one lane in each direction).

Figure 5.1 – Barron Road (W) Rail Crossing

The speed limit along this roadway is 50km/h, however the operating speeds along this segment are expected to vary. The operating speeds were determined using the 85th percentile speeds based off a recent speed study that was completed in the Allanburg Area Transportation Planning Study by RVA. The 85th percentile speed along this segment was 60 km/h, thus the Stopping Sight Distance was determined to be 85m for both approaches. **Figure 5.2** shows the resulting SSD sight triangle with the warning system at the crossing.

Figure 5.3, shows the available sightlines from the planned stop sign and stop bar locations from future developments.

The $D_{Stopped}$ was calculated at 60m as per section 7 of the Grade Crossing Standards (2019). **Figure 5.4**, shows the resulting site triangles using the $D_{Stopped}$ values.

As set out in 21 (1) of Section 19 in the Grade Crossing Regulations, this crossing is not subjected to D_{SSD} requirements as it has an active warning system with flashing lights, and bells.

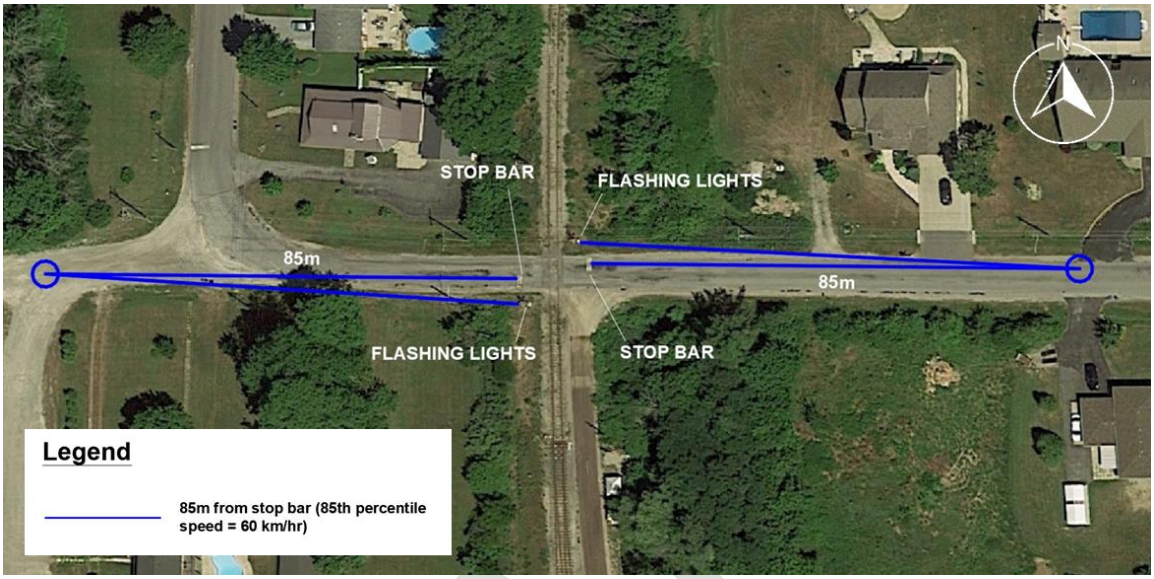

Figure 5.2 – Barron Road (W) Rail Crossing SSD

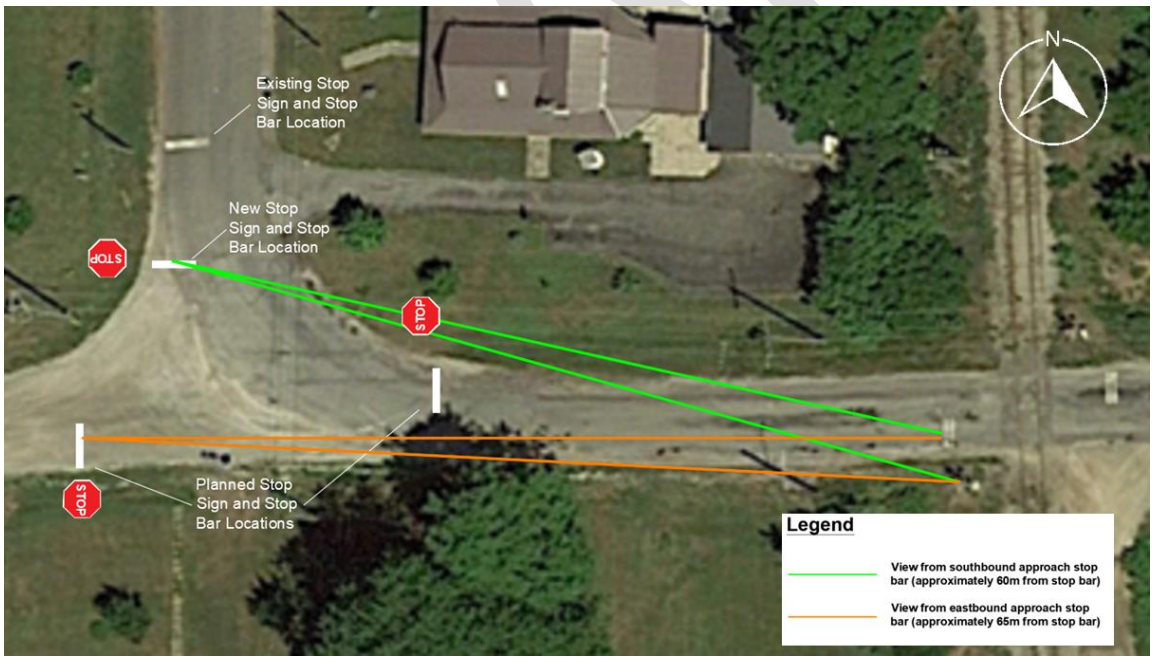

Figure 5.3 – Barron Road (W) Rail Crossing – Proposed Stop Bar Available Sightline

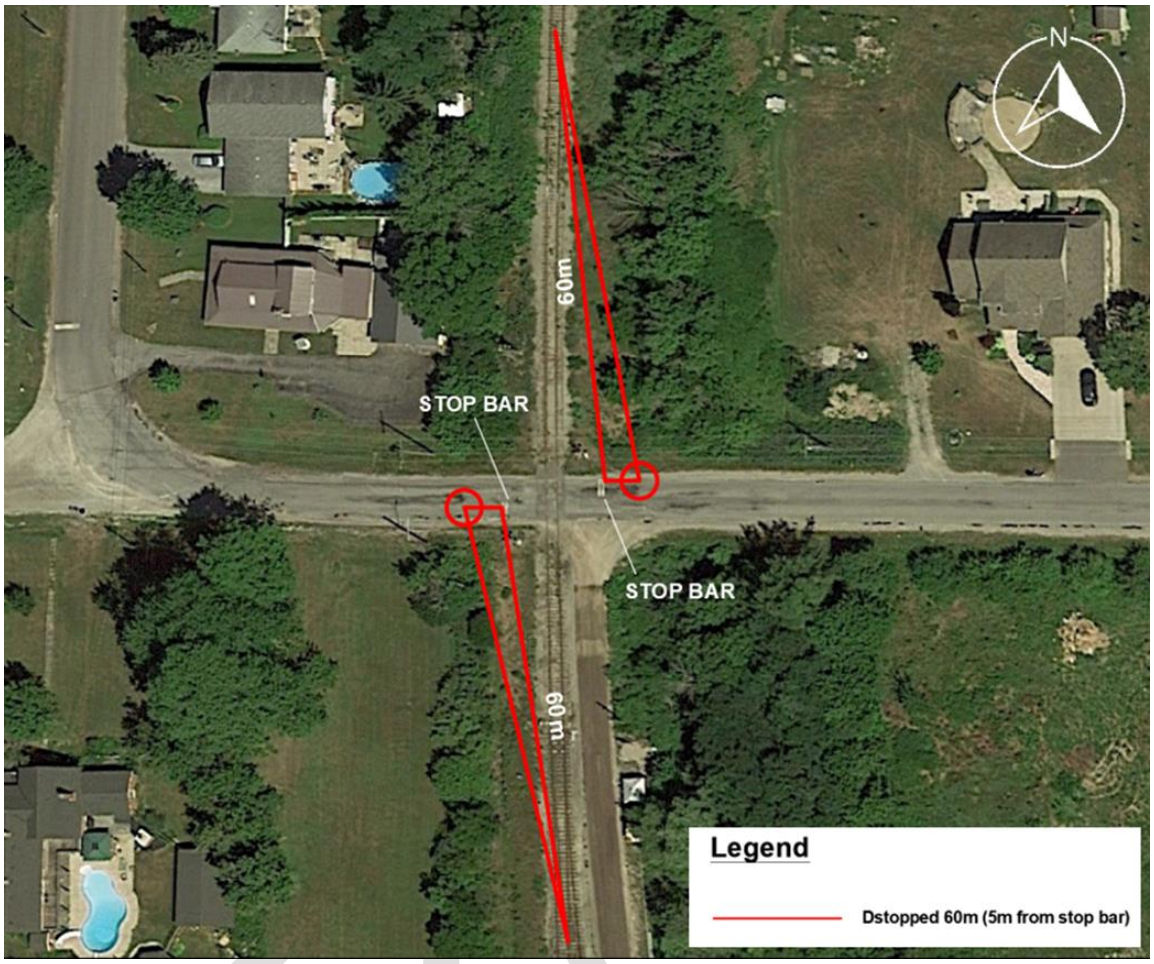

Figure 5.4 – Barron Road (W) Rail Crossing $D_{Stopped}$

Below is summary of findings for the rail crossing at Barron Road (W).

Table 5.1 – Barron Road (W) Crossing Existing Conditions

Criteria	Requirement	Barron Road (W) Existing Conditions
Location	Rail Crossings within 400m	• None
	Nearby Intersections and Accesses • measured stop bar to stop bar • not including railway access	• Barron Road at Centre Street - 60m, **Figure C-1** • Barron Road at Gainer Street – 175m, **Figure C-2** • Barron Road at new Residential Development Access – 65m, **Figure C-3**
	Surrounding Land Uses	• Residential
Grade Crossing Surface	Crossing Material & Condition	• Wood planks and Asphalt • Good Condition, smooth and continuous, **Figure C-4**
	Condition of Roadway Asphalt	• Good Condition
	Width of Crossing Surface	• Distance between Tracks: 2.4m • Stop Bar to Stop Bar, Clearance Distance: 14.8m
	Extension of Crossing Surface beyond edge of road or shoulder	• North Side – 2.7m • South Side – 2.2m
Road Geometry	Difference in Railway slope and road gradient	• None • Rail track area raised compared to both road approaches
	Active Transportation Facilities	• None
	Roadway Width	• 5.7m

Criteria	Requirement	Barron Road (W) Existing Conditions	
	Shoulder	Eastbound (Width Varies, **Figure C-5**) • North: 0.7m • South: 0.9m	Westbound • North: 1.1m • South: 1.8m
Sightlines	Calculation Parameters	• Clearance Distance: 14.8m • Railway Design Speed: 17km/h • Roadway Design Speed: 60km/h	
	SSD	• SSD = 85m • Eastbound and westbound sightlines exceed the required SSD, **Figure C-6 & Figure C-7**	
	$D_{Stopped}$	• $D_{Stopped}$ = 60m **Eastbound approach:** • There are available sightlines for vehicles exceeding the required $D_{Stopped}$ in each direction. **(Figure C-8, Figure C-9)**	**Westbound approach:** • There are available sightlines for vehicles exceeding the required $D_{Stopped}$ in each direction. **(Figure C-10, Figure C-11)**
	D_{SSD}	• D_{SSD} = 35m • Not applicable due to the presence of a warning system with flashing lights and bells	
	Other	**Visibility of warning system** • Visible from Barron Road at Centre Street (approximately 60m) • Visible from Barron Road at Gainer Street (approximately 175m)	

Criteria	Requirement	Barron Road (W) Existing Conditions	
		• Visible from Barron Road at new Residential Development Access (approximately 65m)	
Signage and Pavement Markings	Warning Signage	• "Watch for Bumps", Rotated away from roadway, **Figure C-12**	
	Pavement Markings	• Painted 'X' on westbound approach located 130m from stop bar, Poor condition and faded, **Figure C-13** • Stop Bar, **Figures C-14 & Figure C-15** › Eastbound: 4.7m from edge of tracks › Westbound: 5m from edge of tracks	
Warning System	Warning System	• Warning System with Flashing Lights and Bells, **Figure C-16**	
	Location of Warning System	Eastbound • 2.8m from the edge of the roadway • 3.4m from the edge of the tracks	Westbound • 2.8m from the edge of the roadway • 3.4m from the edge of the rail tracks
Fencing	Fencing	• None	
	Evidence of Trespassing	• None	
Additional Comments	Parking	• No parked cars within the vicinity of the crossing during the site visit.	

6.0 LOCATION 3: BARRON ROAD (E) RAIL CROSSING

The eastern rail crossing along Barron Road is located approximately 45m east of the intersection of Barron Road at Allanport Road. The speed limit along the roadway at this location is 50km/hr and has an AADT of 1500 vehicles. The maximum train speed at this location is 60 mph (97km/h). There are approximately 12 trains a day that pass through this crossing location. Barron Road is classified as a Local Road. Below in **Figure 6.1** is an arial view of the subject crossing, indicating one rail track and a two-lane roadway (one lane in each direction).

Figure 6.1 – Barron Road (E) Rail Crossing

The speed limit along this roadway is 50km/hr, however, the Stopping Sight Distance was examined at 20 km/hr over (70km/hr) due to the rural nature of this crossing. **Figure 6.2** shows the resulting SSD sight triangle with the warning system at the crossing.

As set out in 21 (1) of Section 19 in the Grade Crossing Regulations, this crossing is not subjected to D_{SSD} and$D_{Stopped}$ requirements as it has an active warning system with flashing lights, bells, and gates.

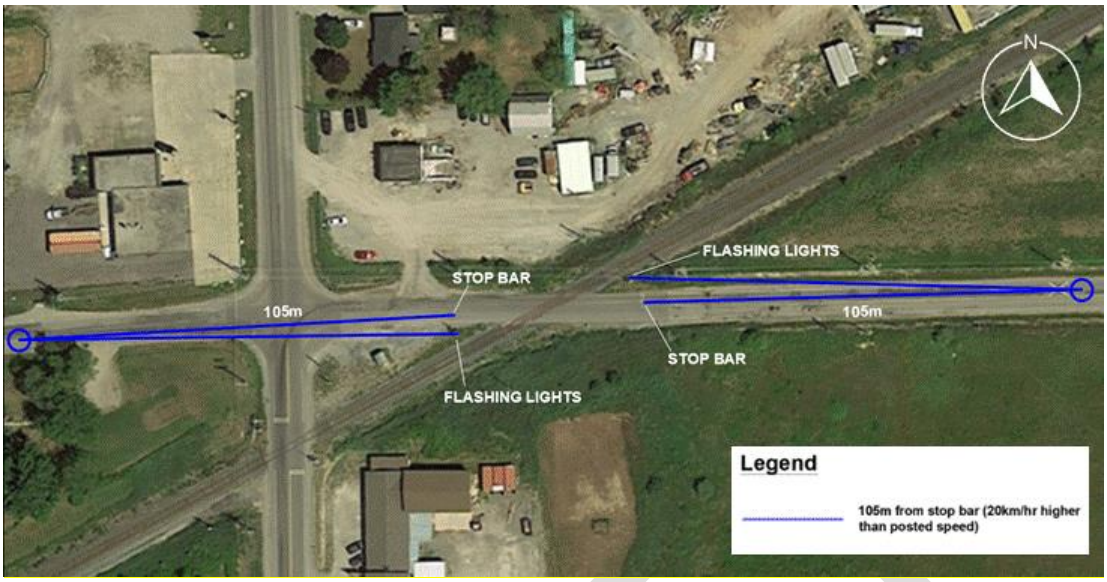

Figure 6.2 – Barron Road (E) Rail Crossing SSD

Below is summary of findings for the rail crossing at Barron Road (E).

Table 6.1 – Barron Road (E) Crossing Existing Conditions

Criteria	Requirement	Barron Road (E) Existing Conditions
Location	Rail Crossings within 400m	• Allanport Road Crossing 55m southwest of this crossing
	Nearby Intersections and Accesses • measured stop bar to stop bar • not including railway access	• Barron Road at Allanport Road – 45m, **Figures D-1 and D-2**
	Surrounding Land Uses	• Residential, Commercial, and Light Industrial
Grade Crossing Surface	Crossing Material & Condition	• Wood planks and Asphalt • Good Condition and smooth **Figure D-3**
	Condition of Roadway Asphalt	• Good Condition
	Width of Crossing Surface	• Distance between Tracks: 2.9m • Stop Bar to Stop Bar, Clearance Distance: 32m
	Extension of Crossing Surface beyond edge of road or shoulder	• North Side – 2.7m • South Side – 3.4m
Road Geometry	Difference in Railway slope and road gradient	• None • Rail track area raised compared to both road approaches
	Active Transportation Facilities	• None
	Roadway Width	• 7.1m

Criteria	Requirement	Barron Road (E) Existing Conditions	
	Shoulder	Eastbound (Width Varies, **Figure D-4**) • North: 0.7m • South: 0.9m	Westbound • North: 1.1m • South: 1.8m
Sightlines	Calculation Parameters	• Clearance Distance: 32m • Railway Design Speed: 97km/h • Roadway Design Speed: 70km/h	
	SSD	• SSD = 105m • Eastbound and westbound sightlines exceed the required SSD, **Figure D-5 & Figure D-6**	
	$D_{Stopped}$	• $D_{Stopped}$ = 710m • Not applicable due to the presence of a warning system with gates.	
	D_{SSD}	• D_{SSD} = 210m • Not applicable due to the presence of a warning system with flashing lights and bells.	
	Other	**Visibility of warning system** • Visible from driveway – approximately 20m west of crossing, **Figure D-7**	
Signage and Pavement Markings	Warning Signage	• W-10a located 102m from stop bar, good condition, **Figure D-8**	
	Pavement Markings	• Painted 'X' on westbound approach located 93m from stop bar, Poor condition and faded, **Figure D-9** • Road Centreline, good condition • Road Edge Markings, good condition	

Criteria	Requirement	Barron Road (E) Existing Conditions	
		• Stop Bar, **Figures D-10 & Figure D-11** › Eastbound: 14.3m from edge of tracks, faded › Westbound: 14.9m from edge of tracks, good condition	
Warning System	Warning System	• Warning System with Flashing Lights, Bells, and Gates **Figure D-12**	
	Location of Warning System	Eastbound • 2.6m from the edge of the roadway • 3.3m from the edge of the tracks	Westbound • 2.7m from the edge of the roadway • 3.3m from the edge of the rail tracks
Fencing	Fencing	• None	
	Evidence of Trespassing	• None	
Additional Comments	Parking	• No parked cars within the vicinity of the crossing during the site visit.	

7.0 LOCATION 5: ALLANPORT ROAD RAIL CROSSING

The crossing along Allanport Road is located approximately 20m south of the intersection of Barron Road at Allanport Road. The speed limit along the roadway at this location is 80km/hr and has an AADT of 4300 The maximum train speed at this location is 60 mph (90km/hr). There are approximately 12 trains a day that pass through this crossing location. Allanport Road is classified as an Arterial Road. **Figure 7.1** is an arial view of the subject crossing, indicating one rail track and a two-lane roadway (one lane in each direction).

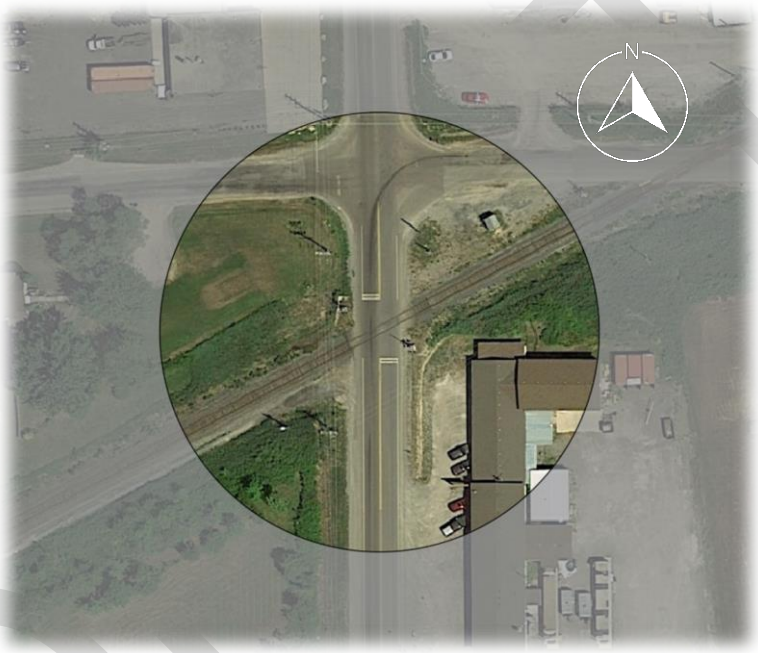

Figure 7.1 – Allanport Road Rail Crossing

The speed limit along this roadway is 80km/hr, however, the Stopping Sight Distance was examined at 100km/hr. **Figure 7.2** shows the resulting SSD sight triangle with the warning system at the crossing.

As set out in 21 (1) of Section 19 in the Grade Crossing Regulations, this crossing is not subjected to D_{SSD} and$D_{Stopped}$ requirements as it has an active warning system with flashing lights, bells, and gates.

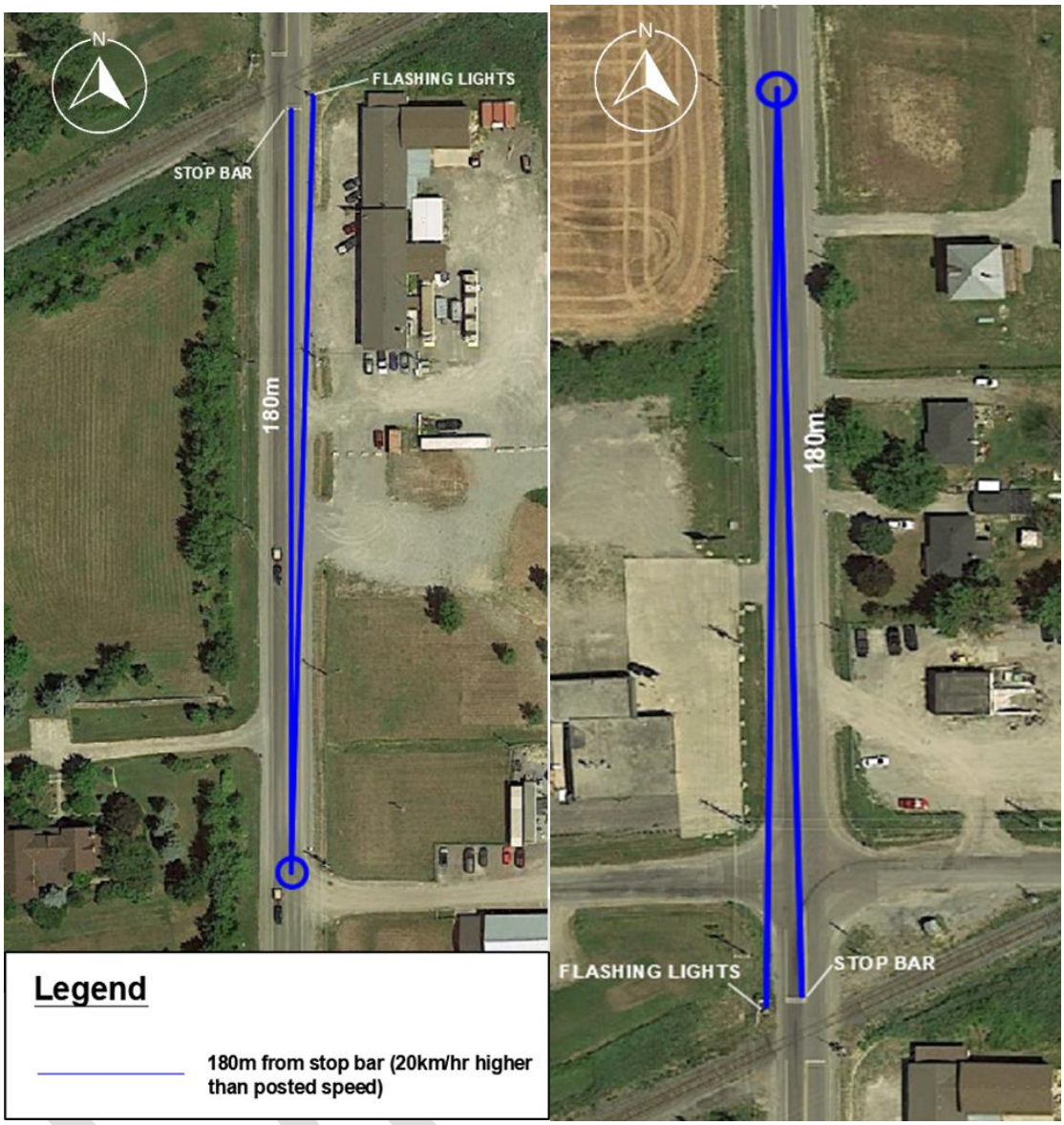

Figure 7.2 – Allanport Road Rail Crossing SSD

Below is summary of findings for the rail crossing at Allanport Road.

Table 7.1 – Allanport Road Crossing Existing Conditions

Criteria	Requirement	Allanport Road Existing Conditions
Location	Rail Crossings within 400m	• Barron Road (E) Crossing – 55m
	Nearby Intersections and Accesses • measured stop bar to stop bar • not including railway access	• Barron Road at Allanport Road - 20m, **Figures E-1 and E-2**
	Surrounding Land Uses	• Residential, Commercial, Light Industrial
Grade Crossing Surface	Crossing Material & Condition	• Asphalt: Good Condition, Some Warping **Figure E-3**
	Condition of Roadway Asphalt	• Good Condition
	Width of Crossing Surface	• Distance between Tracks: 1.9m • Clearance Distance: 12.2m
	Extension of Crossing Surface beyond edge of road or shoulder	• East Side – 2.5m • West Side – 2.1m
Road Geometry	Difference in Railway slope and road gradient	• None
	Active Transportation Facilities	• None
	Roadway Width	• 7.1m

Criteria	Requirement	Allanport Road Existing Conditions	
	Shoulder	Northbound (Width Varies) • East: 2.2m • West: 2.3m	Southbound (Width Varies) • East: 2.5m • West: 1.9m
Sightlines	Calculation Parameters	• Clearance Distance: 12.2m • Railway Design Speed: 97km/h • Roadway Design Speed: 100km/h	
	SSD	• SSD = 185m • Eastbound and westbound sightlines exceed the required SSD, **Figures E-4 & E-5**	
	$D_{Stopped}$	• $D_{Stopped}$ = 310m • Not applicable due to the presence of a warning system with flashing lights and bells	
	D_{SSD}	• D_{SSD} = 205m • Not applicable due to the presence of a warning system with flashing lights and bells	
	Other	**Visibility of warning system** • Good sightlines from driveway approximately 82m north of the rail crossing **(Figure E-6)** • Good sightlines from eastbound leg of Barron Road intersection **(Figure E-7)**	

Criteria	Requirement	Allanport Road Existing Conditions	
Signage and Pavement Markings	Warning Signage	• W-10a Signage located 207m (NB) and 285m (SB) from stop bar, good condition, **Figure E-8, E-9, E-10, E-11**	
	Pavement Markings	• Stop Bar, **Figure E-12 & E-13** › Northbound: 5.3 from edge of tracks › Southbound: 5.0m from edge of tracks • Painted 'X' located 217m (NB) and 293m (SB) from stop bar, good condition, **Figure E-14 & E-15** • Road Centreline, Good Condition • Road Edge, Good Condition	
Warning System	Warning System	• Warning System with Flashing Lights, Bells, and Gates, **Figure E-16**	
	Location of Warning System	Northbound • 1.8m from the edge of the roadway • 6.2m from the edge of the tracks	Westbound • 2.1m from the edge of the roadway • 6.1m from the edge of the rail tracks
Fencing	Fencing	• None	
	Evidence of Trespassing	• None	
Additional Comments	Parking	• No parked cars within the vicinity of the crossing during the site visit.	

APPENDIX A

LUNDY’S LANE (RR 20) RAIL CROSSING

Figure A-1: Lundy's Lane Crossing – Crossing Material

Figure A-2: Grade Crossing Surface (North side)

Figure A-3: Grade Crossing Surface (South side)

Figure A-4: Lundy's Lane Crossing – Shoulder Width

Figure A-5: Lundy's Lane Crossing Sightline Visibility – Eastbound Approach (105m)

Figure A-6: Lundy's Lane Crossing Sightline Visibility – Westbound Approach 105m)

Figure A-7: Lundy's Lane Crossing Dstopped (westbound approach facing southbound) – 50m

Figure A-8: Lundy's Lane Crossing Dstopped (westbound approach facing southbound) – 50m

Figure A-9: Lundy's Lane Crossing Dstopped (eastbound approach facing southbound) – 50m

Figure A-10: Lundy's Lane Crossing Dstopped (eastbound approach facing northbound) – 50m

Figure A-11: Lundy's Lane Crossing Stop Bar – View from Intersection of Lundy's Lane (Highway 20) at Highway 58/82

Figure A-12: Lundy's Lane Crossing Warning Signage – Westbound Approach

Figure A-13: Lundy's Lane Crossing Painted "X" and Warning Signage – Eastbound Approach

Figure A-14: Lundy's Lane Crossing Stop Bar – Westbound Approach

Figure A-15: Lundy's Lane Crossing Stop Bar – Eastbound Approach

Figure A-16: Lundy's Lane Crossing Painted "X" – Westbound Approach

Figure A-17: Lundy's Lane Crossing – View from 13227 Lundy's Lane

Figure A-18: Lundy's Lane Crossing – Warning System

APPENDIX B

HENDERSON STREET RAIL CROSSING

Figure B-1: Henderson Street Crossing – Crossing Material

Figure B-2: Henderson Street Crossing – Shoulder Condition

Figure B-3: Henderson Street Crossing Sightline Visibility – Westbound Approach (20m)

Figure B-4: Henderson Street Crossing Sightline Visibility – Eastbound Approach (50m)

Figure B-5: Henderson Street Crossing (Dstopped) – Eastbound Approach (facing southbound)

Figure B-6: Henderson Street Crossing (Dstopped) – Eastbound Approach (facing northbound)

Figure B-7: Henderson Street Crossing (Dstopped) – Westbound Approach (facing southbound)

Figure B-8: Henderson Street Crossing (Dstopped) – Eastbound Approach (facing northbound)

Figure B-9: Henderson Street Crossing (Dssd) – Eastbound Approach (facing southbound)

Figure B-10: Henderson Street Crossing (Dssd) – Eastbound Approach (facing northbound)

Figure B-9: Henderson Street Crossing (Dssd) – Westbound Approach (facing northbound)

Figure B-11: Henderson Street Crossing (Dssd) – Westbound Approach (facing southbound)

Figure B-12: Henderson Street Crossing – View from Henderson Street at Clifton Street

Figure B-13: Henderson Street Crossing – View from Henderson Street at Centre Street

Figure B-14: Henderson Street Crossing – Stop Sign Control

Figure B-15: Henderson Street Crossing – Other Considerations (Potential Generator of Parked Vehicles)

APPENDIX C

BARRON ROAD (W) RAIL CROSSING

Figure C-1: Barron Road (West) Crossing – View from Stop Bar at Barron Road and Centre Street)

Figure C-2: Barron Road (West) Crossing – View from Stop Bar at Barron Road and Gainer Street)

Figure C-3: Barron Road (West) Crossing – View from New Residential Development (85m west of tracks)

Figure C-4: Barron Road (West) Crossing – Crossing Material

Figure C-5: Barron Road (West) Crossing – Shoulder Condition

Figure C-6: Barron Road (West) Crossing Sightline Visibility – Westbound Approach (85m)

Figure C-7: Barron Road (West) Crossing Sightline Visibility – Eastbound Approach (85m)

Figure C-8: Barron Road (West) Crossing (Dstopped) – Eastbound Approach (facing southbound)

Figure C-9: Barron Road (West) Crossing (Dstopped) – Eastbound Approach (facing northbound)

Figure C-10: Barron Road (West) Crossing (Dstopped) – Westbound Approach (facing northbound)

Figure C-11: Barron Road (West) Crossing (Dstopped) – Westbound Approach (facing southbound)

Figure C-12: Barron Road (West) Crossing – “Watch for Bumps” Sign Condition

Figure C-13: Barron Road (West) Crossing – View from painted “X” (Westbound Approach)

Figure C-14: Barron Road (West) Crossing Stop Bar – Westbound Approach

Figure C-15: Barron Road (West) Crossing Stop Bar – Eastbound Approach

Figure C-16: Barron Road (West) Crossing – Grade Crossing Warning System

APPENDIX D

BARRON ROAD (E) RAIL CROSSING

Figure D-1: Barron Road (East) – View of Crossing from Southbound Approach Facing Eastbound

Figure D-2: Barron Road (East) – View of Crossing from Northbound Approach Facing Westbound

Figure D-3: Barron Road (East) – Crossing Material

Figure D-4: Barron Road (East) – Shoulder Condition

Figure D-5: Barron Road (East) Crossing Sightline Visibility – Westbound Approach (105m)

Figure D-6: Barron Road (East) Crossing Sightline Visibility – Eastbound Approach (105m)

Figure D-7: Barron Road (East) Crossing – View from Driveway 20m West of Crossing

Figure D-8: Barron Road (East) – Warning Signage

Figure D-9: Barron Road (East) Stop Bar – Eastbound Approach

Figure D-10: Barron Road (East) Stop Bar – Westbound Approach

Figure D-11: Barron Road (East) – Painted “X”

Figure D-12: Barron Road (East) – Grade Crossing Warning System

APPENDIX E

ALLANPORT ROAD RAIL CROSSING

Figure E-1: Allanport Road Crossing - View of Crossing from Westbound Approach Facing Southbound

Figure E-2: Allanport Road Crossing – Grade Crossing Warning System

Figure E-3: Allanport Road Crossing – Grade Crossing Surface (Facing Northbound)

Figure E-4: Allanport Road Crossing Sightline Visibility – Northbound Approach (180m)

Figure E-5: Allanport Road Crossing Sightline Visibility – Southbound Approach (180m)

Figure E-6: Allanport Road Crossing – View of Crossing Facing Southbound from Driveway at 2065 Allanport Road

Figure E-7: Allanport Road Crossing - View of Crossing from Eastbound Approach Facing Southbound

Figure E-8: Allanport Road Crossing Warning Sign Condition – Southbound Approach (Front of Sign)

Figure E-9: Allanport Road Crossing Warning Sign Condition – Southbound Approach (Back of Sign)

Figure E-10: Allanport Road Crossing Northbound Approach – Warning Signage

Figure E-11: Allanport Road Crossing Southbound Approach – Warning Signage

Figure E-12: Allanport Road Crossing Stop Bar – Northbound Approach

Figure E-13: Allanport Road Crossing Stop Bar – Southbound Approach

Figure E-14: Allanport Road Crossing Northbound Approach – Painted “X”

Figure E-15: Allanport Road Crossing Southbound Approach – Painted “X”

Figure E-16: Allanport Road Crossing – Grade Crossing Surface (Facing Westbound)

APPENDIX 2

Cost Estimate For Recommended Improvements

Whistle Cessation Cost Estimate

Item	Cost Estimate
Lundy's Lane Rail Crossing	
Retrofit & Extend Crossing Surface	$10,000
Advisory Speed Signs (2)	$2,000
Stop Ahead Signs (2)	$2,000
Installation of Gates including upgrading Warning System	$300,000
Signal Pre-emption at the intersection of Lundy's Lane & Allanport Road	$40,000
Sub-total	*$354,000*
Contigencies 30% (Engineering and Other Costs)	$106,200
Lundy's Lane Rail Crossing G. Total Cost	$460,200
Henderson Street Rail Crossing	
Retrofit Crossing Surface	$10,000
Crossing Ahead Signs (2)	$2,000
Advisory Speed Signs (2)	$2,000
Stop Ahead Signs (2)	$2,000
Installation of Warning System	$250,000
Move Mailbox, Coordinate with Canada Post	$500
Triming of Foliage to improve the sightlines	$1,000
Sub-total	*$267,500*
Contigencies 30% (Engineering and Other Costs)	$80,250
Henderson Street G. Total Cost	$347,750
Barron Street (W) Rail Crossing	
Crossing Ahead Signs (1)	$1,500
Advisory Speed Signs	$2,000
Stop Ahead Signs	$2,000
Repaint faded markings	$1,000
Triming of Foliage to improve the sightlines	$2,500
Sub-total	*$9,000*
Contigencies 30% (Engineering and Other Costs)	$2,700
Barron Street (W) Rail Crossing Total	$11,700
Barron Street (E) Rail Crossing	
Pre-Emption only with Signalize Allanport Road / Barron Road Intersection	$30,000
Crossing Ahead Signs	$2,000
Advisory Speed Signs	$2,000
Stop Ahead Signs	$2,000
Repaint faded markings	$1,000
Wc-104 signs	$2,000
Sub-total	*$39,000*
Contigencies 30% (Engineering and Other Costs)	$11,700
Barron Street (E) Rail Crossing Total	$50,700
Allanport Road Crossing	
Signalize Allanport Road / Barron Road Intersection w/ pre-emption	$325,000
Crossing Ahead Signs	$2,000
Advisory Speed Signs (WA-7T)	$2,000
Stop Ahead Signs	$2,000
Repaint faded markings	$1,000
Wc-104 signs	$2,000
Sub-total	*$334,000*
Contigencies 30% (Engineering and Other Costs)	$100,200
Allanport Road Rail Crossing Total	$434,200