

B. M. ROSS AND ASSOCIATES LIMITED

Engineers and Planners

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VIA EMAIL ONLY

File No. 00221

October 7, 2024

Scott McLeod, Works Manager
Municipality of Arran-Elderslie
1925 Bruce Road 10, Box 70
Chesley, ON N0G 1L0

Re: Priebe Bridge, Structure E1 on Sideroad 25

We completed an inspection of the above structure on May 31 of this year and a follow-up review on September 29, 2024. Due to the condition of various bridge components we recommended the load limit on the bridge be reduced to 5 tonne. We are also recommending that the bridge be closed so that emergency repairs to address the deficiencies can be completed this fall. A summary of our observations and reasons for our recommendations follow.

The existing bridge is a steel truss bridge with a concrete bridge deck. It is anticipated that this bridge was originally constructed in 1938. According to our records, some supplemental stringers (floor beams) were installed along the outside edge of the bridge deck in 2002. This bridge previously had a load limit of 10 tonnes. We are recommending the load limit be reduced because the concrete deck is in poor condition with concrete failure above both the north and south abutment, as well as deck stringers in the north and south bays are failing.

With regards to the concrete deck, there is one hole in the deck at the north end that has been covered with a steel plate and a second hole has started in the south end of the deck. The concrete is about 125mm thick, but concrete has spalled off the underside of the deck; about over 40% of the soffit, leaving the reinforcing steel exposed in those areas. When the concrete deck is exposed to heavier vehicle loads, we suspect the deck flexes and more concrete will fall off; as such, the deck becomes weaker. Additionally, exposed reinforcing steel corrodes more quickly than steel electrochemically protected by the concrete, leading to steel section loss. Therefore, the bridge deck should be replaced.

With regards to the stringers (floor beams) under the deck, there were originally 6 stringers under the concrete deck in each bay, but in 2002, supplemental stringers were installed along the outside edge of the bridge deck. When reviewing the north span, 4 of the original stringers did not appear to be providing support for the deck, as large portions of their top flanges have corroded all the way through. As a result, loads must be transferred through the weak

deck to the stringers along the outside edge. In the most southern bay, there appeared to be two stringers not providing any support for the deck because they are corroded through in places. The other four original girders are in poor condition and only the supplemental two stringers installed in 2002 are in fair to good condition.

Within the other three spans along the length of the bridge, there is at least one stringer, with a portion of the top flange rusted through, which is providing limited support to the underside of the deck. Additionally, all five other stringers are generally corroding with localized pitting along the top flanges, which has led to the weakening of these stringers. When doing repairs, we recommend replacing all the stringers in the bridge deck.

Enclosed with this letter is a copy of the OSIM report that includes photos to illustrate the deficiencies identified during our review. The OSIM report lists a few other deficiencies such as a damaged guiderail and concrete spalling at the one corner of the abutments.

To avoid closing the bridge and maintaining the 5 tonne load limit, supplemental stringers could be installed under the north and south bays of the bridge and localized repairs should be completed to the bridge deck where the holes are present, or have started to form. These repairs should be completed as soon as possible, and we would recommend the Township budget \$27,000 for construction and \$6,000 for Engineering to complete these repairs. Our concern is that although these repairs should provide adequate support for the bridge deck, given the deck is in poor condition and there is a risk that a heavier vehicle will break through the deck, we are recommending that the load limit be kept at 5 tonne until the bridge deck is replaced. At the 5 tonne load posting, the bridge is insufficient to support the Township's grader or other snow plows. Also, these repairs are only considered a short-term solution because it does not address the fact that most of the concrete deck will still be in poor condition.

In lieu of a short-term repair, the bridge could be rehabilitated to address the deficiencies. To repair this structure, we would recommend that all the floor beams (stringers) and the concrete deck be replaced, as well as miscellaneous other repairs be completed to address the other deficiencies identified. We have been in discussion with, AJN Builders Inc., which has experience completing truss bridge repairs. The Contractor has indicated he can start rehabilitating the bridge within approximately three weeks, and if authorized to start, can order materials within the next week. This should allow the work to be completed before mid-December. BMROSS can prepare the design for this rehabilitation before he begins repairs and provide him information to order the components needed. However, when rehabilitating a steel truss bridge, we recommend examining all the truss members in detail. Additionally, we recommend completing an analysis of the bridge trusses and other steel members to confirm the load posting listing is appropriate. Unfortunately, due to other commitments, we do not have time to complete this analysis until after the rehabilitation work would be started and possibly not until it is finished. Our analysis may determine that some of the truss components are inadequate to support the desired load posting and it may be determined that some of the truss members have to be replaced or reinforced to provide a 10 tonne load posting, as was previously provided, to support the Township's snow removal equipment. Based on our experience, and the fact that the bridge was supporting the Township's snow removal equipment in past years, we suspect that the number of upgrades to the truss should not be very significant, but that is one of the risks associated with doing the deck repairs before we complete the truss analysis.

We calculated a probable cost of \$270,000, plus HST, to complete the repairs including a \$20,000 contingency. The Contractor has reviewed the scope of work and has agreed that our price estimate is fair; however, would like to review the final drawings and details before he commits to doing the work for that price. Note, that scope of work includes completion of all the other miscellaneous repairs listed in the OSIM such as replacing deteriorated guiderail posts and concrete repairs to the abutments. While there is insufficient time to tender the project in the traditional way, we would still prepare an agreement, similar to what is included in a tender document, and ensure the Contractor provides general liability insurance coverage.

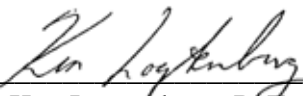
With regards to Engineering fees, we have estimated that the probable cost to complete the design, provide general specification for the work, formalize an agreement with the Contractor, administer the contract, and analysis of the truss at approximately \$37,000, plus HST. As discussed above, the analysis work would be completed at a later date which may lead to some additional repairs to the bridge.

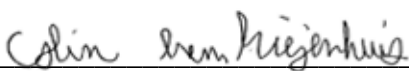
We have also calculated a probable cost to replace the bridge. When replacing the bridge, it is assumed the structure would be reconstructed as a two-lane concrete structure up to current codes requirements, with reconstructed approaches to improve the alignment of the bridge with the road. The total probable cost to construct a replacement structure was calculated to be approximately \$1,950,000 (2024 dollars), excluding HST, including Engineering. However, this work cannot start until next year and the repairs should be completed to make it through the winter.

Upon review of the options, we would recommend rehabilitating the bridge this fall unless the Township wants to replace the bridge next year. If you have any questions about this report or our recommendations, feel free to contact us.

Yours very truly

B. M. ROSS AND ASSOCIATES LIMITED

Per 
 Ken Logtenberg, P. Eng.

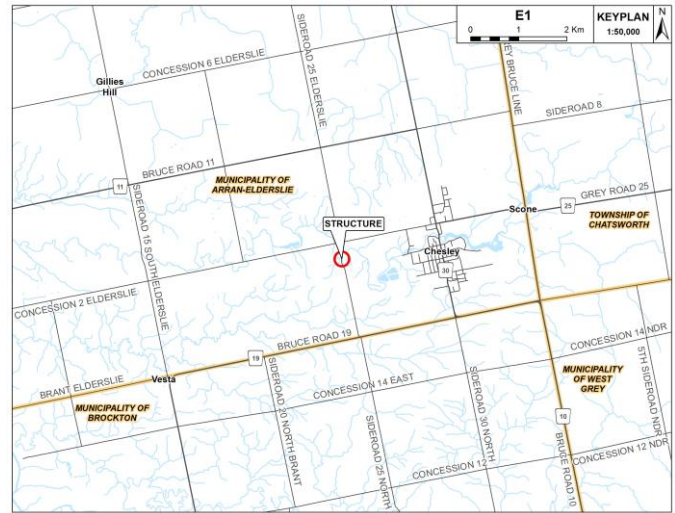
Per 
 Colin Van Niejenhuis, P. Eng.

KDL:hv
 Encl.

Summary Report:



2-East Elevation



Datum: NAD83 17N Northing: 4904769 Easting: 490339

Structure Name:	Priebe Bridge	BMROSS File #:	BR-773	MTO #:	
Main Hwy / Road #:		Bridge Condition Index (BCI):	34	CRV:	\$1,319,200
Road Name:	Sideroad 25	Inspection Date:	5/31/2024		
Structure Location:	South of Concession 2		Next Inspection:	1/1/2026	
Condition Summary:	Repairs recommended	Recommended Timing:	1-5 Years		Current Load Limit:
Overall Comments:	Half-through truss in poor condition. Needs emergency repairs to avoid closure, or rehabilitation to extend the life of the bridge. Load limit reduced from 10 tonnes to 5 tonne until concrete deck is replaced.				

Repair / Rehabilitation:				
Element:	Work Required	Period	Cost	
Beams/MLE's	Replace stringers and deck end beams	1 to 5 yrs.	\$46,000	
Decks	Replace concrete deck, with drains, curbs	1 to 5 yrs.	\$120,000	
Approaches	Site restoration, misc. site work	1 to 5 yrs.	\$20,000	
Abutments	Concrete repairs	1 to 5 yrs.	\$12,000	
			\$0	
			\$0	
			\$0	
Various	Associated Work		\$118,000	
			Total	\$316,000

Additional Investigations:

Maintenance Needs:

Inventory Data:

Structure Name: <input type="text" value="Priebe Bridge"/>	Crossing Type: <input type="text" value="Navigable Waterway"/>
Main Hwy / Road #: <input type="text"/>	On <input checked="" type="checkbox"/> Under <input type="checkbox"/>
Road Name: <input type="text" value="Sideroad 25"/>	Northing: <input type="text" value="4904769"/>
Structure Location: <input type="text" value="South of Concession 2"/>	Easting: <input type="text" value="490339"/>
Owner(s): <input type="text" value="Municipality of Arran-Elderslie"/>	Heritage Designation: <input type="text" value="Not Designated"/>
MTO Region: <input type="text" value="Southwestern"/>	Road Class: <input type="text" value="Local"/>
MTO District: <input type="text" value="Owen Sound"/>	Posted Speed: <input type="text"/>
Current County: <input type="text" value="Bruce"/>	No. of Lanes: <input type="text" value="1"/>
Geographic Twp.: <input type="text" value="ELDERSLIE"/>	AADT: <input type="text" value="200-499"/>
Structure Group: <input type="text" value="Truss"/>	% Trucks: <input type="text"/>
Structure Type: <input type="text" value="Half-Through Truss"/>	Special Routes: <input type="text"/>
Total Deck Length: <input type="text" value="25.1"/> (m)	Surface Type: <input type="text" value="Concrete"/>
Overall Str. Width: <input type="text" value="5.4"/> (m)	Detour Length Around Bridge: <input type="text"/> (km)
Total Struct. Area: <input type="text" value="135.54"/> (sq.m)	Fill on Structure: <input type="text" value="0"/> (m)
Roadway Width: <input type="text" value="4.5"/> (m)	Skew Angle: <input type="text" value="0"/> (Degrees)
Number of Spans: <input type="text" value="1"/>	Direction of Structure: <input type="text" value="North/South"/>
Span Length(s): <input type="text" value="23.2"/> (m) <input type="text"/> (m) <input type="text"/> (m) <input type="text"/> (m) <input type="text"/> (m)	Min. Vert. Clearance: <input type="text"/> (m)
MTO Number: <input type="text"/>	Bridge Condition Index: <input type="text" value="34"/>
	BMROSS File Number: <input type="text" value="BR-773"/>

Historical Data:

Year Built: <input type="text" value="1938"/>	Last Biennial Inspection: <input type="text" value="2022"/>
Current Load Limit: <input type="text" value="5"/> (tonnes)	Last Evaluation: <input type="text"/>
Load Limit By-Law #: <input type="text"/>	Last Enhanced Inspection: <input type="text"/>
By-Law Expiry Date: <input type="text"/>	Enhanced Access Equipment: <input type="text"/>

Rehabilitation / Investigation History:

Year	Work Type	Description	Cost
2002		Some stringers replaced, bearing seats repaired, some stringers repaired	0

Field Inspection Information:		
Date of Inspection: 5/31/2024	Inspection Type: OSIM Inspection	Next Detailed Inspection: 2026
Inspector: Ken Logtenberg		
Inspecting Firm: BM Ross & Associates Limited		
Others in Party: Andrew McGarvey		
Equipment Used: Hammer, Camera, Measuring Tape, Chain		
Weather: Sunny, Slight Breeze		
Temperature: 22 °C		

Additional Investigations			
Investigation Description	Note	Priority	Estimated Cost
Detailed Deck Condition or Corrosion Potential Survey		N/R	\$0
Non-destructive Delamination Survey of Asphalt-Covered Deck		N/R	\$0
Concrete Substructure Condition Survey		N/R	\$0
Detailed Coating Condition Survey		N/R	\$0
Detailed Timber Investigation		N/R	\$0
Post-Tensioned Strand Investigation		N/R	\$0
Underwater Investigation		N/R	\$0
Fatigue Investigation		N/R	\$0
Seismic Investigation		N/R	\$0
Structure Evaluation		N/R	\$0
Monitoring Deformations, Settlements, or Movements of Crack Widths		N/R	\$0
Total Cost:			\$0

Overall Structure Notes:	
Bridge Condition Summary: Repairs recommended	Recommended Timing: 1-5 Years
Overall Comments: Half-through truss in poor condition. Needs emergency repairs to avoid closure, or rehabilitation to extend the life of the bridge. Load limit reduced from 10 tonnes to 5 tonne until concrete deck is replaced.	

Replacement Value:	
Structure Type: <input type="text" value="Bridge"/>	Structure Area: <input type="text" value="136"/> (sq.m)
Replacement Cost: \$ <input type="text" value="1,319,200"/>	Complexity Factor: <input type="text" value="1"/>
	Price per sq. m.: \$ <input type="text" value="9,700.00"/>
<i>Note: Replacement cost calculation is based on the above price per square metre, the total deck or structure area for the existing structure and the chosen complexity factor. This cost may not be a suitable value when budgeting to replace a structure.</i>	

Suspected Performance Deficiencies

- | | | |
|---|--|------------------------------|
| 01 Load carrying capacity | 06 Bearing not uniformly loaded/unstable | 12 Slippery surfaces |
| 02 Excessive deformations (deflections and rotations) | 07 Jammed expansion joint | 13 Flooding/channel blockage |
| 03 Continuing settlement | 08 Pedestrian/vehicular hazard | 14 Undermining of foundation |
| 04 Continuing movements | 09 Rough riding surface | 15 Unstable embankments |
| 05 Seized bearings | 10 Surface ponding | 16 Other |
| | 11 Deck drainage | |

Maintenance Needs

- | | | |
|--------------------------------------|---------------------------------|--|
| 01 Lift and Swing Bridge Maintenance | 07 Repair to Structural Steel | 13 Erosion Control at Bridges |
| 02 Bridge Cleaning | 08 Repair of Bridge Concrete | 14 Concrete Sealing |
| 03 Bridge Handrail Maintenance | 09 Repair of Bridge Timber | 15 Rout and Seal |
| 04 Painting Steel Bridge Structures | 10 Bailey bridges - Maintenance | 16 Bridge Deck Drainage |
| 05 Bridge Deck Joint Repair | 11 Animal/Pest Control | 17 Scaling (Loose Concrete or ACR Steel) |
| 06 Bridge Bearing Maintenance | 12 Bridge Surface Repair | 18 Other |

Repair / Rehabilitation:			
Element:	Work Required	Period	Cost
Beams/MLE's	Replace stringers and deck end beams	1 to 5 yrs.	\$46,000
Decks	Replace concrete deck, with drains, curbs	1 to 5 yrs.	\$120,000
Approaches	Site restoration, misc. site work	1 to 5 yrs.	\$20,000
Abutments	Concrete repairs	1 to 5 yrs.	\$12,000
			\$0
			\$0
			\$0
Repair/Rehabilitation Sub-Total:			\$198,000

Associated Work Required:		
Mobilize / Demobilize	and access platform	\$35,000
Approaches		\$10,000
Traffic Control / Detours		\$10,000
Utilities		\$0
Right of Way		\$0
Environmental Study	Approval	\$5,000
Engineering		\$33,000
Other		\$0
Contingencies		\$25,000
Associated Work Sub-Total:		\$118,000
Total Cost:		\$316,000

Justification:

Element Data:						
Element Group:	Abutments			Length:	0.7	
Element Name:	Abutment Walls			Width:	6.4	
Location:	North and South			Height:	1.2	
Material:	Cast-in-place Concrete			Count:	2	
Element Type:	Gravity Wall			Total Quantity:	15.4 m2	
Environment:	Moderate			Limited / Not Inspected:	<input type="checkbox"/>	
Protection System:	None			BCI - Element Condition Values:		
Condition Data:	Excellent	Good	Fair	Poor	TEV	CEV
			95% (14.63)	5% (0.77)	\$13,860	\$5,267
Comments:	Abutment at south west corner has concrete spall off, below the bearing seat and a crack in the south abutment at centering Should be repaired in those areas.					
Performance Deficiencies:	None					
Recommended Work:	Perform concrete repairs to abutment where required.			Recommended Timing:	1-5 years	
Maintenance needs:						
Maintenance work:				Maintenance Priority:		
Element Data:						
Element Group:	Abutments			Length:	2.6	
Element Name:	Wingwalls			Width:		
Location:				Height:	1.2	
Material:	Cast-in-place Concrete			Count:	4	
Element Type:	Mass Concrete			Total Quantity:	6.2 m2	
Environment:	Benign			Limited / Not Inspected:	<input type="checkbox"/>	
Protection System:	None			BCI - Element Condition Values:		
Condition Data:	Excellent	Good	Fair	Poor	TEV	CEV
			100% (6.2)		\$2,170	\$868
Comments:	No concerns identified.					
Performance Deficiencies:	None					
Recommended Work:				Recommended Timing:	None	
Maintenance needs:						
Maintenance work:				Maintenance Priority:		
Element Data:						
Element Group:	Barriers			Length:	25.1	
Element Name:	Railing Systems			Width:		
Location:				Height:		
Material:	Corrugated Steel			Count:	2	
Element Type:	Steel Flex Beam on Wood Post			Total Quantity:	50.2 m	
Environment:	Benign			Limited / Not Inspected:	<input type="checkbox"/>	
Protection System:	None			BCI - Element Condition Values:		
Condition Data:	Excellent	Good	Fair	Poor	TEV	CEV
			95% (47.69)	5% (2.51)	\$10,040	\$3,815
Comments:	Section of guide rail on south approach is badly damaged and should be replaced.					
Performance Deficiencies:						
Recommended Work:	Replace damaged section of guiderail			Recommended Timing:	< 1 year	
Maintenance needs:						
Maintenance work:				Maintenance Priority:		

Ontario Structure Inspection Manual - Inspection Report:

Site Number: E1

Element Data:						
Element Group:	Beams/MLE's			Length:		
Element Name:	Diaphragms			Width:	0.15	
Location:				Height:	0.46	
Material:				Count:	6	
Element Type:	Cross Type			Total Quantity:	6 Each	
Environment:	Benign			Limited / Not Inspected:	<input type="checkbox"/>	
Protection System:	None			BCI - Element Condition Values:		
Condition Data:	Excellent	Good	Fair	Poor	TEV	CEV
			65% (3.9)	35% (2.1)	\$0	\$0
Comments:	Cross beams at end are providing none to limited support for floor beams. Vertical studs installed to help support floor beams. Central beams in better condition, but coating disintegrated over 20-30%, and small amount of section loss.					
Performance Deficiencies:	None					
Recommended Work:	Replace end beams and recoat other cross beams to help preserve their condition.				Recommended Timing:	1-5 years
Maintenance needs:						
Maintenance work:					Maintenance Priority:	
Element Data:						
Element Group:	Beams/MLE's			Length:	4.8	
Element Name:	Floor Beams			Width:	0.23	
Location:				Height:	0.11	
Material:	Steel			Count:	30	
Element Type:	I-type			Total Quantity:	131 m2	
Environment:	Moderate			Limited / Not Inspected:	<input type="checkbox"/>	
Protection System:	None			BCI - Element Condition Values:		
Condition Data:	Excellent	Good	Fair	Poor	TEV	CEV
			80% (104.8)	20% (26.2)	\$55,020	\$17,606
Comments:	Struts to support floor beams in end spans. Supplemental stringers: 208x130x9, installed at all outside stringers. In the north bay 3 beams poor condition, south bay 2 in poor condition, in other bays about one in poor condition.					
Performance Deficiencies:	None					
Recommended Work:	Install two more supplemental stringers in end two bays below wheel tracks.				Recommended Timing:	< 1 year
Maintenance needs:						
Maintenance work:					Maintenance Priority:	
Element Data:						
Element Group:	Decks			Length:	25.1	
Element Name:	Deck Top			Width:	4.9	
Location:				Height:		
Material:	Cast-in-place Concrete			Count:	1	
Element Type:	Cast-in-place Concrete on Supports			Total Quantity:	123 m2	
Environment:	Moderate			Limited / Not Inspected:	<input type="checkbox"/>	
Protection System:	None			BCI - Element Condition Values:		
Condition Data:	Excellent	Good	Fair	Poor	TEV	CEV
			50% (61.5)	50% (61.5)	\$14,760	\$2,952
Comments:	Many transverse cracks. Deck leaks water thru which propomotes corrosion of floor beams. One hole in deck covered with steel plate. Other holes starting to form elsewhere in the deck. Other holes starting					
Performance Deficiencies:	None					
Recommended Work:	Deck is beyond repair or any repairs will not last long. Replace concrete bridge deck.				Recommended Timing:	1-5 years
Maintenance needs:						
Maintenance work:					Maintenance Priority:	

Ontario Structure Inspection Manual - Inspection Report:

Site Number: E1

Element Data:						
Element Group:	Decks			Length:	23.2	
Element Name:	Soffit - Thin Slab			Width:	5.4	
Location:				Height:		
Material:	Cast-in-place Concrete			Count:	1	
Element Type:				Total Quantity:	125.3 m2	
Environment:	Benign			Limited / Not Inspected:	<input type="checkbox"/>	
Protection System:	None			BCI - Element Condition Values:		
Condition Data:	Excellent	Good	Fair	Poor	TEV	CEV
			60% (75.18)	40% (50.12)	\$15,036	\$3,609
Comments:	Exposed rebar on underside of deck over 40% of area and concrete is spalling off. Installation of supplemental stringer may delay deck replacement work but suspect deck is flexing when exposed to heavier truck traffic.					
Performance Deficiencies:						
Recommended Work:	Replace concrete deck.				Recommended Timing:	1-5 years
Maintenance needs:						
Maintenance work:					Maintenance Priority:	
Element Data:						
Element Group:	Sidewalks/curbs			Length:	25.1	
Element Name:	Curbs			Width:		
Location:				Height:		
Material:	Cast-in-place Concrete			Count:	2	
Element Type:				Total Quantity:	50.2 m	
Environment:	Benign			Limited / Not Inspected:	<input type="checkbox"/>	
Protection System:	None			BCI - Element Condition Values:		
Condition Data:	Excellent	Good	Fair	Poor	TEV	CEV
			95% (47.69)	5% (2.51)	\$2,008	\$763
Comments:	Section of concrete curb broken off south west corner of the deck. Allows water to land on truss bearing seat in that corner.					
Performance Deficiencies:						
Recommended Work:	Replace deck and curbs.				Recommended Timing:	1-5 years
Maintenance needs:						
Maintenance work:					Maintenance Priority:	
Element Data:						
Element Group:	Trusses/Arches			Length:	26	
Element Name:	Top Chords			Width:	0.31	
Location:				Height:	0.15	
Material:	Steel			Count:	2	
Element Type:	T-type			Total Quantity:	52 m	
Environment:	Benign			Limited / Not Inspected:	<input type="checkbox"/>	
Protection System:	None			BCI - Element Condition Values:		
Condition Data:	Excellent	Good	Fair	Poor	TEV	CEV
			100% (52)		\$15,600	\$6,240
Comments:	Includes all truss members. Analysis should be completed before major repairs.					
Performance Deficiencies:	None					
Recommended Work:					Recommended Timing:	None
Maintenance needs:						
Maintenance work:					Maintenance Priority:	



1-Facing South



2-East Elevation



3-Soffit



4-Soffit and South Abutment



May 31, 2024 2:36 p.m.

5-Soffit and Stringers at North End (1)



May 31, 2024 2:37 p.m.

6-Soffit and Stringers at North End (2)



7-North Abutment



8-West Girder Slight Deflection



May 31, 2024 2:34 p.m.

9-West Girder Bearing Point



May 31, 2024 2:33 p.m.

Deck Top



Deck Top Cracks



Guiderail Posts



Hole In Bridge Deck and Temporarily Installed Steel Cover Plate



North Bay Stringer Corroded Top Flange



South Bay Corroded Perforated Web

