B. M. ROSS AND ASSOCIATES LIMITED
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File No. 00221

VIA EMAIL ONLY

October 7, 2024

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

Re: Pearce Bridge, Structure E12

We completed an inspection of the above structure on May 31, 2024 and due to the condition of various bridge components we recommended the bridge be closed until the structure is repaired or replaced. However, based on specifics pertaining to this bridge we do not think it would be cost effective over the long term to rehabilitate this structure. A summary of our observations and reasons for our recommendations follow.

The existing bridge is a steel truss bridge bearing on tall concrete abutments installed to accommodate for high water levels and the elevated roadway approaches. It is anticipated that this bridge was originally constructed in 1930. According to our records, this structure underwent repairs in 1971, 2002 and 2008. It was recommended in 2002 that future expenditures on this bridge be put towards replacing this structure. We agree with that recommendation given that the existing bridge is now over 90 years old, truss members are buckling which reduces their load carrying capacity, the poor alignment of the bridge relative to the road, the fact the structure is a single lane bridge with a load limit, the abutment shifted in the past and may do so again in the future, and the fact that when we re-analyzed the load limit of the aging truss members the load carrying capacity of the bridge may have to be reduced further. If the load limit is reduced from 8 to 5 tonnes it is not practical for passing snow removal equipment over it.

Enclosed with this letter is a copy of the OSIM report that includes photos to illustrate the deficiencies identified during our review. When reviewing the structure the following deficiencies were identified.

- Abutments have shifted in the past and there is a large crack in the south abutment. Efflorescence staining over 5% of the surface and should be removed and replaced.
- Top flange of most of the cross beams are corroding and some have lost 50% of their cross-sectional area.

- About 25 to 30% of the floor beams (stringers) are deteriorated to the point that the beams are not providing any support for the bridge deck. Many of the other beams are still providing some support but are also in poor condition.
- The wooden deck is still in fair condition, but allows water to pass through the deck and on to the floor beams that are corroding and the deck will have to be removed and replaced to complete all the repairs.
- The bridge trusses on each side of the bridge are buckling. The buckle along the bottom tension chords is very obvious, and the top of the trusses are also bent. This condition reduces the ultimate capacity of the trusses and makes it more difficult to complete repairs to the structure.

To repair this structure, we would recommend that all the cross beams and floor beams be replaced, concrete repairs be completed, the trusses be straightened out as much as reasonably possible, the deck boards be replaced, and miscellaneous other tasks be completed to address all deficiencies identified. When including a contingency, approvals and engineering in the estimate, we calculated that the total probable costs, excluding HST, will be approximately $400,000. The last set of repairs to the bridge took place 16 years earlier; however, given that the abutment has shifted in the past, we are unsure how long this rehabilitated structure will last before it is necessary to decide whether to repair or replacement the structure again.

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 so the alignment of the bridge is improved to better line up with the road. The total probable cost to construct a replacement structure, including Engineering, approvals, etc. was calculated to be about $3,070,000, excluding HST.

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.

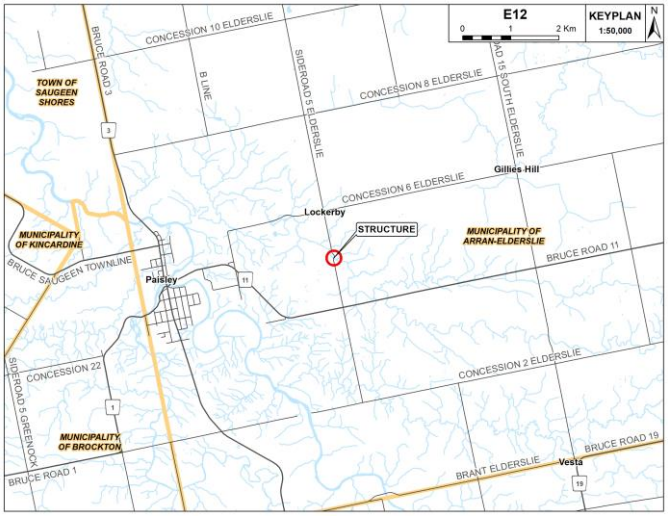
KDL:hv
Encl.

Ontario Structure Inspection Manual - Inspection Report:

Site Number: E12

Summary Report:

2-West Elevation



Datum: NAD83 17N **Northing:** 4906509 **Easting:** 481708

Structure Name:	Pearces Bridge	**BMROSS File #:**	BR-280	**MTO #:**	
Main Hwy / Road #:		**Bridge Condition Index (BCI:)**	40	**CRV:**	$1,619,900
Road Name:	Sideroad 5			**Inspection Date:**	5/31/2024
Structure Location:	Concession 6			**Next Inspection:**	1/1/2026
Condition Summary:	Replacement recommended	**Recommended Timing:**	Within 1 yr.	**Current Load Limit:**	8
Overall Comments:	Half through truss in poor condition. In lieu of completing extensive repairs; recommend closure and replacement of structure.				

Repair / Rehabilitation:

Element:	Work Required	Period	Cost
	Replace structure	Within 1 yr.	$2,100,000
			$0
			$0
			$0
			$0
			$0
			$0
Various	Associated Work		$973,000
		Total	$3,073,000

Additional Investigations:

Maintenance Needs:

Ontario Structure Inspection Manual - Inspection Report:

Site Number: E12

Inventory Data:

Structure Name:	Pearces Bridge		
Main Hwy / Road #:		On ☑ Under ☐	Crossing Type: Navigable Waterway
Road Name:	Sideroad 5	Northing:	4906509
Structure Location:	Concession 6	Easting:	481708
Owner(s):	Municipality of Arran-Elderslie	Heritage Designation:	Not Designated
MTO Region:	Southwestern	Road Class:	Local
MTO District:	Owen Sound	Posted Speed:	No. of Lanes: 2
Current County:	Bruce	AADT: 200-499	% Trucks:
Geographic Twp.:	ELDERSLIE	Special Routes:	
Structure Group:	Truss	Surface Type:	Wood
Structure Type:	Half-Through Truss	Detour Length Around Bridge:	(km)
Total Deck Length:	29.3 (m)	Fill on Structure:	0 (m)
Overall Str. Width:	5.7 (m)	Skew Angle:	0 (Degrees)
Total Struct. Area:	167.01 (sq.m)	Direction of Structure:	North/South
Roadway Width:	4.8 (m)	Min. Vert. Clearance:	(m)
Number of Spans:	1	Bridge Condition Index:	40
Span Length(s):	27.1 (m) (m) (m) (m) (m)		
MTO Number:		**BMROSS File Number:**	BR-280

Historical Data:

Year Built:	1930	Last Biennial Inspection:	2022
Current Load Limit:	8 (tonnes)	Last Evaluation:	
Load Limit By-Law #:		Last Enhanced Inspection:	
By-Law Expiry Date:		Enhanced Access Equipment:	

Rehabilitation / Investigation History:

Year	Work Type	Description	Cost
2008		Deck replaced and stringers replaced	0
2002		Some stringers replaced	0
1971		South abutment repaired	0

Ontario Structure Inspection Manual - Inspection Report:

Site Number: E12

Field Inspection Information:

Date of Inspection: 5/31/2024 **Inspection Type:** OSIM Inspecton **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: 15 ^{O}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: Replacement recommended **Recommended Timing:** Within 1 yr.

Overall Comments: Half through truss in poor condition. In lieu of completing extensive repairs; recommend closure and replacement of structure.

Replacement Value:

Structure Type:	Bridge	Structure Area:	167 (sq.m)
Replacement Cost:	$ 1,619,900	Complexity Factor:	1
		Price per sq. m.:	$ 9,700.00

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.

Suspected Performance Deficiencies

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

Maintenance Needs

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

Ontario Structure Inspection Manual - Inspection Report:

Site Number: E12

Repair / Rehabilitation:

Element:	Work Required	Period	Cost
	Replace structure	Within 1 yr.	$2,100,000
			$0
			$0
			$0
			$0
			$0
			$0

Repair/Rehabilitation Sub-Total:	**$2,100,000**

Associated Work Required:

Mobilize / Demobilize		$60,000
Approaches	Removal and re-align approaches when constructing new abutments	$320,000
Traffic Control / Detours		$10,000
Utilities		$0
Right of Way		$0
Environmental Study		$23,000
Engineering		$260,000
Other	Bonding and Insurance	$50,000
Contingencies		$250,000

Associated Work Sub-Total:	**$973,000**
Total Cost:	**$3,073,000**

Justification:

Element Data:						
Element Group:	Abutments				**Length:**	
Element Name:	Abutment Walls				**Width:**	8.2
Location:					**Height:**	2.3
Material:	Cast-in-place Concrete				**Count:**	2
Element Type:	Gravity Wall				**Total Quantity:**	37.7 m2
Environment:	Benign				**Limited / Not Inspected:**	☐
Protection System:	None				**BCI - Element Condition Values:**	
Condition Data:	**Excellent**	**Good**	**Fair**	**Poor**	**TEV**	**CEV**
			90% (33.93)	10% (3.77)	$33,930	$12,215
Comments:	Abutments moved forward sometime in the past. South abutment has large crack and some efflorescence staining through smaller cracks. Cannot be sure abutment will not shift forward further in future.					
Performance Deficiencies:	None					
Recommended Work:	In lieu of concrete repairs recommend replace the structure.				**Recommended Timing:**	< 1 year
Maintenance needs:						
Maintenance work:					**Maintenance Priority:**	

Element Data:						
Element Group:	Abutments				**Length:**	4.6
Element Name:	Wingwalls				**Width:**	
Location:					**Height:**	3.0
Material:	Cast-in-place Concrete				**Count:**	4
Element Type:	Reinforced Concrete				**Total Quantity:**	27.6 m2
Environment:	Benign				**Limited / Not Inspected:**	☐
Protection System:	None				**BCI - Element Condition Values:**	
Condition Data:	**Excellent**	**Good**	**Fair**	**Poor**	**TEV**	**CEV**
			100% (27.6)		$9,660	$3,864
Comments:	Wingwalls attached to abutment and at least one abutment shifted forward.					
Performance Deficiencies:	None					
Recommended Work:	Replace structure.				**Recommended Timing:**	< 1 year
Maintenance needs:						
Maintenance work:					**Maintenance Priority:**	

Element Data:						
Element Group:	Barriers				**Length:**	29.3
Element Name:	Railing Systems				**Width:**	0.05
Location:					**Height:**	1.1
Material:	Steel				**Count:**	2
Element Type:	Steel Flex Beam on Steel Post				**Total Quantity:**	117.2 m
Environment:	Benign				**Limited / Not Inspected:**	☐
Protection System:	Galvanized				**BCI - Element Condition Values:**	
Condition Data:	**Excellent**	**Good**	**Fair**	**Poor**	**TEV**	**CEV**
		100% (117.2)			$23,440	$17,580
Comments:	Appears sound.					
Performance Deficiencies:	None					
Recommended Work:	Replace structure.				**Recommended Timing:**	< 1 year
Maintenance needs:						
Maintenance work:					**Maintenance Priority:**	

Element Data:						
Element Group:	Beams/MLE's				**Length:**	
Element Name:	Diaphragms				**Width:**	
Location:					**Height:**	
Material:	Steel				**Count:**	6
Element Type:	Cross Type				**Total Quantity:**	6 Each
Environment:	Benign				**Limited / Not Inspected:**	☐
Protection System:	None				**BCI - Element Condition Values:**	
Condition Data:	**Excellent**	**Good**	**Fair**	**Poor**	**TEV**	**CEV**
			50% (3)	50% (3)	$0	$0
Comments:	Top flange of some cross beams appear to have lost 50% of top flange, rusted away. Southernmost and second from north appear to be in poorest condition.					
Performance Deficiencies:						
Recommended Work:	In lieu of replacing all cross beams, replace structure.				**Recommended Timing:**	< 1 year
Maintenance needs:						
Maintenance work:					**Maintenance Priority:**	

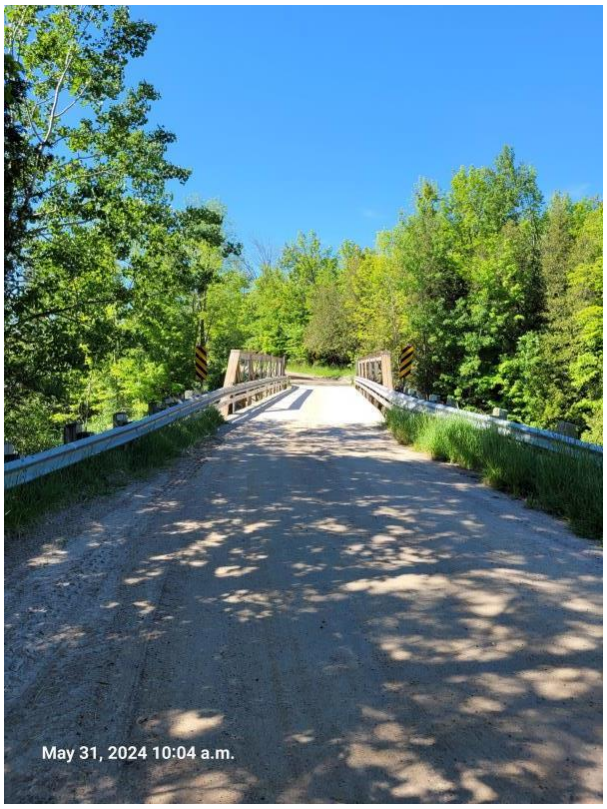
Element Data:						
Element Group:	Beams/MLE's				**Length:**	4.0
Element Name:	Floor Beams				**Width:**	0.09
Location:					**Height:**	0.18
Material:	Steel				**Count:**	49
Element Type:	I-type				**Total Quantity:**	123.5 m2
Environment:	Moderate				**Limited / Not Inspected:**	☐
Protection System:	None				**BCI - Element Condition Values:**	
Condition Data:	**Excellent**	**Good**	**Fair**	**Poor**	**TEV**	**CEV**
			70% (86.45)	30% (37.05)	$51,870	$14,524
Comments:	Many floor beams are rusted through and providing no support for deck. From north to south: Bay 1 - 1 poor, 6 fair. Bay 2 - 4 poor, 3 fair. Bay 3 - 2 poor, 5 fair. Bay 4 - 2 poor, 5 fair. Bay 5 - 1 poor, 6 fair. Bay 6 - 3 poor, 4 fair. Bay 7 - fair.					
Performance Deficiencies:						
Recommended Work:	In lieu of replacing all the floor beams, replace the structure.				**Recommended Timing:**	< 1 year
Maintenance needs:						
Maintenance work:					**Maintenance Priority:**	

Element Data:						
Element Group:	Bracing				**Length:**	
Element Name:	Bracing				**Width:**	
Location:					**Height:**	
Material:	Steel				**Count:**	16
Element Type:					**Total Quantity:**	16 Each
Environment:	Benign				**Limited / Not Inspected:**	☐
Protection System:	None				**BCI - Element Condition Values:**	
Condition Data:	**Excellent**	**Good**	**Fair**	**Poor**	**TEV**	**CEV**
			90% (14.4)	10% (1.6)	$8,000	$2,880
Comments:	Diagonal cross bracing. Only found one in poor condition but are old like other members and slowly deteriorating.					
Performance Deficiencies:						
Recommended Work:	Replace structure.				**Recommended Timing:**	< 1 year
Maintenance needs:						
Maintenance work:					**Maintenance Priority:**	

Element Data:						
Element Group:	Decks				**Length:**	29.3
Element Name:	Deck Top - Thin Slab				**Width:**	4.9
Location:					**Height:**	0.14
Material:	Wood				**Count:**	1
Element Type:	Laminated Wood Decking - transverse				**Total Quantity:**	143.6 m2
Environment:	Severe				**Limited / Not Inspected:**	☐
Protection System:	Other				**BCI - Element Condition Values:**	
Condition Data:	**Excellent**	**Good**	**Fair**	**Poor**	**TEV**	**CEV**
			100% (143.6)		$17,232	$6,893
Comments:	Abrasion to wood wearing down the surface of deck. Wooden deck allows water through and onto the floor beams below that are corroding. Deck would have to be removed to complete other repairs.					
Performance Deficiencies:	None					
Recommended Work:	Replace structure.				**Recommended Timing:**	< 1 year
Maintenance needs:						
Maintenance work:					**Maintenance Priority:**	

Element Data:						
Element Group:	Trusses/Arches				**Length:**	27.1
Element Name:	Bottom Chords				**Width:**	0.16
Location:					**Height:**	0.08
Material:	Steel				**Count:**	2
Element Type:					**Total Quantity:**	2 Each
Environment:	Benign				**Limited / Not Inspected:**	☐
Protection System:	None				**BCI - Element Condition Values:**	
Condition Data:	**Excellent**	**Good**	**Fair**	**Poor**	**TEV**	**CEV**
				100% (2)	$600	$0
Comments:	At north end, both bottom chords buckled by abutment moving inwards. Monitor. Gravel on bottom chords and bearing seats.					
Performance Deficiencies:	None					
Recommended Work:	In lieu of repairs recommend replacing the structure.				**Recommended Timing:**	< 1 year
Maintenance needs:						
Maintenance work:	Remove gravel from bottom chords and bearing seats				**Maintenance Priority:**	Within 1 Yr.

Element Data:						
Element Group:	Trusses/Arches				**Length:**	
Element Name:	Top Chords				**Width:**	
Location:					**Height:**	
Material:	Steel				**Count:**	
Element Type:	T-type				**Total Quantity:**	
Environment:	Benign				**Limited / Not Inspected:**	☐
Protection System:	None				**BCI - Element Condition Values:**	
Condition Data:	**Excellent**	**Good**	**Fair**	**Poor**	**TEV**	**CEV**
			80% ()	20% ()		$0
Comments:	Element includes remaining truss members (top chord, vertical and diagonal members). Curve in top chord of each truss. Coating system is not protecting steal and surface rust is present throughout trusses.					
Performance Deficiencies:						
Recommended Work:	Replace structure.				**Recommended Timing:**	< 1 year
Maintenance needs:						
Maintenance work:					**Maintenance Priority:**	



1-Facing North

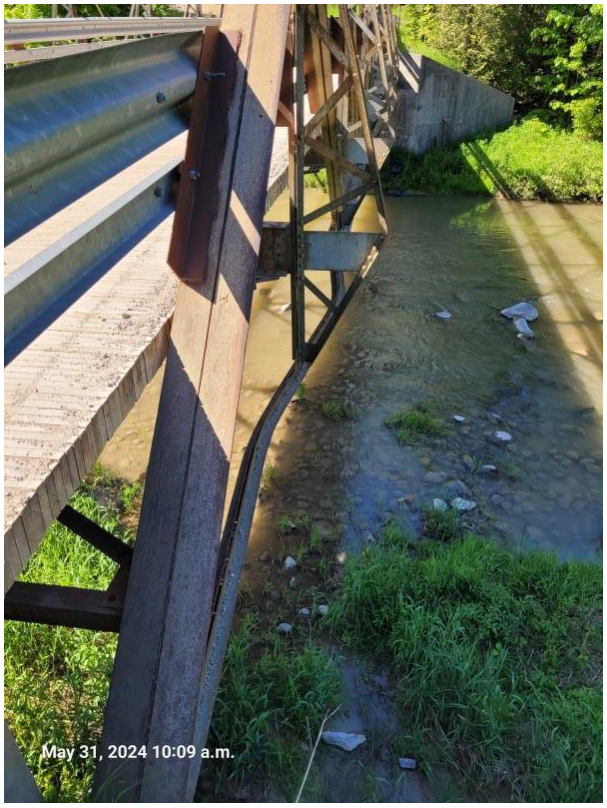
2-West Elevation

3-Soffit Looking North

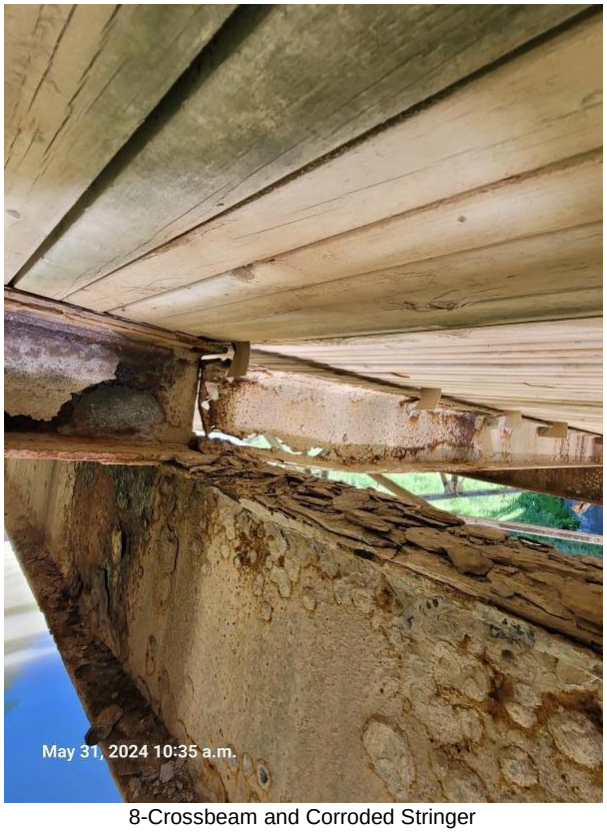
4-South Abutment and South Stringer

5-Bay 2 Stringers

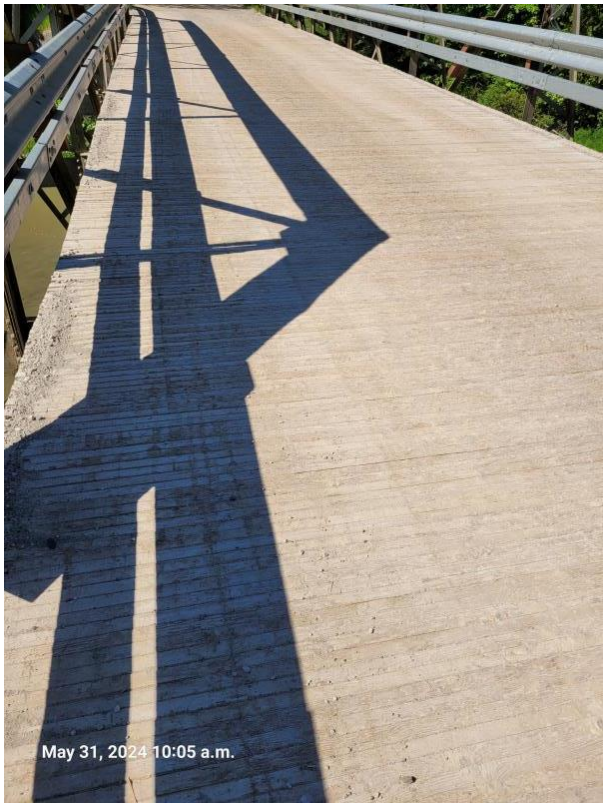
6-Bay 2 Crossbeam



7-Bent West Bottom Chord



8-Crossbeam and Corroded Stringer



9-Deck Top

Bent East Bottom Chord

Crossbeam

Top Chord-East Truss