

<b>SITE NUMBER AND NAME:</b> NC052 – Pembina River Bridge	<b>HIGHWAY AND KM:</b> 621:02, km 16.420	<b>PREVIOUS INSPECTION:</b> June 29, 2021	<b>CURRENT INSPECTION:</b> June 15, 2022
<b>LEGAL DESCRIPTION:</b> SE 01-50-09-W5	<b>NAD83 COORDINATES:</b> UTM11U 5905008N, 621749E		<b>RISK ASSESSMENT:</b> PF: 10 CF: 10 Total: 100
<b>AVERAGE ANNUAL DAILY TRAFFIC (AADT):</b> 1,140 (2021)		<b>CONTRACTOR MAINTENANCE AREA (CMA):</b> 509	

<b>SUMMARY OF INSTRUMENTATION:</b> Three slope inclinometers, two pneumatic piezometers, one vibrating wire piezometers, one standpipe piezometer, and one tiltmeter functional <b>LAST READING DATE:</b> May 6, 2022	<b>INSPECTED BY:</b> Stantec: Leslie Cho, Sonja Pharand AT: Rocky Wang, Amy Driessen, Wilf Cousineau
<b>PRIMARY SITE ISSUE:</b> Slope instability at east abutment. Artesian pressures at west abutments. Shallow groundwater table at east abutment. Bridge (BF74969) rotating with crushed bearing plates.	
<b>APPROXIMATE DIMENSIONS:</b> 40 m wide by 60 m long.	
<b>DATE OF ANY REMEDIAL ACTION:</b> Winter 2014/2015 – Dewatering of east abutment using sub-horizontal drains. Fall 2020 – Riprap placed on slope south of east abutment to about halfway down slope.	


ITEM	CONDITIONS EXIST		DESCRIPTION AND LOCATION	NOTICEABLE CHANGE FROM LAST INSPECTION	
	YES	NO		YES	NO
Pavement Distress	X		Transverse crack near SI13-01.		X
Slope Movement	X		Ground crack at toe of east abutment south of riprap channel.		X
Erosion	X		Downslope of riprap south of east abutment.		X
Seepage	X		Artesian flow from SI-1 on west abutment.		X
Bridge/Culvert Distress	X		Top of east pier rotating to the east. East abutment pushing into bridge deck. Through cracks in both abutment seats. Separation of guardrails at all four corners of bridge deck.		X

<b>COMMENTS</b>
<ul style="list-style-type: none"> <li>• Bridge rotation appears unchanged since 2021. The separation of the guardrails along the bridge deck have remained unchanged with 30 mm, 70 mm, 50 mm, and 20 mm of separation at the NE, SE, NW, and SW corners, respectively (Photos 1 to 4). The top of the guardrail at the SE corner has been reconnected to the post since the last inspection.</li> <li>• The expansion joint at the east abutment has a gap 35 mm wide in the west-bound lane where the rubber has fallen below the bridge deck (Photo 2).</li> <li>• Tiltmeter TE2 had its battery replaced in winter 2021. Data following battery replacement showed similar oscillation range as prior to replacement. The oscillation ranges were 0.05 degrees (A-axis) to 0.1 degrees (B-axis).</li> <li>• All the SIs show signs of creep. Creeping is occurring at a rate of less than 1 mm/year. Piezometric levels at the site have been relatively stable since installing the horizontal drains.</li> </ul>

- Concrete cracks at both east and west abutment seats appear unchanged. A 20 mm gap was written onto the crack at the west abutment at an unknown date. This same gap was measured to be 20 mm by Stantec since 2016. (Photos 5 and 7)
- The girders were in contact with the abutment backwall at the east abutment. The bearing plates appear to be crushed at both abutments. (Photo 6)
- The locks on the drainage galleries have been cut. In the easternmost drainage gallery, 7 of the 20 drains were flowing and in the westernmost gallery, 9 of the 32 drains were flowing. Minor flow of water was also observed at the gabion outfall.
- The ground crack south of the riprap channel near S114-01 appeared unchanged at about 7 m long with vertical difference up to about 0.4 m high (Photo 8).
- No apparent change was observed in the riprap channel and erosion south of the bridge at the east abutment slope (Photo 9).
- The highway surface at both the east and west abutment was recently patched. Potholes are present adjacent to the west abutment patch and east of the east patch. Multiple vehicles travelling west moved into the east-bound lane to avoid uneven (rutted/potholed) pavement. (Photo 10).
- The nearest detour route to cross the Pembina River appears to be at Range Road 91 and Township Road 491A, approximately a 12-minute drive south of the site. This detour would require the use of gravel roads and would not be suitable for all types of traffic.

**RECOMMENDATIONS**

- The bridge should be inspected by a bridge engineer.
- Batteries should be replaced for the remaining tiltmeters to collect regular readings. Otherwise, regular survey of the bridge should be conducted to monitor its rate of rotation/movement.
- The riprap channel south of the bridge should be extended downslope to the river or revegetated for increased erosion protection.
- Pavement cracks should be sealed and potholes should be filled to reduce surface water infiltration into the slope.
- Site inspections should continue annually.
- Instrumentation readings should continue semi-annually.

<b>PREPARED BY:</b> Sonja Pharand, E.I.T.	<b>PREPARED BY:</b> Leslie Cho, M.Eng., P.Eng.	<b>REVIEWED BY:</b> Xiteng Liu, M.Sc., P.Eng., PMP
		

2022 Site Inspection Photos at NC052



**Photo 1:** Guardrail separation at southeast corner of bridge. Looking south.



**Photo 2:** Guardrail separation at northeast corner of bridge and gap in expansion joint. Looking north.



2022 Site Inspection Photos at NC052



**Photo 3:** Guardrail separation at northwest corner of bridge. Looking north.



**Photo 4:** Guardrail separation at southwest corner of bridge. Looking south.



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**Photo 5:** Cracking of east abutment. Looking northeast.



**Photo 6:** Girders in contact with east abutment. Movement of bearing plate. Looking south.



2022 Site Inspection Photos at NC052



**Photo 7:** 20 mm crack at west abutment. Looking west.



**Photo 8:** Riprap lined channel north of east abutment. Ground cracks near S114-01. Looking northeast.



2022 Site Inspection Photos at NC052



**Photo 9:** Riprap placed south of bridge along previous erosion channel. Looking southeast.



**Photo 10:** Pavement surface at west abutment. Looking east across bridge.



