

SITE NUMBER AND NAME: NC057 – Highway 624 Embankment Failure	HIGHWAY AND KM: 624:02, km 2.571	PREVIOUS INSPECTION: June 15, 2022	CURRENT INSPECTION: June 2, 2023
LEGAL DESCRIPTION: NE & NW 34-50-07-W5	NAD83 COORDINATES: UTM11U 5915066N, 637131E		RISK ASSESSMENT: PF: 10 CF: 6 Total: 60
AVERAGE ANNUAL DAILY TRAFFIC (AADT): 1,290 (2022)		CONTRACTOR MAINTENANCE AREA (CMA): 509	

SUMMARY OF INSTRUMENTATION: Two vibrating wire piezometers and one standpipe piezometer functional	INSPECTED BY: Stantec: Leslie Cho, Sonja Pharand TEC: Rocky Wang, Amy Driessen, Jennifer Mazurek, Pramaya Kannel
LAST READING DATE: May 19, 2023	
PRIMARY SITE ISSUE: Highway embankment failure due to high groundwater level and weak foundation soils.	
APPROXIMATE DIMENSIONS: 140 m long by 15 m wide	
DATE OF ANY REMEDIAL ACTION: Pavement dip repaired in 2006. Granular drains installed in 2007. Milled and paved in 2014 and 2017. Milled in 2022.	


ITEM	CONDITION EXISTS		DESCRIPTION AND LOCATION	NOTICEABLE CHANGE FROM LAST INSPECTION	
	YES	NO		YES	NO
Pavement Distress	X		Pavement cracking reflecting through milled asphalt.	X	
Slope Movement	X		Eastbound lane (EBL) slumping near BH17-06. Bulge feature south of BH17-06 approximately at mid-embankment height. Vertical differential developing southwest of BH17-01 on westbound lane (WBL)		X
Erosion		X			X
Seepage	X		A spring was observed at BH17-03 in 2018, 2019 and 2023. Artesian conditions were also observed in BH17-02. Anecdotal evidence from the nearby residents suggests springs exist in this area.	X	
Bridge/Culvert Distress		X			X

COMMENTS
In general, little change was observed since the 2022 inspection. The following summarizes Stantec's observations: <ul style="list-style-type: none"> • Pavement cracks are visible within the milled asphalt surface (Photos 1 to 4). • On the WBL, cracking has progressed to about 25 m east of BH17-02. • Vertical displacement was observed at the west extents of the pavement cracks on the WBL due to transition from milled to non-milled pavement (Photo 1). • The EBL pavement cracks near BH17-06 show about 20 to 40 mm vertical displacement after milling. A portion of pavement near BH17-06, at the location of the greatest vertical displacement south of the crack, was not milled (Photo 4) • A potential bulge was observed south of BH17-06 approximately halfway down the embankment slope.

- The piezometer levels remain high at this site with the piezometers showing artesian conditions as high as 0.3 m above ground surface. High piezometric levels are likely contributing to the embankment instability.
- Range Roads 71 and 72 could be used for detours and would require less than 20 minutes of additional travel time. However, travel over gravel roads would be required and may not be suitable for transport trucks. Transport trucks may see additional travel times in the order of 30 minutes on paved roadways.

RECOMMENDATIONS

- Pavement cracks should be sealed to reduce surface water infiltration into the embankment. Additional pavement patches are not recommended since it is considered an additional driving force on the embankment. Mill and fill could be completed to address the vertical displacement until remediation is completed.
- Preliminary remediation design was completed by Stantec in January 2018. The selected remedial option includes improving embankment drainage using tire derived aggregate. The preliminary cost was estimated to be \$980,000, excluding engineering. Detailed design for this option is currently underway. The high-level cost of construction is \$1.2 million to \$1.6 million, excluding engineering.
- Site inspections should continue annually.
- Instrumentation should continue to be read semi-annually.
- If remediation is delayed by more than two years, slope inclinometers should be considered to monitor the depth and rate of slope movement. This information will be useful for characterizing the failure and optimizing the design.

PREPARED BY: Sonja Pharand, P.Eng.	PREPARED BY: Leslie Cho, M.Eng., P.Eng.
	
REVIEWED BY: Xiteng Liu, M.Sc., P.Eng., PMP	PERMIT TO PRACTICE

2023 Site Inspection Photos at NC057



Photo 1: West limits of WBL pavement cracks. Looking east.



Photo 2: Diagonal pavement cracks approximately at km 2.55. Looking southeast.

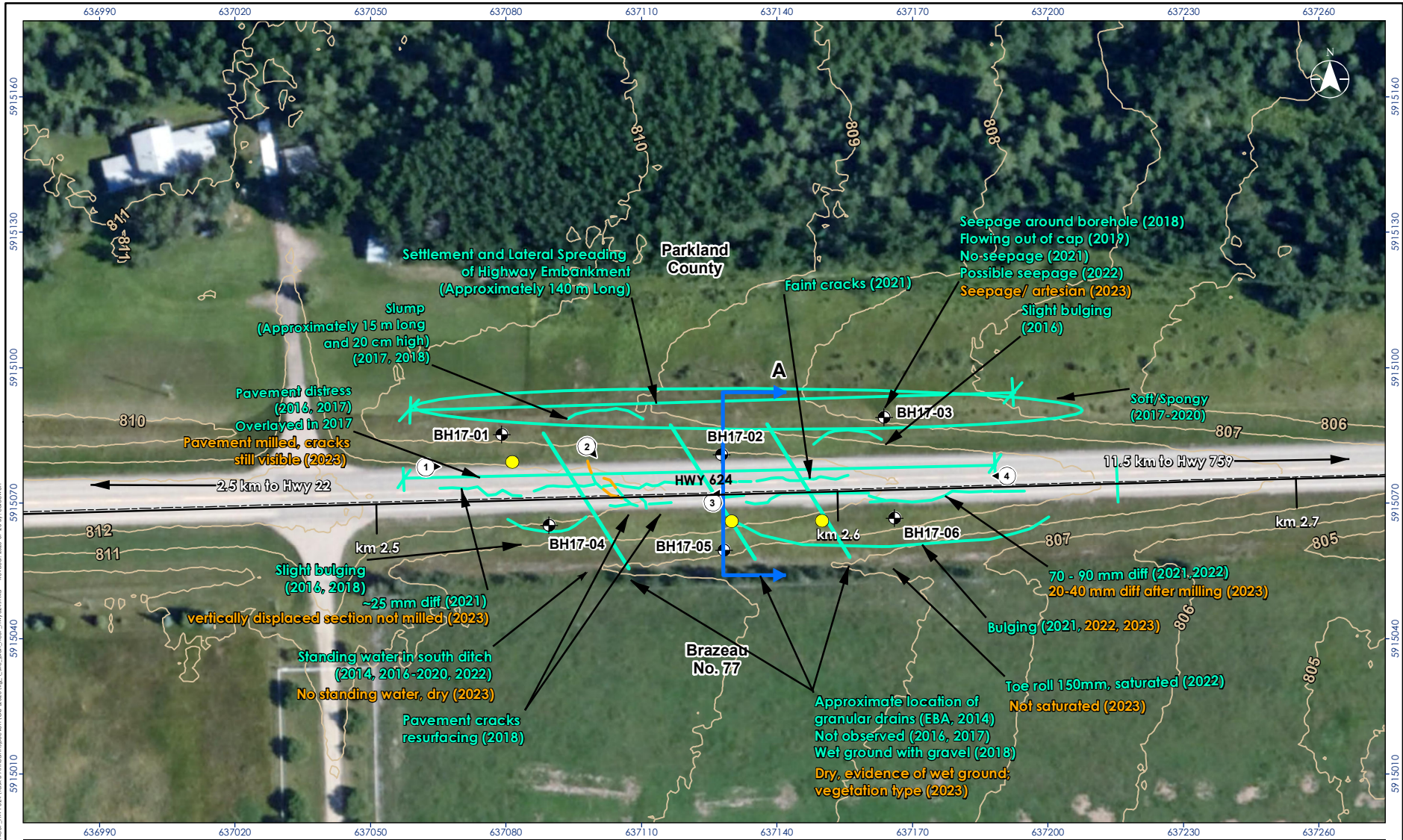
2023 Site Inspection Photos at NC057



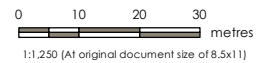
Photo 3: Pavement cracking on EBL. Looking northeast.



Photo 4: Pavement cracking on EBL. Looking west.



- Photo Number and Direction
- ⬆️ Cross Section Location
- ⊕ Borehole Location
- Gravel Drain
- Previous Observation
- 2023 Observation
- ▭ Municipality Boundary



- Notes**
1. Coordinate System: NAD 1983 UTM Zone 11U
 2. Base features: Geogratis, ©Department of Natural Resources Canada. All rights reserved.
 3. Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

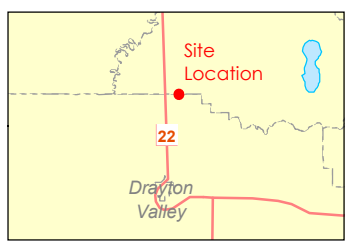
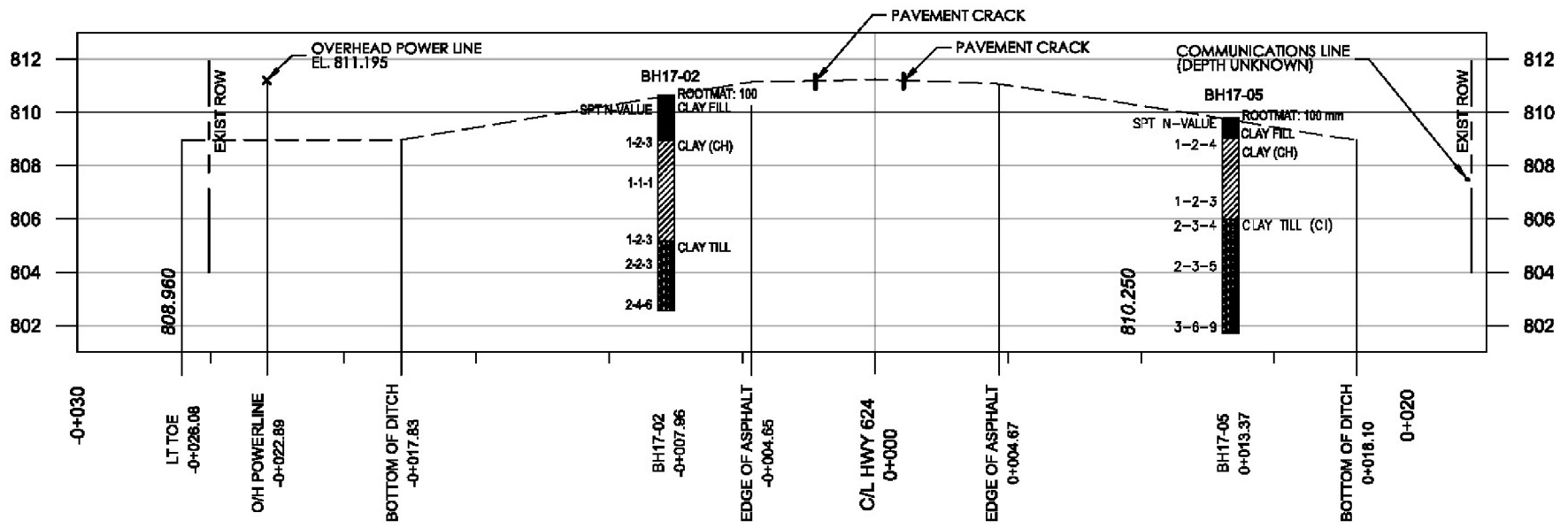
Project Location: Hwy 624, 2.5 km East of Hwy 22, Alberta
12331 5222
Prepared by CL on 2023-07-25
Quality Review by LC on 2023-07-25
Independent Review by XL on 2023-07-25

Client/Project: Transportation and Economic Corridors
Geohazard Monitoring Program
NC57 Embankment Failure on Hwy 624

Figure No.: 1
Title: Site Plan



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Figure No.: 2
 Title: Cross-Section A

