NORTH CENTRAL REGION GRMP
EDSON / STONY PLAIN
Call Out Inspection

SITE NUMBER AND NAME:	LOCATION:	HIGHWAY:	KM:
NC108 - Highway 32 Slide 1.7 km south of TWP592	On Highway 32 approximately 1.7 km south of Township Road 592	32:10	23.700
LEGAL DESCRIPTION: NE-2-59-13-W5M	**NAD83 COORDINATES:** UTM11U 5992905N, 576550E		
AVERAGE ANNUAL DAILY TRAFFIC (AADT): 1,790 (2021)		**CONTRACTOR MAINTENANCE AREA (CMA):** 508	

	DATE	PF	CF	TOTAL
PREVIOUS INSPECTION:	N/A			
CURRENT INSPECTION:	October 18, 2022	5	7	35
INSPECTED BY:	Stantec: Leslie Cho, Sonja Pharand AT: No Presence			
REPORT ATTACHMENTS:	Figure 1 – Site Plan Figure 2 – Ground Profile Figure 3 – LiDAR Plan Site Photographs			

PRIMARY SITE ISSUE:

Failure of the east embankment causing pavement distress along Highway 32.

APPROXIMATE DIMENSIONS:

150 m wide. Unclear where the toe is.

SITE HISTORY:

No files were available from AT for review. Google Earth images suggest that both lanes were last patched in 2020 over an approximately 480 m long section of Highway 32.

St-Onge (1973)[1] suggests surficial deposits along this section of Highway 32 consists of deltaic sand deposits. Fenton et al. (2013)[2] indicates glaciofluvial sediment deposited by glacial meltwater streams. Sediment ranges from massive to stratified, poor to well sorted, coarse to fine grained. Till may also be included. The estimated overburden thickness at the site is in the order of 30 m (Carlson and Green 1976)[3].

LiDAR data suggests this section of Highway 32 is located along the crest of an ancient landslide (Figure 3).

ITEM	CONDITIONS EXIST		DESCRIPTION AND LOCATION	NOTICEABLE CHANGE FROM LAST INSPECTION	
	YES	NO		YES	NO
Pavement Distress	X		Cracking over both lanes on Highway 32. Rutting in wheel paths along both lanes.		
Slope Movement	X		Semi-circular pavement cracks along highway with vertical displacement.		
Erosion		X			

[1] St-Onge, D.A. (1973). Surficial Geology Whitecourt. Geological Survey Canada Map 1367A.
[2] Fenton, M.M., Waters, E.J., Pawley, S.M., Atkinson, N., Utting, D.J. and Mckay, K. (2013). Surficial geology of Alberta; Alberta Energy Regulator, AER/AGS Map 601.
[3] Carlson, V.A., and Green, R. (1977). Bedrock Topography of the Whitecourt Area, NTS 83J, Alberta. Alberta Research Council Map 063.

Seepage	X		Possible seepage through pavement cracks south of culvert inlet.		
Bridge/Culvert Distress	X		Possible separation between the first and second culvert segments at the inlet. Vegetation growth at beveled end of outlet.		
Other		X			

ASSESSMENT

- Significant cracking and pavement distress has resurfaced since the 2020 patch.
- Pavement cracks were observed to be between 5 to 50 mm wide, with most of the wider cracks occurring on the shoulder of the southbound lane (SBL) (Photo 2). One crack on the SBL shoulder on the north side of the culvert was measured to be up to 125 mm deep (Photo 3).
- The semi-circular pavement cracks at the north and south flanks of the slide have vertical displacements of up to approximately 100 mm (Photos 4 & 5).
- Rutting along the wheel tracks was observed in both lanes, with some accompanying cracking. Tire marks were visible in the SBL approximately 20 m north from the northern semi-circular crack (Photo 6).
- The east slope is well vegetated, and the toe of the slide could not be located. Possible ground cracking or gullying was observed east of the barbed-wire fence, with nearby wetland grasses and ground moss that could signify high groundwater.
- The 900 mm diameter centerline culvert was observed to be dry, with some grass growing inside the beveled end of the outlet (Photo 7). Riprap lined the slope below the outlet. At the inlet on the west side, a possible separation was noted between the first and second segments of culvert as a thin ring of light was seen (Photos 8 &9).
- Two wet spots were observed on the pavement, to the south of the inlet. One spot was in the centre of the SBL and approximately 100 mm in diameter. The second spot was at the shoulder of the SBL, where moisture appeared to be coming out from between the pavement patch and the underlying pavement (Photo 9).
  - Weather data from Carrot Creek weather station approximately 58 km south of Whitecourt indicated no precipitation was recorded in the week prior to the call-out inspection. As such, it is possible that the observed wet spots may be related to seepage or a spring under the highway.
- A Probability Factor of 5 was assigned since there appears to be a slow rate of movement with some uncertainty. A Consequence Factor of 7 was assessed since closure of both lanes would be a direct result of a slide occurrence. In addition, potential detours would result in additional travel time of 1.5 to 2 hours on paved highways.

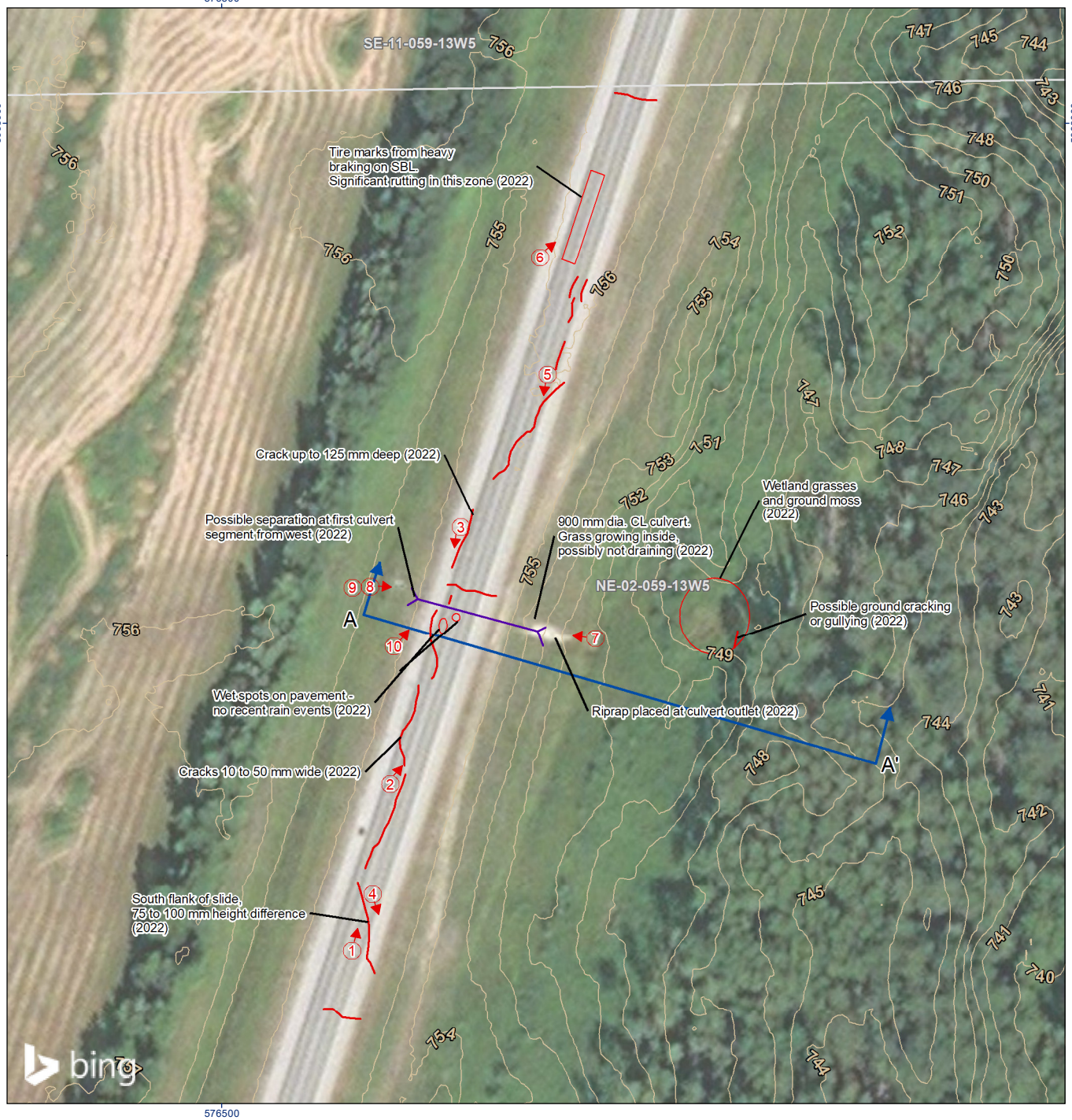
RECOMMENDATIONS

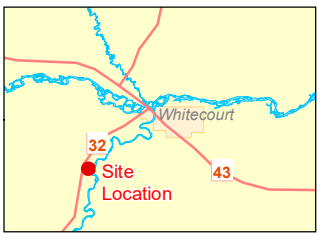
- In the short-term, Stantec recommends that all pavement cracks should be sealed to reduce surface water infiltration into the embankment and landslide. This could include milling and paving to improve rideability. Paving should be conducted such that the final highway surface should match the existing elevation or lower (i.e., no net addition of loads).
- A geotechnical investigation program should be completed, and slope inclinometers and piezometers installed to better characterize landslide movements. Any instrumentation installed should be included in the instrumentation monitoring program.
- Long-term remediation options could include:
  - Construction of a pile wall using cast-in-place concrete piles installed along the east slope near to the shoulder of the road. The high-level cost for installation of a 150 m long pile wall is $3,000,000 to $4,000,000 not including engineering costs.
  - Reconstruct the highway embankment using lightweight fill. This would involve replacing approximately 1m of pavement with lightweight cellular concrete to reduce the load on the slope. The high-level cost for this option is $1,300,000 to $1,700,000 not including engineering costs.
  - Realign the highway further west. This would require land negotiations and purchasing. Assuming a realignment length of 800 m, the high-level cost is $1,000,000 to $1,300,000 excluding engineering and land purchase.
- Potential wetlands may exist east of the right-of-way and may trigger environmental approvals should construction encroach into the wetlands.
- Historical Resources Act approval will be required since the remediation options are not included under its Land Use Bulletin.

- Site inspections should be completed every two years as part of the annual site inspection program.

PREPARED BY: Sonja Pharand, E.I.T.	**PREPARED BY:** Leslie Cho, M.Eng., P.Eng.	**REVIEWED BY:** Xiteng Liu, M.Sc., P.Eng., PMP
	PROFESSIONAL ENGINEER ALBERTA LESLIE CHO February 23, 2023 ID# 139079	

PERMIT TO PRACTICE
STANTEC CONSULTING LTD.
Signature _____ ID 78675
Date 23 Feb. 2023
PERMIT NUMBER: P 0258
The Association of Professional Engineers and Geoscientists of Alberta





- Photo Number and Direction
- Cracks
- Culvert
- Ground Elevation Contours (m)
- Cross Section
- Quarter Section

0 10 20 metres

(At original document size of 8.5x11)
1:1,200

N

Stantec

Project Location
Highway 32, South of Whitecourt, Alberta

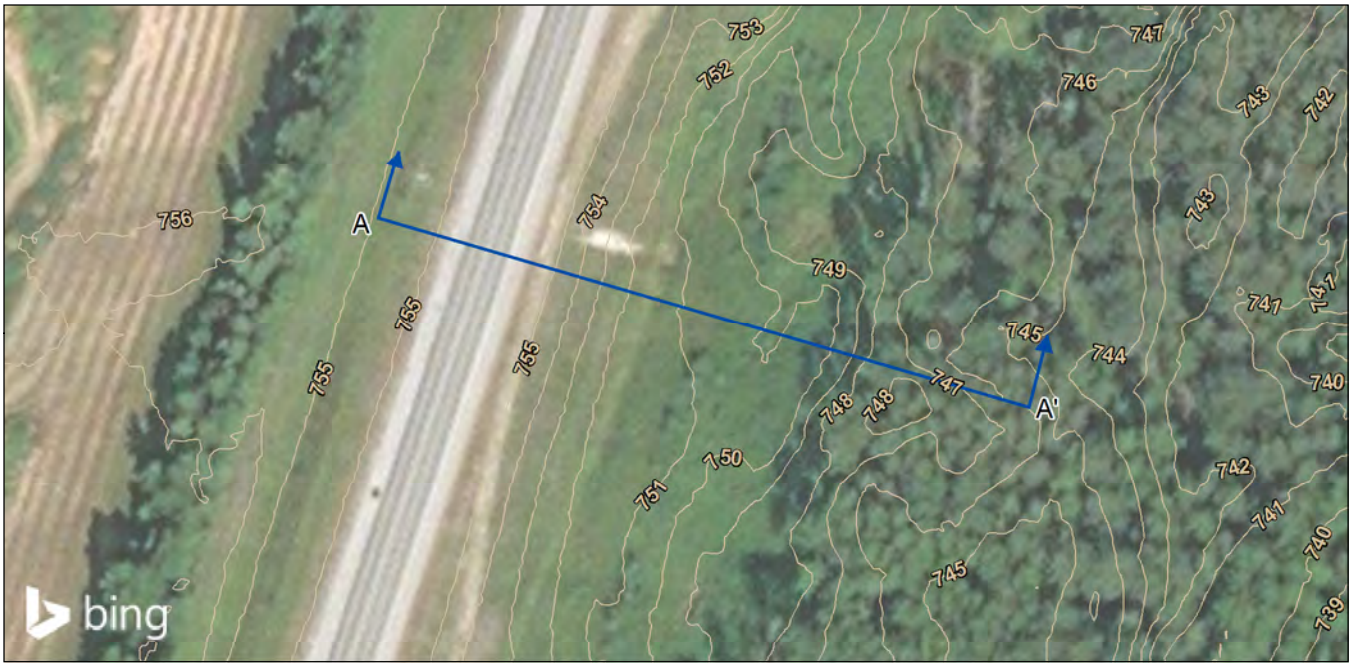
Prepared by CLoewen on 2022-11-04
TR by LCho on 2022-11-04
IR by XLiu on 2022-11-04

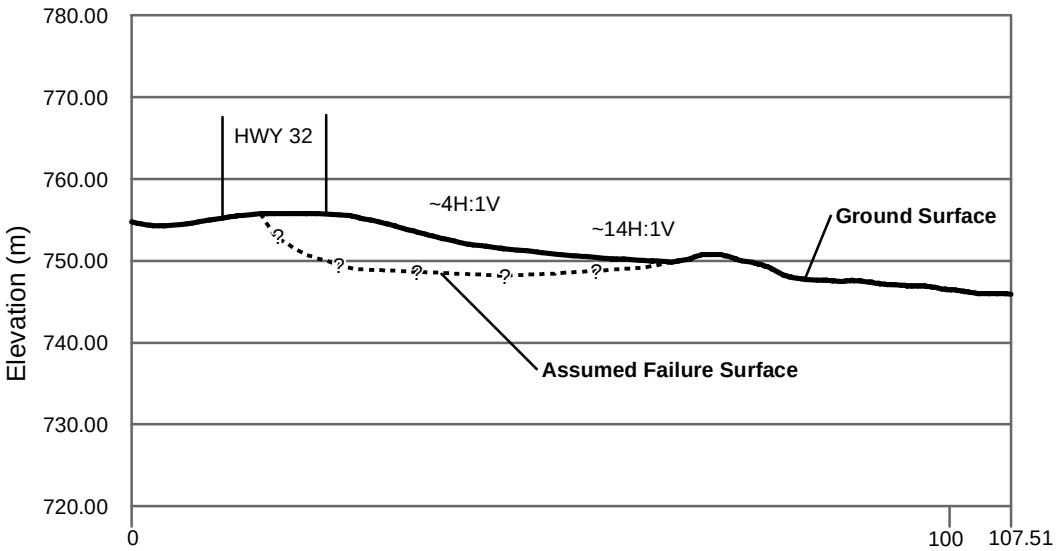
Client/Project 123315222
Alberta Transportation
Geohazard Monitoring Program, Highway 32: 10 km 23,700

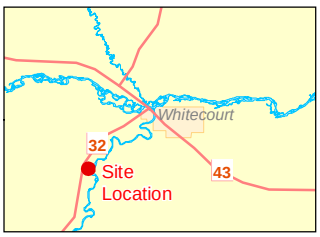
Figure No.
1

Title
Call Out

Notes
1. Coordinate System: NAD 1983 UTM Zone 11N
2. Data Sources: Geogratis, ©Department of Natural Resources Canada, All rights reserved.
3. Background: © 2022 Microsoft Corporation © 2022 Maxar ©CNES (2022) Distribution Airbus DS







Cross Section

Ground Elevation Contours (m)

0 10 20 metres

(At original document size of 8.5x11)
1:1,200

N

Stantec

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Client/Project 123315222
Alberta Transportation
Geohazard Monitoring Program,
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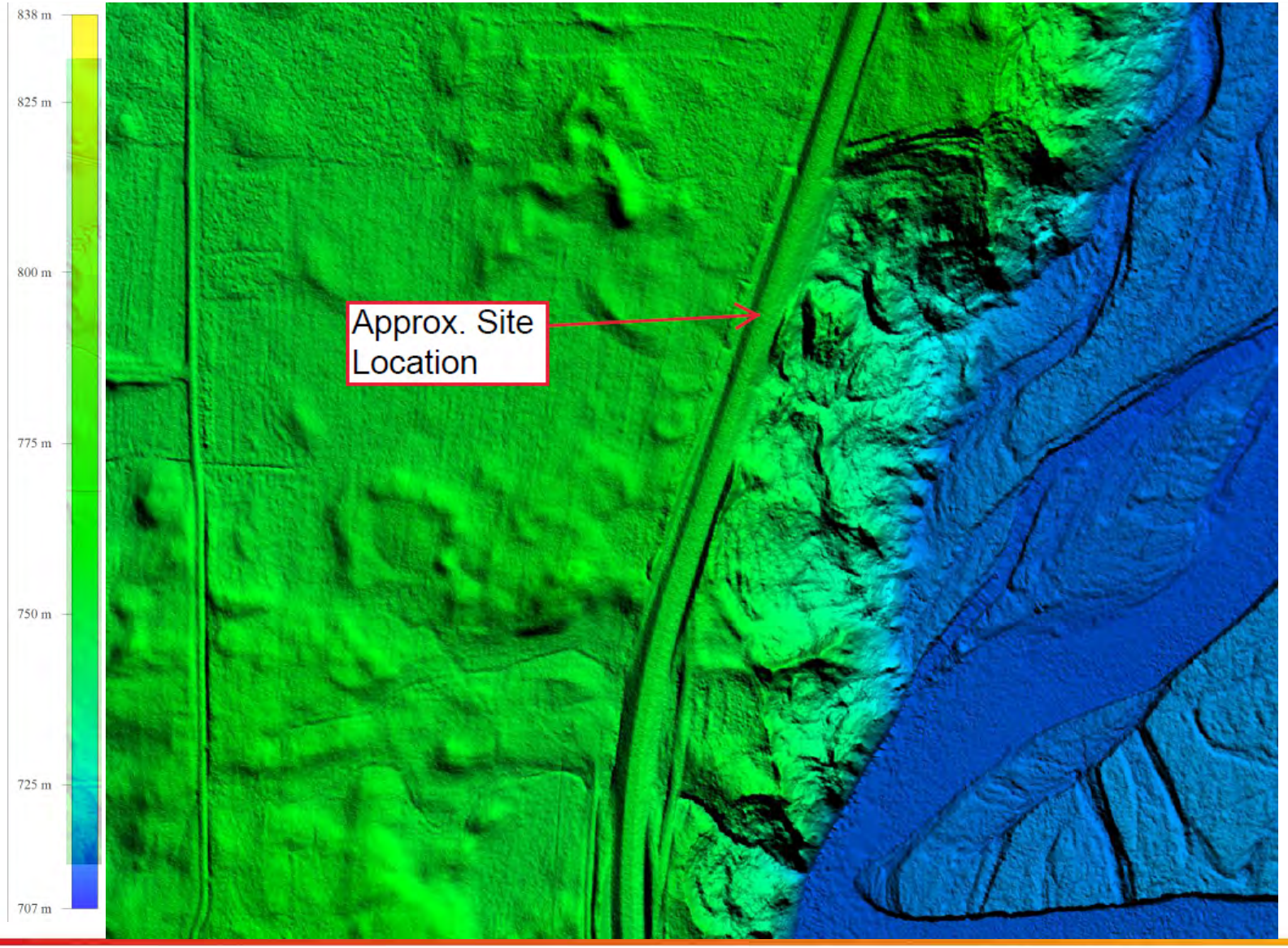
Figure No.
2

Title
Ground Profile Plan



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*LiDAR Provided by Alberta Transportation

Project No.:	123315222
Scale:	---
Date:	December 7, 2022
Prepared by:	SP
Checked by:	LC

Client/Project

Alberta Transportation
Highway 32:10 Call-Out

Title

Highway 32:10 LiDAR Plan

Figure No.

3

2022 Call-Out Inspection Photos at Hwy 32:10 km 23.700

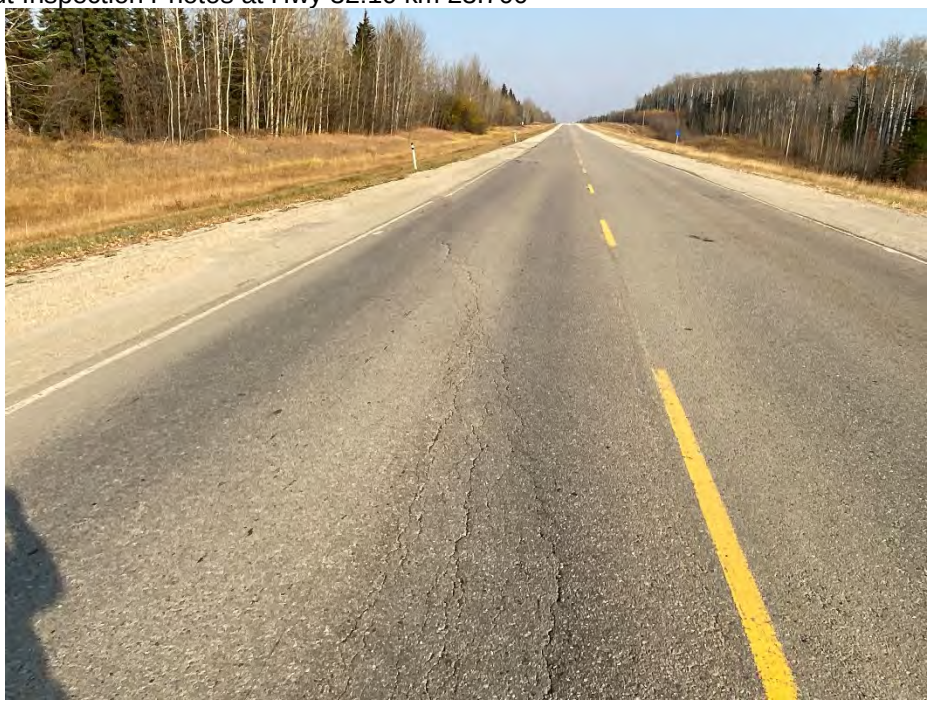

Photo 1: South extent of pavement cracking on Highway 32. Looking northeast.

Photo 2: Wider cracks developing on shoulder of SBL. Looking northeast

2022 Call-Out Inspection Photos at Hwy 32:10 km 23.700

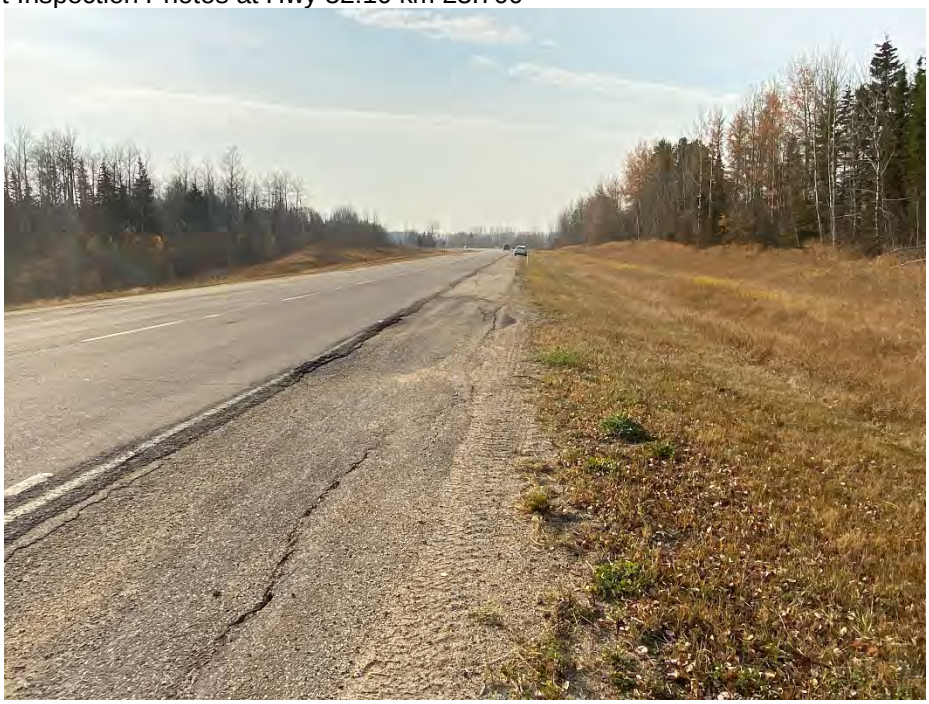

Photo 3: Cracking of SBL, looking southwest. Crack in left corner is approx. 125 mm deep.

Photo 4: Crack at south flank of landslide. Pavement dipping to the east. Looking southwest.

2022 Call-Out Inspection Photos at Hwy 32:10 km 23.700

Photo 5: Cracking at the north flank of landslide. Pavement dipping to the east. Looking south.

Photo 6: Tire marks and rutting in SBL. Looking northeast.

2022 Call-Out Inspection Photos at Hwy 32:10 km 23.700

Photo 7: Culvert outlet becoming grown-in. Looking west.

Photo 8: Culvert inlet, looking east.

2022 Call-Out Inspection Photos at Hwy 32:10 km 23.700

Photo 9: Possible separation between first and second segments of culvert inlet, looking east.

Photo 10: Wet spots on pavement, looking east.