

**ALBERTA TRANSPORTATION
GEOHAZARD ASSESSMENT PROGRAM
PEACE REGION – SWAN HILLS
2020 CALLOUT**



Site Number	Location	Name	Hwy	km
Callout	East of Arcadia	Callout	2:50	44.42
Legal Description		UTM Co-ordinates		
NE9-74-14-W5		11V N 6,139,489	E 557,842	

	Date	PF	CF	Total RISK LEVEL
Previous Inspection:	None	-	-	-
Current Inspection:	1-June-2020	10	3	30
Road AADT:	2,310	Year:	2020	
Inspected By:	Ed Szmata, TRANS Rodney Johnston, TRANS Russell Romick, TRANS Rocky Wang, TRANS Ken Froese, Thurber			
Report Attachments:	<input checked="" type="checkbox"/> Photographs <input checked="" type="checkbox"/> Plans <input type="checkbox"/> Maintenance Items			

Primary Site Issue:	Shallow slide in south half of EBL.		
Dimensions:	50 m length of highway affected.		
Date of any remediation:	None		
Maintenance:	2017: Milled and overlay	Worsened?	
Observations:	Description	Yes	No
<input checked="" type="checkbox"/> Pavement Distress	Cracks in south half of EBL	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/> Slope Movement	Slight dip near south shoulder; potential toe roll in ditch below.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Erosion		<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Seepage		<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Culvert Distress		<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Other		<input type="checkbox"/>	<input type="checkbox"/>
Instrumentation:	None.		

Assessment:

The site is new this year. Distress had not been observed at this location previously.

The site is located on the south side of Highway 2:50 east of High Prairie near Arcadia about 9.3 km east of Highway 750 and 285 m west of Township Road 143. The highway embankment is about 1.7 m in height with sideslopes inclined at 2.7H:1V. The ditch bottom is about 3.3 m wide and the backslope on both sides rises to slightly higher than the embankment. Based on information from the AT Map, the highway structure following the overlay undertaken in 2017 is 430 mm of ACP over 150 mm of cement-stabilized base over predominantly high plastic clay.

The surrounding terrain is fairly level and the ditch gradients relatively flat. Presumably, the general grading is towards the creek about 850 m further east along the highway. Published geological mapping indicates that the site is located within a glaciolacustrine unit which are typically flat-lying and predominantly clay in composition. The estimated depth to bedrock is between 5 m and 10 m. The underlying bedrock is marine shales and siltstones of the Puskwaskau Formation.

At the time of the callout inspection, approximately 21 m length of the east-bound lane (EBL) had an arch-shaped crack in the middle of the lane with a dip between the crack at the south shoulder. This main crack was up to 50 mm in width and 40 mm of height differential. There was a secondary crack near the shoulder on the south side of the dip which was up to 30 mm wide with 30 mm of differential. There appeared to be a toe roll in the lower part of the sideslope. The crack in the centre of the lane continued an additional 30 m west indicating that a great extent of movement is likely.

The site appears similar to other failures seen in the general area such as at SH030 and SH031 thus a similar mechanism is expected: higher-than average precipitation over the last few years resulting in elevation of the groundwater table or saturation of the high plastic foundation soils leading to shallow rotation failure. Given the terrain, it will be difficult to improve the drainage. Thus, mitigation will need to either reduce the loading on the foundation soils or improving the embankment strength. The types of repairs used at SH030 and SH031 are also appropriate for this site:

- Slope flattening: this would require shifting the ditch further away from the embankment; however, there appears to room to do this without impacting the overhead power line. A minimum slope of 4H:1V is recommended. Low to medium plastic clay or clay till is recommended for the additional fill. Ideally, the main slide mass should be excavated and replaced.
- Toe berm: Although also requiring a shift of the ditch further southward, the embankment could be stabilized with a 3 m to 4 m wide toe berm constructed halfway up the embankment.
- Gravel replacement: The failed portion of the highway embankment should be excavated with slopes no steeper than 1H:1V and to about 0.5 m deeper than the ditch with a 1 m deep and 1.5 m wide shear key excavated at the toe of the embankment. The excavation should be backfilled with Des. 2-20 gravel compacted to at least 95 percent SPMDD separated from the embankment and native soils by a non-woven geotextile.

All of these options will involve excavation and hauling of material. The gravel wedge would maintain the existing shape of the embankment and ditch but is likely more expensive due to the higher cost material. The toe berm or slope flattening options will require ditch realignment but can be readily extended if more of the embankment fails. Checks on available right-of-way should be done for the slope flattening and toe berm options.

Recommendations:**Short-Term (<3 months):**

- It is understood that patching was going to be undertaken shortly after the callout inspection to improve the safety of the roadway surface. Such patching should be undertaken as necessary.

Medium-Term:

- A geotechnical drilling investigation should be considered particularly if it can be combined with other projects in the area to reduce mobilization costs. A design could be done for this low-height embankment without an investigation, but it would, by necessity, be more conservative and would have to be flexible should conditions encountered during construction not match the assumptions made during design.

Long-Term:

- Reconstruct the embankment using the selected option. The estimated costs are in the order of \$200,000 to \$300,000.



Photo 1 – Looking west along the EBL at the main crack and dip (at the fog line).



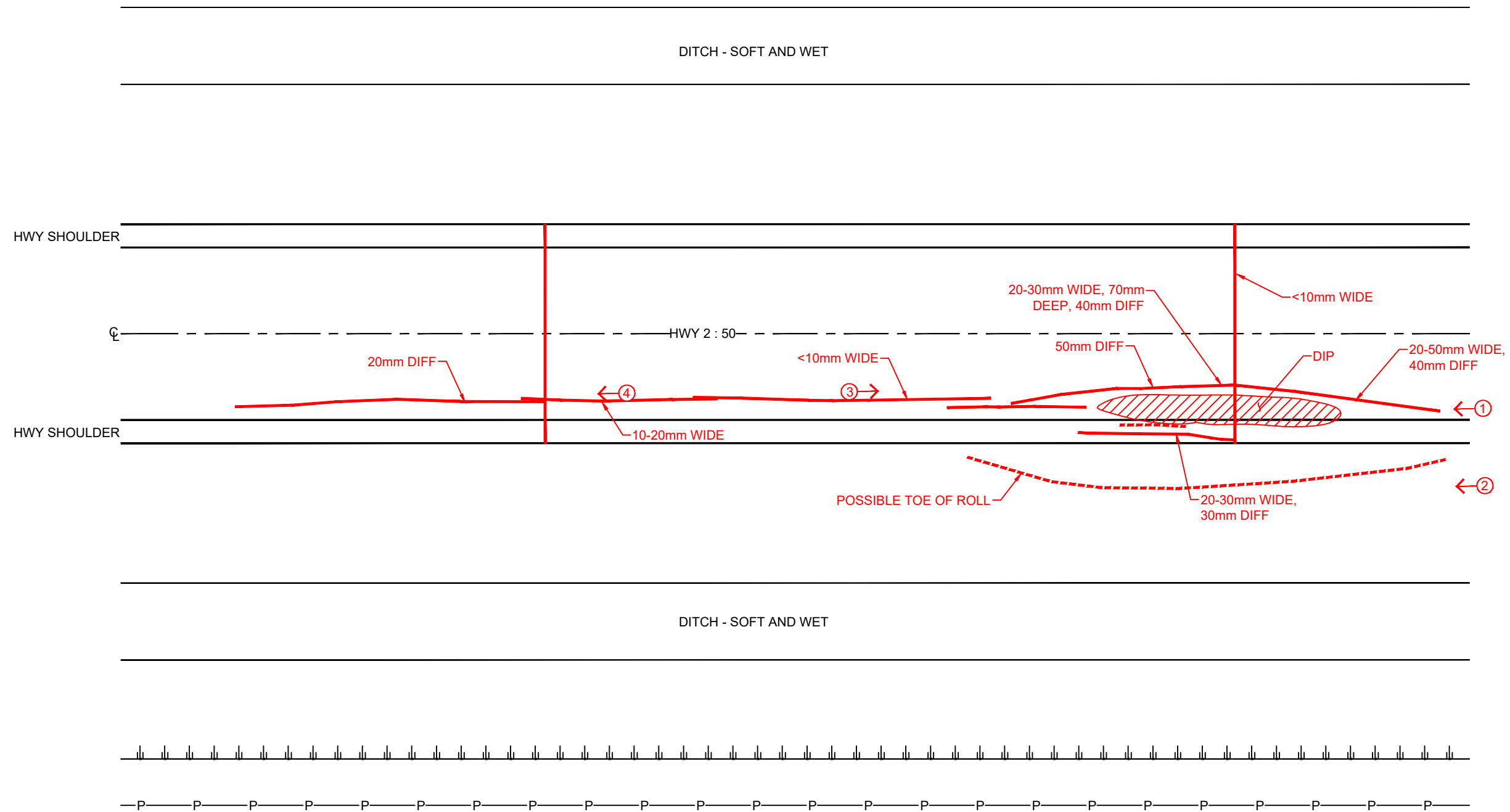
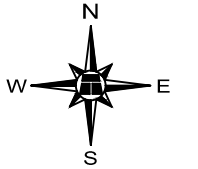
Photo 2 – Looking west at the sideslope below the main crack where there may be a toe roll.



Photo 3 – Looking east at the main area of distress.

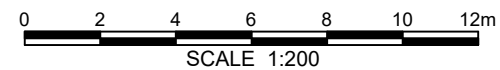


Photo 4 – Looking west at developing extension of the crack.



LEGEND

- CRACK
- POWER LINE
- PHOTOGRAPH NUMBER, AND APPROXIMATE DIRECTION AND LOCATION



**PEACE REGION (SWAN HILLS)
HWY 2:50 KM 44.4, EAST OF ARCADIA**

JUNE 1, 2020 CALLOUT PLAN

DWG No. 13355-HWY2:50-CALLOUT

DRAWN BY	ML
DESIGNED BY	KEF
APPROVED BY	DWP
SCALE	1:200
DATE	SEPTEMBER 2020
FILE No.	13355

THURBER ENGINEERING LTD.