

**ALBERTA TRANSPORTATION  
GEOHAZARD ASSESSMENT PROGRAM  
PEACE REGION – PEACE-HIGH LEVEL  
2018 CALL OUT**



<b>Site Number</b>	<b>Location</b>	<b>Name</b>	<b>Hwy</b>	<b>km</b>
PH034	Judah Hill	Fence Slide	744:04	59.177
<b>Legal Description</b>		<b>UTM Co-ordinates</b>		
SE¼ 29-083-21 W5M		11V E 482792	N 6230946	

	<b>Date</b>	<b>PF</b>	<b>CF</b>	<b>Total</b>
<b>Previous Inspection:</b>	14-May-2017	14	5	70
<b>Current Inspection:</b>	30-Oct-2017	14	5	70
<b>Road AADT:</b>	540		<b>Year:</b>	2017
<b>Inspected by:</b>	Ed Szmata, TRANS		Shawn Russell, Thurber	
<b>Report Attachments:</b>	<input checked="" type="checkbox"/> Photographs <input checked="" type="checkbox"/> Plans <input type="checkbox"/> Maintenance Items			

<b>Primary Site Issue:</b>	An approximately 50 m wide slide, with its backscarp within the road, was repaired in 2005 by excavating the slide mass (including some old stone columns) and rebuilding the highway with geogrid reinforced fill. Since repairs, settlement and cracking of the pavement have occurred and cracks have extended further south and north of the original slide.		
<b>Dimensions:</b>	Main slide is about 60 m wide at the road shoulder. Additional areas of pavement distress and cracking extend 80 m to 100 m north and south of the main slide.		
<b>Maintenance:</b>	Cracking and dips in pavement were patched in 2008 and again in 2011. Patching has occurred intermittently following these repairs and both the guardrail and posts were replaced in 2009. Highway was closed between May 2013 and December 2013 due to the occurrence of the Sunshine Landslide at km 58.2 further to the south.		
<b>Observations:</b>	<b>Description</b>	<b>Worsened?</b>	
<input checked="" type="checkbox"/> Pavement Distress	Cracking and spalling with a vertical offset (100 mm to 250 mm) has occurred along the extents of previous repair work (Photos 3 and 6). Cracking is also present along the SBL shoulder (Photos 1, 2 9 and 10) and some of the transverse cracking in the asphalt pavement is becoming more apparent. The overall drop in the dip is at 400 mm (Photos 3, 6 and 7). Older cracks have not been sealed for several years and are worsening. A stone column is protruding the ACP in the SBL at km 59.245 (Photo 9)	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/> Slope Movement	A shallow slump and skin failure have occurred in the clay cap that was constructed over the sideslope during the 2005 repairs. Slope inclinometers indicate lateral creep movement in the previously repaired slide mass.	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/> Erosion	Rill erosion is present on the embankment downslope shoulder above the highway along the northbound lane backslope and in the east ditch.	<input checked="" type="checkbox"/>	

<input checked="" type="checkbox"/> Seepage	Possible seepage zones with wet green grass were previously observed below the shallow slump near SI10-13.	<input checked="" type="checkbox"/>
<input type="checkbox"/> Bridge/Culvert Distress		<input type="checkbox"/>
<input checked="" type="checkbox"/> Other	Geogrid installed as part of the 2005 repair is becoming more exposed on the embankment downslope resulting in a further reduction of its anchoring capacity.	<input type="checkbox"/>
<b>Instrumentation:</b>		
SI05-15	Slope inclinometer installed at the top of the hill in the former ATCO gas utility right of way above the Fence Slide, approximately 30 m elevation above the road, shows no discrete slide planes.	
SI10-12 and 15	The Fall 2018 readings for SI10-12 and SI10-15 exhibited zones with cumulative movements ranging from 30 mm to 64 mm at depths ranging between 2.2 m and 5.5 m, with rates between 4 mm/yr to 5 mm/yr.	
SI10-13 and 14	SI10-13 and SI10-14 are obstructed at depths of 6.4 m and 5.7 m, which correspond to the approximate elevation of the base of the upper clay fill of the 2005 repair.	
PN10-12 and 15	No significant change since the 2010 readings with small heads above tips (0.05 m to 0.32 m).	
PN10-13 and 14	Non-Operational (Pinched or Blocked).	
<b>Assessment:</b>		
<p>Cracking and settlement at the repair have continued, and cracking is re-appearing through the 2011 asphalt patch and continues to worsen along the road shoulder to the north and south of the main slide. The movement trends observed in slope inclinometers SI10-13 and SI10-14 indicate that the movement is occurring in the clay backfill from the 2005 repair.</p> <p>It is postulated that the dipping in the highway pavement surface is the result of the clay fill settling and spreading over time. The shallow sloughing of the clay cap is considered due to the loss of cohesion as a result of weathering (wetting and desiccation cycles). The inclination of the repaired sideslope is steep and lateral spreading of the clay fill is expected to continue.</p> <p>The development of additional cracks in the highway shoulder south and north of the Fence Slide are getting worse and likely indicate potential slope failures at these locations in the southbound lanes in the future.</p> <p>Rill erosion and scouring below the highway SBL resulting from the concentrated water runoff in the lower dipped sections also needs to be addressed as it can lead to progressively larger erosion gullies, skin failures and landslide features, which could eventually retrogress into the roadway.</p>		
<b>Recommendations:</b>		
A short term solution for the shallow skin failures in the clay cap over the sideslope is to seed and cover the sideslope with Macmat and anchor it into the slope with Duckbill anchors. In addition to attenuating the dips at the landslide scarp in the roadway surface on-going crack sealing, milling and patching of the dipped pavement sections should be completed prior to the next anticipated asphalt resurfacing project.		<b>Cost</b> \$75,000
Mid-term to long term solutions would involve excavating and removing the upper clay backfill from the 2005 repair and rebuilding the highway embankment with granular fill reinforced with uniaxial geogrid, the reinstatement of the clay cap on the embankment sideslope and the placement of an overlying slope protection (Armormax anchored with Duckbill anchors).		\$ 500,000
Long term solutions to deal with the propagation of cracks to the north and south of the Fence Slide could consist of a realignment of the highway into the backslope (now that the natural gas pipeline will be decommissioned following the winter of		

2017), digging out weaker clay layers and rebuilding the slope with geogrid reinforced gravel (like the Fence Slide repair from 2015) or pile walls. The cost could range from \$2,000,000 to \$10,000,000. The realignment is likely the cheapest option but will only buy some time until further retrogression occurs whereas the pile wall option should be a more permanent solution.



**Photo 1.**  
Looking southeast from the shoulder of the SBL at km 59.135 towards the cracks and dip in the pavement at SI10-12. The dip in the guardrail is at 210 mm and the cracks in the ACP or open from 50 to 60 mm with drops along the edges of cracks up to 70 mm.



**Photo 2.**  
Looking northwest from km 59.145 along the outer edge of the SBL. The cracks along the white line in the SBL are open from 30 mm to 60 mm.



**Photo 3.**  
Looking north from km 59.15 at the south end of the Fence Slide repair. The dip and grown and extends 1.5 m into the NBL. Cracks in the SBL shoulder of the are now open to 60 mm.



**Photo 4.**  
Looking north from km 59.155 along sideslope towards SI10-13. The dip in the guardrail is at 700 mm near the lowest point in the dip in the SBL. The shallow slump below SI10-13 is more apparent than in May 2018.



**Photo 5.**

Looking west downslope of the SBL shoulder from km 59.17 at the sloughing in the clay cap from the 2005 repair. There is a 0.3 m wide ledge exposed along the base of the clay fill. A shallow slump has also formed in the sideslope.



**Photo 6.**

Looking south in the NBL from km 59.18 at the south portion of the large dip in the highway in the NBL. The differential drop varies from 100 mm to 250 mm and there are more cracks on the ACP along the edge of the dip and more of the ACP as spalled since May 2018.



**Photo 7.**  
Looking southeast from km 59.198 in the SBL at the large dip. There are more cracks along the edge of the dip than in May 2018 and the overall drop along the dip at 400 mm.



**Photo 8.**  
Looking northeast from NBL shoulder at km 59.23 towards the south end of the chain link fence. The six southernmost fence panels are more tilted/jacked than in May 2018.



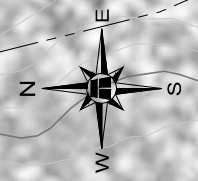
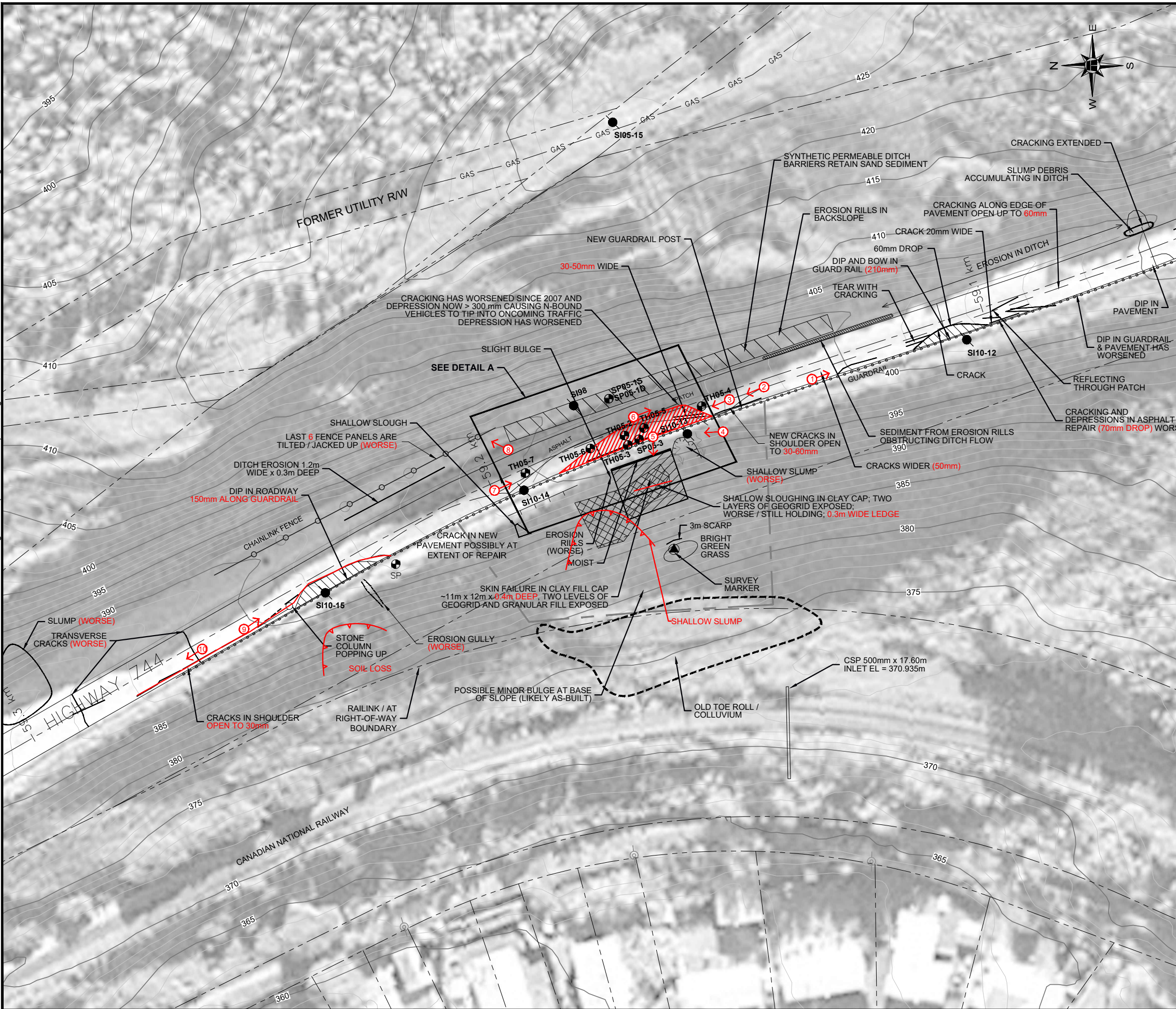
**Photo 9.**  
Looking southeast along the shoulder of the SBL at km 59.255. There is an old stone column protruding through the ACP and the dip in the guardrail is at 150 mm at SI10-15.



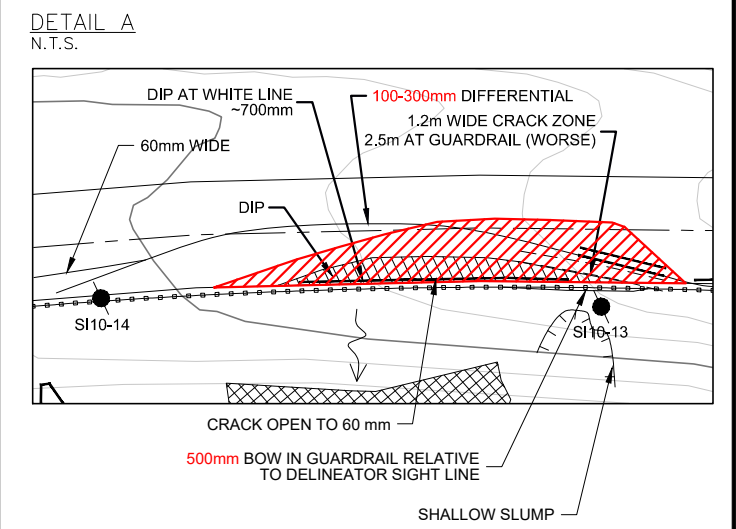
**Photo 10.**  
Looking south from the SBL at km 59.265 at the cracks in the shoulder of the ACP are open to 30 mm.



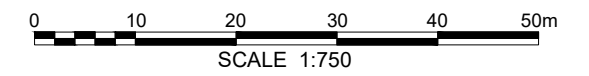
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- LEGEND**
- TEST HOLE LOCATION
  - SLOPE INDICATOR
  - DIRECTION AND PHOTO NUMBER



- NOTES:**
1. LOCATION DATA RECORDED USING HAND HELD GPS RECEIVER. ALL LOCATIONS ARE APPROXIMATE AND ARE FOR ILLUSTRATIVE PURPOSES ONLY.
  2. OCTOBER 30, 2018 OBSERVATIONS SHOWN IN RED.



**PEACE REGION (PEACE RIVER/HIGH LEVEL)  
PH034-1 JUDAH HILL FENCE SLIDE**

**2018 PH034-1 CALLOUT PLAN**

DWG No. 13351-PH034-1

DRAWN BY	ML
DESIGNED BY	SGR
APPROVED BY	DWP
SCALE	1:750
DATE	OCTOBER 2018
FILE No.	13351

