

**ALBERTA TRANSPORTATION
GEOHAZARD ASSESSMENT PROGRAM
PEACE REGION – PEACE-HIGH LEVEL
2017 INSPECTION**



Site Number	Location	Name	Hwy	km
PH009-2	Peace River	Shafsbury Trail - Overpass Slide	2:62	1.299
Legal Description		UTM Co-ordinates		
SW¼ 31-083-21 W5M		11V E 480201	N 6232475	

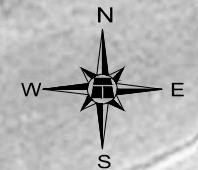
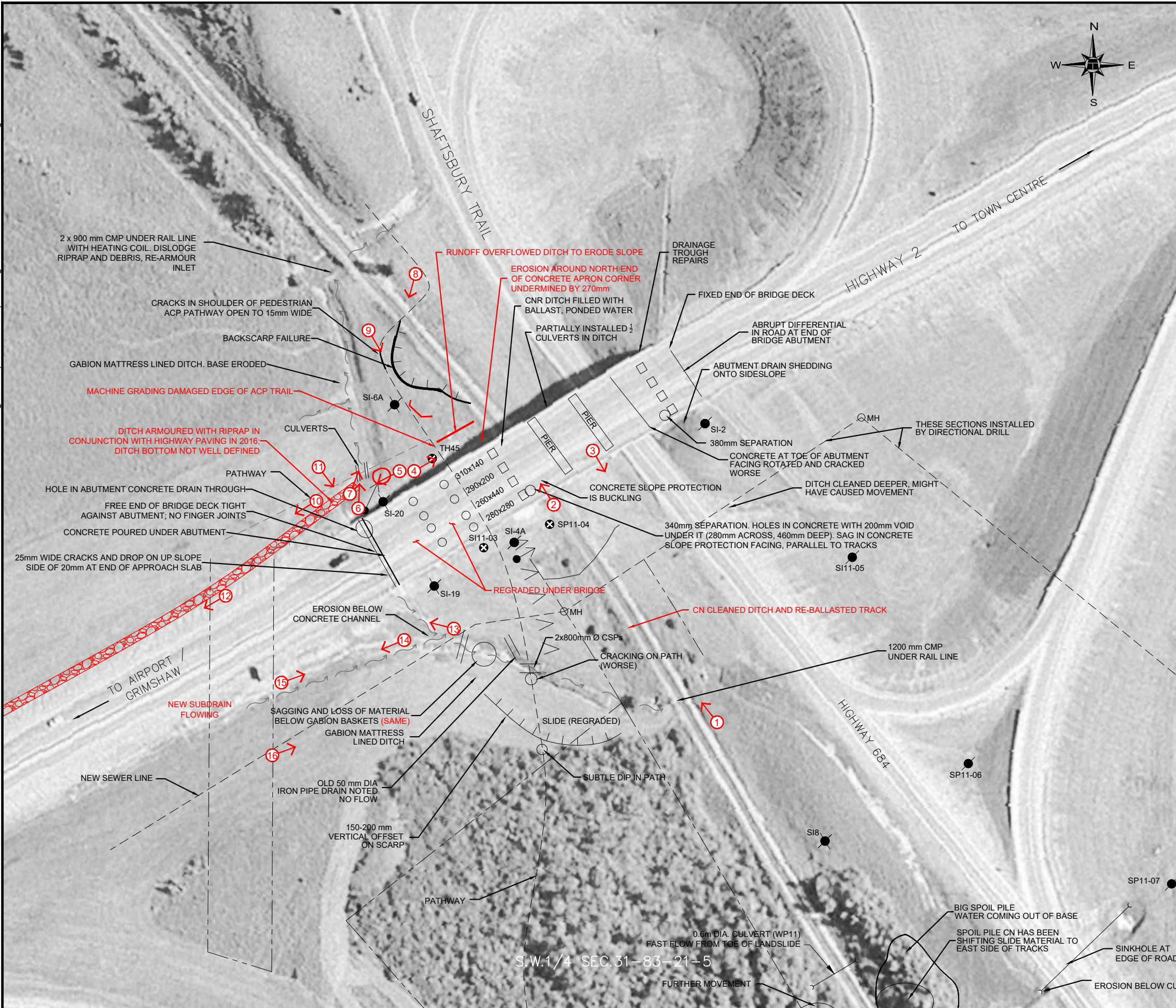
	Date	PF	CF	Total
Previous Inspection:	6-Jun-2016	10	4	40
Current Inspection:	6-Jun-2017	10	4	40
Road AADT:	15490		Year:	2016
Inspected By:	Rocky Wang, TRANS Ed Szmata, TRANS		Don Proudfoot, Thurber Shawn Russell, Thurber	
Report Attachments:	<input checked="" type="checkbox"/> Photographs <input checked="" type="checkbox"/> Plans <input type="checkbox"/> Maintenance Items			

Primary Site Issue:	Creeping landslide movement affecting the Hwy 2 overpass over the rail line and Shafsbury Trail. Erosion in the ditches, including undermining of the gabion basket lining on the south side of Hwy 2. May be experiencing movement at the northern flank of a large ancient landslide feature extending upslope towards the airport.		
Dimensions:	Slide movement affects entire width of overpass under the west abutment. Additional signs of movement on the south side of Hwy 2 at regional pathway, extending southwards to the Shop slide.		
Maintenance:	<p>Voids between the concrete slope protection and the east abutment seat, in addition to those at east abutment pier columns, were filled with ACP in October 2013.</p> <p>Flange brackets were installed to fasten girders to the east abutment seat, bolt pins were also installed to connect the underside of the girders to supports plates in 2013.</p> <p>Voids at the east abutment approach slab were filled with ACP during the summer of 2013.</p> <p>Cast-in-place concrete median was replaced in 2016.</p> <p>CNR have recently cleaned the ditches along their railway line and have replaced some ballast material underneath the rails.</p> <p>AT did some regrading work and placed rip rap in the bottom of the Hwy 2 WBL ditch when the highway was re-paved in 2016.</p>		
Observations:	Description	Worsened?	
<input type="checkbox"/> Pavement Distress	The highway was repaved in 2016. Historically, the joint at west end of abutment has performed badly with cracks periodically requiring to be filled.	<input type="checkbox"/>	
<input checked="" type="checkbox"/> Slope Movement	Cracking in the regional pathway near the culvert crossing on the south side of Hwy 2, near the location of a previous scarp.	<input checked="" type="checkbox"/>	

	Voids historically that have appeared in the Hwy 2 ACP surface at the west abutment approach slab tie-in and the bending in the general downslope (northeast) direction of the bolt pins on the girder plates at the east abutment seat both indicate an overall downslope (northeast) movement of the bridge structure.	
<input checked="" type="checkbox"/> Erosion	<p>Erosion at the extremity of the west abutment drain trough and the undermining of gabion basket lining of ditch on south side of Hwy 2 appears to be gradually worsening (Photos 13, 14 and 15).</p> <p>AT regraded the ditch on north side of Hwy 2 along sideslope of the west abutment fill and placed rip rap in the ditch bottom (Photos 5, 6, 10 and 12).</p> <p>The concrete slope protection on the north side of the west abutment has been undermined along the edge and the resulting void is about 270 mm deep (Photo 4)</p>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Seepage	Seepage is extensive in the west abutment area, both north and south of Hwy 2. Springs noted on north side of the west abutment, and just above rail line on south side of Hwy 2.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Bridge/Culvert Distress	<p>Bolt pins connecting girder flanges to abutment seat brackets are bending.</p> <p>Voids continue to grow at the downslope interface of the piers at the base of the concrete slope protection of the west abutment (Photos 2 and 3). Slope protection has shifted and open holes and steel mesh reinforcement are visible through the concrete slope protection. The concrete slope protection on the north side of the west abutment has been undermined along the edge and the resulting void is about 270 mm deep (Photo 4)</p>	<input checked="" type="checkbox"/>
<input type="checkbox"/> Other		<input type="checkbox"/>
<p>Instrumentation:</p> <p>SI2/SI-4A Inclinometers installed to 44 m and 28 m depth on the south side of Hwy 2. SI-2, located on the east side of the Overpass has been destroyed and can no longer be read. Prior to being destroyed, SI-2 exhibited on-going creep movement, (<1 mm/yr.) at 28 m to 30 m depth. SI-4A is located on the west side and has shown 38 mm of movement near the ground surface at 0.5 m to 3 m depths with a rate of movement of 2 mm/yr. in June 2017.</p> <p>SI11-01, SI11-03, SI11-5, SI11-42 and SI11-45 Installed as part of geotechnical investigations for the twinning of Hwy 2 in 2011. SI11-03 and SI11-42 have not exhibited signs of discernable movement zones since Thurber began reading these instruments in the spring of 2014. SI11-01 and SI11-05 were initialized by Thurber during the spring 2015 readings. SI11-1 has not exhibited signs of discernable movement zones and SI11-5 has since been destroyed. SI11-45 was found to be blocked at 31 m depth in the spring of 2016.</p>		

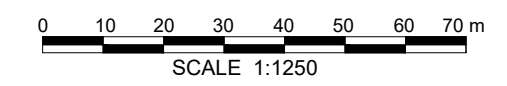
<p>SP11-04, SP11-06 and SP11-07</p>	<p>Installed as part of geotechnical investigations for the twinning of Hwy 2 in 2011 and were read by Thurber for the first time as part of the spring 2015 reading program. Standpipes SP11-4 and SP11-06 were both dry and SP11-07 was found to be destroyed and could not be read.</p>
<p>VW11-42A/B/C/D and VW11-45A3B3C</p>	<p>These nested vibratory wire piezometers were installed with depth intervals ranging from 3 m to 46 m at locations in relative proximity to the existing overpass bridge abutments as part of geotechnical investigations for the twinning of Hwy 2 in 2011. Piezometric groundwater levels fluctuated from -0.64 m to 0.13 m from the fall of 2017 readings and were either dry (VW11-42A, VW11-42C and VW11-45C) or varied from 8.54 m to 36.73 m below the existing ground surface.</p>

<p>Assessment:</p>	
<p>A deep-seated slide is affecting the bridge structure over the CNR rail line and Shaftsbury Trail. High groundwater conditions could be a contributing factor to the movements. Slide movement has reduced the distance between the abutments, so that the deck is tight against the abutments at both ends. Concrete facing on the abutments has moved relative to the piers. The inclinometers do not appear to show high rates of movement at depth, though near-surface movement has increased. There appears to be increasing distress in the regional pathway in the vicinity of a landslide scarp, though this might also be caused by frost action and poor performance of the asphalt.</p>	
<p>The need for rehabilitation work depends on bridge serviceability. Discussions should be held with the bridge engineering department to determine when further action needs to be taken. Replacement of the abutments and dewatering and reinforcement (with piles) of the west headslope may be required to resist compression of the structure.</p>	
<p>There is erosion of the soil from under the gabion basket lined ditch on the south side of Hwy 2, causing the gabions to settle. At the moment this does not appear to be a significant issue, but if it progresses, may require future replacement of the ditch lining. There was some erosion of the ditch on the north side of the overpass and AT have since regraded the ditch and placed riprap in the ditch bottom in 2016.</p>	
<p>Recommendations:</p> <p>It is understood that TRANS have retained others to review the stability of the overpass as part of the future widening/re-alignment of the Hwy 2 Peace River Crossing Project.</p>	<p>Cost</p>



- LEGEND**
- INSTRUMENT
 - SPRING OR SEEPAGE
 - INSTRUMENT (INACTIVE)
 - SLOPE INCLINOMETER
 - AECOM INSTRUMENT
 - DIRECTION AND PHOTO NUMBER
 - 2016 BURIED STORM DRAIN

- NOTES:**
1. LOCATION DATA RECORDED USING HAND HELD GPS RECEIVER. ALL LOCATIONS ARE APPROXIMATE AND ARE FOR ILLUSTRATIVE PURPOSES ONLY.
 2. JUNE 6, 2017 OBSERVATIONS SHOWN IN RED



**PEACE REGION (PEACE RIVER/HIGH LEVEL)
PH009-2 SHAFTSBURY TRAIL OVERPASS SLIDE**

2017 PH009-2 INSPECTION PLAN

DWG No. 13351-PH009-2-1

DRAWN BY	KLW
DESIGNED BY	SGR
APPROVED BY	DWP
SCALE	1:1250
DATE	JUNE 2017
FILE No.	13351

THURBER ENGINEERING LTD.



Photo 1.
Looking northwest at Shafstbury Trail overpass. CN has cleaned the ditch on the west side of the railway and have re-ballasted the tracks.



Photo 2.
Looking northwest at the buckling of the concrete slope protection at the base of the west side headslope pier.



Photo 3.
Looking southeast at the sliding of the concrete slope protection at the base of the west side headslope pier.



Photo 4.
Looking northeast at the concrete headslope protection on the north side of the west abutment headslope that has been undermined by 270 mm.



Photo 5. Looking southwest from the inlet of the double barrel culvert below the ACP trail on the north side of the west abutment. The ditch was lined with rip rap in 2016 when the Highway was repaved.



Photo 6. Looking northeast at the inlet to the double barrel culverts that run beneath the ACP pedestrian trail on the north side of the west abutment. Note the presence of oxides in the water at the culvert inlets.



Photo 7.
Looking
northeast at the
outlet of the twin
culverts.



Photo 8.
Looking
southwest at the
small backslope
failure above the
CNR railway line
and ACP trail the
runs beneath the
west abutment.



Photo 9.
Looking southeast at the cracks forming in the ACP trail above the small backlope failure above the CNR railway line.



Photo 10.
Looking southwest at the rip rap placed in 2016 on the regraded WBL ditch bottom.



Photo 11.
Looking southeast from the north side of the west bridge abutment seat.



Photo 12.
Looking southwest along the Hwy 2 WBL sideslope at the new rip rap placed in the ditch bottom in 2016.



Photo 13.
Looking northwest at the erosion occurring below the west abutment south sideslope concrete drainage swale.



Photo 14.
Looking southwest at the gabion mattresses along the interface of the west abutment sideslope and the slope (No significant change since 2016).



Photo 15.
Looking northeast along the gabion mattresses at the interface of the west abutment sideslope and the slope (No significant change since 2016).



Photo 16.
Looking northeast at the area that was regraded as part of the new storm utility pipe installation in 2016.