ALBERTA TRANSPORTATION
GEOHAZARD ASSESSMENT PROGRAM
PEACE REGION – PEACE-HIGH LEVEL
2018 INSPECTION

THURBER ENGINEERING LTD.

Site Number	Location	Name	Hwy	km
PH052-1	Dunvegan	Dunvegan North 10+800	2:68	10.80
Legal Description		**UTM Co-ordinates**		
SE¼ 16-080-04 W6M		11U E 402466	N 6199552	

	Date	PF	CF	Total
Previous Inspection:	7-Jun-2017	9	2	18
Current Inspection:	15-May-2018	9	2	18
Road AADT:	2800		**Year:**	2017
Inspected By:	Roger Skirrow, TRANS Ed Szmata, TRANS		Don Proudfoot, Thurber Shawn Russell, Thurber	
Report Attachments:	☑ Photographs ☑ Plans		☑ Maintenance Items	

Primary Site Issue:	On May 21, 2015, Alberta Transportation was alerted that the dip in the pavement had dropped suddenly in the NBL lanes of Hwy 2.	
Dimensions:	Arcuate cracking defined a slide that was approximately 22 m to 28 m wide at the road shoulder.	
Maintenance:	Due to the dip that had formed in both northbound lanes in 2015, TRANS constructed a temporary detour, providing two lane traffic around the affected area, in the SBL ditch in the spring of 2015. The site was remediated in 2015/2016 under TRANS Contract CON0017398 with the construction of a 46 m long cantilever cast-in-place concrete pile wall with all three traffic lanes re-instated.	
Observations:	**Description**	**Worsened?**
☑ Pavement Distress	Prior the 2015/2016 repair, the cracks in the ACP of the NBL cracks had drops up to 80 mm with openings as wide as 60 mm. There have been no signs of any cracks in the new ACP since the 2015/2016 repair.	☐
☑ Slope Movement	The main landslide feature affecting the roadway was repaired in 2015/2016. There have been some cracks and a graben that have formed in the passive bench downslope of the pile wall since 2016. The openings in the cracks are up to 180 mm in width and the graben is 1.5 m to 4.5 m wide with an overall drop of 200 mm (Photos 5 and 6). There is bow in the new barbed wire fence below the highway (Photo 4). Slides above the highway were also noted in the backslope (Photos 7 and 8).	☑
☑ Erosion	Runoff from both the roadway ditch and the scoured channel below the centerline culvert appears to be causing sediment to accumulate about 80 m downslope below the roadway. There has been some deepening of the scour channel	☑

	and some slight retrogressing on the scour channel sidewalls. There has been no retrogression of the scour channel upslope towards the outlet of the centerline culvert since 2017 (Photos 9, 10 and 13).	
☐ Seepage		☐
☑ Bridge/Culvert Distress	There is a 600 mm diameter 28 m long CSP centerline culvert to the east of the pile wall (Photo 2).	☐
☐ Other		☐

Instrumentation:

SI16-12 and SI16-24	Two slope inclinometers were installed in the cantilever retaining wall piles during construction and there has been no discernable movement observed since their initialization on July 4, 2016.
VW16-1 and VW16-2	Two vibrating wire piezometers were installed upslope of the cantilever pile wall during construction at 9 m and at 16 m depths below the finished ground surface (BGS). VW16-1 (9 m BGS) showed a water level of 0.2 m above the tip and VW16-2 (16 m BGS) showed a water level of 2.1 m above the tip during the spring 2017 readings.

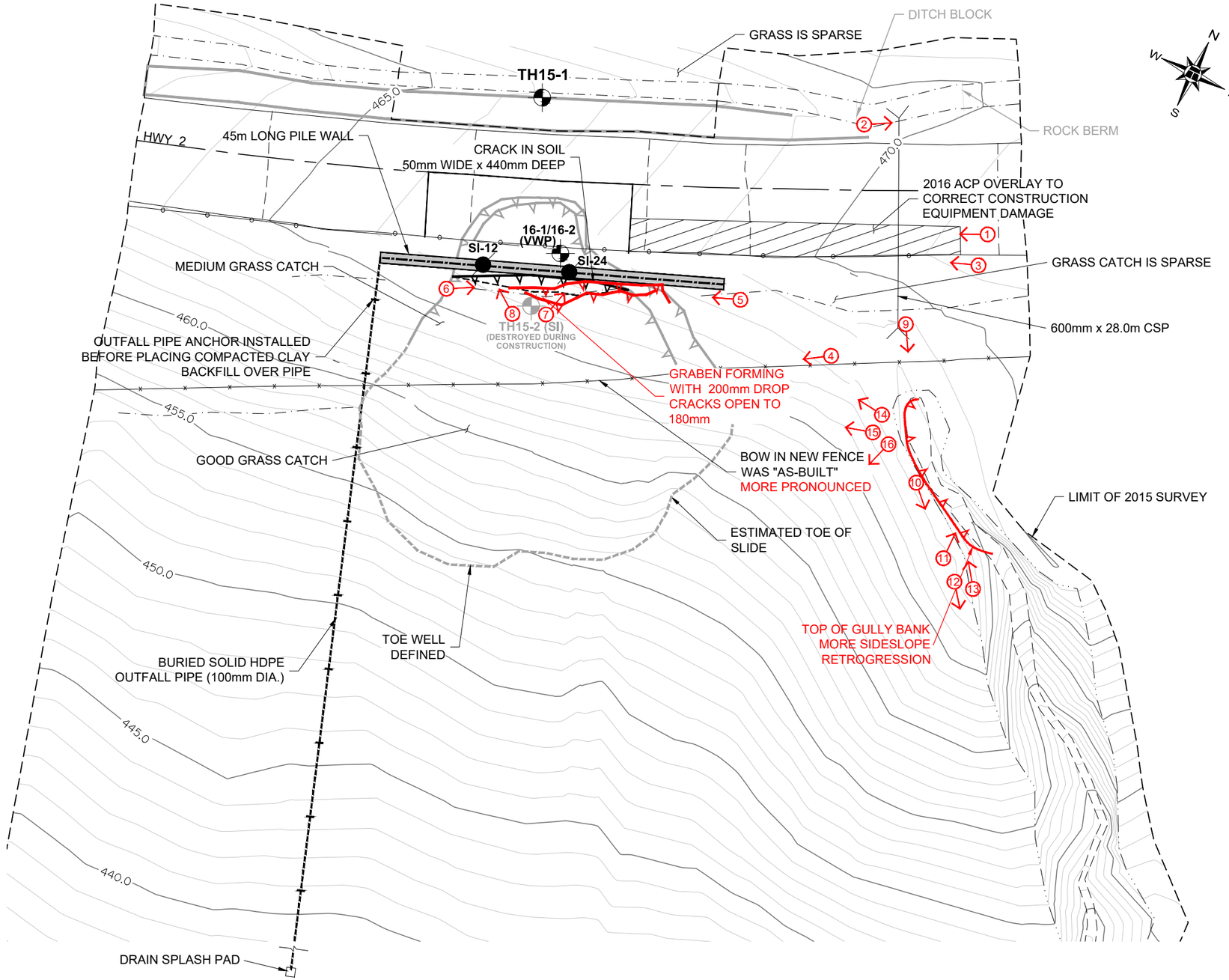
Assessment:

Following the two May 2015 call-outs, Thurber performed a geotechnical investigation and prepared tender drawings for the remediation work to repair the landslide. The landslide was repaired in 2015 and 2016 as part of TRANS Contract CON0017398 with the construction of a 46 m long cantilever cast-in-place concrete pile wall. The top of the pile wall was buried below ground and the original highway NBL and sideslope were reinstituted as part of the repair. Two slope inclinometers were installed in selected piles in the wall and will be monitored twice annually for downslope movement as part of the annual geohazard instrument reading program.

The new pile wall was built as cantilever pile wall with the capability of accommodating tie-back anchors in the eventuality that the passive soil bench support would become compromised.

A 1.5 m to 4.5 m wide graben with a 0.2 m drop has formed since in the passive bench below the pile wall.

Recommendations:	**Cost**
Bi-annual readings of the SI's in the wall and annual inspection of the cracks in the passive bench downslope of the pile wall are still required to monitor for any sign of downslope movement of the pile wall.	Monitoring
The graben that has formed in the passive bench below the pile wall should be backfilled, top soiled and seeded.	Maintenance
The existing centerline culvert that crosses the highway east of the landslide could be grouted and surface water should be directed along the existing southbound lane ditch to the existing bridge culvert further downslope to the southwest, if the downstream culvert and ditch can accommodate the extra flow. Alternatively, the culvert should be flushed out and the erosion gully repaired.	$500,000



LEGEND

- GUARD RAIL
- DIRECTION AND PHOTO NUMBER
- SLOPE INCLINOMETER
- 2015 TEST HOLE LOCATION

NOTE:

1 MAY15, 2018 OBSERVATIONS SHOWN IN RED.

0 5 10 15 20 30m

SCALE 1:600

Alberta

PEACE REGION (PEACE RIVER/HIGH LEVEL)
PH052-1 DUNVEGAN NORTH - HIGHWAY 2:68

2018 PH052-1 INSPECTION PLAN

DWG No. 13351-PH052-1

DRAWN BY	ML
DESIGNED BY	SGR
APPROVED BY	DWP
SCALE	1:600
DATE	MAY 2018
FILE No.	13351

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	**Photo 1.** Looking SW from the NBL of Hwy 2:68 towards the 2015/2016 landslide repair under Alberta Transportation Contract CON0017398. The ACP placed in 2016 is still smooth and there are no signs of cracks or dips.
	**Photo 2.** Looking northeast at inlet to 600 mm diameter CSP and rock berm. No significant change since 2017.

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	**Photo 3.** Looking southwest from east of the new pile wall built in 2015/2016. The pile wall is buried below ground. Grass catch is sparse east of the pile wall (foreground).
	**Photo 4.** Looking southwest along the new pile wall built in 2015/2016. The pile wall is buried below ground. The grass catch in the area seeded in the highway sideslope at the wall location is good. The bow in the new fence installed in 2016 is more pronounced than in 2017.

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	**Photo 5.** Looking southwest along the buried cantilever pile wall built in 2015. The graben in the passive bench below the wall is more apparent since 2017 with cracks open to 180 mm with a 200 mm drop.
	**Photo 6.** Looking northeast along the graben forming in the passive bench below the pile wall. The graben varies in width from 4 m at the west end to 1.5 m at the east end of the pile wall.

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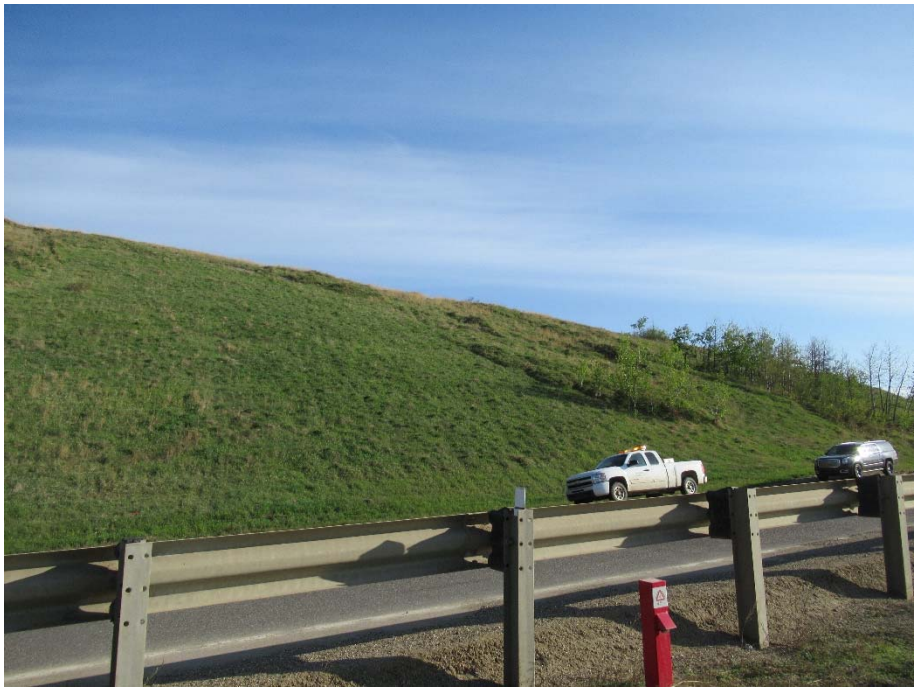	**Photo 7.** Looking north from the new pile wall at the skin failures in the backslope above the highway.
	**Photo 8.** Looking northwest from the new pile wall at the skin failures in the backslope above the highway.

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	**Photo 9.** Looking southeast from north of the centerline culvert outlet towards the scour channel. No significant change since 2017.
	**Photo 10.** Looking southeast from the north end of the scour channel that has developed below the outlet of the centerline culvert. The scour is slightly wider and there are no signs of retrogression towards the highway since 2017.

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	**Photo 11.** Looking north from the west side of the scour channel that is situated below the outlet of the centerline culvert.
	**Photo 12.** Looking southeast along the centerline culvert scour channel at mid-slope.

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	**Photo 13.** Looking northwest from the north end of the scour channel towards the outlet of the centerline culvert.
	**Photo 14.** Looking west towards the Dunvegan North landslide repair. The grass catch is still good downslope of the repair.

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	**Photo 15.** Looking southwest towards the Dunvegan North landslide repair. The grass catch is good downslope of the repair. The old toe bulge is still distinct.
	**Photo 16.** Looking southwest downslope of the Dunvegan North landslide repair. The grass catch is still good downslope of the repair. No significant change since 2017.