

**ALBERTA TRANSPORTATION  
GEOHAZARD ASSESSMENT PROGRAM  
PEACE REGION – PEACE-HIGH LEVEL  
2020 INSPECTION**



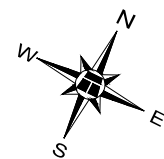
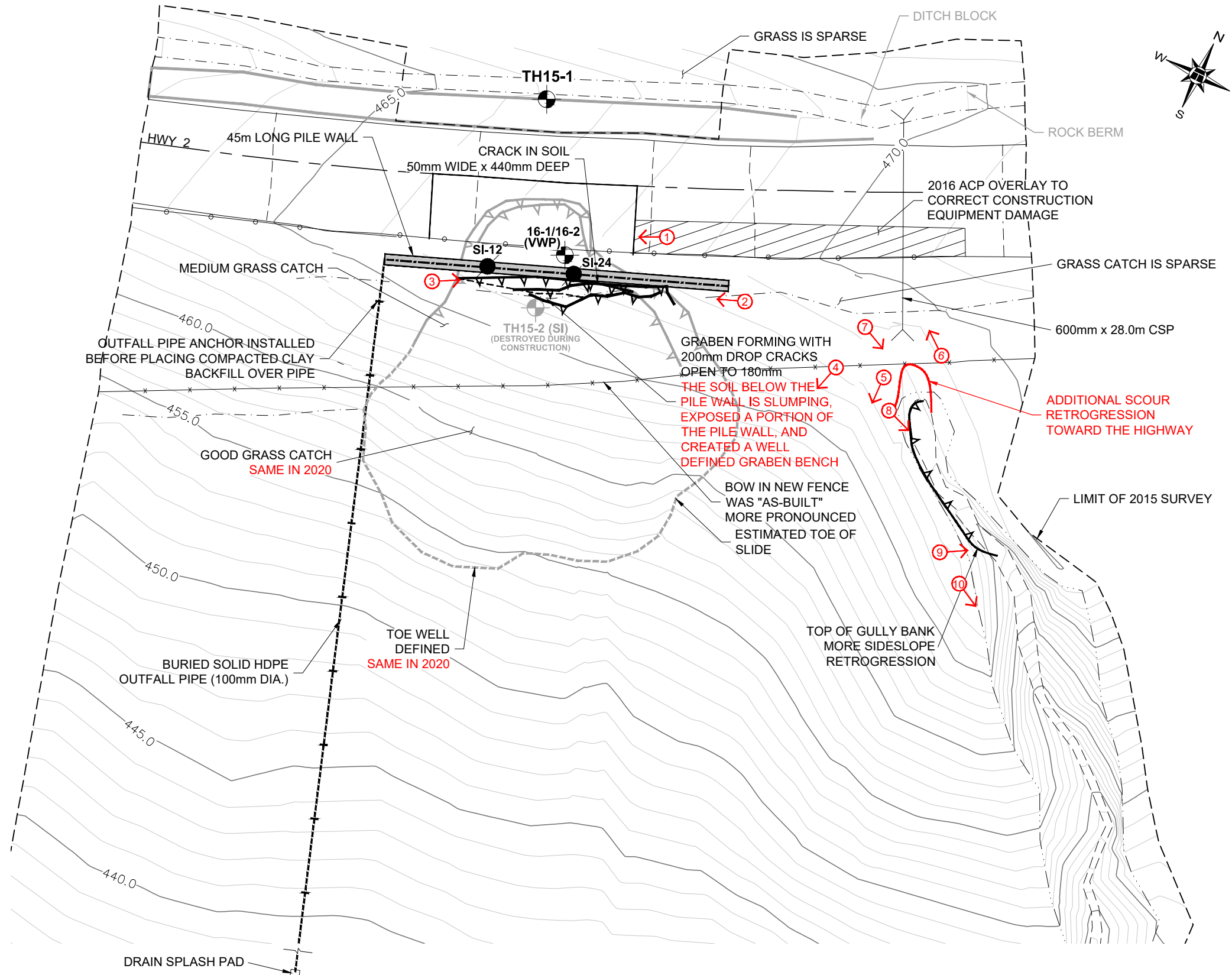
Site Number	Location	Name	Hwy	km
PH052-1	Dunvegan	Dunvegan North 10+800	2:68	10.80
Legal Description		UTM Co-ordinates		
SE¼ 16-080-04 W6M		11U E 402466	N 6199552	

	Date	PF	CF	Total
<b>Previous Inspection:</b>	15-May-2018	9	2	18
<b>Current Inspection:</b>	June 12, 2020	9	2	18
<b>Road AADT:</b>	2,680		<b>Year:</b>	2019
<b>Inspected By:</b>	Rocky Wang, TRANS Ed Szmata, TRANS		Don Proudfoot, Thurber José Pineda, Thurber	
<b>Report Attachments:</b>	<input checked="" type="checkbox"/> Photographs <input checked="" type="checkbox"/> Plans <input checked="" type="checkbox"/> Maintenance Items			

<b>Primary Site Issue:</b>	On May 21, 2015, Alberta Transportation was alerted that the dip in the pavement had dropped suddenly in the NBL lanes of Hwy 2.		
<b>Dimensions:</b>	Arcuate cracking defined a slide that was approximately 22 m to 28 m wide at the road shoulder.		
<b>Maintenance:</b>	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.		
<b>Observations:</b>	<b>Description</b>	<b>Worsened?</b>	
<input checked="" type="checkbox"/> 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. Minor reflective cracks became visible again since the 2015/2016 repair.	<input type="checkbox"/>	
<input checked="" type="checkbox"/> Slope Movement	<p>The main landslide feature affecting the roadway was repaired in 2015/2016. There have been some cracks and subsequent profile drop and a graben formed in the passive bench downslope of the pile wall since 2016. The ground surface dropped 1.5 m at the downslope edge of the wall near the north SI in the pile wall (Photo 2).</p> <p>There is bow in the new barbed wire fence below the highway.</p> <p>Slides above the highway were also noted in the backslope in the 2018 inspection.</p>	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/> Erosion	There has been some deepening of the scour channel and some slight retrogressing on the scour channel sidewalls. There has been slight retrogression of the scour channel upslope towards the outlet of the centerline culvert since 2018 (Photos 6 and 7).	<input checked="" type="checkbox"/>	

<input type="checkbox"/> Seepage		<input type="checkbox"/>
<input checked="" type="checkbox"/> Bridge/Culvert Distress	There is a 600 mm diameter 28 m long CSP centerline culvert to the east of the pile wall (Photo 5).	<input type="checkbox"/>
<input type="checkbox"/> Other		<input type="checkbox"/>
<b>Instrumentation:</b>		
SI16-12 and SI16-24	Two slope inclinometers were installed in the cantilever retaining wall piles during construction and there has been none to creep movement observed since their initialization on July 4, 2016. SI16-P12 showed a rated of movement of 0.3 mm/yr since the fall of 2019 with a total head movement of 2.5 mm. SI13-21 has showed a total pile head movement of 1.3 mm to date, but the calculated movement is considered inconclusive due to the misaligned casing at 12.2 m depth.	
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) continued to be dry and VW16-2 (16 m BGS) showed a water level of 11.4 m BGS during the spring 2020 readings representing a 0.4 m water level increase since the fall of 2019 readings.	
<b>Assessment:</b>		
<p>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 reinstated 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.</p> <p>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.</p> <p>A 1.5 m ground surface drop was noted in the passive bench below the pile wall during the 2020 inspection. In addition, minor reflective cracks were noted on the highway north bound lane asphalt paved surface. However, additional reinforcement of the pile wall is currently not considered required as the ground movements are small and the impacts on the highway surface are still negligible.</p>		
<b>Recommendations:</b>		
Bi-annual readings of the SI's in the wall and annual inspection of the cracks in the soil 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. The bowing zone in the barbed wire fence might also need to be straightened out.		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.		\$50,000

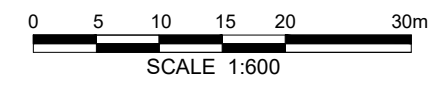
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**LEGEND**

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

NOTE:  
1 JUNE 12, 2020 OBSERVATIONS SHOWN IN RED.






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

**2020 PH052-1 INSPECTION PLAN**

**DWG No. 13351-PH052-1**

DRAWN BY	ML
DESIGNED BY	JGP
APPROVED BY	DWP
SCALE	1:600
DATE	SEPTEMBER 2020
FILE No.	13351



**THURBER ENGINEERING LTD.**



**Photo 1.**  
Looking SW from the NBL of Hwy 2:68 towards the 2015/2016 landslide repair under Alberta Transportation Contract CON0017398. Reflective cracks became visible.



**Photo 2.**  
Looking southwest along the pile wall built in 2015/2016. The soil below the pile wall is slumping, exposed a portion of the pile wall, and created a well-defined graben bench.



**Photo 3.**  
Looking northeast along the graben formed in the passive bench below the pile wall.



**Photo 4.**  
Looking southwest at landslide mass. Note the soil dropped up to 1.5 m below the pile wall and is now exposing the upper 0.5 m of the pile wall at the crest of the slide near the guardrail. The toe bulge is still well-defined at the bottom. The barbed wire fence is still being impacted by landslide movement. But, has not been broken yet.



**Photo 5.**  
Looking south towards the Dunvegan North landslide repair. The grass catch is still good downslope of the repair.



**Photo 6.**  
Looking at the 600 mm centre line culvert outlet. Erosion downstream of the outlet is still occurring



**Photo 7.**  
Looking southeast from north of the centerline culvert outlet towards the scour channel.



**Photo 8.**  
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 is retrogressing towards the highway since 2018.



**Photo 9.**  
Looking north from  
the west side of the  
scour channel that is  
situated below the  
outlet of the  
centerline culvert.



**Photo 10.**  
Looking southeast  
along the centerline  
culvert scour channel  
at mid-slope.





**Photo 11.**  
Looking northwest from the north end of the scour channel towards the outlet of the centerline culvert. Note grass growing at the bottom of the gully and bird burrows on the upper weathered sandstone layer