

**ALBERTA TRANSPORTATION  
GEOHAZARD ASSESSMENT PROGRAM  
PEACE REGION–GRANDE PRAIRIE  
2020 INSPECTION REPORT**



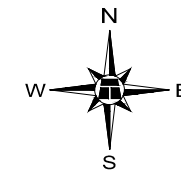
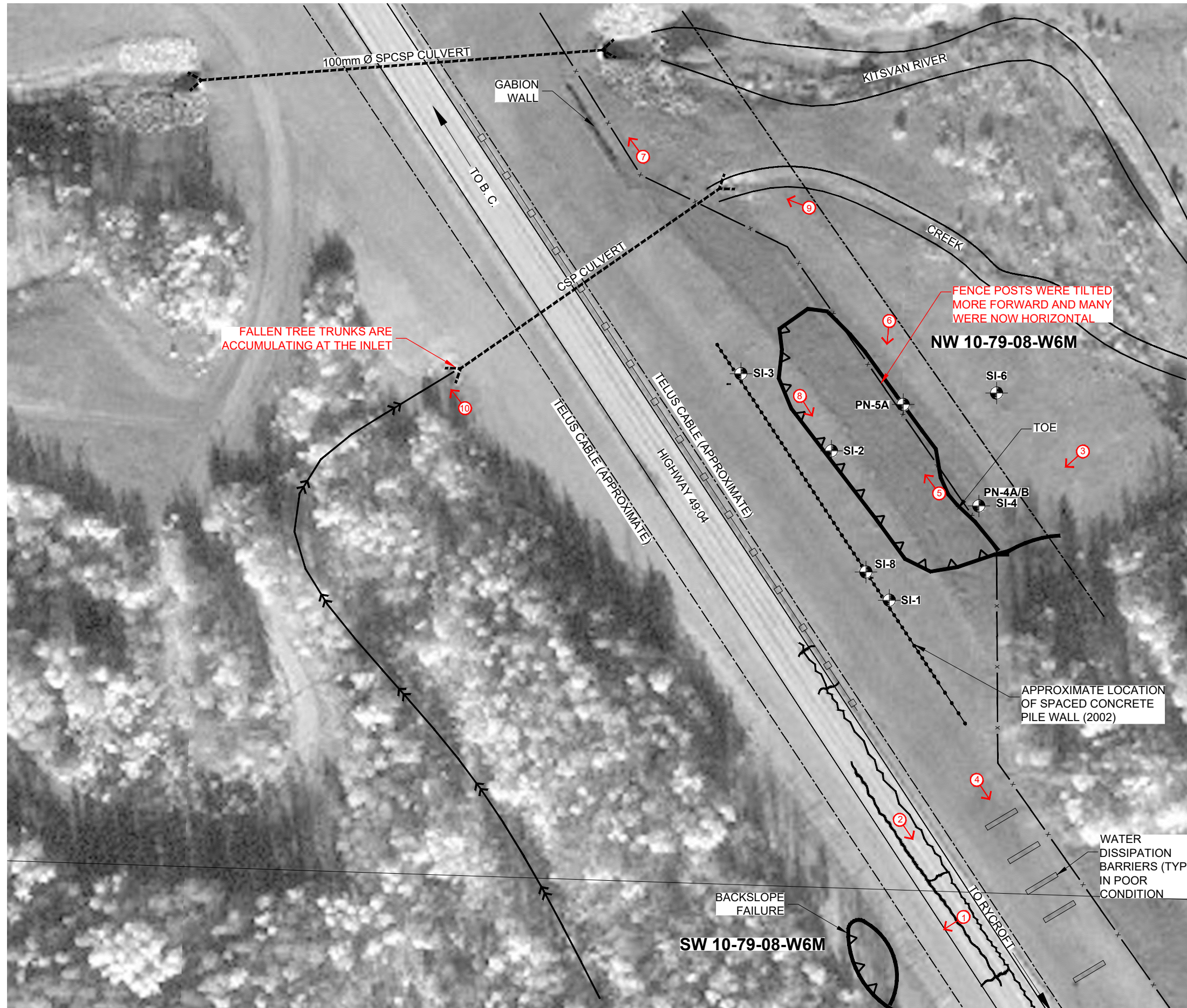
Site Number	Location	Name	Hwy	km
GP012B	Ksituan River West Valley Slope (east of Jct. with Hwy 725)	Ksituan Pile Wall	49:04	2.398
Legal Description		UTM Co-ordinates		
NW¼10-079-08-W6M		11U E 364030	N 6189796	

	Date	PF	CF	Total
<b>Previous Inspection:</b>	24-May-2018	5	6	30
<b>Current Inspection:</b>	28-May-2020	3	6	18
<b>Road AADT:</b>	1640		<b>Year:</b>	2019
<b>Inspected by:</b>	Rishi Adhikari, AT Ed Szmata, AT Graham Cooper, AT		Don Proudfoot, Thurber Nicole Wilder, Thurber	
<b>Report Prepared By:</b>	Nicole Wilder, Renato Clementino (Review)			
<b>Report Attachments:</b>	<input checked="" type="checkbox"/> Photographs <input checked="" type="checkbox"/> Plans <input type="checkbox"/> Maintenance Items			

<b>Primary Site Issue:</b>	<p>A landslide that previously affected the highway was stabilized with the construction of a toe berm in 2001 and sixty buried slope stabilization piles in 2002.</p> <p>The highway embankment fill was placed at a 3.5H:1V slope. The toe berm was about 7 m in height and constructed at a 2H:1V sideslope due to the right-of-way restriction. In 2008, a shallow landslide occurred in the upper portion of the toe berm.</p>	
<b>Dimensions:</b>	<p>The approximate width of the landslide was about 80 m and the landslide extended from the crest to the toe of the as-built berm. The maximum depth of the backscarp along the crest of the toe berm was about 0.5 m.</p>	
<b>Maintenance:</b>	None since 2015.	
<b>Observations:</b>	<b>Description</b>	<b>Worsened?</b>
<input checked="" type="checkbox"/> Pavement Distress	Several longitudinal and transverse cracks were observed in the pavement in the north and southbound lanes, which may not be related to slope movement. No change observed in 2020.	<input type="checkbox"/>
<input checked="" type="checkbox"/> Slope Movement	Failure of the 2H:1V sideslope of the toe berm located below the pile wall constructed in 2002. Fresh sloughing from recent movement was observed and the soil was moist in 2017. In 2020 it appeared to be slightly active (Photo 8). The fence posts at the bottom of the slope were pushed over from movement of the toe, and they were tilted over more with some posts now horizontal.	<input checked="" type="checkbox"/>
<input type="checkbox"/> Erosion		<input type="checkbox"/>
<input type="checkbox"/> Seepage		<input type="checkbox"/>
<input checked="" type="checkbox"/> Bridge/Culvert Distress	At the inlet of the 1.6 m SPCSP culvert, there has been some debris accumulation such as fall tree trunks, at the time on the inspection this	<input type="checkbox"/>

	posed no harm but the culvert may be blocked if debris continues to accumulate.	
<input checked="" type="checkbox"/> Other	As a result of the landslide in the toe berm, displaced mass has been accumulated at the toe and encroached into the right-of-way of the sour natural gas pipeline located adjacent to the highway.  The water dissipation barriers were in noticeably worst condition than previously.	<input checked="" type="checkbox"/>
<b>Instrumentation:</b>		
SI-1 SI-3	Installed in the 2002 slope stabilization piles. Small amount of movement has been detected in SI-3 and no discernable movement was detected in SI-1. The current rate of movement at SI-3 is 2.2 mm/yr.	
SI-2	Installed 10 m downslope of the 2002 pile wall. This SI showed a decrease in the rate of slope movement in the upper zone and no discernible movement in the lower; the current rate for the upper zone is: 24.1 mm/yr .	
SI-4	Installed at the toe of the lower berm sideslope. This SI was damaged and not able to be read in fall 2020.	
SI-6	Installed about 18 m northeast of the lower sideslope berm toe (further towards the Ksituan River). This SI showed no discernible movement in fall 2020.	
SI-8	Installed about 10m upslope of the 2002 pile wall. This SI showed a slight increase in the rate of slope movement; the current rate is: 4.5 mm/yr within depths from 0.9 to 19.2 m below existing ground surface	
PN-4A PN-4B PN-5A PN-5B	Installed at the toe of the lower berm sideslope. Piezometers PN-4A and PN-5A were destroyed. Piezometers PN-4B and PN-5B showed slight decreases in groundwater levels of 0.5 m and 0.02 m, respectively since the spring 2020 readings.	
<b>Assessment:</b>		
<p>A slope failure has occurred in the toe berm, which was constructed at a slope angle of 2H:1V. The toe berm was constructed of locally obtained clayey colluvium soils of high plasticity, which typically undergo a gradual loss of cohesion with time. Based on local experience of the sites with similar soil conditions, the onset of the shallow landslides typically occurs in about 10 to 20 years following the completion of fill placement. Once the landslide has developed, the stability of the fill slope deteriorates. Over time, this has been observed at this site as the toe berm slide appears slightly worse than what was observed in 2018. This may become a concern as the slide mass moves down it will reduce the passive support of the pile wall.</p> <p>The most cost-effective measure could be to flatten the upper portion of the toe berm by cutting the crest of the toe berm into the pile wall location. However, it is recommended that stability analyses be carried out to assess the impact of reducing the size of the toe berm on the global stability of the pile wall and highway embankment.</p>		
<b>Recommendations:</b>		<b>Ballpark Cost</b>
The site should be monitored annually. As displaced material from the landslide has been encroaching into the right-of-way of the sour natural gas pipeline, a dialog should be opened between AT and the pipeline owner/operator in order to implement remediation measure in the future.		Monitoring
Consideration should be given to plant some deep-rooted trees at the sliding area to help dewater the ground and improve its stability by developing a root system.		\$50,000
The inlet of the 1.6 m diameter culvert should be cleaned for the drift material that is currently blocking the inlet.		\$1,000



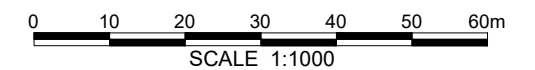


**LEGEND**

- APPROXIMATE INSTRUMENT LOCATION
- SLOPE INCLINOMETER
- PNEUMATIC PIEZOMETER
- SCARP CRACK
- CRACK (APPROXIMATE)
- BARBED WIRE FENCE (APPROXIMATE)
- SPECTRA MIDSTREAM SOUR NATURAL GAS PIPELINE (APPROXIMATE)
- GUARDRAIL
- WATER FLOW DIRECTION
- RUT
- DIRECTION AND NUMBER OF PHOTO

**NOTES :**

1. FEATURE LOCATIONS ARE APPROXIMATE
2. PREVIOUS OBSERVATIONS SHOWN IN BLACK
3. MAY 28, 2020 FEATURES SHOWN IN RED



PEACE REGION (GRANDE PRAIRIE)

GP012B-1: HWY 49:04 KSITUAN PILE WALL  
2020 INSPECTION FIGURE

DWG No. 13353-GP12B-1-1

DRAWN BY	ML
DESIGNED BY	NPW
APPROVED BY	RVC
SCALE	1:1000
DATE	DECEMBER 2020
FILE No.	13353







**Photo 1.**  
Looking southwest  
at backslope failure  
on other side of  
highway.



**Photo 2.**  
Looking southeast  
from the  
northbound lane at  
cracking in  
pavement.



**Photo 3.**  
Looking southwest  
towards the  
landslide in the toe  
berm.



**Photo 4.**  
Looking southeast  
at water dissipation  
barriers that are  
tattered and in poor  
condition.





**Photo 5.**  
Looking northwest  
along the toe of the  
landslide. The  
fence posts are  
bent over further  
from movement of  
the toe bulge.



**Photo 6.**  
Looking at the toe  
bulge and bent  
over posts





**Photo 7.**  
Looking northwest  
at gabion wall  
above CSP culvert  
outlet.



**Photo 8.**  
Looking southeast  
at relatively fresh  
slumping from head  
scarp.





**Photo 9.**  
Looking northwest  
towards the 6.1 m  
diameter SPCSP  
centerline culvert  
outlet.



**Photo 10.**  
Looking northwest  
towards the 6.1 m  
diameter SPCSP  
centerline culvert  
inlet.