

**ALBERTA TRANSPORTATION
GEOHAZARD ASSESSMENT PROGRAM
PEACE REGION–GRANDE PRAIRIE
2018 INSPECTION REPORT**

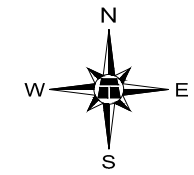
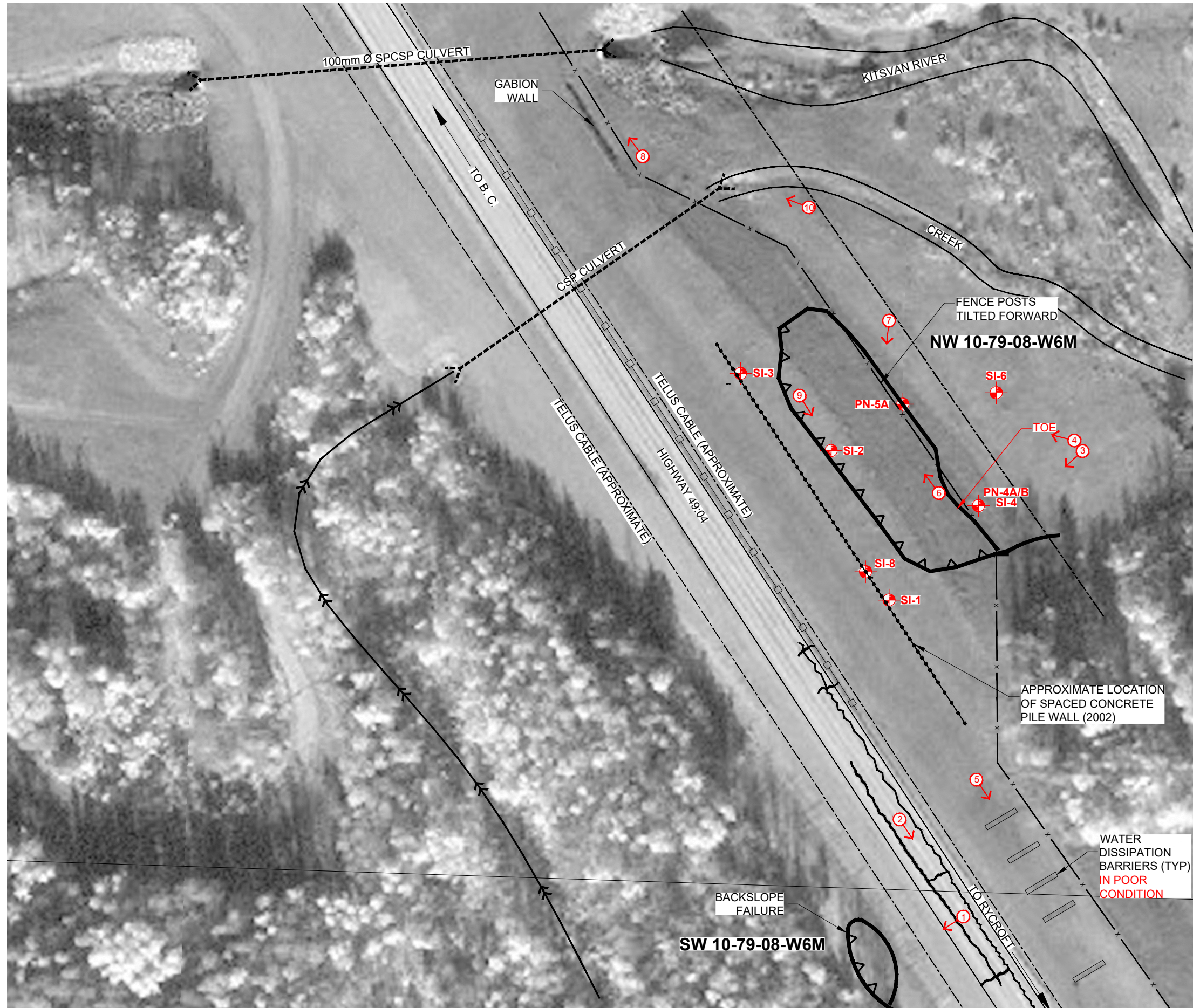


Site Number	Location	Name	Hwy	km
GP012B	Ksituan River West Valley Slope (east of Jct. with Hwy 725)	Ksituan Pile Wall	49:04	2.398
Legal Description		UTM Co-ordinates		
NW¼10-079-08-W6M		11U E 364030	N 6189796	

	Date	PF	CF	Total
Previous Inspection:	13-Jun-2017	5	6	30
Current Inspection:	24-May-2018	5	6	30
Road AADT:	1860		Year:	2017
Inspected by:	Rocky Wang, AT Ed Szmata, AT Dwayne Lowen, AT		Renato Clementino, Thurber Nicole Wilder, Thurber	
Report Prepared By:	Nicole Wilder, Renato Clementino (Review)			
Report Attachments:	<input checked="" type="checkbox"/> Photographs <input checked="" type="checkbox"/> Plans <input type="checkbox"/> Maintenance Items			

Primary Site Issue:	<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>	
Dimensions:	<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>	
Maintenance:	None since 2015.	
Observations:	Description	Worsened?
<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 2018.	<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; however, in 2018 it appeared to be slightly grown over. The fence posts at the bottom of the slope were pushed over from movement of the toe, it is in the same condition as last year.	<input type="checkbox"/>
<input type="checkbox"/> Erosion		<input type="checkbox"/>
<input type="checkbox"/> Seepage		<input type="checkbox"/>
<input type="checkbox"/> Bridge/Culvert Distress		<input type="checkbox"/>

<input checked="" type="checkbox"/> Other	<p>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.</p> <p>The water dissipation barriers were in noticeably worst condition than last year.</p>	<input checked="" type="checkbox"/>
Instrumentation:		
SI-1 SI-3	Installed in the 2002 slope stabilization piles. Small amount of movement has been detected in SI-1 and no discernable movement was detected in SI-3. The current rates are 2.1 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 small movement in the lower; the current rates are: 22.9 mm/yr within depths from 1.1 m to 5.9 m and 0.4 mm/yr from 10.8 to 15.7 m below existing ground surface since the fall 2017 readings.	
SI-4	Installed at the toe of the lower berm sideslope. No discernable movement has been detected since installation.	
SI-6	Installed about 18 m northeast of the lower sideslope berm toe (further towards the Ksituan River). This SI showed a slight increase in the rate of slope movement; the current rate is: 0.5 mm/yr within depths from 1.1 to 2.3 m below existing ground surface since the fall 2017 readings.	
SI-8	Installed about 10m upslope of the 2002 pile wall. No discernable movement has been detected since installation.	
PN-4A PN-4B PN-5A	Installed at the toe of the lower berm sideslope. These piezometers showed small changes in groundwater levels from 0.18 m to 0.57 m since the fall 2017 readings.	
Assessment:		
<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 gradually loss of cohesion with time. Based on local experience of the sites with similar soil conditions, the onset of the shallow landslides typically occur 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 worse than what was observed in 2016; however, is in similar condition to what was observed in 2017. 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 asses the impact of reducing the size of the toe berm on the global stability of the pile wall and highway embankment.</p>		
Recommendations:		Ballpark Cost
<p>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.</p> <p>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.</p>		Monitoring \$50,000

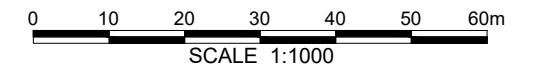


LEGEND

- APPROXIMATE INSTRUMENT LOCATION
- SI SLOPE INCLINOMETER
- PN 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 24, 2018 FEATURES SHOWN IN RED



PEACE REGION (GRANDE PRAIRIE) 2018

GP012B-1: HWY 49:04 KSITUAN PILE WALL
2018 INSPECTION FIGURE

DWG No. 13353-GP12B-1-1

DRAWN BY	ML
DESIGNED BY	NPW
APPROVED BY	RVC
SCALE	1:1000
DATE	AUGUST 2018
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 west
towards the
landslide in the toe
berm.



Photo 5.
Looking southeast
at water dissipation
barriers that are
tattered and in poor
condition.



Photo 6.
Looking northwest
along the toe of the
landslide. The
fence posts are
bent over further
from movement of
the toe bulge.



Photo 7.
Looking at the toe
bulge and bent
over posts



Photo 8.
Looking northwest
at gabion wall
above CSP culvert
outlet.



Photo 9.
Looking southeast
at relatively
grownover
slumping from head
scarp.



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