

**ALBERTA TRANSPORTATION
GEOHAZARD ASSESSMENT PROGRAM
PEACE REGION – PEACE RIVER DISTRICT
2022 CALLOUT INSPECTION**



Site Number	Location	Name	Hwy	km
Callout	S of High Prairie	Nicholls Creek Slide	747:02	35.2
Legal Description		UTM Co-ordinates (NAD 83)		
SW09-74-19-W5		11U N 6,138,622	E 508,118	

	Date	PF	CF	Total
Previous Inspection:				
Current Inspection:	August 9, 2022	12	4	48
Road AADT:	440	Year:		2021
Inspected By:	Don Proudfoot, Nicole Wilder (Thurber) Ed Szmata, Max Shannon (AT)			
Report Attachments:	<input checked="" type="checkbox"/> Photographs <input checked="" type="checkbox"/> Plans <input type="checkbox"/> Maintenance Items			

Primary Site Issue:	Landslide in a 3.5 m high embankment above a culvert on the west side of highway with backscarp 2.8 m into pavement.	
Dimensions:	The landslide is about 18.5 m wide (on highway) and has about 0.1 m drop in the asphalt along the backscarp.	
Date of any remediation:		
Maintenance:	The site appeared to have been patched in 2021.	
Observations:	Description	Worse?
<input checked="" type="checkbox"/> Pavement Distress	The main scarp extends into the highway and a portion of the southbound lane has a 100 m drop and has been closed off to traffic by barricades. There are also cracks open to 100 mm on the southbound lane shoulder.	<input type="checkbox"/>
<input checked="" type="checkbox"/> Slope Movement	The landslide occurred within the west embankment fill adjacent to the meandering Nicholls Creek. On the west side of the highway the creek bank has eroded and has sloughed into the river causing it to retrogress towards the highway. The flank of the slide continues into the tree line, but no toe roll was observed.	<input type="checkbox"/>
<input checked="" type="checkbox"/> Erosion	There is some bank erosion on the south side of the highway along Nicholls Creek and on either side of the culvert outlet	<input type="checkbox"/>
<input type="checkbox"/> Seepage		<input type="checkbox"/>
<input checked="" type="checkbox"/> Bridge/Culvert Distress	The culvert outlet had about 800 mm of scour below it. The shotcrete on the outlet also has extensive cracks and perforations.	<input type="checkbox"/>
<input type="checkbox"/> Other		<input type="checkbox"/>

Instrumentation: None

Assessment:

In June 2022 the MCI reported the slide and in early August the slide had dropped significantly requiring closing of the southbound lane. The slide is approximately 27 m wide by 20 m long and landslide scarp has retrogressed into the southbound lane requiring it to be closed off with barricades on either side. The flank of the scarp extending into the tree line appeared to be somewhat grown over and no exposed soil was visible during the inspection. The banks of Nicholls Creek were eroded and slumping into the creek on both sides of the creek.

The pavement in the southbound lane has dropped approximately 100 mm over an 18 m length, hence why it was blocked off from traffic. It appeared that the road had been patched several times over the years as approximately 300 mm of ACP was observed near the middle of the slide

It is anticipated that the landslide was triggered by creek erosion. Weak embankment materials and a steep embankment slope (approximately 20 degrees) have likely contributed to causing the slide. The main scarp extends into the highway and could eventually retrogress further and affect both lanes of the highway.

The creek appears to be eroding/undercutting the bank which causes overhang to slough into the creek and this process continues to retrogress towards the highway, is now behind the culvert outlet and there is also a scour hole below the culver outlet.

It is understood that a paving overlay project is coming through the site next year and the intention is to include the Nicholls Creek landslide repair into the paving contract.

Recommendations:

Investigation:

Drill 2 or 3 test holes; east of the main scarp and/or along the west edge and downslope of the highway to a depth of about 12 m. The test holes should be completed with piezometers (and one if possible, downslope with an inclinometer). This would provide information on the soil and groundwater conditions and potential depth of slide movement at this location and confirm slope stabilization design measures. WSP should complete the detailed topographic survey for this site.

Short Term:

In the short term, the slide should be regularly monitored for regression of the slide scarp, which could require jersey barriers and widening of the highway on the east side for a detour, if it retrogresses.

Medium to Long Term:

Option 1:

The recommended repair for this project is to sub-excavate the failed slide mass down to intact foundation soil, and rebuild the slope with imported 6-80 gravel to a slightly flatter 3H:1V inclination. The new fill material should be placed and compacted in thin horizontal lifts, benched into the intact slope surface, utilizing a gravel shear key (if required) to stabilize the slide area. Some of the more suitable excavated material could be used to provide a covering layer ovetop the gravel as the finished slope surface to shed runoff, with any excess removed from site. A subdrain should be installed along the base of the slide excavation to drain any subsurface water that may enter the new fill zone. Some sheet piling could be installed along the creek to provide separation of the excavation from the creek and associated flowing water. Some additional right-of-way might be required for this option.

Ballpark Cost ~\$0.6 Million

Option2:

Construct a pile wall between the slide and the highway, consisting of steel H piles, or possibly drilled cast-in-place concrete piles.

Ballpark Cost ~\$1 Million

A temporary detour will likely have to be constructed on the east side of existing highway to accommodate traffic during construction. The outlet of the culvert should also be rehabilitated, and Class 2 riprap placed around the outlet and downstream to mitigate the scour issue. A water act permit might be required to perform in-stream work. The cost of the detour is included in the above ballpark costs. The ballpark cost for the culvert rehabilitation and riprap is provided below.

Ballpark Cost ~\$100,000

CLOSURE

It is a condition of this letter report that Thurber's performance of its professional services will be subject to the attached Statement of Limitations and Conditions.

Don Proudfoot, M.Eng., P.Eng.
Principal | Senior Geotechnical Engineer

Nicole Wilder, M.Eng., P.Eng.
Geotechnical Engineer



STATEMENT OF LIMITATIONS AND CONDITIONS

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This Report has been prepared in accordance with generally accepted engineering or environmental consulting practices in the applicable jurisdiction. No other warranty, expressed or implied, is intended or made.

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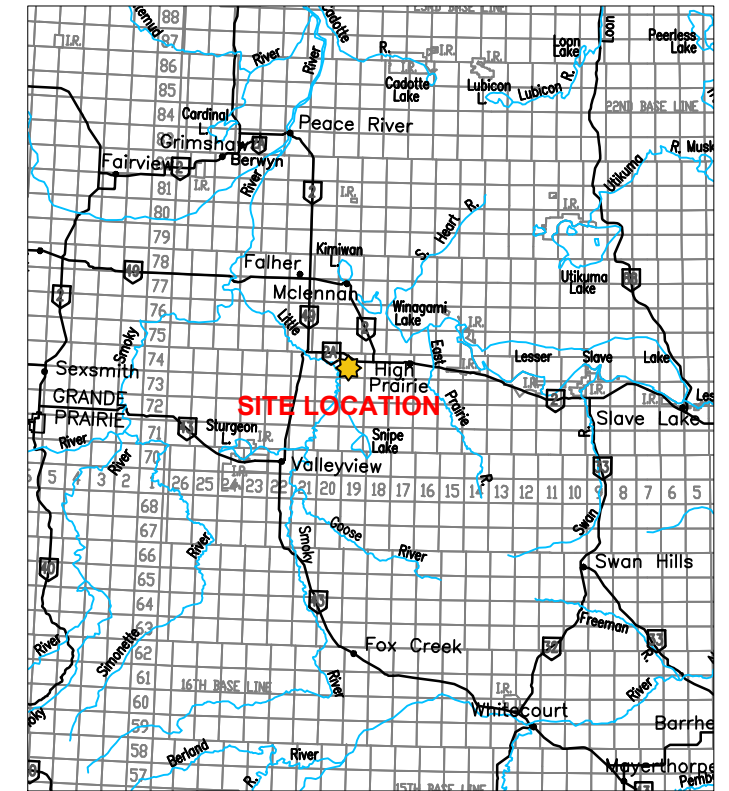
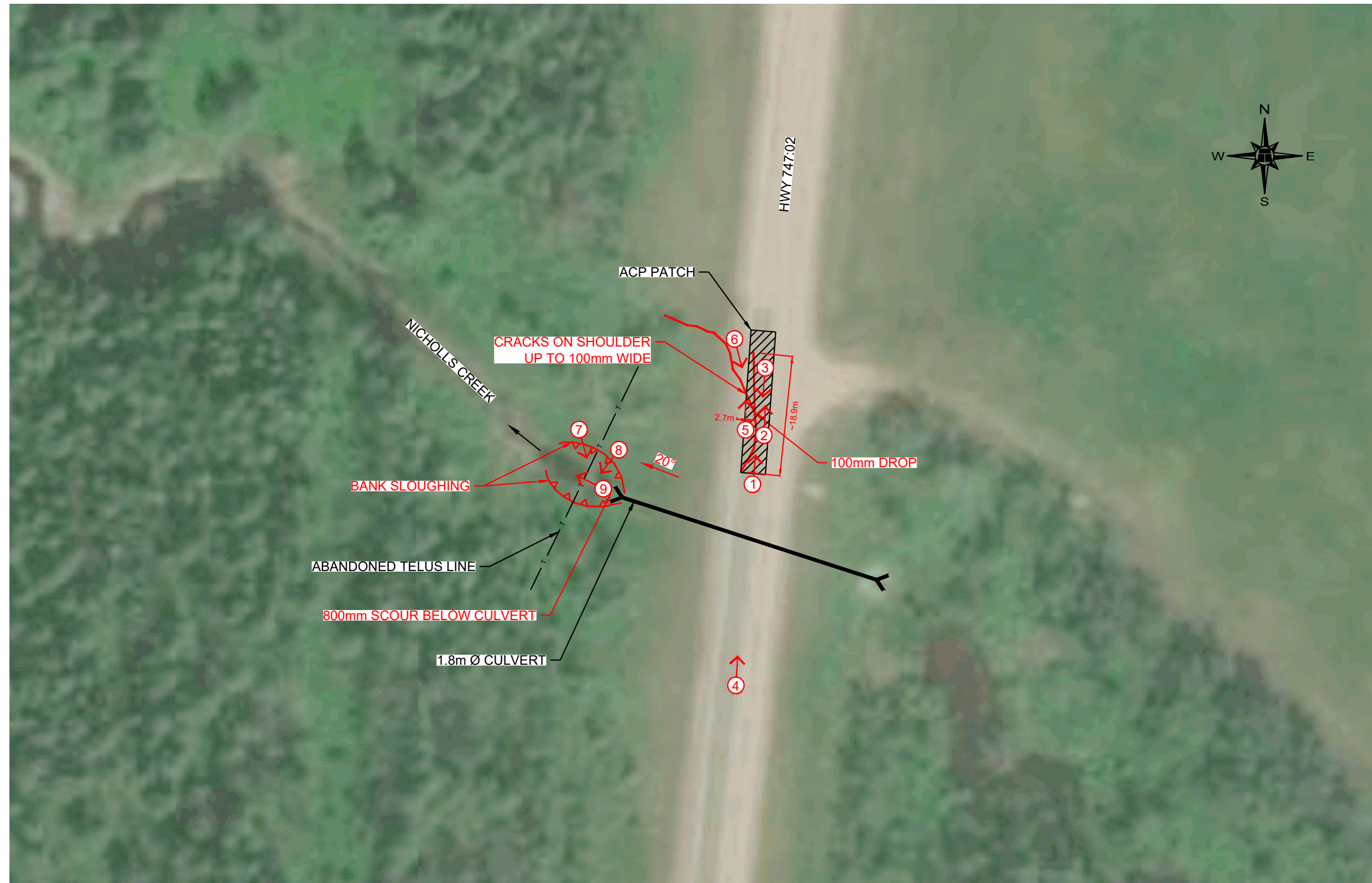
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- b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.
- c) Design Services: The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber should be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design detailed in the contract documents should be reported to Thurber immediately so that Thurber can address potential conflicts.
- d) Construction Services: During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions in order to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

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Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause the escape, release or dispersal of those substances. Thurber shall have no liability to the Client under any circumstances, for the escape, release or dispersal of pollutants or hazardous substances, unless such pollutants or hazardous substances have been specifically and accurately identified to Thurber by the Client prior to the commencement of Thurber's professional services.

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KEY MAP
SCALE 1:3 000 000

SATELLITE IMAGE FROM ESRI WORLD IMAGERY (DOWNLOADED 2022-08-22)






PEACE REGION (PEACE RIVER DISTRICT)

**HWY 747:02 km 35.2 NICHOLLS CREEK
CALLOUT SITE PLAN**

FIGURE 1

LEGEND

-  CRACK (APPROXIMATE)
-  SCARP CRACK (APPROXIMATE)
-  PHOTOGRAPH NUMBER, AND APPROXIMATE DIRECTION AND LOCATION



DRAWN BY	ML
DESIGNED BY	NPW
APPROVED BY	DWP
SCALE	1:750
DATE	SEPTEMBER 2022
FILE No.	32121





Photo 1.
Looking north at scarp affecting the southbound lane.



Photo 2.
Looking north standing near middle of scarp crack.



Photo 3.
Looking south at
scarp drop being
measured.



Photo 4.
Looking north at
lane patching and
barricades on
either side of scarp.



Photo 5.
Looking at cracks
on shoulder of
highway open up to
100 mm wide.



Photo 6.
Looking southeast
at where scarp
extends into the
grass.



Photo 7.
Looking east at
1.8 m diameter
corrugated multi-
plate.



Photo 8.
Looking south at
where bank erosion
has taken place.



Photo 9.
Looking west from
culvert outlet at
creek and creek
erosion.