

**ALBERTA TRANSPORTATION AND  
ECONOMIC CORRIDORS  
GEOHAZARD ASSESSMENT PROGRAM  
PEACE REGION – SWAN HILLS  
2024 INSPECTION**



Site Number	Location	Name	Hwy	km
SH023-11	Little Smoky River	Little Smoky River Valley, North Hill – Site #11	744:02	20.46-20.79
Legal Description		UTM Co-ordinates		
NE21-76-22-W5M		11U E 478,317	N	6,162,188

	Date	PF	CF	Total
<b>Previous Inspection:</b>	1-Jun-2022	10	4	40
<b>Current Inspection:</b>	4-Jun-2024	10	4	40
<b>Road AADT:</b>	270		<b>Year:</b>	2023
<b>Inspected By:</b>	Rishi Adhikari, TEC Robert Senior, TEC		Ken Froese, Thurber Roger Skirrow, Thurber	
<b>Report Attachments:</b>	<input checked="" type="checkbox"/> Photographs <input checked="" type="checkbox"/> Plans <input type="checkbox"/> Maintenance Items			

<b>Primary Site Issue:</b>	Highway traverses deep-seated (likely 35 m to 45 m deep at this Site), retrogressive landslides with ongoing creep movements due partly to erosion at toe by the Little Smoky River and Peavine Creek resulting in cracking and sagging of the pavement surface at numerous locations. Approx. 4 km of the highway crosses this unstable north valley slope. Site #11 is 60 m above and 260 m away from the Peavine Creek.	
<b>Dimensions:</b>	330 m length of highway affected by cracking and distortion	
<b>Date of Remediation:</b>	1988: 6 m deep subdrain installed in upslope ditch from Sta. 20+600 to 20+860. 2000: Toe berm, gravel drainage blanket, and subdrain pipe (drains to Site #10) installed (by AGRA/AMEC). Patching of the highway and ditch cleaning done at the same time. 2005: West ditch lined with ECP and GeoRidge (20 m spacing).	
<b>Maintenance:</b>	Routine ACP crack sealing, milling, and patching, when required. 2017: ACP patch placed over south portion of Site #11. Guardrail removed and sideslopes regraded (1,200 m <sup>3</sup> of pitrun). Fall 2017: Milled and patched. 2019: Milling over most of the Site. 2021: Highway overlay (50 mm)	
<b>Observations:</b>	<b>Description</b>	<b>Worsened?</b>
<input checked="" type="checkbox"/> Pavement Distress	Some of the previous longitudinal and traverse cracks have reflected through. Existing cracks have extended. Rutting was observed in a patch located in the outer wheel path of the SBL. Cracks were infilled with sand.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Slope Movement	Site is located on an active deep-seated landslide moving toward the Peavine Creek. There is continuing vertical deformation of the pavement.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Erosion	Upslope ditch was regraded and erosion control measures installed.	<input type="checkbox"/>
<input type="checkbox"/> Seepage		<input type="checkbox"/>
<input type="checkbox"/> Bridge/Culvert		<input type="checkbox"/>

<input type="checkbox"/> Other		<input type="checkbox"/>
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**Instrumentation:**

Active:	There are no active instruments at this Site.
Destroyed: (year lost)	<i>Installed in 1999 by AGRA: SI99-1 (2000, sheared about 24m), PN99-1 (2008), SP99-3 (2006), SP99-4 (2006), SP99-5 (unknown), SP99-6 (2005),</i> <i>Installed in 2000 by AGRA: SI00-1 (2002), SP00-1</i> <i>Installed in 2001 by Thurber: S01-1 (2002, sheared at 5.5m), SP-TH01-1A (2006), SP-TH01-1B (2006)</i>

**Assessment:**

The overall valley slope movement pattern is complex. It is moving as several separate slide blocks in response to the toe erosion and downcutting of two different rivers resulting in numerous scarps, sag ponds, and differential movement zones going in slightly different directions. The highway intersects the scarps of these blocks at several locations resulting in an uneven highway surface and cracking. There is approximately 55 m to 60 m elevation difference between the highway and the Peavine Creek located about 250 m to the southeast with two significant scarps identified from LiDAR at 110 m and 205 m from the highway.

Site #11 is located on an active scarp with significant vertical deformation that affects the highway. Two significant scarp cracks were identified crossing the highway surface and could also be traced in the adjacent ditches (although obscured by regrading done in 2019 and 2021). The ditches were regraded and removed previously observed erosion gullies. Erosion control measures including matting and GeoRidges were installed in a portion of the upslope ditch. Since the highway overlay in 2021, the two main scarp cracks have become re-established. The south of the two sets of scarp cracks has greater deformation since the observed cracks were wider and deeper. There was less deformation at the north scarp crack; however, there is a significant 4 m high scarp located downslope in the trees (identified from LiDAR topography). During the 2024 inspection, extension of existing cracks was observed, with some faint new cracks reflecting from previous cracks. Most of the cracks were infilled with sand.

Historically, there has also been shallow movement of the embankment which was remediated in 2000 with the construction of a toe berm and blanket drain. There does not appear to be signs of toe berm instability (such as cracking or bulging); however, the crack pattern in the highway above the berm continues to expand which is likely indicative of deeper-seated movement below the berm.

**Recommendations:**

**Short-Term:**

- Road maintenance such as milling and patching should continue as necessary to maintain as safe roadway surface. Minor embankment grading may be required to maintain safe sideslope conditions. Guardrail height adjustment may be required. Cracks within the ACP should be sealed to limit infiltration of rain fall and snow melt into the crack network.

**Mid-Term:**

- There is significant vertical distortion at SH023-11; vertical realignment of the highway could be undertaken to offload the valley slope and reduce the rate of movement and severity of scarp development over the highway surface. Lowering of the highway grade, or subcut and replacement with light-weight fill, would reduce the driving weight at the top of this slide block and might decrease the rate of maintenance. Alternatively, a horizontal shift of at least 20 m into the slope could be considered to move the highway off this active slide block.

**Long-Term:**

- It is understood that, at this time, the only long-term remediation option under consideration is realignment of the entire north hill section of Highway 744 and this study is currently being undertaken by CIMA+. Consideration is also being given to a shorter realignment which would include both of the SH023 sites as they currently require frequent maintenance.

**Ongoing Investigation:**

- It is recommended that the annual Geohazard inspection should continue as scheduled.

As this is one of the more-active Sites along this north valley slope, consideration should be given to installing two or three deep slope inclinometers to evaluate the ongoing performance of the toe berm and assessing current slope movement rates particularly if vertical or horizontal realignment is being considered. If very deep seated movement zones are found it would help inform the mitigation decisions for this and adjacent geohazard site.

**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.

Roger Skirrow, P.Eng.  
Senior Geotechnical Engineer

Mark Gallego, 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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- a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other persons making use of such documents or records with our express written consent should be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.
- 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.

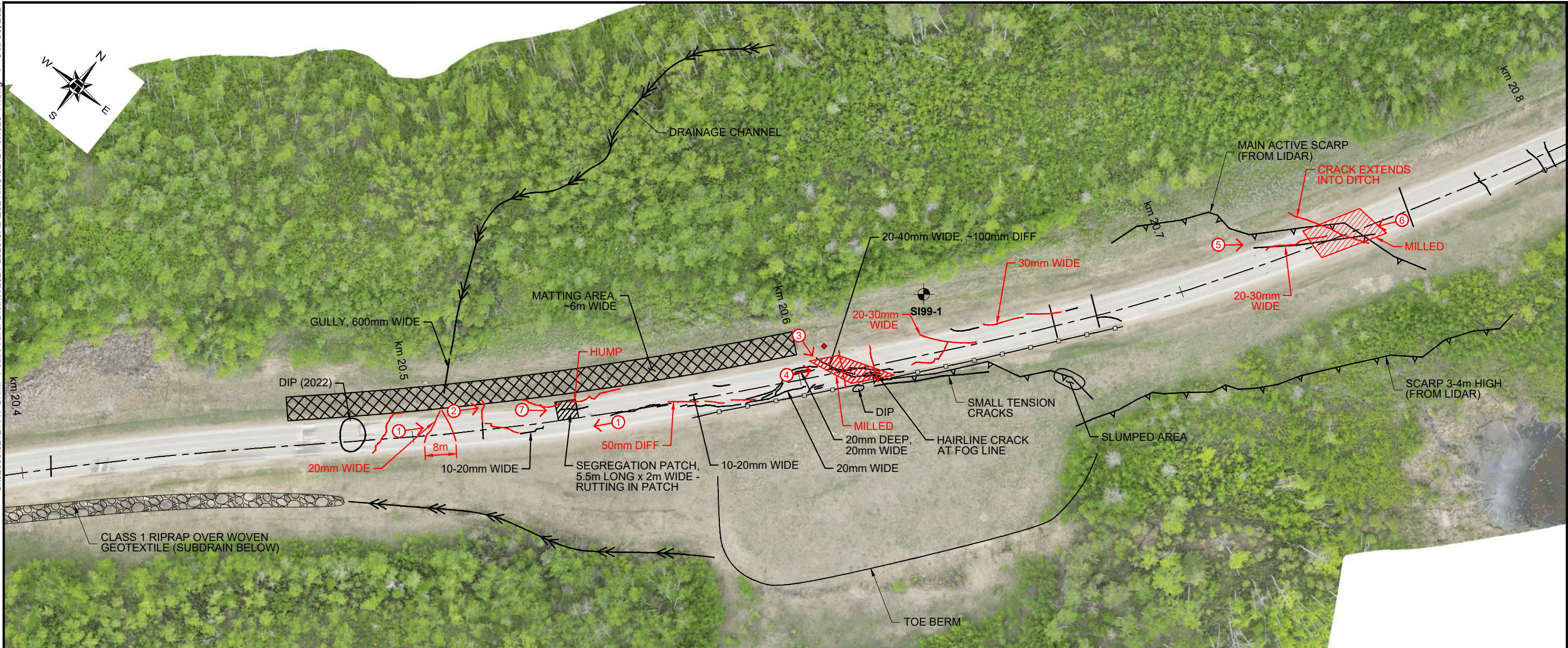
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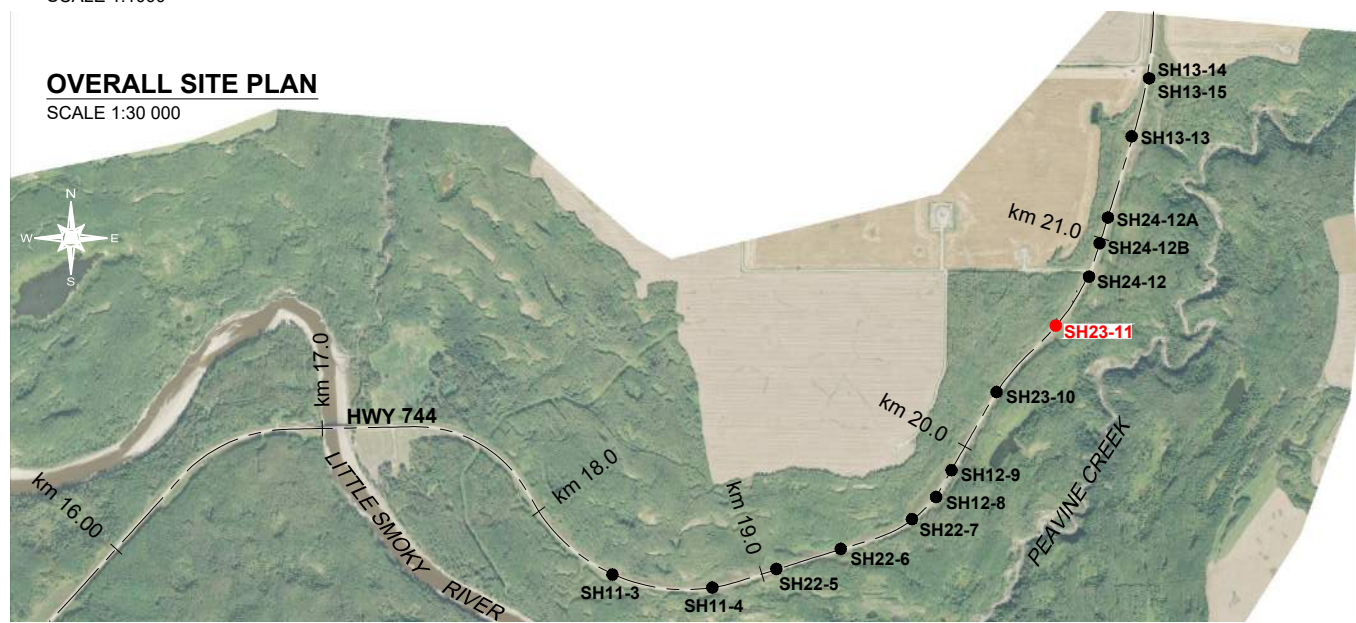


**DETAILED SITE PLAN**

SCALE 1:1000

**OVERALL SITE PLAN**

SCALE 1:30 000

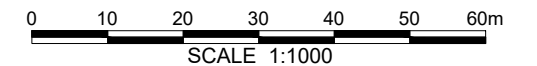


**LEGEND**

- LANDSLIDE SCARP (GREY FOR PORTIONS OBSCURED BY PATCHING OR GRADING)
- SLOPE INCLINOMETER (APPROXIMATE)
- GUARDRAIL
- DIRECTION AND NUMBER OF PHOTO

**NOTES**

1. FEATURE LOCATIONS ARE APPROXIMATE.
2. JUNE 2024 OBSERVATIONS SHOWN IN RED.
3. CRACK AND PATCH PATTERNS RESET AS HWY 744 WAS OVERLAID IN SUMMER 2021.
4. GUARDRAIL AND CULVERT LOCATIONS TAKEN FROM MCINTOSH PERRY AS-BUILT DRONE SURVEY (JULY 2021).



ORTHOIMAGE DERIVED FROM UAV IMAGERY FLOWN BY THURBER IN JUNE 2024  
OVERALL SITE PLAN IMAGE: SATELLITE IMAGE FROM VALTUS IMAGERY (DATED 2014)



**PEACE REGION (SWAN HILLS)**

**SH023-11: HWY 744:02 LITTLE SMOKY RIVER VALLEY  
2024 SITE INSPECTION PLAN**

DWG No. 32121-SH023-11

DRAWN BY	KLP
DESIGNED BY	MG
APPROVED BY	RKS
SCALE	AS SHOWN
DATE	OCTOBER 2024
FILE No.	32121





**Photo 1 – Looking northeast from the southwest end of Site 11.**



**Photo 2 – Looking east at south end of site at installed erosion control measures where previously observed significant gully was regraded.**



Photo 3 – Looking east at south scarp crack crossing highway (see Photo #4).



Photo 4: Looking northeast where south scarp crack crosses the highway at the central portion of Site 11.



**Photo 5 – Looking northeast at north scarp crack.**



**Photo 6 – Looking southwest at north scarp crack.**





**Photo 7: Scarp crack and rutting in a patch located in the SBL.**