

ALBERTA TRANSPORTATION AND
ECONOMIC CORRIDORS
GEOHAZARD RISK MANAGEMENT PROGRAM
PEACE REGION (PEACE RIVER DISTRICT)
2025 INSPECTION



Site Number	Location	Name	Hwy	km
SH003-1	North of Little Smoky River	Little Smoky River (North of Bridge)	49:12	0.4-0.8
Legal Description		UTM Co-ordinates		
NW34-74-21-W5M		11 E 490,730	N 6,145,966	

	Date	PF	CF	Total
Previous Inspection:	3-Jun-2024	13	6	78
Current Inspection:	26-May-2025	13	6	78
Road AADT:	1460		Year:	2024
Inspected By:	Kristen Tappenden, TEC Mark Gallego, Thurber Roger Skirrow, Thurber			
Report Attachments:	<input checked="" type="checkbox"/> Photographs	<input checked="" type="checkbox"/> Plans	<input type="checkbox"/> Maintenance Items	

Primary Site Issue:	The highway traverses the 120 m deep Little Smoky River valley over a very deep-seated, retrogressive landslide with associated intermediate slide blocks and local zones of slope movement. There are persistent widespread creep movement over most of the valley slope. The slide movements intersect the highway and produce significant pavement distortions. The movements are partly related to erosion of the toe of the valley slope by the Little Smoky River. This site is related to Geohazard sites SH004 and SH016.		
Dimensions:	At least 400 m length of highway affected by several intersecting scarps resulting in uneven riding surface. There is also a localized embankment failure on the north slope and erosion issues at specific locations. Approx. 1.5 km of the highway crosses this unstable east valley slope.		
Date of Remediation:	1972: Minor road realignment to accommodate new climbing lane. 1990's: Draining and regrading of a sag pond adjacent to the highway. 2003: Slope flattening of the local instability failure.		
Maintenance:	There is a repeated cycle of patching and milling and guardrail adjustments that extends to the original construction of the highway at this location. Annual patching and milling costs on both sides of the Hwy 49 Little Smoky River valley alignment exceed \$75,000. 2016: Grader-laid patch (350 t) 2018: \$90,000 of milling on SH003 and SH004 Fall 2019: Milling both sides of valley for about \$172,000 Fall 2020: Pavement overlay and guardrail replacement Spring 2022: Milling Spring 2023: Milling 2024: Patching		
Observations:	Description	Worsened?	
<input checked="" type="checkbox"/> Pavement Distress	Cracking and uneven roadway surface requires ongoing patching and milling.	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/> Slope Movement	Overall slope movement continues and the localize failure at Sta. 0+640 to 0+680 continues to ravel.	<input type="checkbox"/>	
<input checked="" type="checkbox"/> Erosion	Gully at 0+460 culvert inlet continues to down cut and now encroaching toward highway. Surface erosion gully between Sta. 0+480 to 0+610 was unchanged from 2022.	<input type="checkbox"/>	
<input checked="" type="checkbox"/> Seepage	Seepage observed at a few locations adjacent to the localized failure.	<input type="checkbox"/>	

<input checked="" type="checkbox"/> Bridge/Culvert	Erosion bowl forming at outlet of culvert at 0+810 Slumping obstructing culvert inlet at Sta. 0+460	<input type="checkbox"/>
<input type="checkbox"/> Other		<input type="checkbox"/>

Instrumentation (Spring 2025):	
SI96-4, SI96-5, SI96-6	These instruments show no discernable movement pattern as they are likely installed too shallow to record deep-seated movement patterns
SI31a	Sheared at 22.5 m; readings have continued above this depth after resetting in Spring 2017. A zone of movement between 15.7 m to 16.9 m has 3 mm of cumulative movement at an overall rate less than 1 mm/yr.
PZ01-1, PZ01-3, VW07-1, VW07-1A	Water levels at PZ01-1 and PZ01-3 generally stable over last decade with levels at 540 m and 515 m elevation, respectively. VW07-1 had been essentially stable since Fall 2016 at 14.3 m below ground, trended upwards starting Fall 2021, and started to trend back down to Fall 2016 levels in the Spring 2025; VW07-1A has been relatively stable around 18.2 m below ground, but started to trend downwards in Spring 2025.
Sheared/ Damaged/ Destroyed	SI01-3 (discontinued, main movement was at 48.7 m), VW07-1B
Assessment: <p>The west and east valley slopes are prime examples of large scale, deep-seated retrogressive translational landslides. The overall east valley slope is moving as several separate slide blocks with numerous intermediate scarps, sag ponds, and differential movement zones. The highway intersects these features which results in multiple crack zones and several patches of uneven highway surface. The driving mechanism appears to be toe erosion by the Little Smoky River; a high ground water table may also be contributing. Based on GPS survey of the InSAR points conducted by Alberta Geological Survey and supported by TEC (AGS Open Report 2013-14), the central portion of the highway distress is situated on a faster-moving block (40 mm to 90 mm per year) compared to the rest of the east valley slope which is moving at 5 mm to 40 mm per year. Drawing 32121-SH003-1-1 shows some of the slide scarps and sag pond features that have been interpreted from the 2008 LiDAR imagery.</p> <p>The ongoing movement of the valley slope results in continued deformation of the highway surface that requires frequent widespread patching of the asphalt. Patching was necessary in Spring 2024 at Sta. 0+600 which is one of the transitions at the edge of the faster-moving blocks and the crack pattern was re-established by the time of the inspection in June 2024. It appears that the cracks at Sta. 0+670 and Sta. 0+780 were recently patched and cracks have started to resurface in May 2025.</p> <p>The localized embankment failure (Sta. 0+640 to 0+680) slope flattening repair appears to be stable based on the 2025 inspection.</p> <p>An erosion gully in the south ditch leading to the culvert inlet at Sta. 0+460 was first observed about four years ago. There was no noticeable deterioration of this problem area between 2023 and 2025.</p>	
Recommendations:	
Short-term:	
<ul style="list-style-type: none">▪ Road maintenance consisting of milling and patching should continue as necessary (once or twice annually) to maintain the roadway surface in a safe condition. Crack sealing of the ACP should be done to limit infiltration of rain fall and snow melt into the extensive crack network.▪ The gully in the north ditch from about Sta. 0+500 to 0+550 could be repaired with minor excavation and placement of pitrun gravel. Consideration could be given to placing topsoil and seed that is secured with an erosion control blanket.▪ The erosion gully at the Sta. 0+460 culvert inlet is deteriorating and may affect the highway within a few years. Consideration should be given to regrading this section of the ditch and lining with erosion control measures (Class 1M riprap or comparable protection).▪ The erosion bowl that has formed at the culvert outlet at about Sta. 0+810 could be repaired before it increases significantly in size. This could consist of backfilling the bowl with pitrun gravel and adding riprap as per TEC culvert outlet protection specifications.	

Medium-Term:

The localized embankment failure could be repaired using clay or pitrun backfill and regraded to match the surrounding slope. Alternatively, consideration could be given to using a geogrid-reinforced backfill to reduce the amount of fill. This approach has the advantage of reducing the driving force on the slide block.

Long-Term:

The two alternatives for this location are to: realign the highway using the existing bridge, or; construct a new alignment and bridge on more stable ground. If the existing bridge location option is preferred, additional extensive riverbank protection could be installed to control river erosion at the toe of the slope. This would augment the effectiveness and life of the existing bridge alignment option. A series of realignment and functional planning studies have been undertaken to identify potential realignment options. These studies have shown that the choice of realignment options are limited; additional location specific investigations and study would be required to confirm the costs and feasibility of such options. It is understood that AMEC (now WSP) prepared a report under the 2013 High Water Related Mitigation Works program providing recommendations for erosion control at the toe and drainage measures on the slope to reduce the number and size of the sag ponds.

Ongoing Investigation:

- It is recommended that the annual Geohazard inspection and twice-annual instrumentation readings should continue as scheduled.
- At this time, additional test holes or slope inclinometers are not recommended at this site given the short life span of SIs. Consideration could be given to movement measurement methods that can tolerate higher displacements such as fibre optics or SAA.
- Consideration should be given to re-surveying the InSAR (interferometric synthetic aperture radar) targets, perhaps annually, to supplement the work done by the AGS as this will provide an overall view of ground movements. Restoration of the InSAR study could be undertaken as most of the InSAR targets are still in-place and appear to be in good condition.
- A GPS real-time ground movement system (SparkFun or Geocube based) similar to that installed at SH004 may be an option worth considering at this site particularly for identifying lower-movement rate zones for potential realignment. Alternatively, a series of targets or pins would be surveyed twice a year to map out the slower-moving zones. It is understood that a conventional terrestrial survey program is being considered for the west abutment of the bridge and this site could be included.

Closure

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

Roger Skirrow, P.Eng.
Senior Geotechnical Engineer

Mark Gallego, P.Eng.
Geotechnical Engineer

STATEMENT FOR USE AND INTERPRETATION OF REPORT

1. STANDARD OF CARE

This Report has been prepared in a manner consistent with that degree of care and skill ordinarily exercised by members of the same profession currently practicing under similar circumstances at the same time and in the same or similar locality and in compliance with all applicable laws.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment, including this Statement For Use and Interpretation of Report, are a part of the Report, which is of a summary nature and is not intended to stand alone without reference to the instructions given to Thurber by the Client, communications between Thurber and the Client, and any other reports, proposals or documents prepared by Thurber for the Client relative to the specific site described herein, all of which together constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT, AS DESCRIBED ABOVE. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE OF THE REPORT.

3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives, and purposes that were described to Thurber by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the Report, subject to the limitations provided herein, are only valid to the extent that the Report expressly addresses proposed development, design objectives and purposes, and then only to the extent that there has been no material alteration to or variation from any of the said descriptions provided to Thurber, unless Thurber is specifically requested by the Client to review and revise the Report in light of such alteration or variation.

4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client for the development, design objectives, and/or purposes described to Thurber by the Client. **NO OTHER PARTY MAY USE OR RELY ON THE REPORT OR ANY PORTION THEREOF FOR OTHER THAN THE CLIENT'S BENEFIT IN CONNECTION WITH THE PURPOSES DESCRIBED IN THE REPORT.** Any use which a third party makes of the Report is the sole responsibility of such third party and is always subject to this Statement for Use and Interpretation of Report. Thurber accepts no liability or responsibility for damages suffered by any third party resulting from use of the Report for purposes outside the reasonable contemplation of Thurber at the time it was prepared or in any manner unintended by Thurber.

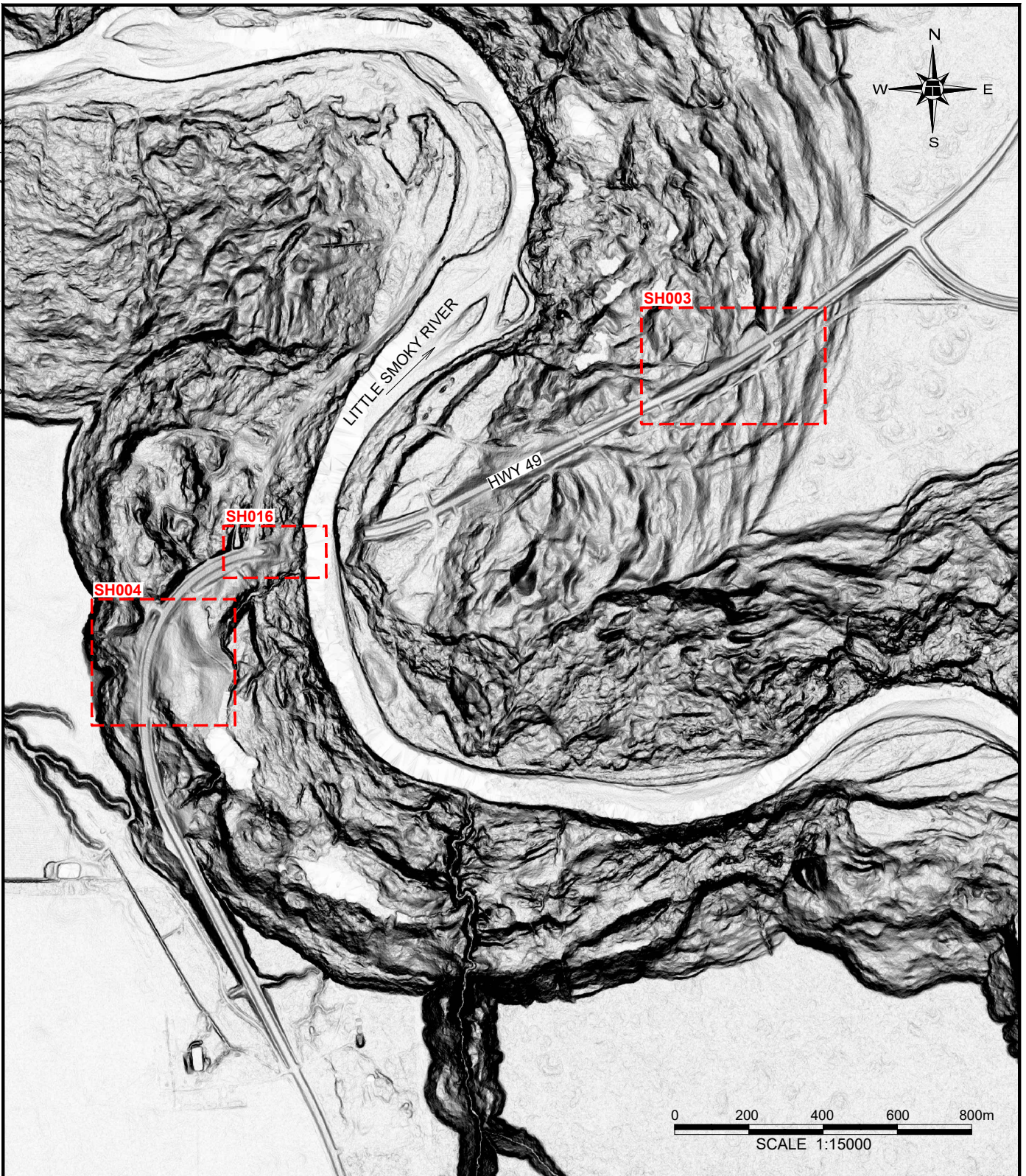
5. INTERPRETATION OF THE REPORT

- 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 is inherently judgement-based. 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 parties making use of such documents or records with or without our express written consent need to 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 parties. Some conditions are subject to change over time and those making use of the Report need to be aware of this possibility and understand that the Report only presents the interpreted conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client must 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 based on conditions in evidence at the time of site inspections and based on 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 resulting from misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other parties 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 is recommended to 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 need to 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 to confirm and document that the site conditions do not materially differ from those 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.

6. INDEPENDENT JUDGEMENTS OF CLIENT

The information, interpretations and conclusions in the Report are based on Thurber's interpretation of conditions revealed through limited investigation conducted within a defined scope of services. Thurber does not accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or other parties who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes, but is not limited to, decisions made to develop, purchase, or sell land, unless such decisions expressly form part of the stated purpose of the Report as described in Paragraph 3.

G:\32000\32121 AT GRMP Peace River District 2021-2025\CAD\2025 GEOHAZARD\MG\32121 Figure 1 - SH003, SH004, SH016 Key Map.dwg - 1 - Oct. 09, 2025



2008 LIDAR PROVIDED BY ALBERTA TRANSPORTATION.

PEACE REGION (PEACE RIVER DISTRICT)

SH003-1, SH004-1, SH016-1 KEY MAP

FIGURE 1

Alberta

DRAWN BY	ML
DESIGNED BY	MG
APPROVED BY	RKS
SCALE	1:15000
DATE	OCTOBER 2025
FILE No.	32121

THURBER



Photo 1 – Inlet of the 750 mm diameter culvert at about Sta. 0+810.



Photo 2 – Erosion bowl at outlet of the 750 mm diameter culvert at about Sta. 0+810.



Photo 3 – Looking east where the main scarps cross the highway at three locations.



Photo 4 – Looking east at area of frequent patching at Sta. 0+700.



Photo 5 – Looking northwest at area of frequent patching at Sta. 0+700.



Photo 6 – Looking northeast at where main scarp crack crosses highway at Sta. 0+600.



Photo 7 – Looking north at where main scarp crack crosses highway at Sta. 0+700.



Photo 8 – Looking northwest at where main scarp crack crosses highway at Sta. 0+780.



Photo 9 – Looking southeast at cracks that were milled at Sta. 0+600.



Photo 10 – Looking south at cracks that were milled at Sta. 0+600.



Photo 11 – Looking southeast at the cracks on the west side of main scarp block at Sta. 0+770.



Photo 12 – Erosion rills by the guardrail and ravelling of the north side slope backscarp between Sta. 0+650 and 0+700.



Photo 13 – Erosion gully at outlet of culvert at about Sta. 0+470.



Photo 14 – Looking southwest along erosion gully near Sta. 0+550.



Photo 15 – Erosion at the culvert inlet (foreground). Scour bowl (background) at Sta. 0+430 is encroaching towards the highway.