ALBERTA TRANSPORTATION
GEOHAZARD ASSESSMENT PROGRAM
PEACE REGION (PEACE RIVER DISTRICT)
2023 INSPECTION

THURBER ENGINEERING LTD.

Site Number	Location	Name	Hwy	km
SH008-1	2 km E of Watino Bridge	Watino East Hill	49:08	18.80-19.05
Legal Description		**UTM Co-ordinates**		
NE26-77-24-W5M		11U E 462,307	N 6,173,153	

	Date	PF	CF	Total
Previous Inspection:	28-Jun-2021	10	2	20
Current Inspection:	06-Jun-2023	10	2	20
Road AADT:	764		**Year:**	2023
Inspected By:	Kristen Tappenden, TEC Max Shannon, TEC		Ken Froese, Thurber Mark Gallego, Thurber	
Report Attachments:	☑ Photographs ☑ Plans		☐ Maintenance Items	

Primary Site Issue:	Rotational, retrogressive failures in a 10 m high backslope.	
Dimensions:	250 m length of backslope slumping on south side of highway.	
Date of Remediation:	1993: Highway re-routed to this current alignment. 1994: Assessment of subdrains in north slope found them to be working well. 1999: Design undertaken for French drains in south backslope slump area but not constructed. 2001: Gravel placed to buttress upper portion of Slump A and lower portion of Slump C and placed 3 m wide riprap lining in ditch. 2003: Rip-rap-lined channel constructed on lower half of Slump B. 2020: Pavement overlay placed on valley hill section of highway through this site.	
Maintenance:	2004: Additional stone added to south ditch east of Slump C. 2006: Riprap placed in north ditch. 2015: Slumped material in the south ditch removed. 2019: Site regraded to open up south ditch; north sideslope also regraded	
Observations:	**Description**	**Worsened?**
☐ Pavement Distress		☐
☑ Slope Movement	Five separate slump blocks in the south backslope. Continued creep movement causing toe rolls to obstruct the ditch.	☑
☑ Erosion	Slumped material removed from the ditch, leaving bare soil exposed.	☑
☑ Seepage	Seepage noted in the backslope and accumulating in grabens.	☐
☑ Bridge/Culvert Distress	Outlet of drainage pipe partially obstructed.	☐
☑ Other	Two pipelines are located immediately south of the backslope.	☐
Instrumentation:		
None.		
Assessment:		

This site is located at the crest of the Smoky River valley; however, the backslope slumping appears to be the result of seepage from exposed sandy/silty layers in the backslope rather than deep-seated instability due to valley movements. At the present time, there is no impact to the highway surface as the depth of failure is contained within the height of the backslope. South slopes to the west and east of this localized area are apparently stable although not quite as high; the north slope is of a similar height and appears to be stable. This may indicate that the direction of horizontal groundwater flow is a contributing factor, as well as a shaded north facing slope that stays wetter than the south facing one.

In the spring of 2019, the maintenance contractor excavated the toe rolls to improve ditch drainage. The material was wasted higher up on the slopes. The contractor also added two swales on the slope to assist with drainage from the sag ponds further up the slope. The grading work obscured some of the slide features and may also contributed to local instability at the toe due to the overall steepening of the lower portion of the backslope. However, the work re-established flow in the south ditch. In 2020, there was deterioration of the toe of this regrading with some sloughing and erosion observed. Not many changes were observed at the site in 2021; it was noted that the upper portions of the fill revegetated. The conditions of the site in 2023 were mostly similar to 2021. The toe of Slump B has pushed out further into the ditch and some minor slumping of the Slump A toe roll was noted. Some of the previously wet sag ponds were dry in 2023.

An underground utility locate was undertaken in 2018 to identify the locations of the pipelines at the top of the slope. The TransCanada pipeline (TCPL) was closest at an offset 3.9 m south of Pin A1 and 0.1 m south of Pin B3. The East Peace Gas Co-op natural gas line is located further south of the TCPL line.

Overall, there does not appear to be significant changes since the 2021 inspection.

Recommendations:

Short-Term:

- Remove material from the ditch when required to maintain flow, but do not place the excavated material back onto the slide mass as it will load the slump. Augment the ditch bottom riprap to minimize downcutting and erosion of the recently graded faces of the slide toe rolls.
- Establish a line of communication with the pipeline owners to determine risk tolerance and minimum setback distance.

Long-Term:

- Develop remediation options such as: flattening of the backslope with a buried culvert along the ditch (so that the toe of the slope can be moved to the north), reconstruct the slope with gravel material or select clay with French drains and subdrains, install a groundwater cut-off trench at the top of the slope.

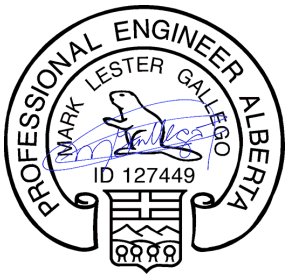
Ongoing Investigation:

- It is recommended that the Geohazard inspection should continue as scheduled every second year.
- A geotechnical drilling program is recommended if the long-term remediation option(s) are considered.

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.

Tarek Abdelaziz, Ph.D., P.Eng.
Partner | Senior Geotechnical Engineer



October 12, 2023

PERMIT TO PRACTICE
THURBER ENGINEERING LTD.
RM SIGNATURE: _____
RM APEGA ID #: 91085
DATE: October 12, 2023
PERMIT NUMBER: P005186
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

Mark Gallego, M.Eng.,P.Eng.
Geotechnical Engineer

THURBER

STATEMENT OF LIMITATIONS AND CONDITIONS

1. STANDARD OF CARE

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.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment 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. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE 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

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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 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.

6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

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.

7. 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 others 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.

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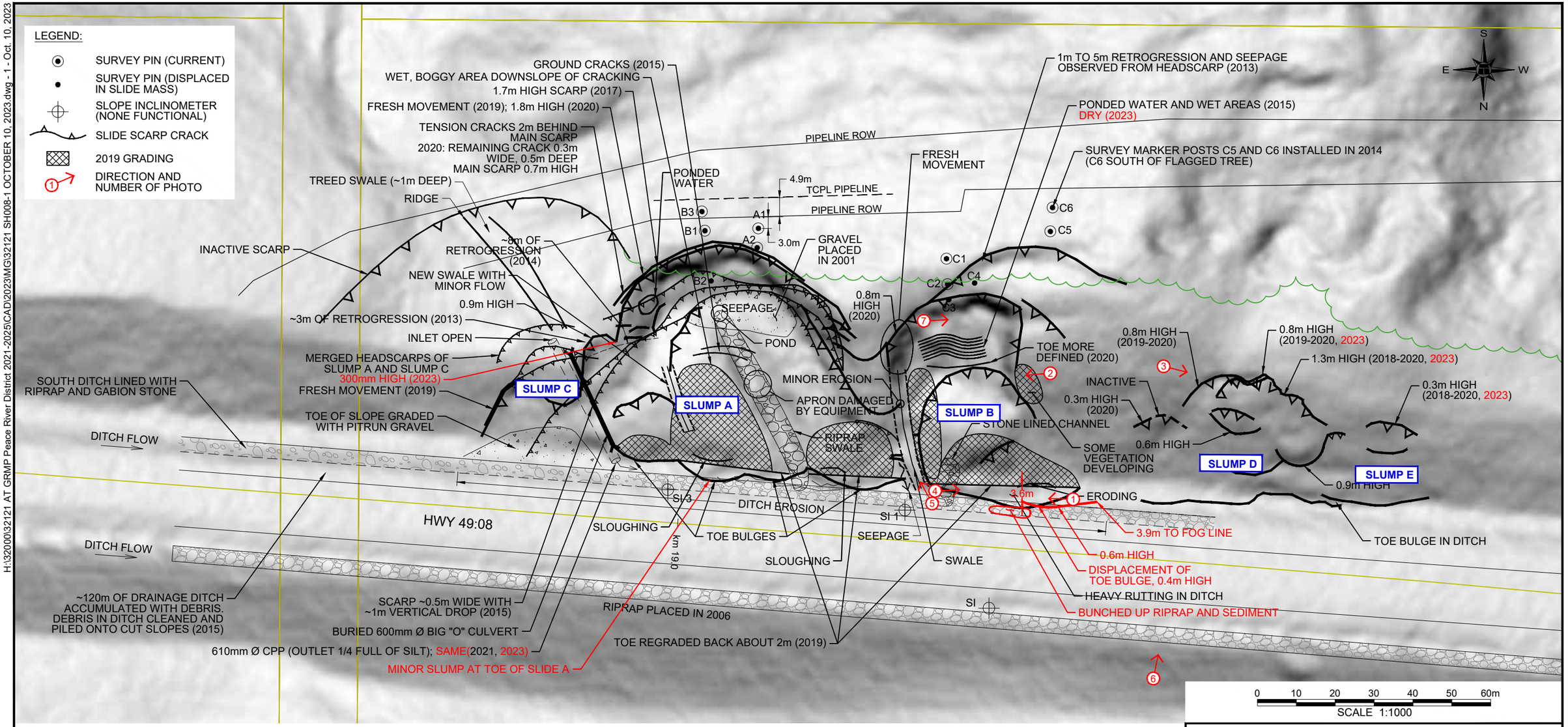

NOTES :

1. FEATURE LOCATIONS ARE APPROXIMATE.
2. PREVIOUS OBSERVATIONS SHOWN IN BLACK.(2013-2015 FROM AMEC FIGURE 1, PROJECT EG10030 PROVIDED BY ALBERTA TRANSPORTATION.)
3. LIDAR PROVIDED BY ALBERTA TRANSPORTATION DATED 2007-2008 AND SHADED FROM WHITE AT 0° TO BLACK AT 30°
4. JUNE 2023 OBSERVATION SHOWN IN RED.
5. DRAWING RESET IN 2017, MANY PREVIOUS OBSERVATIONS REMOVED. SEE 2016 DRAWING FOR THOSE HISTORIC DETAILS.
6. SCARP CRACKS VERIFIED FROM UAV IMAGERY IN 2018.

		MARKER DISTANCES (m)										SCARP HEIGHT (m)					
MARKER	TYPE	2023	2021	2020	2019	2018	2017	2016	2015	2014	2013	2023	2021	2020	2019	2018	2017
B1 - B2						4.9	-	-	-	-	5.7						
B2 - SCARP						-	-	-	-	-	5.2						
B1 - SCARP	REBAR	3.2	3.2	3.2	3.2	3.3	3.3	3.3	3.4	3.4	-	0.7m VERTICAL 1.6m OVERALL	1.6****	1.6****	1.7	1.9	1.9
B1 - B3*, **	REBAR						5.0	-	-	-	-						
A1 - A2***		5.5				5.0	5.4	5.4	6.6	6.6	5.4						
A2 - SCARP		0.8	0.8	0.8	0.8	0.8	0.9	0.9	1.2	1.2	2.1	0.6m VERTICAL 1.3m OVERALL	1.3	1.3	1.3	1.3	1.3
C1 - C2	REBAR	8.1				7.8	7.8	7.8	7.8	7.8	7.9						
C2 - C3	REBAR					-	-	-	-	-	5.1						
C2 - SCARP		0.5	0.5	2.1	2.1	2.1	2.2	2.2	2.3	2.3	2.3			0.6****	1.1	1.0	0.7
C5 - C6	SURVEY MARKER	2.0				2.0	2.0	2.0	2.0	2.0	-						
C5 - SCARP	SURVEY MARKER	5.7		5.7	5.7	5.9	5.9	5.9	5.9	6.0	-	0.8		1.0	0.7	0.4	0.3

*B2 REBAR PIN SALVAGED AND INSTALLED 5m BEHIND B1 AND RENAMED B3
**B3 LOCATED 0.1m NORTH OF TCPL PIPELINE
***A1 LOCATED 3.9m NORTH OF TCPL PIPELINE
**** SCARP HAS RAVELLED SO LESS VERTICAL

Alberta

PEACE REGION (PEACE RIVER DISTRICT)

SH008-1: HWY 49:08 WATINO EAST HILL SMOKY RIVER 2023 SITE INSPECTION PLAN

DWG No. 32121-SH008-1

DRAWN BY	ML
DESIGNED BY	MG
APPROVED BY	DWP
SCALE	1:1000
DATE	OCTOBER 2023
FILE No.	32121

THURBER ENGINEERING LTD.

Photo 1 – Looking east at toes of Slumps B and A which were excavated in 2019 to improve ditch flow with the material placed back on top of the slumps.

Photo 2 – Looking east at the top of Slump B. Vegetation has grown within the regraded area in 2019.

Photo 3 – Looking northwest at the crest of Slump D

Photo 4 – Looking west at the toe of Slump B.

Photo 5: Lower portion of the slope at toe of Slump B becoming vegetated since the 2019 grading work.

Photo 6: Looking southwest at Slump D.

Photo 7: Looking west at the top of Slump B.