

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



Site Number	Location	Name	Hwy	km
PH072	Judah Hill	Sunshine Landslide	744:04	58.154
Legal Description		UTM Co-ordinates		
NE¼ 20-083-21 W5M		11U E 483150	N 6230060	

	Date	PF	CF	Total
Previous Inspection:	6-July-2021	5	5	25 (Highway)
		13	2	26 (Downslope of wall)
		11	2	22 (Slide north of wall)
Current Inspection:	17-May-2023	5	5	25 (Highway)
		13	2	26 (Downslope of wall)
		11	2	22 (Slide north of wall)
Road WAADT:	600	Year:	2022	
Inspected By:	Tyler Clay, TEL Pramaya Kannel, TRANS Max Shannon, TRANS		Don Proudfoot, TEL Rocky Wang, TRANS	
Report Attachments:	<input checked="" type="checkbox"/> Photographs <input checked="" type="checkbox"/> Plans <input checked="" type="checkbox"/> Maintenance Items			

Primary Site Issue:	In May of 2013, a new landslide developed that encompassed both lanes of the highway through a side hill fill that was located at the top of a high, steep valley slope. A cast-in place concrete pile wall supported with soil anchors was constructed to buttress the section of the road affected by the landslide; the highway embankment was rebuilt with expanded polystyrene light-weight fill and the roadway was reinstated to a gravel surface under AT Contract CON0015153 in 2014 and repaved in 2016.
Dimensions:	<p>The 2013 landslide affected about 100 m of highway. The landslide was about 100 m by 140 m in plan size. The backscarp was partially located in the NBL ditch and in the backslope above the highway.</p> <p>Slide area (first observed in 2019) approximately 50 m west of the pullout north of the pile wall: current active slide scarp approximately 15 m in width and 65 m in length in plan size.</p>
Maintenance:	None.

Observations:	Description	Worsened?
<input type="checkbox"/> Pavement Distress		<input type="checkbox"/>
<input checked="" type="checkbox"/> Slope Movement	<p>The passive support bench downslope of the newly constructed pile wall did not have major visible change from the 2021 condition (Photos 2 and 4). The drop from the top of the pile cap to the base of the pile near the middle of the wall (km 58+250) was unchanged at 1.9 m. The cracking/ signs of visible movement in the passive soil bench below the pile wall has occurred mainly within the northern segment of the wall. The drop from the top of the waler to the downslope ground surface at the north end of the wall is now 4.1 m (an increase by 0.1 m from 2021). Sliding in the lower slope appears active with fresh soil exposures (Photos 4 and 5).</p> <p>Slide area approximately 100 m northwest from the north end of the pile wall. 15 m wide scarp with tension cracks that are offset approximately 50 m from the west highway edge. Minor downslope movement noted. No major change in the headscarp since the 2021 inspection. Increased downdrop (up to 0.3 m) and widening (up to 0.4 m) of a tension crack upslope from the headscarp (Photos 6 and 7).</p>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Erosion	An erosion gully (0.15 m wide, 0.1 m deep) approximately 30 m in length has developed parallel to the edge of the ACP near the north end of the pile wall near KM 58.35 (Photo 1).	<input type="checkbox"/>
<input type="checkbox"/> Seepage		<input type="checkbox"/>
<input type="checkbox"/> Bridge/Culvert Distress		<input type="checkbox"/>
<input checked="" type="checkbox"/> Other	The wall surface gutter drain periodically clogs with sediment and/or vegetation and needs to be cleaned on a regular basis. Several anchor caps are cracked.	<input type="checkbox"/>
Instrumentation:		
SI-34, 59 and 82	Three slope inclinometers were installed in retaining wall piles during construction. Since the final lock off the soil anchors in September of 2014, the slope inclinometers have shown about 0 mm to 7 mm of downslope movement in the pile wall. Spring 2023 movement rates are small and measure between 0 mm/yr to 1 mm/yr.	
Load Cells VC1802 to VC1806	<p>All soil anchors were initially locked off to 162 kN (80% of the design SLS load of 192 kN). Since their final lock off, the anchors have exhibited a slight increase in load over the winter months, which then relaxes in the summer months.</p> <p>The latest load cell readings, as of July 16, 2023, show minor changes compared to the previous readings taken in on June 14, 2022. The changes range from a decrease of 1.2 kN in load cell VC1806 to an increase of 2.1 kN in VC1805. Load cell VC1803 (anchor 82U) measured an all-time high load of 191.10 kN on</p>	

December 12, 2022. Two load cells (VC1801/anchor 60U and VC1802/anchor 60L) are showing loads that are higher than the design service load, but these loads are still below the ULS factored design load. Overall, the load cells show a trend of stable loads over the past several readings cycles.

Assessment:

The reconstructed highway embankment and supporting pile wall appear to be performing well. The movement observed in the passive soil bench below wall was anticipated and accounted for in the wall design.

The new slide area is expected to retrogress closer to the highway in the next 10 years. A new inspection site may eventually be required.

Recommendations:

Cost

The new slide area should be monitored during the PH072 annual inspections or alternatively a new site should be created. Monitoring

The slope inclinometers will continue to be read manually twice per year and the datalogger installed at the site will continue to take readings of the load cells twice daily as part of the Geohazard Assessment Program. Monitoring

The erosion gully forming on the west edge of the road near the north end of the pile wall (km 58.35) should be backfilled with granular fill to provide support and minimize further undermining and damage to the ACP. Maintenance

The pile wall surface drainage gutter will require to be regularly cleaned to continue to provide erosion protection for the partially buried pile wall and avoid clogging of its solid down drain evacuation pipe. Maintenance

A small ditch should be dug to drain the ponded water from the soil bench downslope of the wall. This will help slow down the movements in the bench area. Maintenance

The damaged anchor caps should be replaced and repacked with grease. Maintenance

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, P.Eng.
Partner| Senior Geotechnical Engineer

Tyler Clay, P.Eng.
Geological Engineer



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.

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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.

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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.

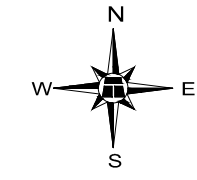
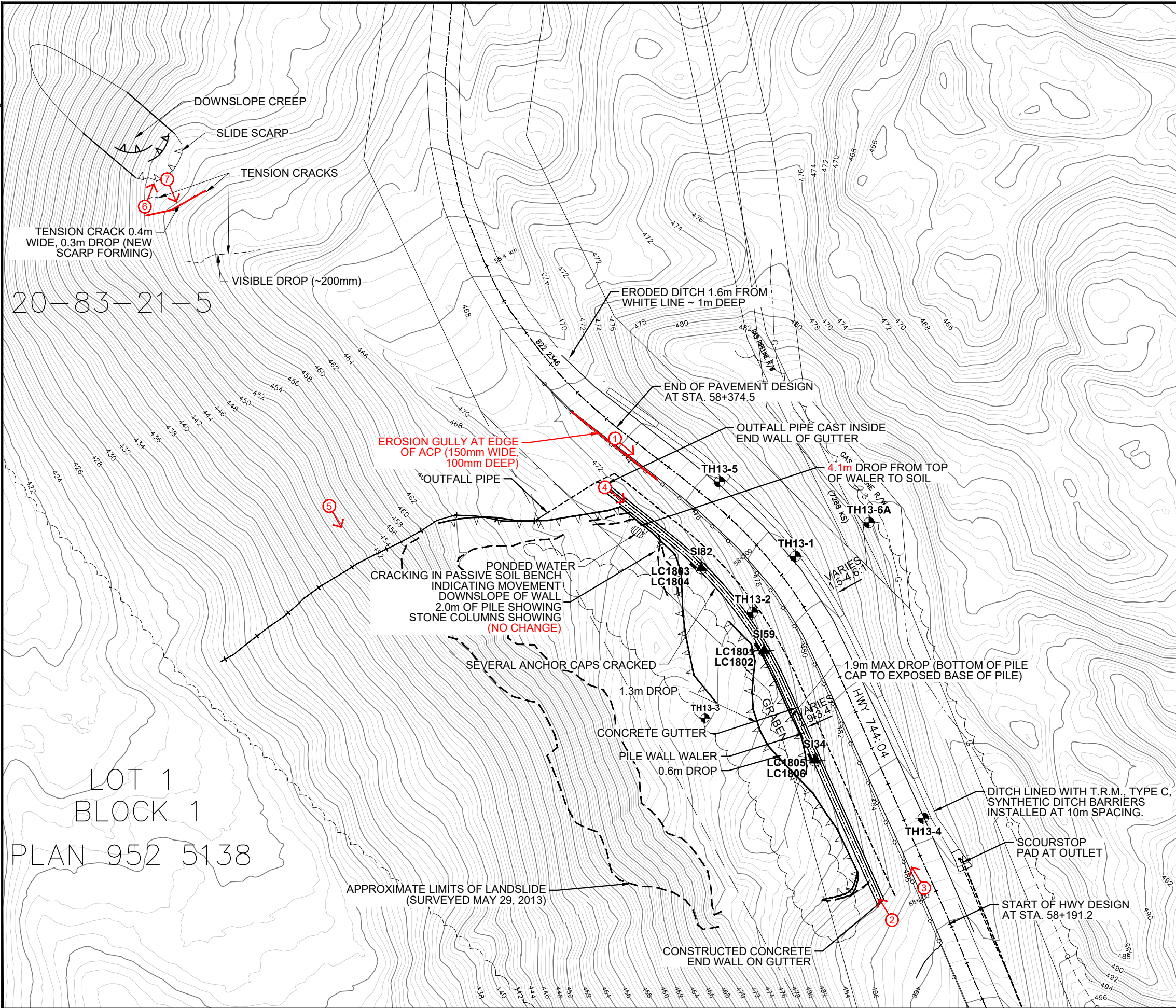
6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

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

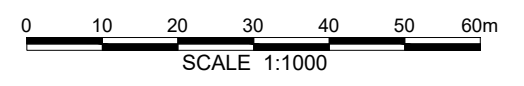
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H:\2020\0132121 AT GRMP Peace River District 2021-2025\CAD\2023\TTC\32121-PH072-1.dwg - 11x17 - Oct. 13, 2023



- LEGEND**
- G --- SURVEYED GAS LINE
 - - - - - ESTIMATED CURRENT ALIGNMENT OF ATCO PIPELINE
 - ~~~~~ TREE LINE
 - ~~~~~ TREE LINE (ESTIMATED)
 - - - - - APPROXIMATE LIMITS OF LANDSLIDE (SURVEYED MAY 29, 2013)
 - ○ ○ ○ ○ NEW STRONG POST GUARD RAIL (2015)
 - ○ ○ ○ ○ GUARD RAIL
 - ① ↗ DIRECTION AND PHOTO NUMBER
 - ⊙ SLOPE INCLINOMETER
 - ⊙ TEST HOLE
 - LOAD CELL

NOTE:
1. MAY 17, 2023 OBSERVATIONS SHOWN IN RED.



PEACE REGION (PEACE RIVER DISTRICT)

PH072-1 SUNSHINE SLIDE
2023 SITE INSPECTION PLAN

DWG No. 32121-PH072-1

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





Photo 1.
Looking south
along the SBL of
Hwy 744:04 at km
58.35 at the north
end of the
Sunshine pile wall.
An erosion gully
has developed
parallel to the
edge of the ACP.



Photo 2.
Looking northwest from south end of the Sunshine pile wall at km 58.200. No major visible changes from the 2021 condition.



Photo 3.
Looking northwest from south end of the Sunshine pile wall at km 58.200 along the highway. No damage to the ACP surface was observed.



Photo 4.
Looking southeast along the pile wall at km 58.33. Head scarp cracks immediately below the wall appear unchanged since the 2021 inspection.



Photo 5.
Looking southeast at the lower slide area below the wall. Active ongoing slide movement within the lower slope.



Photo 6.
Slide area (first observed in 2019) approximately 100 m NW of the north end of the pile wall. No major change at the main scarp since the 2021 inspection; ongoing creep movement further downslope.



Photo 7.
Looking east at one of three tension cracks observed upslope from the slide scarp in previous photo. The crack was opened up to 0.4 m wide and with up to 0.3 m of drop. Will likely become the main head scarp in the future.