

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



Site Number	Location	Name	Hwy	km
PH009-3	Town of Peace River	Shaftesbury Trail – Shop Slide	Old 2:02	0.025
			684:02*	30.990
Legal Description		UTM Co-ordinates		
SW31-083-21 W5M		11V E 480339	N 6232158	

	Date	PF	CF	Total
<b>Previous Inspection:</b>	29-May-2024	4	5	20
<b>Current Inspection:</b>	12-May-2025	7 11	3 2	21 Wall 22 CN Slide
<b>Road AADT:</b>	880 (684:02)		<b>Year:</b>	2025
	*The site is on the Hwy 2 off-ramp and not on Hwy 684:02			
<b>Inspected By:</b>	Rocky Wang, TEC Ken Froese, Thurber Don Proudfoot, Thurber			
<b>Report Attachments:</b>	<input checked="" type="checkbox"/> Photographs <input checked="" type="checkbox"/> Plans <input checked="" type="checkbox"/> Maintenance Items			

<b>Primary Site Issue:</b>	Active landslide movement was most pronounced at NW end of slide, near junction with 99 Avenue.
<b>Dimensions:</b>	Older, deeper slide affects about 130 m of the off-ramp. An active slump located 35 m downslope of the highway was about 40 m in width. There is a dormant slide located upslope of the highway.
<b>Date of Remediation:</b>	2022: 240 m concrete pile wall constructed consisting of 3 segments. Type 1 and 2 (NW end) are 19.2 m x 1.2 m dia. reinforced concrete tangent piles tied-back with 30 m long grouted soil anchors and Type 3 (SE end) are 24.8 m x 1.5 m dia. reinforced concrete piles (2.5 m spacing). The upper 3 m of the wall is timber lagging supported by H-piles embedded in the concrete waler. The slope downslope of the wall was regraded with up to 6 m of soil removed.
<b>Maintenance:</b>	1984: TEC built a 5 m-deep granular shear key at the toe of the slope to mitigate material flowing into the CNR railway right-of-way. 2010: Town of Peace River replaced pipe rack supports for the above-ground insulated water and sewer line. 2011: The Town re-graded area south of the pipe racks after a surface slide. 2013: The Town off-loaded more material and placed geomembrane sheets below the off-ramp embankment to channel the seepage from the springs and the ditches. 2015/2016: The Town re-aligned the storm and water lines to the north around the slide site and removed the pipes and pipe racks. 2016: TEC removed the outer NBL of the Highway 2 off-ramp 2020: CNR most-recently cleaned encroaching debris from their right-of-way (this was ongoing maintenance). 2023 & 2024: Patching of sinkhole on roadway over tieback anchor 2024 & 2025: Town constructed pathway and crosswalk

Observations:	Description	Worsened?
<input checked="" type="checkbox"/> Pavement Distress	The sinkhole near the NW end of the wall (due to subsidence over a tieback anchor) that formed in 2023 was patched again in Spring 2024 and overlaid in 2025.	<input type="checkbox"/>
<input checked="" type="checkbox"/> Slope Movement	Pavement cracks and unevenness SE of 99 Ave indicating ongoing creep movement of the deeper landslide as the slide block engages the new pile wall. There was new movement at the scarp east of the wall ("CN Slide") just beyond the highway ROW.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Erosion	Most of the re-lined SW ditch is stable except for one area where the rock appears to have been disturbed by the power line company contractor which was no worse in 2025. However, a shallow erosion gully has formed along the top of the riprap SE of the 99 Ave intersection. A shallow erosion gully is forming beyond the south-most pile wall riprap drainage basin (not worse in 2025).	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Seepage	The spring along the southeast ditch of 99 Avenue continues to flow. The existing subdrain brought through the pile wall continues to flow. Slow and steady seepage was noted from other subdrains installed during construction.	<input type="checkbox"/>
<input checked="" type="checkbox"/> Bridge/Culvert	The previous sinkhole above the elbow of the buried 762 mm SWSP drainpipe has been successfully repaired. The Town finished installing a culvert in the ditch to connect the pedestrian path to the subdivision SW of the site.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Other	The datalogger enclosure was broken into and the batteries stolen (now replaced). Thermal expansion and contraction appear to have disconnected some conduit connections. These were repaired in Fall 2024; however, moisture and rodent activity have caused some issues with multiplexer connections that are still being investigated.	<input checked="" type="checkbox"/>

Instrumentation (as of Spring 2025):	
Destroyed	<i>Inclinometers: SI05-2 sheared in 2009 at 10.7 m. SI05-3 sheared in 2009 at 17.5 m. SI05-4 sheared in 2012 at 6.7 m. SI09-1/VW09-1 sheared in 2011 at 1.8 m. SI09-2/VW09-2 destroyed in 2010. Piezometers: SP09-6, BH13/SP09-11, SP09-5, SP19-2, SP09-7, VW09-3 (dry since installation)</i>
Upslope Inclinometers	SI05-1 is located outside of the major areas of movement and the measured displacement is shallower (less than 3.0 m in depth).
Pile Wall SAA	SAA-P34 (Type 1, 1.2 m dia., tie-back) has measured pile head deflection of 21 mm. SAA-P77 (Type 2, 1.2 m dia., tie-back) has measured pile head deflection of 22 mm. SAA-P113 (Type 3, 1.5 m dia.) has measured pile head deflection of 21 mm.
Pile Wall Load Cells	The anchor loads have risen since they were locked off and anchors A19, A34, and A77 have exceeded the SLS design loads but not yet exceeded the criteria that would require remedial measures to be implemented. Anchors A51 has exceeded the SLS criteria cyclically but the trend is increasing and A67 has increased only slowly remaining well below the SLS criteria.
Pile Wall Strain Gauges	See the Instrumentation report for details.

Pile Wall Inclinometers	SI09-4 is located immediately downslope of the pile wall, near the SE end, and developed two movement zones (9.6 m and 12.6 m depth) during construction but both have stabilized since. SI11-01 at the NW end of the wall developed a zone at about 15.1 m depth during construction, likely related to a temporary excavation immediately below the location, and though the rate of movement has subsided (5 mm/yr down from a peak of 34 mm/yr), it has not stopped; however, there no surface expression of this movement yet (just over 20 mm cumulative now).
Downslope Inclinometers	SI 19-5, located mid-slope below the wall, has zones at 9.7 m and at 18.8 m that have both plateaued since construction completed and are slightly creeping (0.2 mm/year). SI09-3 is located on the far side of the tracks and has not shown movement.
Standpipe Piezometers	SP09-8, SP09-9, and SP11-06: dry since installation. SP05-4, SP05-5, and SP09-10: no obvious pattern. SP05-1, SP19-3: steadily decreasing over the last four years.
Vibrating Wire Piezometers	VW09-4: steadily decreasing since 2012.
Pneumatic Piezometers	PN19-5A: may no longer be functional. PN19-5B: slightly increasing and reached historical post-construction high.
<p><b>Assessment:</b></p> <p>This site is characterized by several landslides affecting the hillside above and below the road. The slide bowl above the road appears to be currently inactive, while the lower slide was active prior to completing the slope stabilization measures. The highest rates of movement had been at the NW flank of the lower slide bowl where ongoing movement had forced numerous temporary repairs and relocation of the Town of Peace River sewer and water lines outside the limits of the landslide in 2015/16. The movement had destroyed the pedestrian path and was beginning to undermine the roadway shoulder. The toe of this slide was in the CN right-of-way which necessitated routine excavation to keep their ditch flowing but led to further destabilization. The SE flank was semi-active but much deeper-seated and was observed to cause cracking through the highway and could sometimes be observed in the upslope ditch.</p> <p>Both movement zones were addressed by the pile wall constructed in 2021 and 2022. The 240 m pile wall was constructed about 3 m downslope of the highway shoulder with tie-back anchors installed in the more-active NW portion. The backfill behind the wall was a combination of washed rock, drainage gravel, and pitrun and included provisions for drainage to manage the numerous seepage points that have been observed in the past. The slope below this portion was regraded to remove up to 6 m of soil. Downslope of the wall, the ground was covered with riprap channels and erosion control soil coverings to manage overland drainage. The pile wall and slope regrading appear to be performing as intended. Creep movement is being measured in the wall and this may continue until equilibrium is reached and until that time, there will be some deformation observed on the roadway such as the historical crack pattern and dips. Once movement has slowed or stopped, an overlay would remove those features. A sinkhole was observed in 2023 and is likely related to a cavity that formed during anchor installation. The anchor drilling records indicate the presence of sand and gravel in that area and the grouting records suggest that there is the potential for a void as the amount of grout injected was much higher than the theoretical volume of the hole (assuming it was a perfect cylinder of the specified dimensions). The sinkhole area was overlaid in 2025 and appears to be stable now.</p> <p>The changes observed between 2024 and 2025 were minor. The most significant change was the completion of the Town's pathway from the neighborhood above the wall (to the SW) through the site including the installation of a new 900 mm-diameter CSP culvert and crossing signal connecting to the pathway installed during slide construction on the NE side of the highway. Some cracking was noted in the new pathway adjacent to deep ruts in the old laydown area so may represent damage from vehicle traffic. Other changes at the site where a gully along the riprap in the SW ditch, accumulating sediment in one of the riprap basins, and improved vegetation growth in some of the bare areas noted previously.</p> <p>The slump located east of the wall just beyond the highway right-of-way was present before the construction of the pile wall and has gotten worse. However, it is more than 30 m from the highway shoulder and does not appear to be interfering with CN's operations.</p>	

**Recommendations:****Short-Term:**

- Road maintenance such as crack sealing of the ACP to limit infiltration.
- Routine inspection to confirm that the sinkhole has stabilized.
- Repair of the multiplexers to ensure ongoing readings of the instrumentation can be taken. Conduit connections may need to be upgraded and additional desiccant added to limit further degradation of the electronic connections.

**Medium and Long-Term:**

- Nothing is required at this time.

**Ongoing Investigation:**

- This site is currently scheduled for annual inspection. It is recommended that this be reduced to every two years; however, the instrument readings should continue to be completed twice a year to monitor the performance of the remedial measures

**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.

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

Ken Froese, P.Eng.  
Senior Associate | Senior 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.

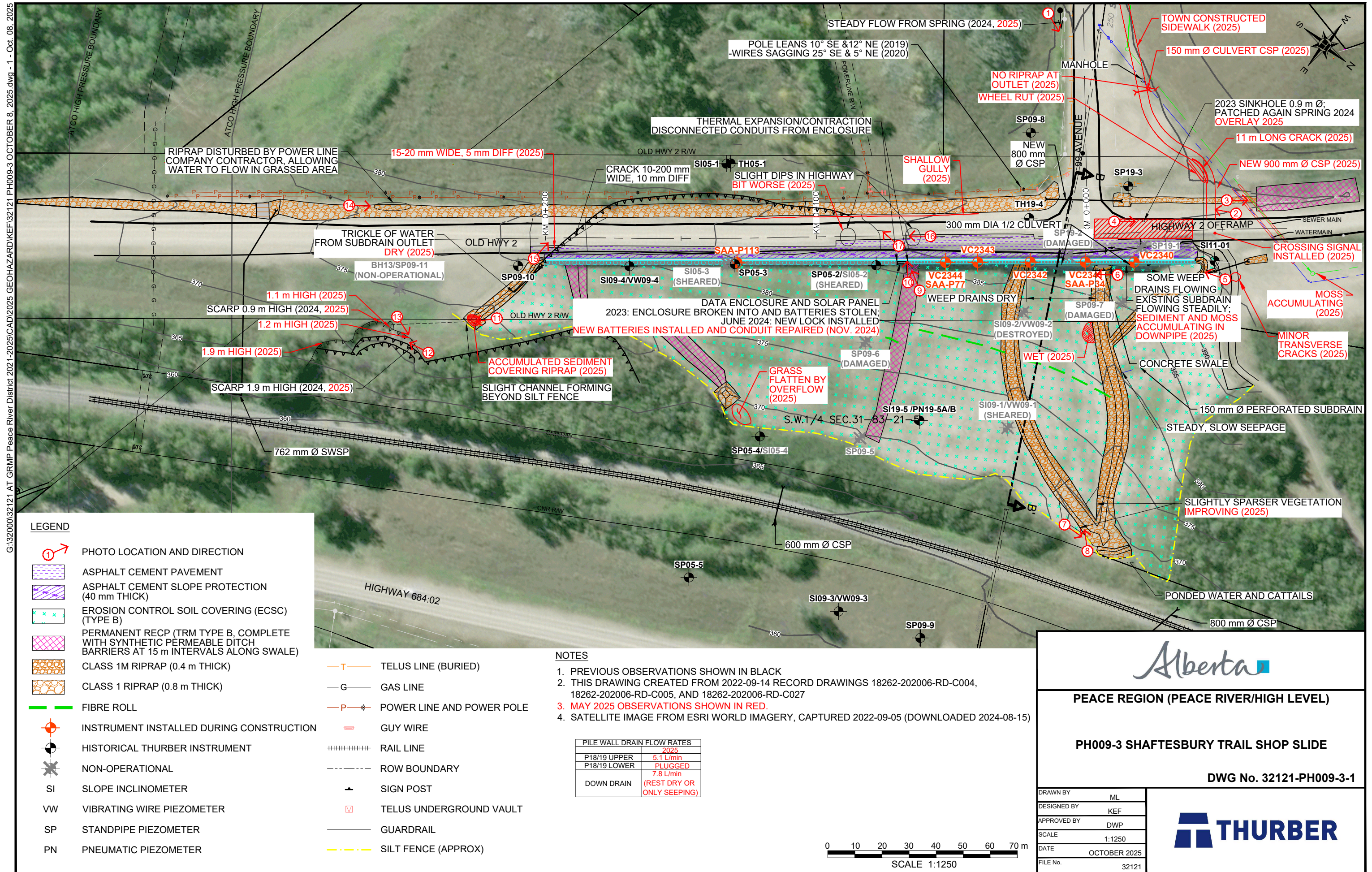
### 5. INTERPRETATION OF THE REPORT

- 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.

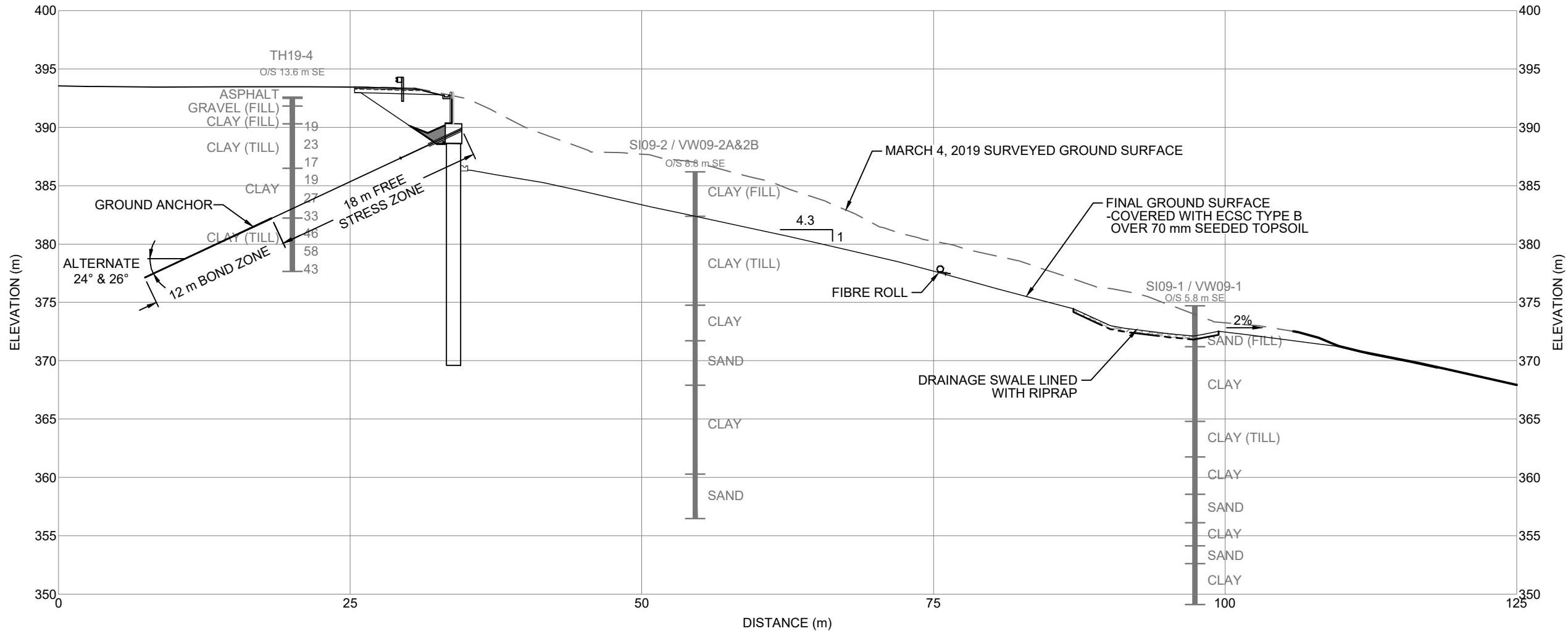
### 6. INDEPENDENT JUDGEMENTS OF CLIENT

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.









LEGEND

- 15 SPT N VALUE
- STANDPIPE PIEZOMETER SCREENED INTERVAL



PEACE REGION (PEACE RIVER/HIGH LEVEL)

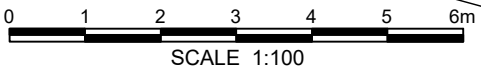
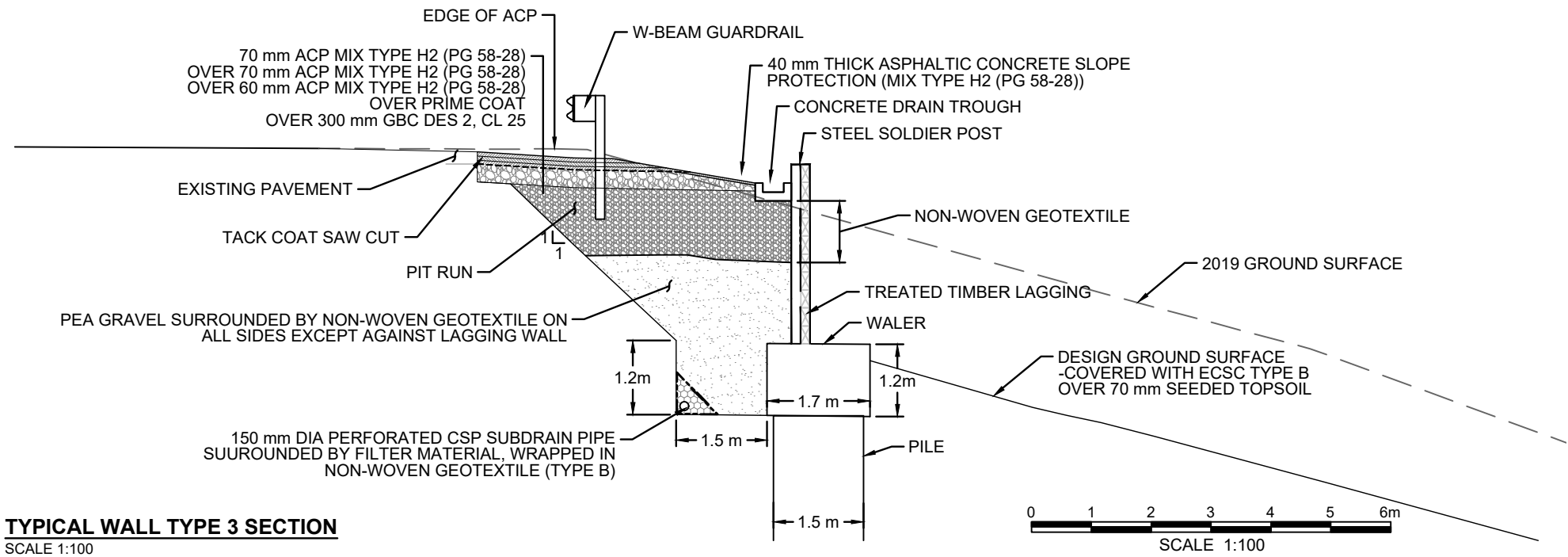
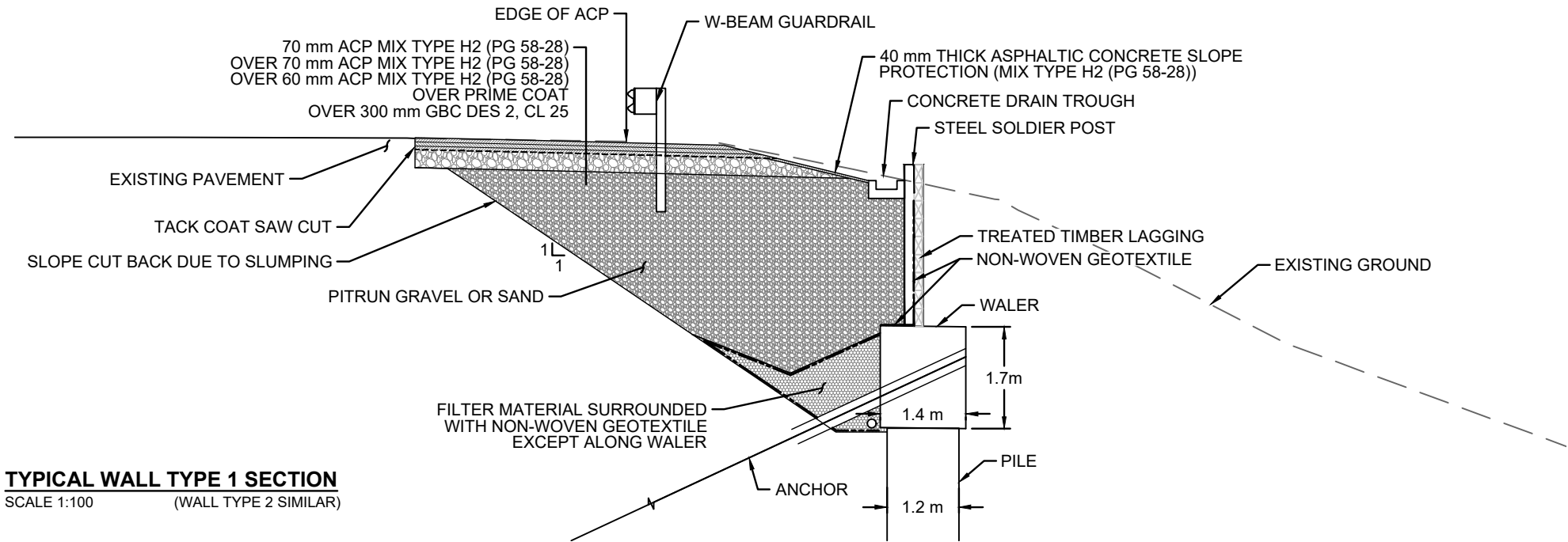
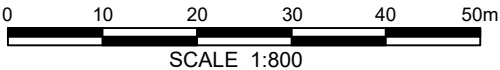
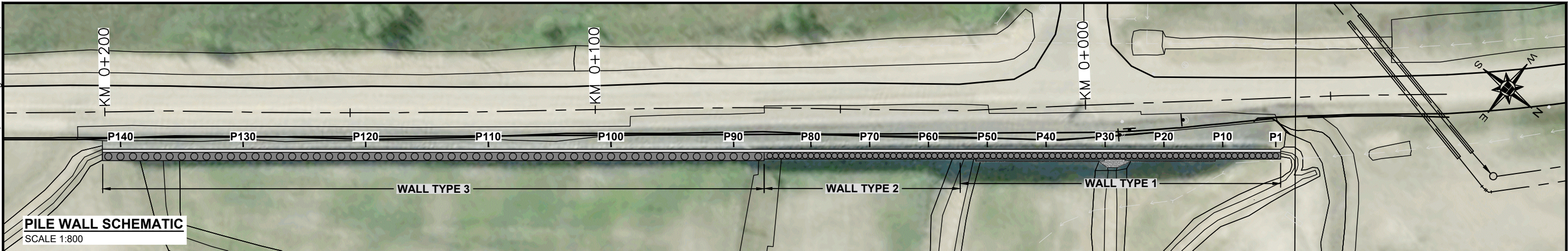
CROSS-SECTION B-B'  
(WALL TYPE 1)

DWG No. 32121-PH009-3-2

DRAWN BY	ML
DESIGNED BY	KEF
APPROVED BY	DWP
SCALE	1:400
DATE	OCTOBER 2025
FILE No.	32121



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PEACE REGION (PEACE RIVER/HIGH LEVEL)

PILE WALL DETAILS

DWG No. 32121-PH009-3-3

DRAWN BY	ML
DESIGNED BY	KEF
APPROVED BY	DWP
SCALE	AS SHOWN
DATE	OCTOBER 2025
FILE No.	32121







**Photo 1A: Looking north at spring along 99 Avenue and new pedestrian pathway constructed by the Town.**



**Photo 1B: Looking north at crack in new pedestrian pathway.**





**Photo 2: Looking southeast at new culvert and crossing lights installed by Town at pedestrian pathway.**



**Photo 3 – Looking northwest at repaired ditch along Hwy 2 off-ramp.**





**Photo 4 – Looking northwest at overlay over location of patched sinkhole in Hwy 2 off-ramp surface northwest of 99 Avenue intersection. Pedestrian pathway crossing is in the background.**



**Photo 5: Looking south at NW end of wall just below SI11-01 which continues to move even after construction is completed.**





**Photo 6: Accumulating sediment and moss growth around the active subdrains. Those on the far side of the apron are dry.**



**Photo 7: Looking north at bottom of the main riprap channel at the edge of the CN ROW.**





**Photo 8: Looking southwest back up at the wall along the regraded slope and riprap drainage channels.**



**Photo 9: Thermal expansion/contraction had detached this conduit from the side of the data enclosure. It has been partially repaired with a rubber boot. More work is recommended to make this more weather-tight.**





**Photo 10: Small void or settlement at the junction between Wall Types 2 and 3. It hasn't gotten worse since 2024.**



**Photo 11: Looking southeast at accumulating sediment in the riprap dissipation bowl. The shallow gully forming beyond the silt fence has started to vegetate and stabilize.**





**Photo 12: Looking southeast at the active scarp just beyond the edge of the highway ROW.**



**Photo 13: Looking north at the recent movement on the northwest flank of the active scarp. The CN rail line is located downslope of this landslide. The scarp has not retrogressed but the soil mass below has moved further downward.**





**Photo 14: Looking northwest along the re-lined upslope ditch where 2024 construction activity had disturbed the riprap diverting flow out of the channel.**



**Photo 15: Looking west at the historical deep-seated crack location at the SE end of the pile wall. There was no significant change from 2024.**





**Photo 16: Looking southeast at the dips in the roadway surface and the shallow gully forming at the top of the riprap in the right ditch.**



**Photo 17: Looking south at the cracks coincident with the northwest flank of the deep-seated landslide.**