SOUTHERN REGION GRMP

SITE INSPECTION FORM

SITE NUMBER AND NAME: **S026 Elkwater Slides**	HIGHWAY & KM: 41:03, 35.169	PREVIOUS INSPECTION DATE: May 11, 2023	INSPECTION DATE: **May 28, 2025**
LEGAL DESCRIPTION SE-18-008-02 W4M and 16-07-008-02 W4M	NAD 83 COORDINATES: UTM 12 Northing 5499046 Easting 553536	RISK ASSESSMENT: Site A: PF: 8 CF: 6 TOTAL: 48 Site B: PF: 9 CF: 5 TOTAL: 45	
AVERAGE ANNUAL DAILY TRAFFIC (AADT): 660 (north), 400 (south), (Ref. No. 138060)		CONTRACTOR MAINTENANCE AREA (CMA): 523	

SUMMARY OF SITE INSTRUMENTATION:	INSPECTED BY:
Site A: Two standpipe piezometers and two slope inclinometers (SIs) Site B: One SI LAST READING DATE: May 22, 2025	Chris Gräpel (KCB) Jorge Rodriguez (KCB) Alex Frotten (TEC) Rishi Adhikari (TEC)

PRIMARY SITE ISSUE: Sliding in the highway embankment and back slopes located within a creek valley. Erosion at the toe of the embankment from the creek and high groundwater table appears to be the triggering mechanism.

APPROXIMATE DIMENSIONS: The extent of the sliding mass is continuous over approximately 600 m from the south end to the north end of the site and between Sites A and B. The embankment height varies from 5 to 10 m high and is sloped between approximately 4H:1V to 5H:1V.

DATE OF ANY REMEDIAL ACTION:

Site A: Between 1970 and 1990 – Shallow drainage was installed near the south end of the site. Fall 2016 – The slope was graded.

Site B: 2012 – A 60-m-long H-pile was installed. The H-pile wall repair was preceded by a temporary repair consisting of slope excavation and reconstruction, and soil nailing. Regular pavement patches and overlays have been completed for both sites for many years.

ITEM	**CONDITION EXISTS**		**DESCRIPTION AND LOCATION**	**NOTICABLE CHANGE FROM LAST INSPECTION**	
	YES	NO		YES	NO
Pavement Distress	X		Pavement distress (cracking and settlement) has been observed at both sites and is reflecting through the regular pavement patches.	X	
Slope Movement	X		Site A: Slope movement (translational) in west direction. Site B: Sliding is occurring below the pile wall, exposing the piles and causing loss of soil behind the pile wall.	X	
Erosion	X		Erosion on embankment slope at culvert outlet.		X
Seepage	X		Wet areas noted on back slopes (upslope of highway) and near toe of slope near stream (downslope of highway).		X

Culvert Distress		X	Erosion observed at outlet of culvert underlying the highway.		X

COMMENTS

General:

- The entire valley slope in the general site location is an active landslide zone with instability features located upslope and downslope of the highway and a general trend of movement to the west, towards the creek. Various slump zones on the embankment fill are present to the west of the highway.
- The toe of landslide appears to be at creek level where erosion is occurring due to stream being partially blocked by slide movement.
- The general area of the site (Cypress Hills) was not glaciated in the last ice age.

Site A:

- The highway was resurfaced between the 2023 and 2025 inspections. During the 2025 inspection, some minor pavement distress (pavement cracking and settlement) was observed, but it was not as severe as during the 2023 inspection (Photos 1 and 2). However, there was some “rippling” observed in the highway surface, which was not observed during the 2023 inspection.
- The pavement at the site is thick due to the regular pavement patching and was estimated to be at least 0.4 m at the east edge of the highway.
- There is a series of small slides along the site, which have resulted in pavement cracking in the west (southbound) lane. The slides are relatively small and between approximately 15 m to 40 m wide.
- There is a flow through the culvert underlying the highway. No erosion was observed at the outlet during the 2025 inspection (Photo 4). However, there is settlement above the culvert within the east (northbound) highway embankment slope (Photo 3).
- Near the north extent of Site A, two successive slip surfaces from a potential retrogression failure were observed during the 2025 inspection on the west (southbound) highway embankment with a slump mass near the toe of the embankment (Photo 5). The slide is approximately 25 m to 30 m wide, with the head scarp approximately 15 m from the edge of movement. The slide appears to have expanded between the 2023 and 2025 inspections, but it does not appear to be impacting the highway surface at the current moment.
- Overall, there have not been significant changes to the site between the 2023 and 2025 inspections.
- During the 2025 inspection, the east (northbound) ditch appears to be well drained and not impacted by slide movement in the highway embankment slope.

Site B:

- The upper portion of the H-pile wall and non-woven geotextile has been exposed by soil sliding downslope of the H-pile wall and soil erosion between the individual H-piles (Photos 6 through 8).
  - Slope movements below H-pile wall have exposed the piles over a length of 30 m at the north limit of the wall. The H-piles are near vertical and do not appear to be deflecting even though the upper 0.5 m to 1.7 m of pile wall is exposed and unsupported.
  - Below the exposed section of H-piles is an approximately 2-m-high section where sloughed material from between and behind the pile wall has eroded out and partially covered the piles. Voids are up to 0.5 m deep between the edge of highway and the H-pile wall, and erosion is ongoing. There is the potential for serious injury to pedestrians/hikers due to roof collapse above voids or falling over the top of the pile wall.
  - The total height from the lower bench to top of the H-pile wall is approximately 3.5 m to 4.0 m.

- KCB reads the SI (SI12-01) during the spring and fall instrument readings. There is discrete movement being record at approximately 5 m to 6 m below ground surface and the rate of movement has been relatively steady since installation (approximately 10 mm/year).
- Minor pavement cracking upslope of the H-pile wall has been observed at the southern end of the wall and does not appear to have worsened between the 2023 and 2025 inspections (Photo 9).
- During the 20205 inspection, pavement distress (cracking and settlement) and evidence of slope movement was observed north of the northern extent of the H-pile wall, indicating the slide is outflanking the H-pile wall. The guardrail at the north edge of the H-pile wall has settled up to approximately 0.5 m and appears worse than during the 2023 inspection (Photo 10).
- Well-developed toe roll near creek level beyond the edge of the trees below the H-pile wall. Wet conditions present at toe of slope. Seepage and surface water runoff has resulted in exposed soils being eroded and deposited at toe of slope.

Maintenance/Repair/Monitoring Recommendations:

General:

- The site should be regularly inspected by TEC's Maintenance Contract Inspector (MCI).
- The site should be inspected annually as part of the Southern Region GRMP Section B inspections.
- The site should be read once per year (spring only) as part of the Southern Region GRMP Section C readings.
- Ditch drainage through the whole S026 area should be improved to minimize infiltration into the slide zones. The highway surface should continue be graded in areas where it has deflected and cracked, to improve the smoothness of the highway through this site. Highway regrading should include milling the existing asphalt, and not placing more material which adds weight to the failure zones.

Site A:

- Carry out additional ground investigation, including boreholes and installation of additional geotechnical instrumentation, to assess the depth of movement in recently active areas for repair design options evaluation. Potential repair options include additional pile walls in slide areas, with drainage trenches installed at the toe of the landslide zone to lower the groundwater table and improve slope stability.

Site B:

- The Highway Maintenance Contractor (HMC) should collapse any soil voids forming between the H-pile wall and edge of the highway. Collapsed voids should be backfilled with sand and gravel.
- The HMC should installed timber lagging between the H-piles and backfill behind the lagging with compacted sand and gravel.
- The H-pile wall should be extended to the north (including timber lagging between H-piles) where the existing H-pile wall is being outflanked. The H-pile wall will need to be extending at an angle to address the sliding towards the north.
- A mitigation assessment should be conducted to review how much tolerable deformation the existing H-pile wall can handle and prepare a design for a pile wall extension. The installation of a waler and tie-back anchors may be required to stabilize the slide. If the H-pile wall is not repaired, this could potentially lead to excessive deformation and retrogression of the active wedge to where movement has not been observed. If the H-pile wall is not repaired, the loss of the wall's functionality is a possibility.

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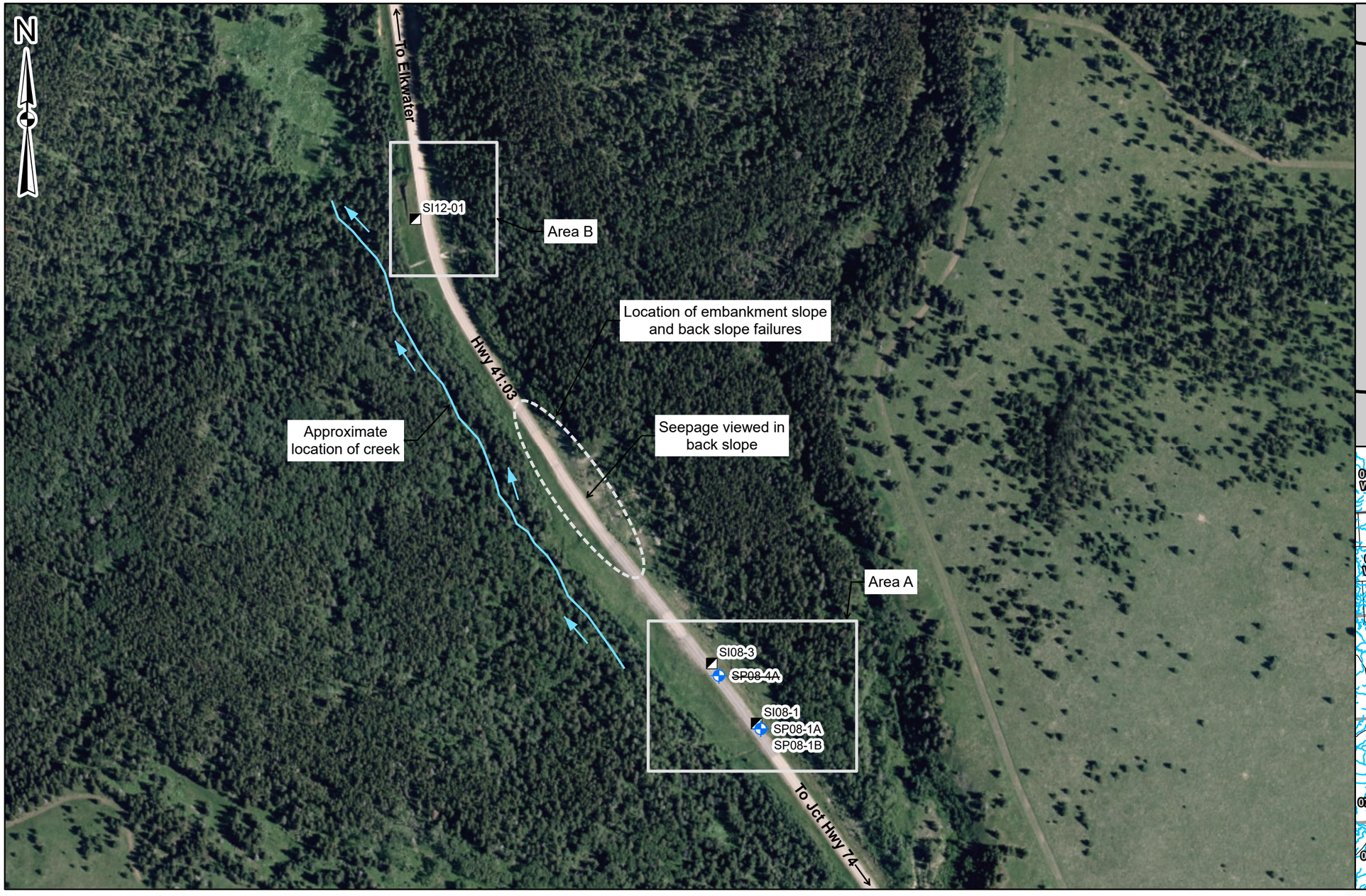
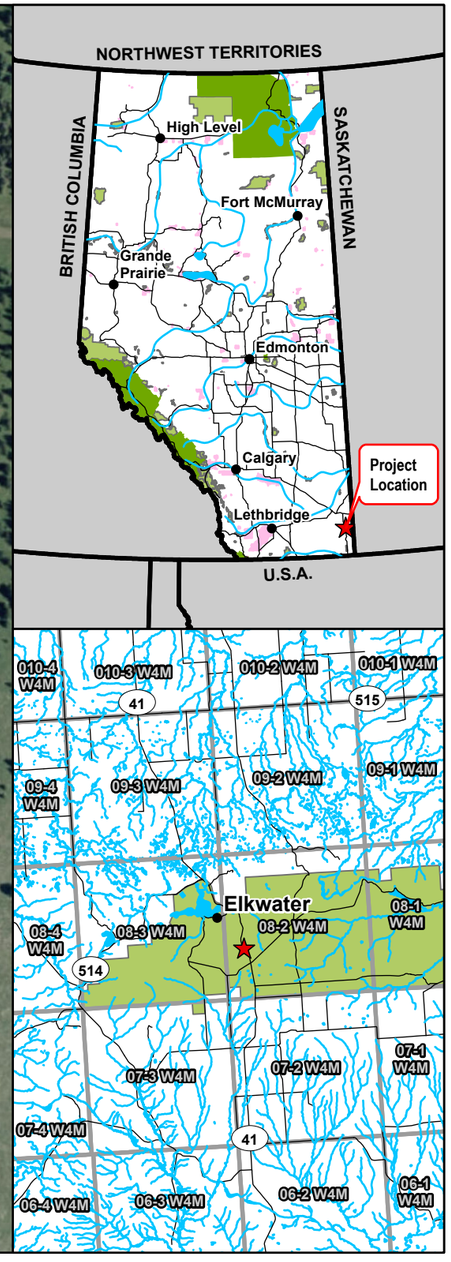
PROFESSIONAL ENGINEER ALBERTA
JORGE RODRIGUEZ NAVARRO
ID 222669
2025 Oct. 10
LICENSED TO PRACTICE

Jorge Rodriguez, Ph.D., M.Sc., P.Eng.
Geotechnical Engineer

PERMIT TO PRACTICE
KLOHN CRIPPEN BERGER LTD.
RM SIGNATURE: _____
RM APEGA ID #: 187607
DATE: 10 Oct. 2025
PERMIT NUMBER: P009196
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)





Legend

- Slope Inclinometer (SI)
- Standpipe Piezometer (SP)
- Flow Direction
- Watercourse
- Slope Failure

0 200 Metres

NOTES:
1. HORIZONTAL DATUM: NAD83
2. GRID ZONE: UTM ZONE 12N
3. IMAGE SOURCE: CYPRESS COUNTY, MAXAR
4. STRIKETHROUGH INDICATES INSTRUMENT IS INACTIVE

CLIENT: Alberta

Klohn Crippen Berger

PROJECT: SOUTHERN REGION GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE: Site Plan
S026 - Elkwater Slides
Hwy 41:03, km 35.169

SCALE 1:4,000 | PROJECT No. A05116A03 | FIG No. 1

File: Z:\AC\CGY\Alberta\A05116A03 ABT Southern Region GRMP\400 Drawings\2022\Section C\Section C - Spring 2022\Section C - Spring 2022.aprx Date: Time: Creator: : aharrison

Inspection Photographs

Photo 1 **Pavement cracking and settlement (red dashed line) reflected through a recent pavement patch at Site A. Photo taken May 28, 2025, facing northwest.**

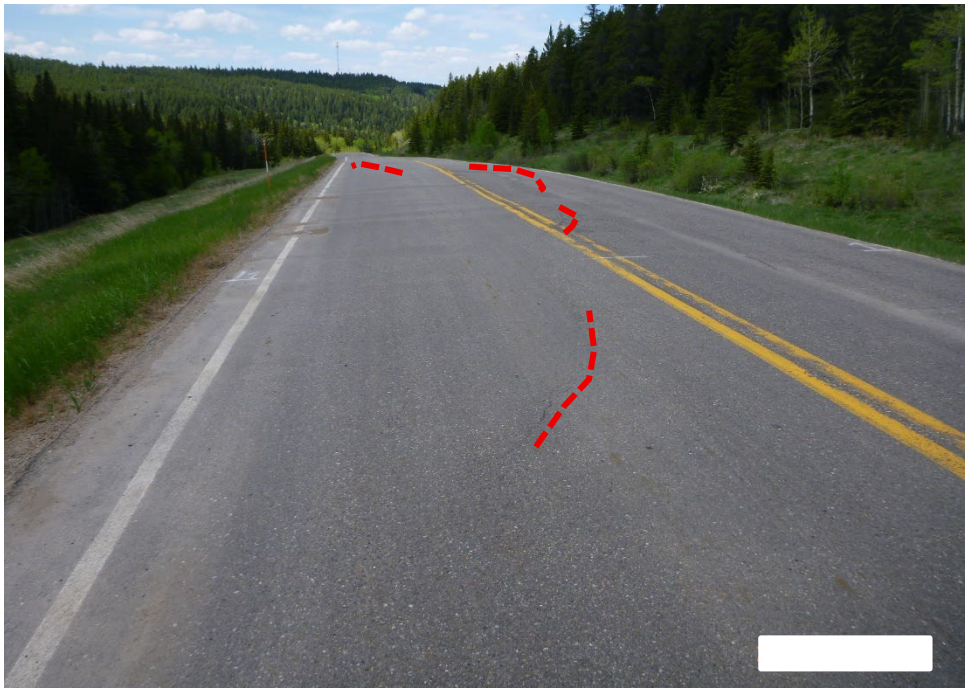


Photo 2 **Pavement cracking and settlement (red dashed line) reflected through a recent pavement patch at Site A. Photo taken May 28, 2025, facing northwest.**

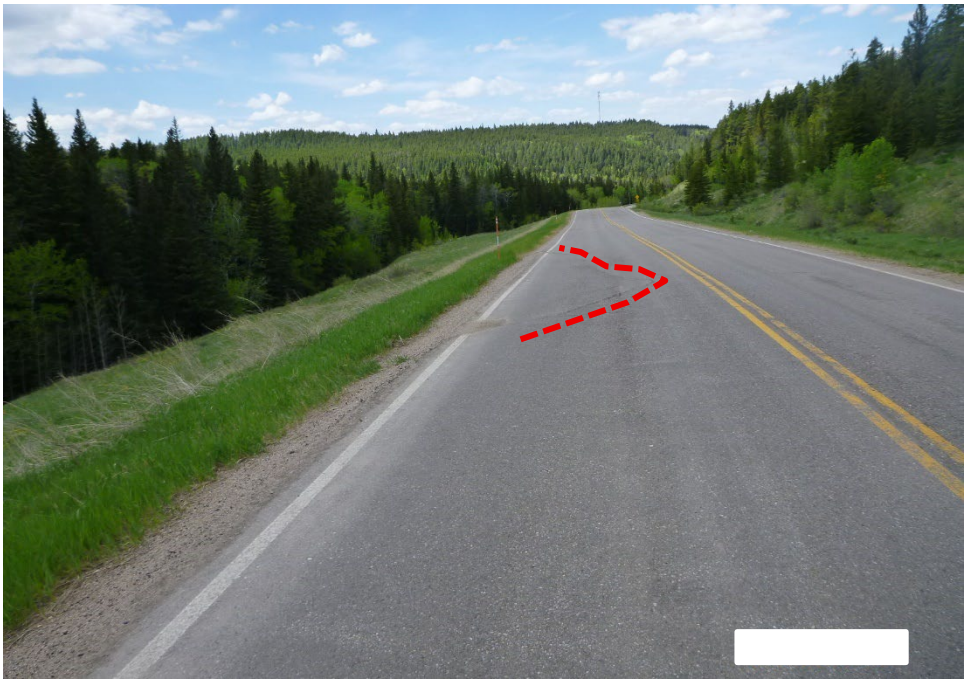


Photo 3 **Settlement in the east (northbound, red arrow) highway embankment slope above the culvert underlying the highway. Photo taken May 28, 2025, facing southeast.**

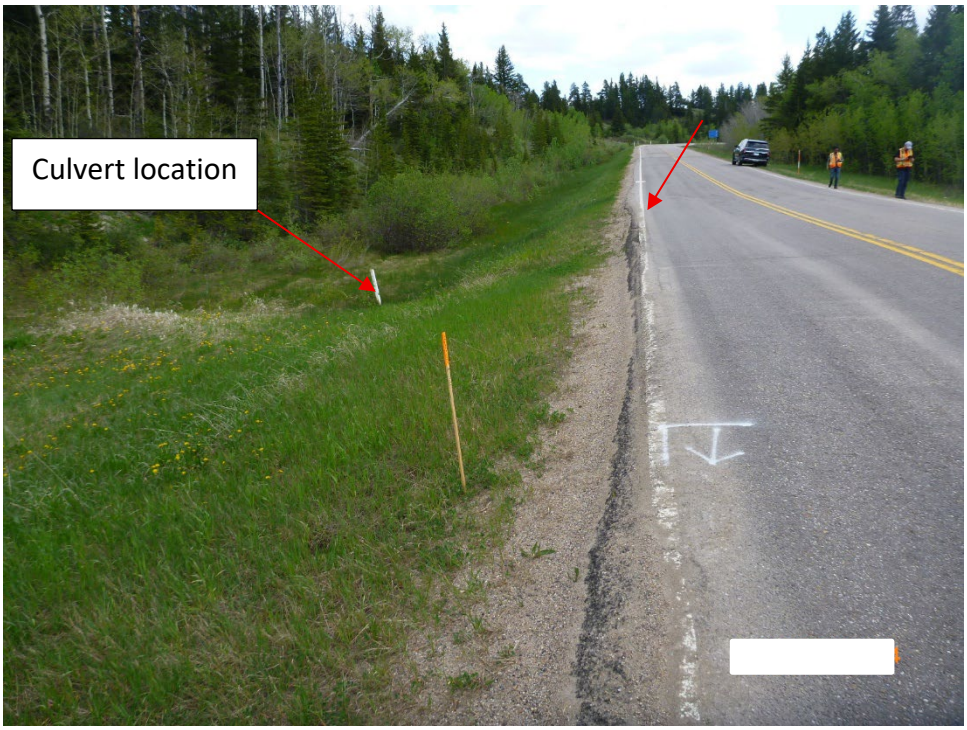


Photo 4 **Low flow through the culvert underlying the highway and no erosion observed during the 2025 inspection. Photo taken May 28, 2025, facing west.**

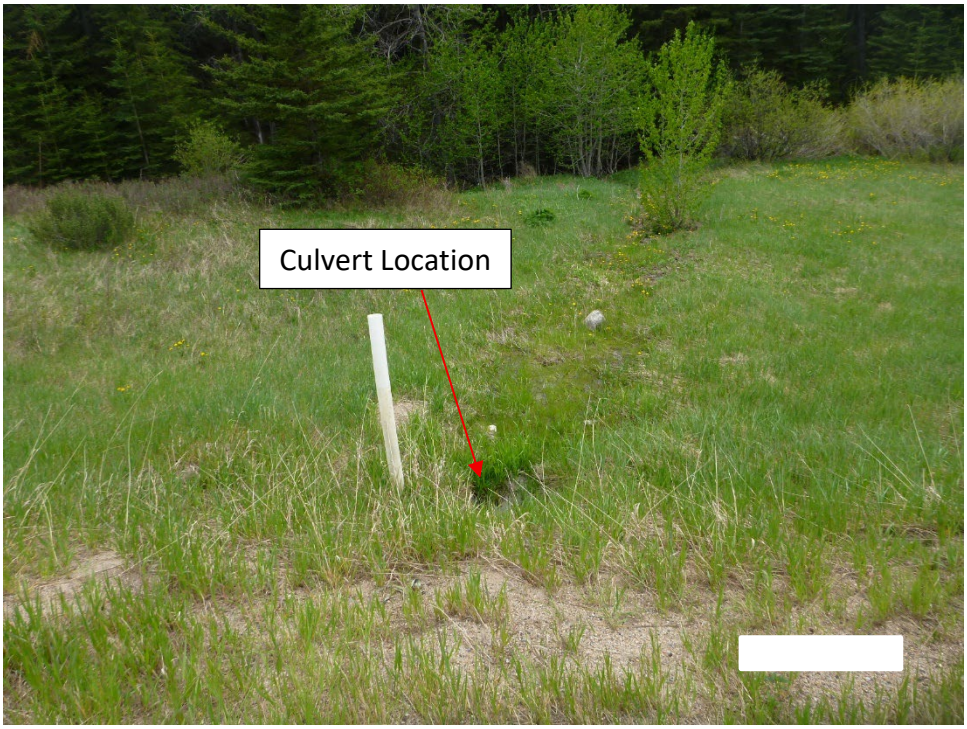


Photo 5 **Near the north extent of Site A there is a slide (approximately 25 m to 30 m wide and 15 m from the edge of pavement) in the west (southbound) highway embankment slope near the toe of the embankment. Photo taken May 28, 2025, facing west.**

Photo 6 **Southeast extent of H-pile wall installed at Site B. Photo taken May 28, 2025, facing northwest.**

Photo 7 **Drainpipe and exposed non-woven geotextile and upper portion of the H-piles at Site B. Photo taken May 28, 2025, facing north.**

Photo 8 **Exposed non-woven geotextile and upper portion of the H-piles. Photo taken May 28, 2025, facing northwest.**

Photo 9 **Pavement and east (northbound) ditch upslope of Site B. Photo taken May 28, 2025, facing southeast.**

Photo 10 **Guardrail deflection at Site B (indicated by red rectangle). Photo taken May 28, 2025, facing north.**