

SITE NUMBER AND NAME: S048 Castle Back Slope Failures	HIGHWAY & KM: 3:04, 23.708	PREVIOUS INSPECTION DATE: May 8, 2023	INSPECTION DATE: May 28, 2025
LEGAL DESCRIPTION: 15/06-12-007-01 W5M	NAD 83 COORDINATES: UTM Northing Easting 11 5492157 715695	RISK ASSESSMENT: PF: 9 CF: 2 TOTAL: 18	
AVERAGE ANNUAL DAILY TRAFFIC (AADT): 4,100 (west), 4,340 (east), (Ref. No. 78050)		CONTRACTOR MAINTENANCE AREA (CMA): 522	

SUMMARY OF SITE INSTRUMENTATION: There is no instrumentation at the S048 site. LAST READING DATE: N/A	INSPECTED BY: Chris Gräpel (KCB) Jorge Rodriguez (KCB) Alex Frotten (TEC) Rishi Adhikari (TEC)
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PRIMARY SITE ISSUE: Multiple slope instabilities on the south (eastbound) highway back slope, which are believed to be partially attributed to a high groundwater table from precipitation and ground infiltration. Head scarps are encroaching on private land and impacting the private fence. The head scarps are merging into one larger slide. Failed material is partially blocking the south (eastbound) ditch.
APPROXIMATE DIMENSIONS: The slope failures are along an approximate 200 m length of the highway's backslope. The backslope is between 6 m and 10 m high and slopes at approximately 3H:1V.
DATE OF ANY REMEDIAL ACTION: A high-tension cable barrier (HTCB) was installed along the edge of the south (eastbound) lane between the 2023 and 2025 inspections.

ITEM	CONDITION EXISTS		DESCRIPTION AND LOCATION	NOTICABLE CHANGE FROM LAST INSPECTION	
	YES	NO		YES	NO
Pavement Distress		X	N/A – none observed during the 2025 inspection.		X
Slope Movement	X		Slope instability in the south (eastbound) highway back slope (Photo 1). Head scarps retrogressing into private land and undermining the fence at multiple locations. Toe rolls are partially blocking the south (eastbound) ditch.	X	
Erosion	X		There has been some erosion of the failed material in the ditch.		X
Seepage	X		Wet areas have been observed within the slide mass. During the 2025 inspection, the ground was soft and dry.		X
Culvert Distress		X	N/A – none observed during the 2025 inspection.		X

COMMENTS
<u>S048:</u> <ul style="list-style-type: none"> There is a Shaw utility line along the site located approximately ¼ of the way up the slope, and its location is marked with a hazard sign.

- The zone of instability in the south (eastbound) highway back slope is approximately 200 m long. There is a series of slides along the back slope that will coalesce over time (Photo 1).
- The south (eastbound) highway back slope (north facing) is between approximately 6 m to 10 m high (increasing in height along the site from east to west) and sloped at approximately 3H:1V. In general, the instability is observed where the embankment height is greater than approximately 6 m (Photo 1).
- A high-tension cable barrier (HTCB) was installed along the edge of the south (eastbound) lane between the 2023 and 2025 inspections (Photo 2).
- No pavement distress (cracking or settlement) was observed during the 2025 inspection (Photo 2).
- Failed material is partially blocking the south (eastbound) ditch and is impacting the ditch's flow capacity (Photos 2 to 3). There was no significant change between the 2023 and 2025 inspections.
- Due to erosion, the head scarp has retreated onto private land, affecting the fence line along the slope's crest in three areas (Photos 4 to 6). The westernmost area, shown in Photo 6, seems to have happened between the 2023 and 2025 site inspections. The head scarp has moved past the fence line by about 2.5 m near the site's eastern end and has undermined one fence post. The centred scarp is roughly 10 m wide (Photo 5), and the new scarp near the western end is approximately 12 m long (Photo 6).
- The slope outside of the site limits is even, well-vegetated, and is performing well; furthermore, the area of instability does not appear to be impacting the private land along the western length of the site, but the head scarp is within approximately 1.5 m of the fence (Photo 7).
- At some locations, the head scarp is up to approximately 2 m high and is near-vertical (Photo 1). There may be more activity at the east and west flanks of the site with material slumping from the head scarp. In general, there were no significant changes between the 2023 and 2025 inspections, except at the west end of backslope.
- The back slope and ditch are well vegetated. The field located at the top of the slope failure is generally graded towards the Oldman River (west of the site).
- Groundwater from the prairie lands south of the site can drain towards the southside backslope of the highway and therefore, drive the movement. Conversely, the north lands appear to be draining away from the backslope on the north of the site, so groundwater effects may not be as adverse. Furthermore, since the south backslope is north facing, there is less direct sunlight, which decreases evapotranspiration from the slope surface. This orientation promotes a longer duration of snow cover in the spring, potentially leading to more infiltration, increasing the groundwater level and reducing the stability of the slope.
- The north (westbound) back slope (south facing) appeared stable with no visual evidence of instability.

Maintenance/Repair/Monitoring Recommendations:

Short-term:

- The site should be regularly inspected by the Maintenance Contract Inspector (MCI).
- The site should be inspected every year as part of the Southern Region GRMP Section B inspections.
- Drainage for the south (eastbound) ditch should be improved by removing failed material partially blocking the ditch. Removed material should be kept to a minimum to re-establish flow capacity in the ditch without further destabilizing the slope.

Long-term:

- The stability of the south (eastbound) highway back slopes should be improved by flattening the slope from approximately 3H:1V to 4H:1V or 5H:1V. This would require purchasing additional right-of-way and moving the fence further south. Excavated material could potentially be stockpiled in the low area southwest of the site. This area could be levelled in the future for possible use by the private landowner as long as it does not impact the stability of the east Oldman River riverbank (south of the Hwy 3 bridge). TEC should conduct a site investigation (2-3 boreholes) to characterize the back slope materials of the

south slope and conduct a hydrogeological analysis to assess the impact of the groundwater and evaluate potential repair options, including drainage improvement.

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



Legend

- Flow Direction
- Scarp
- Fence

NOTES:
1. HORIZONTAL DATUM: NAD83
2. GRID ZONE: UTM ZONE 11N
3. IMAGE SOURCE: MAXAR 2025

CLIENT

Alberta

Klohn Crippen Berger

PROJECT

SOUTHERN REGION GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE

Site Plan
S048 - Castle Back Slope Failures
Hwy 3:04, km 23.708

SCALE
1:2,500

PROJECT No. A05116A03

FIG No. 1

Inspection Photographs

Photo 1 Panoramic view of multiple slides and head scarp (red dashed line) on the south backslope of the highway. Landslides encroaching private land (orange circle). Photos taken May 28, 2025, facing southwest.

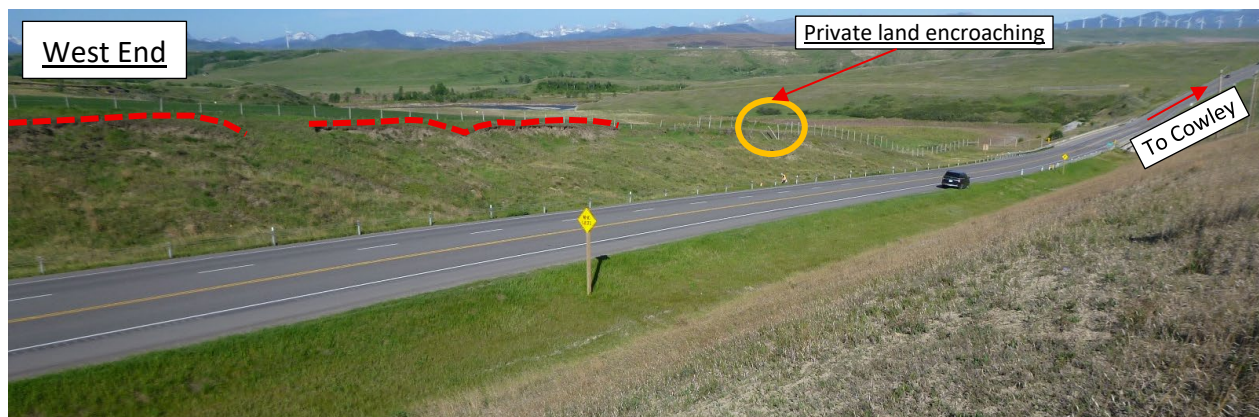


Photo 2 HTCB installed between the 2023 and 2025 inspections, south (eastbound) ditch, and head scarp (red dashed line). Ditch and back slope are well vegetated. Photo taken May 28, 2025, facing east.



Photo 3 Failed material (red line) partially blocking south (eastbound) ditch. Photo taken May 28, 2025, facing east.



Photo 4 Head scarp (red dashed line) and private fence along the crest of the slope. Head scarp extends approximately 2.5 m south of the fence line. Photo taken May 28, 2025, facing east.

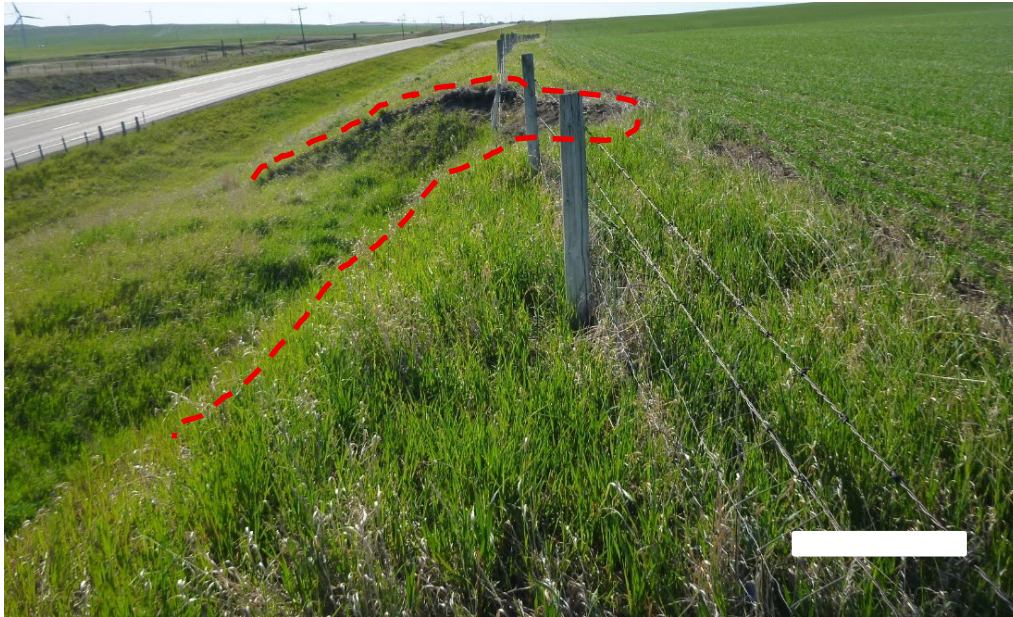


Photo 5 Head scarp (red dashed line) and private fence along the crest of the slope near the west end of the site. Photo taken May 28, 2025, facing west.



Photo 6 Head scarp (red dashed line) and private fence along the crest of the slope near the west end of the site. Photo taken May 28, 2025, facing west.



Photo 7 The slope outside of the site limits is even, well-vegetated, and is performing well. Photo taken May 28, 2025, facing west.

