SOUTHERN REGION GRMP
SITE INSPECTION FORM

SITE NUMBER AND NAME: **S039-I Brocket Slides**	HIGHWAY & KM: 3:06, 12.952	PREVIOUS INSPECTION DATE: May 19, 2022	INSPECTION DATE: **May 29, 2024**
LEGAL DESCRIPTION: 09/10-07-007-28 W4M	NAD 83 COORDINATES: UTM 12 Northing 5491976 Easting 298990	RISK ASSESMENT: PF: 13 CF: 3 TOTAL: 39	
AVERAGE ANNUAL DAILY TRAFFIC (AADT): 5240 (west) & 5260 (east) (Reference No. 84050)		CONTRACTOR MAINTENANCE AREA (CMA): 26	

SUMMARY OF SITE INSTRUMENTATION:	INSPECTED BY:
Operable: Four slope inclinometers and 2 vibrating wire piezometers LAST READING DATE: May 15, 2024	Chris Grapel (KCB) Peter Roy (KCB) Kristen Tappenden (TEC) Alex Frotten (TEC)

PRIMARY SITE ISSUE: Natural slope landslide encroaching on west lane of highway.

APPROXIMATE DIMENSIONS: Landslide approximately 45 m wide at edge of westbound lane (undermining edge of pavement). The overall width of slide zone is approximately 135 m. Landslide sloped at 1.5H:1V below edge of pavement to a mid-slope bench completed as part of the construction in 2023. The overall slope height is approximately 50 m.

DATE OF ANY REMEDIAL ACTION: Construction completed in March 2023 included the installation of 215 soil nails at lengths of 16 m each, to support the north embankment slope.

ITEM	CONDITION EXISTS		DESCRIPTION AND LOCATION	NOTICABLE CHANGE FROM LAST INSPECTION	
	YES	NO		YES	NO
Pavement Distress	X		Pavement cracks extending approximately 4 m from guardrail into north (westbound) lane over a 20 m length.		X
Slope Movement	X		Ongoing movement, cracks opening at crest of slide, in slide mass, and along west flank.	X	
Erosion	X		Runoff from highway is causing erosion rilling down the unvegetated slope	X	
Seepage	X		Seepage previously noted in the east slide mass near the crest of the slope, but not visible during 2024 inspection.	X	
Culvert Distress		X	N/A – none observed		X

COMMENTS

In June 2023 it was noted that movement had occurred at the east end of the repair slope, with the development of a tension crack near the crest of the slope. The contractor was requested to go back to site to fill in the tension crack with fine grained granular material to help limit the amount of water that could flow into the crack. Additionally, large rills and small gullies were observed to be forming on the slope surface due to water flowing over the edge of the pavement.

As part of the initial repair work the contractor also constructed a small berm on the north shoulder of the highway to help deflect surface water from the highway away from the repair slope. These two items were completed in October 2023.

During the site visits in 2024, additional slope movement was observed across most of the repair area. The soil nails were observed to be taking load from the slope movement, but it was observed that in several locations the

material on the slope was moving (or flowing) around the anchor plates. The material on the slope is not acting as it was assumed in the repair design as it was assumed the material was cohesive based on the site investigation completed. More importantly, the observation of the soil deforming around and above the anchor plates at slope surface indicates the soil is acting like a plastic, not a solid. The design work completed by KCB for the soil nail design was based on the soil acting like a solid upon completion of the repair.

The surface mesh installed as part of the construction did not meet the mesh requirements stated in the tender but was accepted as part of a RFI after contract award. The mesh installed does not include an erosion control element and is only a wire mesh that is more suitable for bedrock slopes. Due to this, material on the slope can move through the mesh and will not be held in place. Due to the lack of erosion control material in the mesh (a design requirement), the slope is relatively unprotected which will challenge initial vegetation growth after seeding, leading to a higher chance of erosion occurring which has been the case so far. The site was hydroseeded in June 2023. The seed has not taken and there is little to no growth on the slope which is contributing to erosion and sloughing. Rilling on the slope surface has resulted in a limited number of anchor plates having soil removed from beneath them which will impact the ability of the soil nails to resist destabilizing forces within the slope.

Maintenance/Repair/Monitoring Recommendations:

- Assess what options could be implemented to help with the ongoing movement and erosion observed on the slope. As originally specified in the tender, a hydraulic erosion control produced was to be installed as part of the construction project. To install a hydraulic erosion control product on the slope, the voids caused by slope movement would need to be filled in so there would be intimate contact between the hydraulic erosion control product and the soil. This could be completed by using a blown-on mulch product with a tackifier. The existing wire mesh could be left in place and a new hydraulic erosion control product (which would include a wire mesh and erosion control blanket) installed on the slope. The hydraulic erosion control product would need to be anchored to the slope so that it is able to hold back any material from sloughing or eroding beneath due to ground water in the slope.
- Assess the material on the slope for salinity and if it is suitable for growing vegetation as no vegetation has started to grow on the slope since hydroseeding
- Assess if the soil on the slope is dispersive and contributing to the slope movement.
- Assess if the soil chemistry is incompatible with seed mixes used to date.
- Complete a workshop with Maccaferri to discuss what options they think could be implemented on the slope.
- Assess if drains could be installed to dewater the slope.

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(ii) The observations, findings and conclusions in this report are based on observed factual data and conditions that existed at the time of the work and should not be relied upon to precisely represent conditions at any other time.

(iii) The report is based on information provided to KCB by the Client or by other parties on behalf of the client (Client-supplied information). KCB has not verified the correctness or accuracy of such information and makes no representations regarding its correctness or accuracy. KCB shall not be responsible to the Client for the consequences of any error or omission contained in Client-supplied information.

(iv) KCB should be consulted regarding the interpretation or application of the findings and recommendations in the report.

(v) This report is electronically signed and sealed and its electronic form is considered the original. A printed version of the original can be relied upon as a true copy when supplied by the author or when printed from its original electronic file.

PROFESSIONAL ENGINEER PETER J. ROY ALBERTA

16 Oct. 2024
ID 141695

Peter Roy, P.Eng.
Civil Engineer

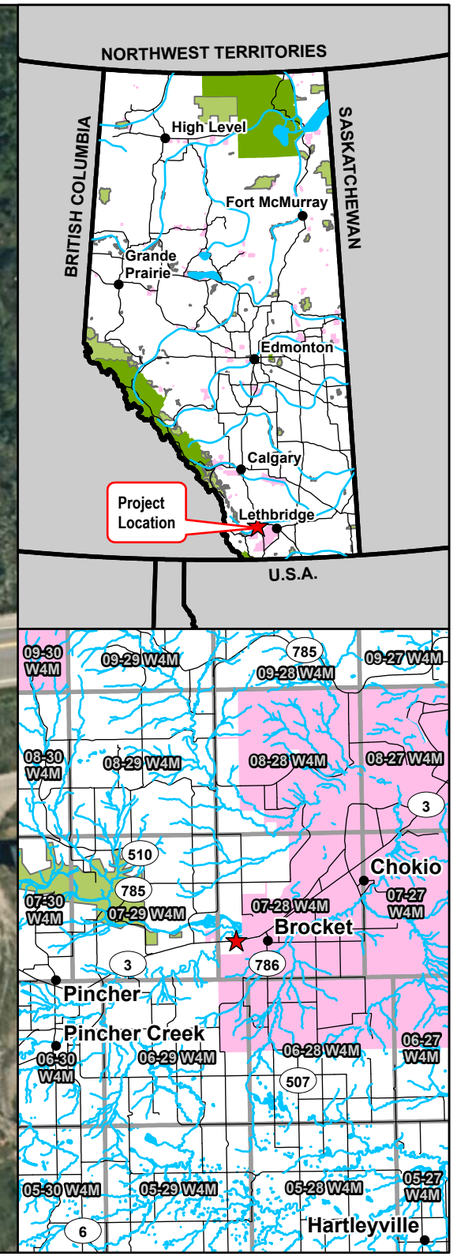
PERMIT TO PRACTICE
KLOHN CRIPPEN BERGER LTD.

RM SIGNATURE: _____

RM APEGA ID #: 187607

DATE: 16 Oct. 2024

PERMIT NUMBER: P009196
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)



Legend

- Slope Inclinometer (SI)
- Vibrating Wire Piezometer (VW)
- Flow Direction
- Scarp
- Soil Nail Repair Area

0 50 Metres

NOTES:
1. HORIZONTAL DATUM: NAD83
2. GRID ZONE: UTM ZONE 12N
3. IMAGE SOURCE: MD OF WILLOW CREEK NO. 26, TOWN OF CARDSTON, TOWN OF PINCHER CREEK, MAXAR
4. STRIKETHROUGH INDICATES INSTRUMENT IS INACTIVE
5. AVAILABLE IMAGERY DOES NOT SHOW EXTENT OF REPAIRS.

CLIENT: Alberta

Klohn Crippen Berger

PROJECT: SOUTHERN REGION GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE: Site Plan
S039 - Brocket Slides
Hwy 3.06, km 12.952

SCALE	PROJECT No.	FIG No.
1:1,250	A05116A03	1

File: Z:\AC\CGY\Alberta\A05116A03 ABT Southern Region GRMP\400 Drawings\2023\01_ProFile\Section C\AT_Southern_SectionC_231124\AT_Southern_SectionC_231124.aprx Date: Time: Creator: aharrison

Photo 1 **Transverse pavement cracking across both lanes east of the slide. Photo taken May 29, 2024, facing west.**

Photo 2 **Erosion rilling from highway runoff down the slope. Photo taken on May 29, 2024 looking south.**

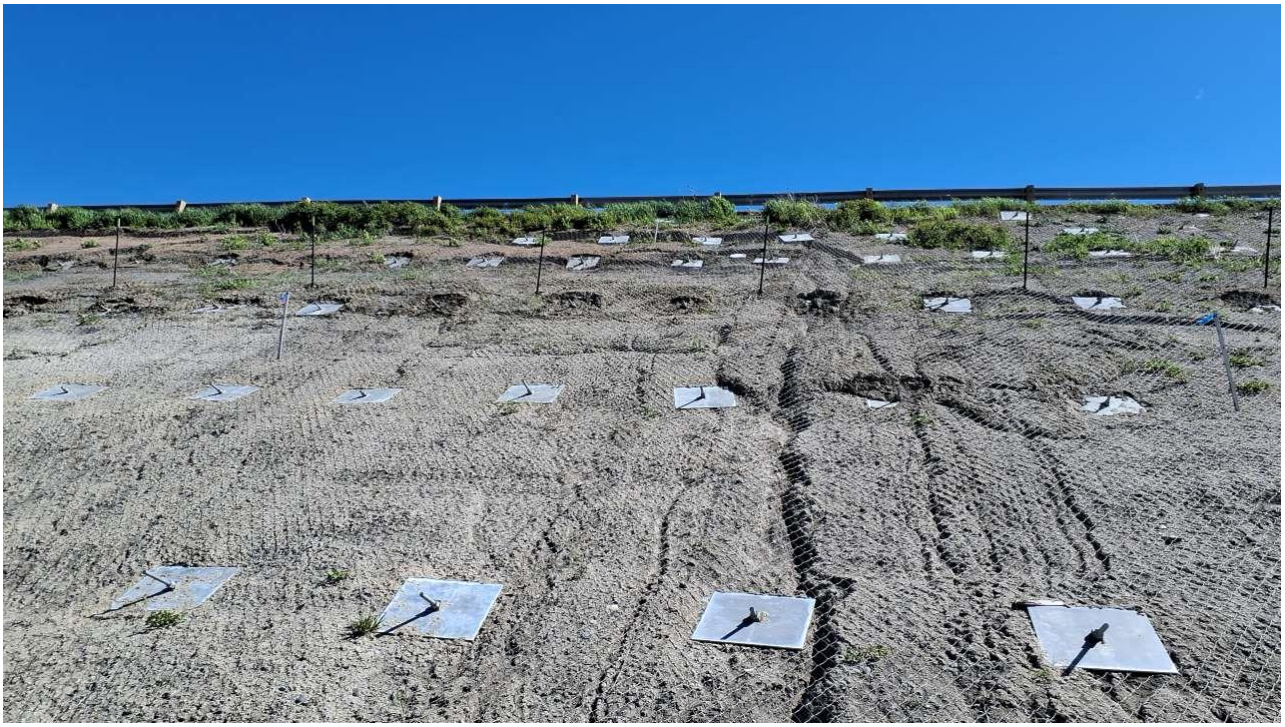


Photo 3 **Soil nails installed with anchor plates. Slope movement, cracking and sloughing of the slope. Photo taken facing west on May 29, 2024.**

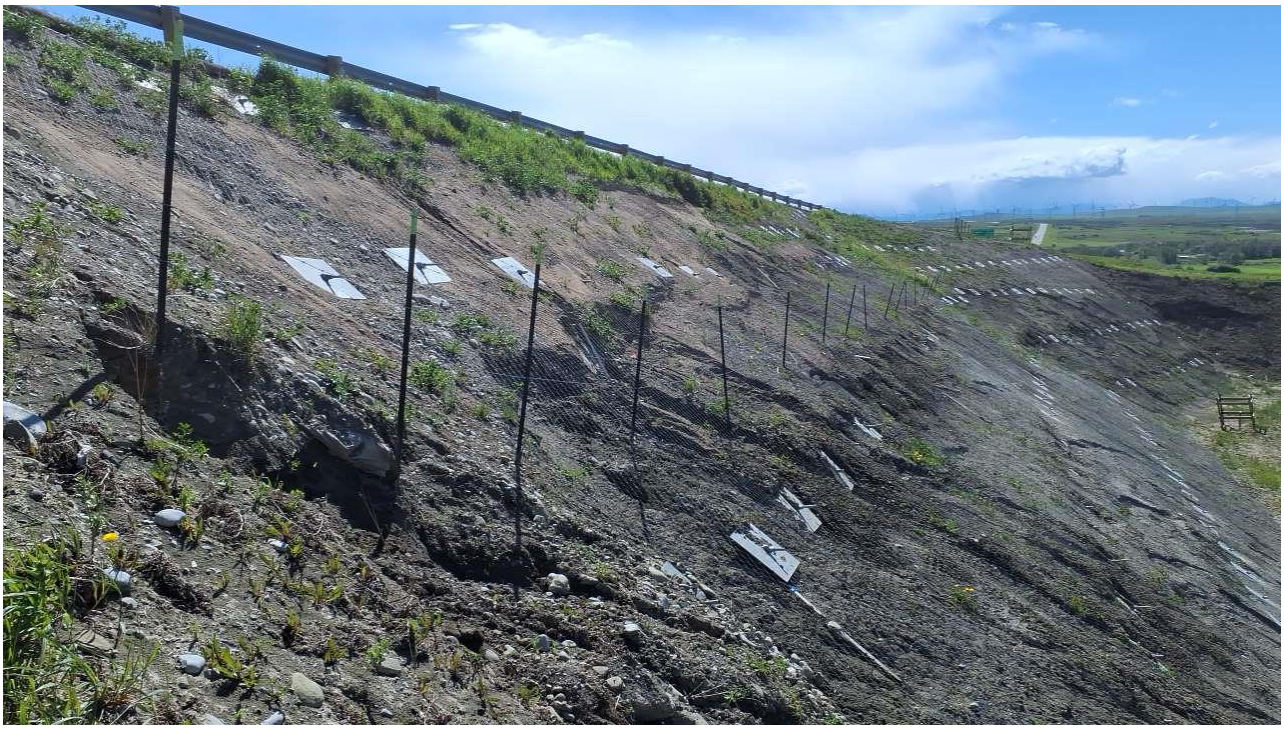


Photo 4 **Slope movement. Material moving around soil nail anchor plates. Photo taken facing south on May 29, 2024.**

Photo 5 **Slope movement. Material moving around soil nail anchor plates. Photo taken facing south on May 29, 2024.**

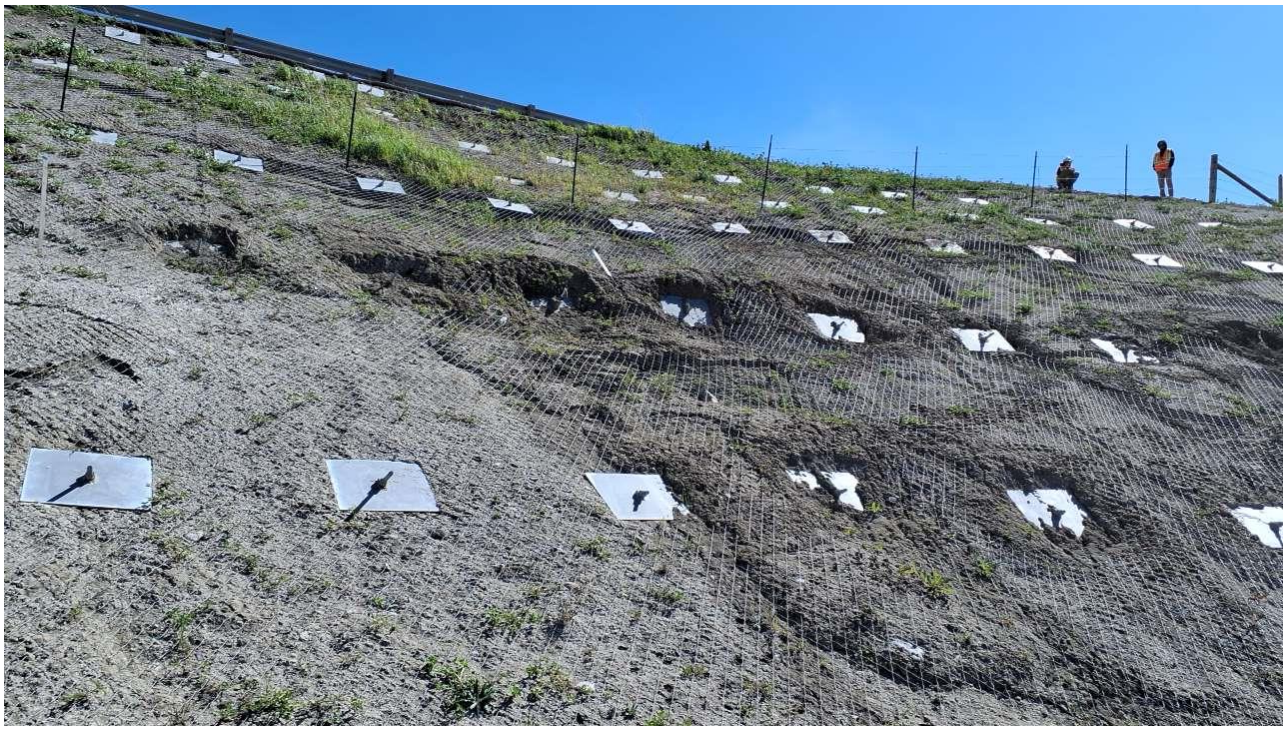


Photo 6 **Slope movement on west flank of repair slope. Photo taken facing northeast on May 29, 2024.**