SOUTHERN REGION GRMP
SITE INSPECTION FORM

SITE NUMBER AND NAME: **S004 Willow Creek (North of Fort Macleod)**	HIGHWAY & KM: 2:08, 6.284	PREVIOUS INSPECTION DATE: May 19, 2022	INSPECTION DATE: **May 10, 2023**
LEGAL DESCRIPTION: 13/14-20-09-26-W4M	NAD 83 COORDINATES: UTM 12 Northing 5514351 Easting 320169	RISK ASSESMENT: PF: 9 CF: 4 TOTAL: 36	
Average Annual Daily Traffic (AADT): 4600 (north) & 5440 (south) (Reference No. 92080)		CONTRACTOR MAINTENANCE AREA (CMA): 26	

SUMMARY OF SITE INSTRUMENTATION:	INSPECTED BY:
Three slope inclinometers, six standpipes, and six vibrating wire piezometers are located at the crest of the slide. Instruments located in the slide mass are assumed to be inoperable. LAST READING DATE: June 14, 2023	Chris Grapel (KCB) Peter Roy (KCB) Roger Skirrow (AT) Alex Frotten (AT)

PRIMARY SITE ISSUE: Landslide at outside bend of Willow Creek (slope crest retrogressing), possibly due to infiltration from irrigation activities on farmland on the opposite side of Hwy 2. Landsliding has retrogressed into eastbound lane ditch, causing ditch flows to discharge onto the slide surface.

APPROXIMATE DIMENSIONS: The site is approximately 400 m long and 20 m in height. The head scarp is located approximately 11 m to 12 m from the guardrail. The slope is approximately 4H:1V to 5H:1V.

DATE OF ANY REMEDIAL ACTION: 2008 – slope stabilization (soil nailing, grading, and bioengineering (live staking)) with longitudinal peaked stone creek bank (LPSTP) armouring to reduce erosion at the toe of the slide. 2014 – installation of a guardrail along the east (northbound) edge of the highway.

ITEM	**CONDITION EXISTS**		**DESCRIPTION AND LOCATION**	**NOTICABLE CHANGE FROM LAST INSPECTION**	
	YES	NO		YES	NO
Pavement Distress		X	Transverse pavement cracking but is not believed to be attributed to the slide.		X
Slope Movement	X		The head scarp of the slide has been retrogressing into the ditch since 2016. The head scarp has retrogressed over 10 m in the last 10 years. No significant changes noted compared to 2022.		X
Erosion	X		Erosion observed on slopes from ditch discharge onto slide area, riprap armouring placed in 2008 is intact.		X
Seepage	X		N/A – none observed during the 2023 inspection. A wet area was observed in the slide zone during a previous inspection.		X
Culvert Distress		X	N/A – none observed		X

COMMENTS

There has been minimal change in slope retrogression observed between 2019 and 2023. The head scarp is approximately 11 m to 12 m from the guardrail at the closest point. South of the main slide, the right flank has retrogressed to approximately 16 m from the guardrail. There are four wooden stakes present at the head scarp that are used to estimate slide retrogression. It is estimated that there has been 2.5 m to 3.5 m of retrogression into the ditch since 2016.

The head scarp has retrogressed 3 m to 5 m past the fence line. The slide zone is actively being undermined and material from the topsoil mat is sloughing into the slide zone over time. No significant changes were noted in the slide mass during the 2023 inspection.
The site was well vegetated during the 2023 inspection. However, bare patches of soil were observed near the top of the slide zone.
A buried black utility cable is exposed in the slide area.
The nature of the slide (i.e., back tilting blocks) suggests a combination of rotational and translational failure along a deep weak layer. The right flank of the slide (southeast) appears to be retrogressing faster than the left flan (northwest).
The creek armouring completed in 2008 is in good condition. However, continued slope movement is displacing the armouring eastward across creek, straightening a former curved zone of creek bank. The riprap is exposed due to low water levels and needs maintenance to the vanes.
Discussed Remedial Actions: <u>Short-Term</u> • The operable instruments should continue to be read twice per year (spring and fall) as part of the Southern Region GRMP. • Data loggers were installed in spring 2023 at all three VWP locations (6 VWPs in total) to gather data on seasonal groundwater fluctuations, irrigation impacts and precipitation events. Data will be downloaded and reported on during the fall 2023 Section C tour. • Additional survey stakes should be installed to monitor slide retrogression. Existing stakes are vulnerable to disturbance from weather events, maintenance activities (i.e., mowing), and vandalism. • A desktop study should be completed for the site including review of existing borehole logs, geological maps, reviewing historic air photos, and assessing available LiDAR data for use in change detection. <u>Long-Term</u> • A geotechnical site investigation should be completed to assess the subsurface conditions (i.e., stratigraphy and groundwater conditions). • Preliminary engineering should be completed to assess repair options for the site. Potential repair options for this site include: diverting surface water away from the slide zone; or installing horizontal drains connected to a seepage collection curtain. The seepage collection curtain would need to be assessed for potential impact to the farmland and reservoir on the west side of the highway. A proposal for this work was issued in March 2023.

This report is an instrument of service of Klohn Crippen Berger (KCB). The report has been prepared for the exclusive use of Alberta Transportation (Client) for the specific application to the Southern Region Geohazard Risk Management Program (Contract No. CON0022161) and it may not be relied upon by any other party without KCB's written consent.

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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.

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PROFESSIONAL ENGINEER ALBERTA
PETER J. ROY

13 Oct. 2023
ID 141695

Peter Roy, P.Eng.
Civil Engineer

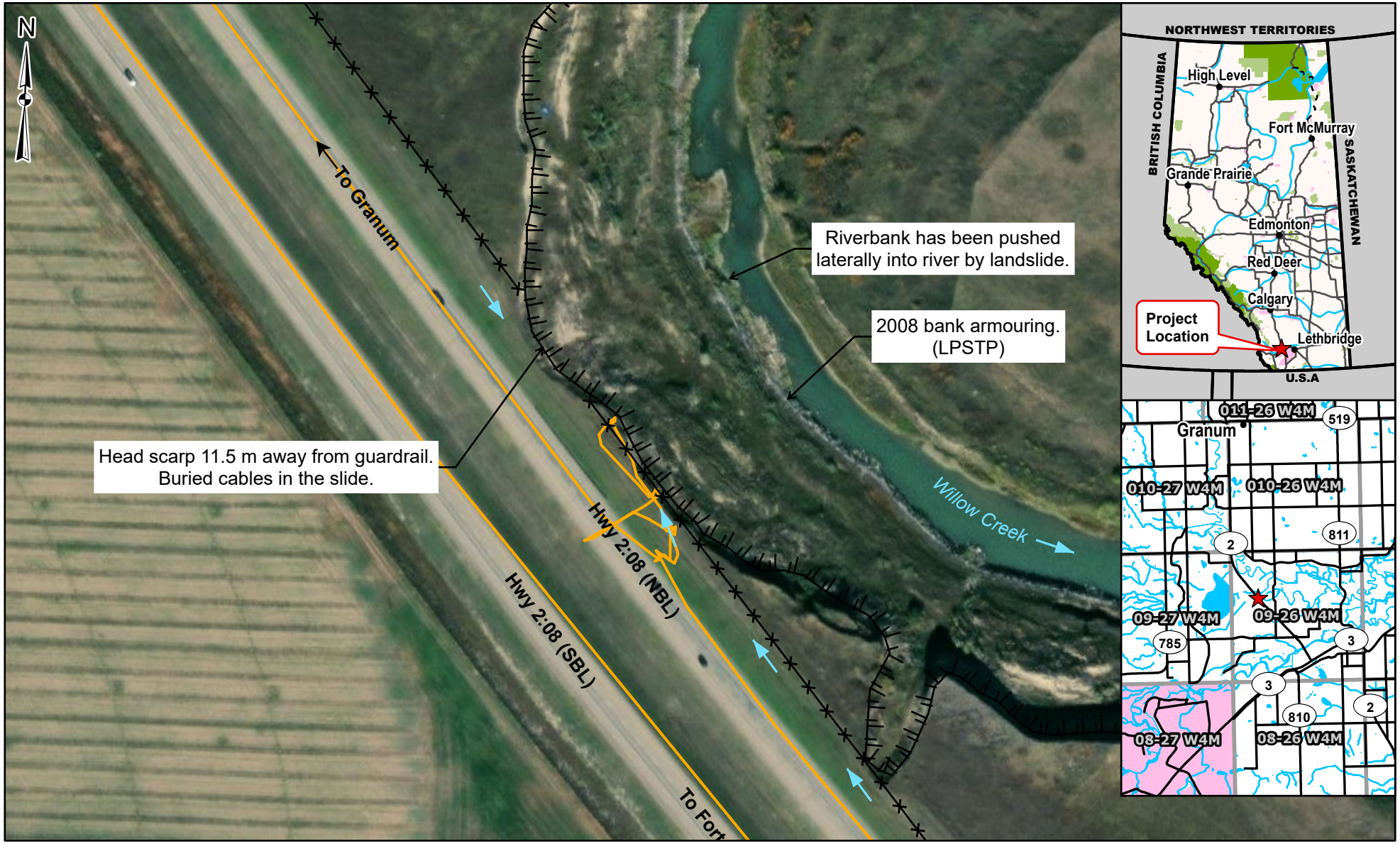
PERMIT TO PRACTICE
KLOHN CRIPPEN BERGER LTD.

RM SIGNATURE: _____

RM APEGA ID #: 187607

DATE: 13 Oct. 2023

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



Legend

- Scarp
- Fence
- GPS Track (May 10, 2023)

0 50 Metres

NOTES:
1. HORIZONTAL DATUM: NAD83
2. GRID ZONE: UTM ZONE 11N
3. IMAGE SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS AND THE GIS USER COMMUNITY.

CLIENT: Alberta

Klohn Crippen Berger

PROJECT: SOUTHERN REGION GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE: Site Plan
S004 - Willow Creek (North of Fort Macleod)
Hwy 2.08, km 6.284

SCALE	PROJECT No.	FIG No.
1:2,000	A05116A03	1

File: Z:\AC\GY\Alberta\A05116A03 ABT Southern Region GRMP\400 Drawings\2023\01_ProFile\Section B\ABT_Southern_SectionB_230713\ABT_Southern_SectionB_230713.aprx Creator: : aharrison

Photo 1 **Slide area. Photo taken facing west on May 10, 2023.**

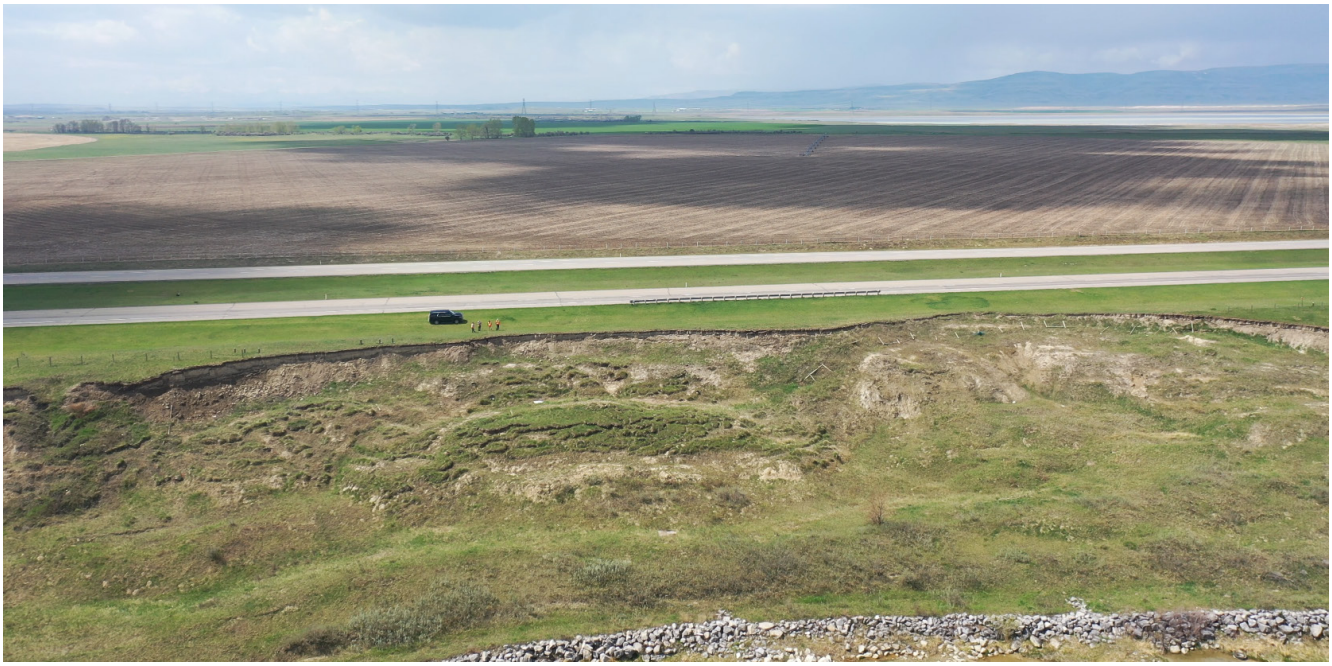


Photo 2 **Head scarp located up to 5 m past the fence line. Photo taken facing north on May 10, 2023.**

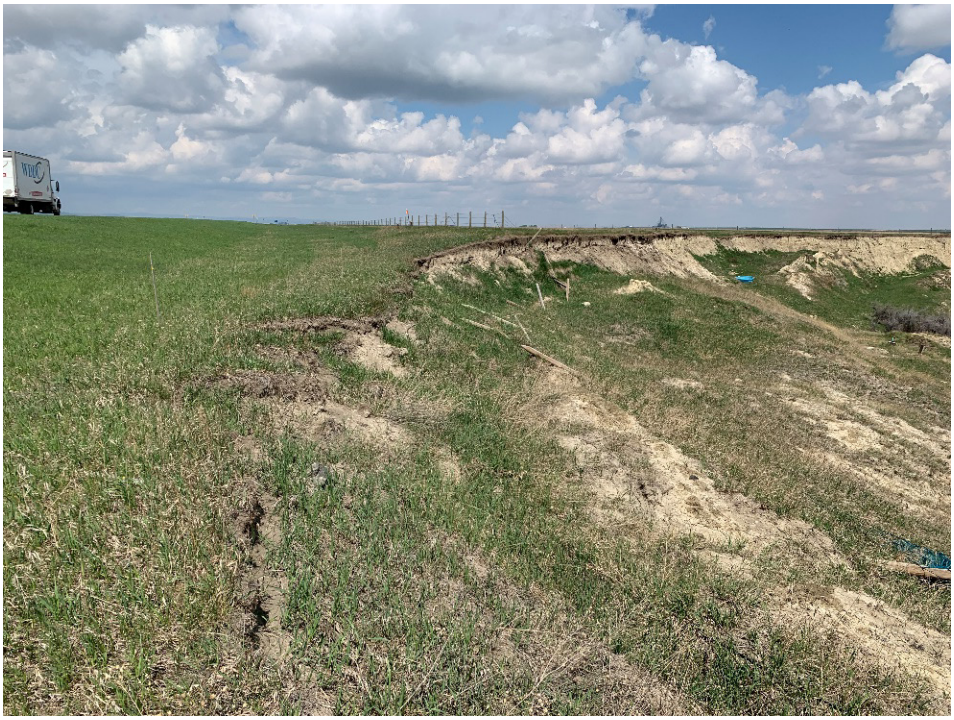


Photo 3 **Back tilting blocks are visible in the slide mass. Photo taken facing north on May 10, 2023.**

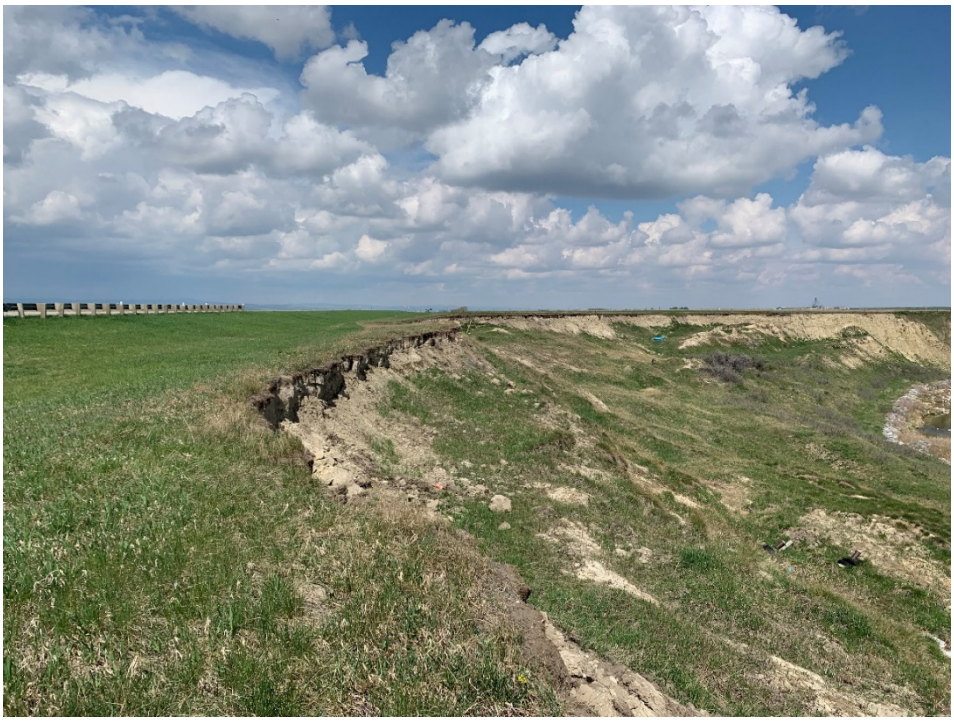


Photo 4 **Ongoing slide movement retrogressing towards the highway. Photo taken facing southeast on May 10, 2023.**