SOUTHERN REGION GRMP

SITE INSPECTION FORM

SITE NUMBER AND NAME:	HIGHWAY & KM:	PREVIOUS INSPECTION DATE:	INSPECTION DATE:
S004 Willow Creek (North of Fort Macleod)	2:08, 6.284	May 29, 2024	**May 28, 2025**
LEGAL DESCRIPTION: 13/14-20-09-26-W4M	NAD 83 COORDINATES: UTM 12 Northing 5514351 Easting 320169	RISK ASSESSMENT: PF: 9 CF: 4 TOTAL: 36	
Average Annual Daily Traffic (AADT): 5000 (north) & 5720 (south) (Reference No. 92080)		CONTRACTOR MAINTENANCE AREA (CMA): 522	

SUMMARY OF SITE INSTRUMENTATION:	INSPECTED BY:
Operable – four slope inclinometers, six standpipes, and six vibrating wire piezometers are located at the crest of the slide. Inoperable – all instruments located in the slide mass. LAST READING DATE: May 23, 2025	Chris Gräpel (KCB) Jorge Rodriguez (KCB) Alex Frotten (TEC) Rishi Adhikari (TEC)

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. Sliding has retrogressed into west (northbound) 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 11m 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 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. June 2023 – KCB installed data loggers with the operable vibrating wire piezometers.

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		Since 2016, the head scarp of the slide has been retrogressing into the ditch. The head scarp has retrogressed approximately 12 m in the last 10 years. Since 2023, no significant changes observed.		X
Erosion	X		Erosion observed on slopes from ditch discharge onto slide area. Riprap armouring placed in 2008 is intact.		X
Seepage	X		Seepage previously observed within the slide. None observed during the 2025 inspection.		X
Culvert Distress		X	N/A – none observed during the 2025 inspection.		X

COMMENTS

General:

- KCB submitted a proposal on March 14, 2023, to perform a hydrogeological site investigation for the site. The scope included a desktop review, hydrogeological field investigation, and preparing a report of our findings (including recommendations). The proposal was approved by TEC, and KCB installed data loggers at the site with the operable VWPs to improve the understanding of seasonal groundwater changes at the site. After the instrument installation, TEC decided to put the project on hold. No further work has been performed.

S004:

- A buried black utility cable is exposed within the slide area.
- Since 2023, there has been minimal change in slope retrogression observed at the site. The head scarp is approximately 11 m to 12 m from the guardrail at the closest point. At the right flank, the head scarp has retrogressed to approximately 16 m from the guardrail.
    - There are three wooden stakes present at the head scarp that are used to estimate the rate of slide retrogression (middle stake is shown in Photo 6). During the 2024 inspection, the south stake was 1.3 m to the scarp, north stake was 0.75 m to the scarp, and the middle stake, where the scarp furthest closest to the highway, was 1.0 m to the scarp (measured during 2025 inspection, Photo 6). There was no change measured at the middle stake between the 2024 and 2025 inspections.
    - The head scarp has impacted the highway's ditch, and it is estimated that 2.5 m to 3.5 m retrogression has occurred into the ditch since 2016.
- The head scarp has retrogressed 3 m to 5 m past the fence line towards the highway. 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 observed in the slide mass during the 2025 inspection.
- In general, the site is well vegetated (Photos 1 through 6). However, bare patches of soil were observed near the top of the slide zone where the slope is steep (Photos 2, 3 and 4).
- During previous inspections, areas of seepage were observed within the slide mass. During the 2025 inspection, the slide mass appeared dry, and no wet areas were observed.
- 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 flank (northwest).
- The creek armouring completed in 2008 is in good condition (Photos 1 through 4, and 7). 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.
- There is a CSP culvert underlying Hwy 2:08. KCB estimated the diameter of the CSP culvert is 500 mm. At the culvert outlet, there is a CSP headwall and the culvert drains into a draw that drains towards Willow Creek (Photo 8). The head wall and culvert appeared to be in good condition during the 2025 inspection.

Maintenance/Repair/Monitoring Recommendations:

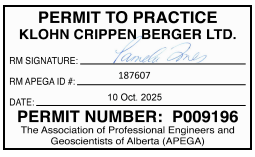
Short-Term:

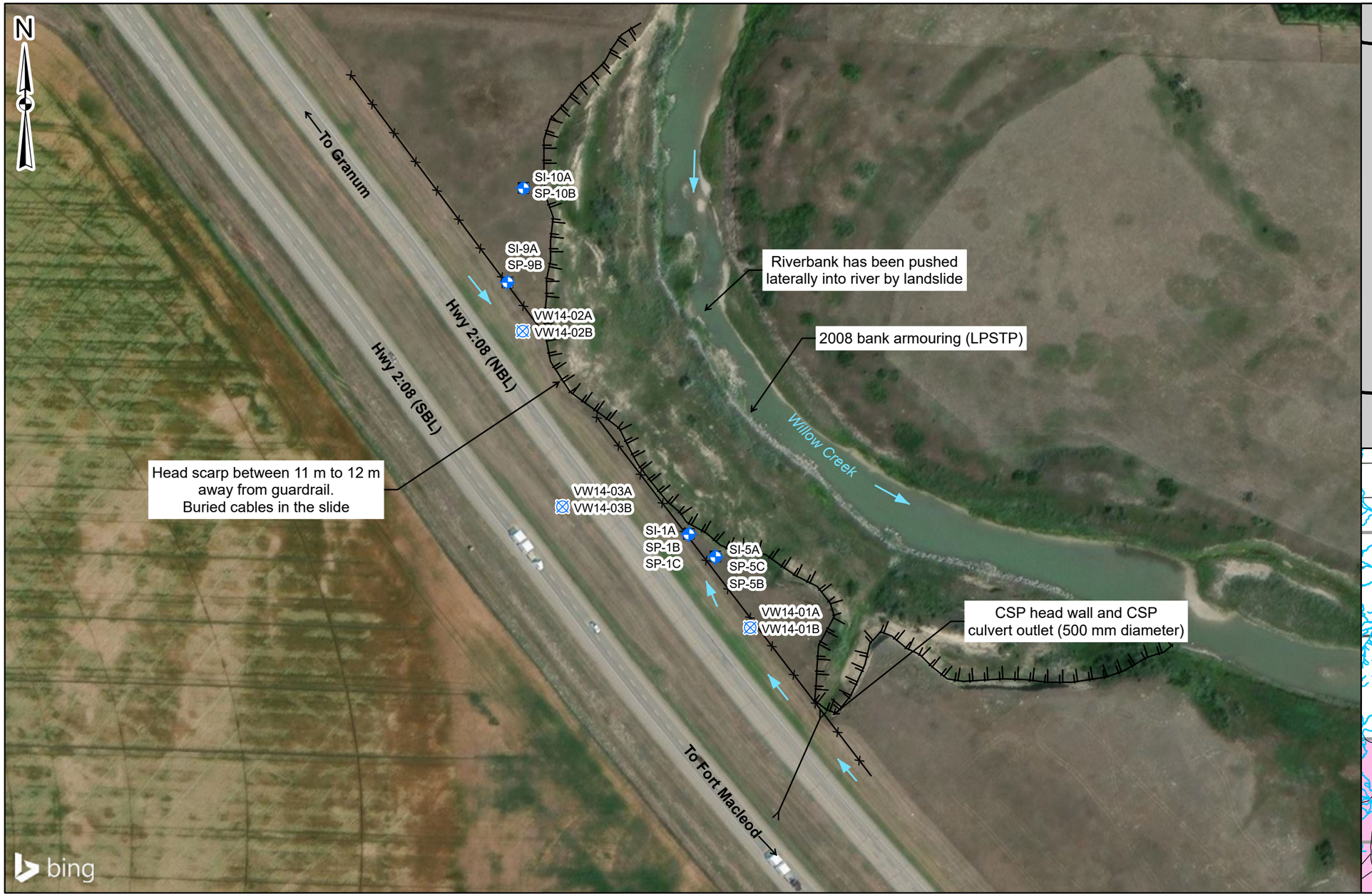
- The site should be regularly inspected by TEC's Maintenance Contract Inspector.
- The operable instruments should continue to be read twice per year (spring and fall) as part of the Southern Region GRMP Section C reading.
- The site should be inspected every two years as part of the Southern Region GRMP Section B inspections.

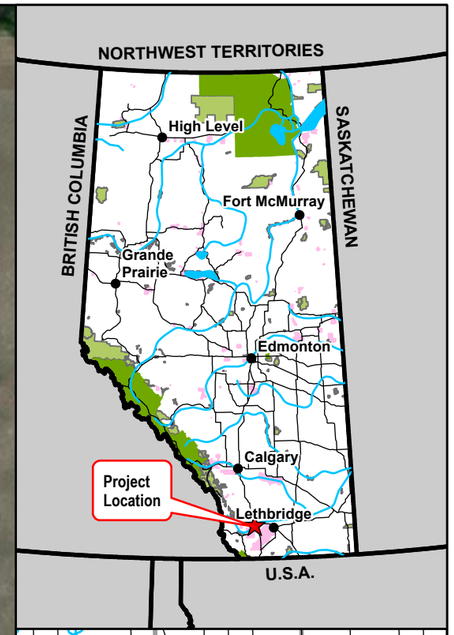
Long-Term:

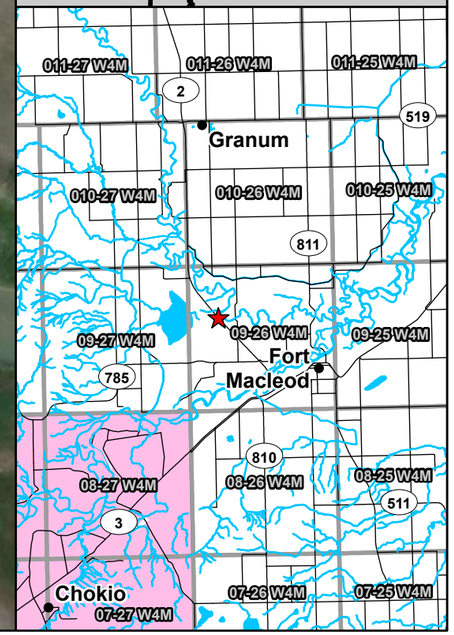
- Complete a hydrogeological analysis of the site to assess the effect of groundwater on the slide movement, and provide repair options for the site, including:
  - The installation of horizontal drains connected to a seepage collection curtain, or
  - the installation of a drainage trench could be constructed (backfilled with clean gravel and wrapped in non-woven geotextile) to improve surface water drainage at the site. The trench could tie into the existing CSP culvert (drains into the draw on the west creek slope) to divert surface water flow away from the slide.

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









Legend

- Slope Inclinometer (SI)
- Standpipe Piezometer (SP)
- Vibrating Wire Piezometer (VW)
- Flow Direction
- Scarp
- Fence
- Culvert

0 100 Metres

NOTES:
1. HORIZONTAL DATUM: NAD83
2. GRID ZONE: UTM ZONE 12N
3. IMAGE SOURCE: MAXAR 2025

CLIENT: Alberta

Klohn Crippen Berger

PROJECT: SOUTHERN REGION GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE: Site Plan
S004 - Willow Creek (North of Ft. Macleod)
Hwy 2:08, km 6.284

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

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

Inspection Photographs

Photo 1 **Aerial photo of the S004 site showing the slide extents, riprap armouring along the west shoreline of Willow Creek, and culvert outlet location (indicated by red arrow). Photo taken May 28, 2025, facing southwest.**

Photo 2 **Aerial photo of the site showing the culvert outlet, natural draw, steep poorly vegetated slopes, and riprap armouring along the west shoreline of Willow Creek. Photo taken May 28, 2025, facing west-southwest.**

Photo 3 **Aerial photo of the south extent of the site showing the steep unvegetated slope, culvert outlet, natural draw, and armoured shoreline. Photo taken May 28, 2025, facing southwest.**

Photo 4 **Aerial photo of the north extent of the site showing the steep unvegetated slope, natural draw, and armoured shoreline. Photo taken May 28, 2025, facing southwest.**

Photo 5 **North extent of the slide. Photo taken May 28, 2025, facing south.**

Photo 6 **Wooden stake installed upslope of the slide (indicated by red circle) is approximately 1 m from the head scarp during the 2025 inspection. Photo taken May 28, 2025, facing north.**

Photo 7 **Riprap armouring along the west shoreline of Willow Creek and downslope of the toe of the side. Photo taken May 28, 2025, facing south.**

Photo 8 **Head wall, culvert outlet, and natural draw. Photo taken May 28, 2025, facing east.**