

SITE NUMBER AND NAME: C055-I and -II Galahad Slide and Riverbank Erosion		HIGHWAY & KM: 861:02, 26.00	PREVIOUS INSPECTION DATE: July 12, 2019	INSPECTION DATE: May 31, 2022
LEGAL DESCRIPTION: 13-14-040-14 W4M	NAD 83 COORDINATES: UTM Northing Easting C055-I 12 5811270 437304 C055-II 12 5811329 437306		RISK ASSESSMENT: C055-I PF: 5 CF: 4 TOTAL: 20 C055-II PF: 8 CF: 3 TOTAL: 24	
AVERAGE ANNUAL DAILY TRAFFIC (AADT): 60 (north) & 60 (south) (Ref No. 70000159)			CONTRACT MAINTENANCE AREA (CMA): 518	

SUMMARY OF SITE INSTRUMENTATION: Operational: One slope inclinometer and one vibrating wire piezometers installed in March 2017. Inoperable: One slope inclinometer and one vibrating wire piezometers installed in 2017. One standpipe piezometer installed in June 2013. LAST READING DATE: September 17, 2021 (no longer reading)	INSPECTED BY: Chris Gräpel (KCB) James Lyons (KCB) Rocky Wang (AT)
PRIMARY SITE ISSUE: C055 – I: Slide affecting gravel road on south slope of Battle River valley. C055-II: Erosion of the outside bank of the Battle River approaching H861:02.	
APPROXIMATE DIMENSIONS: C055-I: Approximately 90 m along H861:02. C055-II: Approximately 200 m along H861:02.	
DATE OF ANY REMEDIAL ACTION: 2013 – Road realigned into backslope ditch adjacent to slide and culvert installed to convey ditch flows. 2021 – C055-I: Material was added at the top of the slide, the guardrail was repaired, and the slope was graded. C055-II: berms were built in the west ditch to divert surface water flows.	

ITEM	CONDITION EXISTS		DESCRIPTION AND LOCATION	NOTICABLE CHANGE FROM LAST INSPECTION	
	YES	NO		YES	NO
Pavement Distress	X		C055-I: Gravel surfaced road has been graded since the previous inspection.		X
Slope Movement	X		C055-I: Guardrail was repaired since the previous inspection.	X	
Erosion	X		C055-II: Riverbank erosion	X	
Seepage		X	N/A – none observed		X
Culvert Distress		X	Cannot see through culvert in south ditch		X

COMMENTS
<p>At C055-I:</p> <ul style="list-style-type: none"> From previous inspections there appeared to be two slope failures below the highway, one upper and one lower. The toe of the upper slide appears to be halfway down slope. The lower slide appears to be rotational or translational, with back tilting of the head of the slide. In 2018, some cracking was previously observed on the backslope above the highway. A depression at the backslope was observed during the 2022 inspection. Trees cleared at crest of natural slope above slide. Timing of tree clearing unknown. A ditch culvert was installed at the south ditch to allow for the road to be shifted to the south, away from the slide. There was erosion observed at culvert inlet.

- In late-2021 the site was repaired. The repair included guardrail replacement, material placement at the edge of the highway beneath where the guardrail was settled, and slope grading from the crest to toe (Photo 1 and 2). During construction, the instrumentation at the top of the slide was removed (one SI and two piezometers) but the instrumentation at the toe (one SI and one piezometer) was not. The SI at the crest of the slope was inoperable (sheared at an approximate depth of 7.7 m at the silty clay till-mudstone bedrock contact) but one of the piezometers was still active before being buried during construction.
- There is erosion near the edge of the north (southbound) lane that should be graded (Photo 3).
- A black cable was observed on the north side of the highway (Photo 4) that ran from the C055-I site to the C055-II site. The cable is indicated by old delineators at the C055-I site and wooden stakes at the C055-II site.

At C055-II:

- Riverbank erosion appears to be progressing at a slow but consistent rate and has progressed towards the edge of the highway since the 2019 inspection (Photo 3).
- Two berms were built in the west (southbound) ditch between the 2019 and 2022 inspections (Photo 3 and 4). KCB and AT believe the berms were built to reduce surface flows from the ditch over the erosion scarp in an effort to reduce the rate of erosion towards the edge of the highway.
- Stakes that were installed in an attempt to track the erosion rate were missing. The stakes may have been removed during mowing or the 2021 construction.

Maintenance/Repair/Monitoring Recommendations:

- C055-I: If the 2021 repair is not successful, a berm should be constructed on lower half of slope to buttress the slope, with finger drains to convey seepage water from the slope face to the toe of the berm; and re-construct upper slope with geosynthetic reinforced fill. The toe berm will require land acquisition after a stability assessment has been completed to assess the amount of land required for the toe berm.
- C055-II: As a short-term measure, AT should install a guardrail. Installing sheet pile walls along the toe of the embankment to reduce the rate of erosion and stabilize the slope. However, vibration caused by installing sheet pile walls may impact sensitive fish species and impact erosion along other locations of the Battle River. Eventually, AT may have to realign this portion of the highway further away from outside bend and erosion zone of the Battle River.

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Chris Gräpel, M.Eng., P.Eng.
Senior Civil Engineer, Associate



Legend

- ▣ Slope Inclinometer (Active)
- ▣ Slope Inclinometer (Inactive)
- ⊗ Vibrating Wire Piezometer (Active)
- ⊗ Vibrating Wire Piezometer (Inactive)
- ⊕ Standpipe Piezometer (Inactive)
- GPS Track (May 31, 2022)
- Flow Direction
- ⊥ Scarp
- ▬ Toe
- ▬ Guardrail
- > Culvert
- ▭ 2021 Repair Extent
- ▭ Slide Extent



NOTES:
 1. HORIZONTAL DATUM: NAD83
 2. GRID ZONE: UTM ZONE 12N
 3. IMAGE SOURCE: 2022 MICROSOFT CORPORATION, 2022 MAXAR CNES, DISTRIBUTION AIRBUS DS

CLIENT

Alberta

Klohn Crippen Berger

PROJECT	CENTRAL REGION GEOHAZARD RISK MANAGEMENT PROGRAM	
TITLE	Site Plan C055 - Galahad Slide Hwy 861:02, km 26.000	
SCALE	PROJECT No.	FIG No.
1:2,500	A05116A02	1

File: \\nt.kohn.com\ProjData\A\EDM\A05116A02\ABT Central Region GRMP\400 Drawings\GIS\IMXD\2022\C055_220613.aprx. Date: Time: Creator: : aharrison

Inspection Photographs

Photo 1 Oblique aerial view of the C055-I site. The instrumentation installed at the top of the slide was buried during the late-2021 repair, and the active instrumentation at the toe of the slide is indicated by the red circle. Minor erosion observed along the north edge of the highway is indicated by the red circle. The south extent of the C055-II site is shown in the background of the photo. Photo taken May 31, 2022, facing east.



Photo 2 **Oblique aerial view of the C055-I site. Photo taken May 31, 2022, facing west.**



Photo 3 Erosion was observed along the north (southbound) edge of the highway. Photo taken May 31, 2022, facing east.



Photo 4 A black cable was observed along the north side of the highway, marked by old delineators. The cable was observed at both the C055-I and-II sites. Photo taken May 31, 2022, facing east.



Photo 5 Aerial photo of the C055-II riverbank erosion. Two berms were constructed in late-2021 near the northeast and southwest extent of the riverbank erosion (indicated by the red arrows) in an attempt to divert flow in the west ditch away from the eroding bank. Photo taken May 31, 2022, facing south.



Photo 6 A length of the ditch near the southwest extent of the C055-II site where a berm was built to divert flow away from the eroding bank. Photo taken May 31, 2022.

