CENTRAL REGION GRMP
SITE INSPECTION FORM

SITE NUMBER AND NAME: **C055-1 and -2 Galahad Slide and Riverbank Erosion**		HIGHWAY & KM: 861:02, 26.00	PREVIOUS INSPECTION DATE: May 31, 2022	INSPECTION DATE: **June 17, 2024**
LEGAL DESCRIPTION: 13-14-040-14 W4M	NAD 83 COORDINATES:		RISK ASSESSMENT:	
		UTM / Northing / Easting		
	C055-1	12 / 5811270 / 437304	**C055-1** PF: 6 CF: 3 TOTAL: 18	
	C055-2	12 / 5811329 / 437306	**C055-2** PF: 7 CF: 2 TOTAL: 14	
AVERAGE ANNUAL DAILY TRAFFIC (AADT): 60 (north) & 60 (south) (Ref No. 70000159)			CONTRACT MAINTENANCE AREA (CMA): 518	

SUMMARY OF SITE INSTRUMENTATION:	INSPECTED BY:
Operable: One slope inclinometer (SI) and one vibrating wire piezometer (VWP) installed in March 2017. Inoperable: One SI and one VWP installed in 2017. One standpipe piezometer installed in June 2013. LAST READING DATE: September 17, 2021 (no longer reading)	Chris Gräpel (KCB) James Lyons (KCB) Tony Penney (TEC) Rocky Wang (TEC)
PRIMARY SITE ISSUE: C055-1: Slide affecting gravel road on south slope of Battle River valley. C055-2: Erosion of the outside bank of the Battle River approaching H861:02.	
APPROXIMATE DIMENSIONS: C055-1: Approximately 90 m along H861:02. C055-2: 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 – C055-1: Material was added at the top of the slide, the guardrail was repaired, and the slope was graded.C055-2: 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	C055-1: Road surface gravel and in good condition.		X
Slope Movement		X	C055-1: Slide was repaired in 2021		X
Erosion	X		C055-2: Riverbank erosion	X	
Seepage		X	N/A – none observed during the 2024 inspection.		X
Culvert Distress		X	Cannot see through culvert in south ditch		X

COMMENTS

C055-1:

- 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. 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 is 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 2021 construction.
- The road surface was graded recently and appears to be in good condition with no signs of slope movement (ground cracks and/or settlement) (Photo 1).
- The south (eastbound) ditch is well vegetated and appears to be in good condition (Photo 2).

- The repaired highway embankment slope appears to be in good condition. The vegetative cover on the highway embankment slope has improved significantly since the 2021 inspection (Photo 3).
- A black cable runs from the C055-1 site to the C055-2 site (observed on the site for several years, previous marked by highway delineators).

C055-2:

- Riverbank erosion appears to be progressing at a slow but consistent rate and has progressed towards the edge of the highway (Photo 3 and 4).
- Two berms were built in the west (southbound) ditch between the 2019 and 2022 inspections. KCB and TEC 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. The vegetation cover on the berms improved between the 2022 and 2024 inspections.
- Three stakes were installed near the midpoint of the site to measure the rate of erosion (Photos 5 through 8). Previous offset stakes appeared to be knocked down by mowing. The offset for each stake (numbered north to south) are as follows:
  - Stake 1: 1.6 m
  - Stake 2: 1.8 m
  - Stake 3: 1.7 m

Maintenance/Repair/Monitoring Recommendations:

General:

- The site should be inspection regularly by TEC's MCI.
- The site should continue be inspected every two years as part of the GRMP Section B Inspections.

C055-1:

- If the 2021 repair is not successful (i.e., movement begins and/or accelerates) a toe berm should be constructed approximately 1/3 to 1/2 the overall slope height to buttress the embankment, finger drains should be installed to improve drainage, and replace the upper portion of the embankment with geogrid reinforced fill.
- The toe berm will require land acquisition. A stability assessment should be completed to assess the amount of land required to facilitate the addition of a toe berm.

C055-2:

- As a short-term measure, TEC should install a guardrail. The installation of an anchored sheet pile wall along the toe of the embankment would reduce the rate of erosion and stabilize the slope. However, vibration and slope disturbance caused by installing sheet pile walls and anchoring may impact sensitive fish species and impact erosion along other nearby locations of the Battle River. Eventually, TEC may have to realign this portion of the highway further away from outside bend and erosion zone of the Battle River. Realigning the highway would require land acquisition.
- KCB can acquire air photos to assess the rate of riverbank erosion.

Use of or reliance upon this instrument of service by the Client is subject to the following conditions:

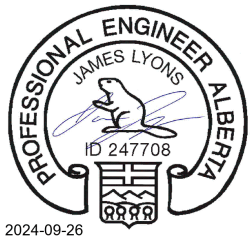
(i) The report is to be read in full, with sections or parts of the report relied upon in the context of the whole report.

(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.



James Lyons, P.Eng.
Civil Engineer

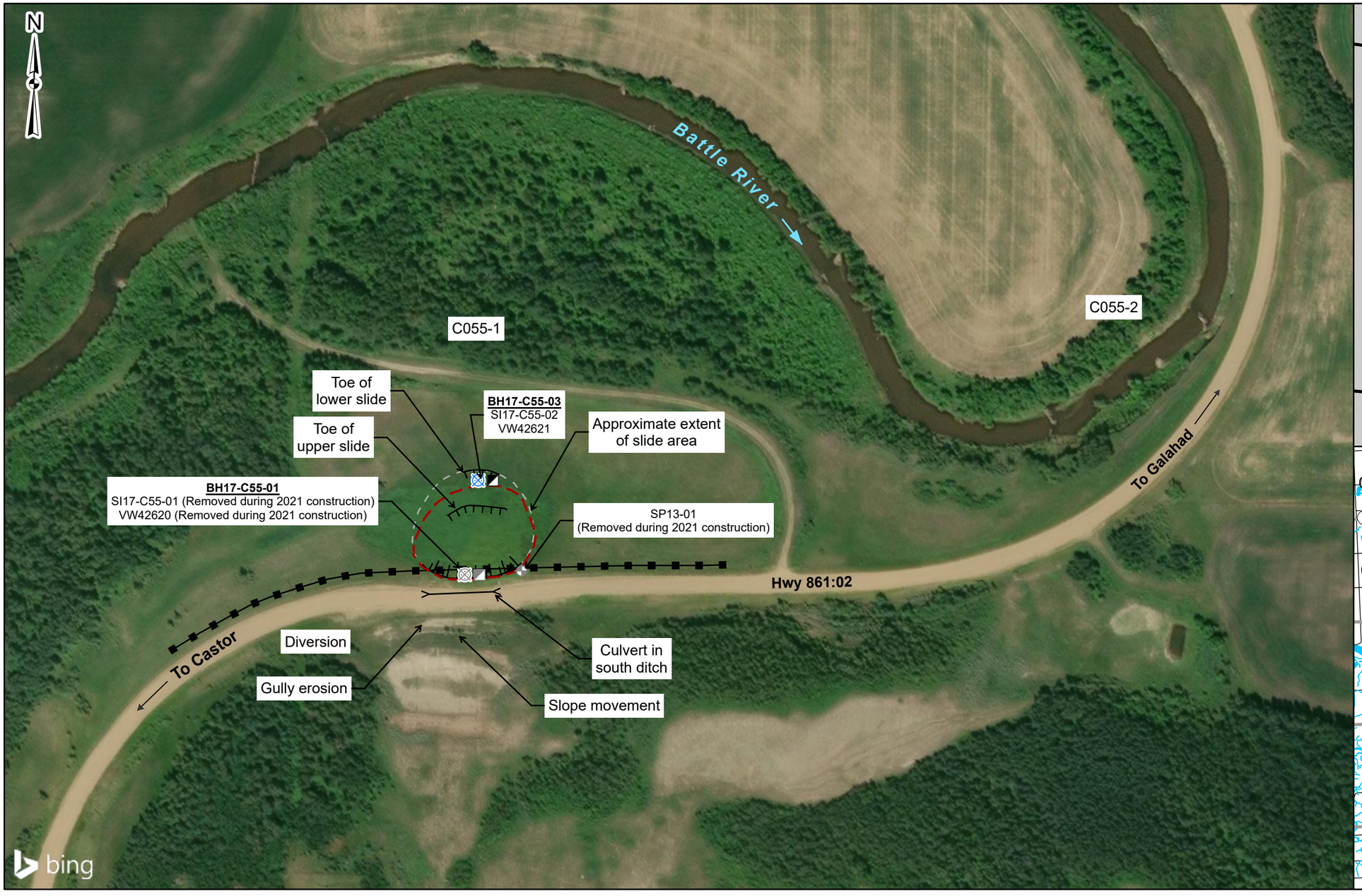
PERMIT TO PRACTICE
KLOHN CRIPPEN BERGER LTD.

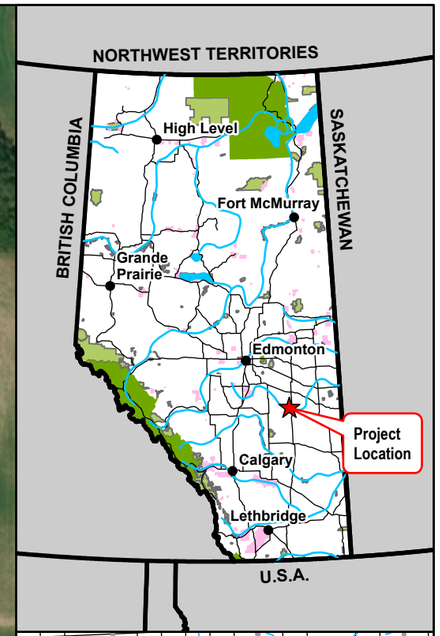
RM SIGNATURE: _____

RM APEGA ID #: 187607

DATE: 26 Sep. 2024

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





Legend

- Slope Inclinometer (Active)
- Slope Inclinometer (Inactive)
- Vibrating Wire Piezometer (Active)
- Vibrating Wire Piezometer (Inactive)
- Standpipe Piezometer (Inactive)
- Flow Direction
- Scarp
- Toe
- Guardrail
- Culvert
- 2021 Repair Extent
- Slide Extent

0 150 Metres

NOTES:
1. HORIZONTAL DATUM: NAD83
2. GRID ZONE: UTM ZONE 12N
3. IMAGE SOURCE: 2024 MICROSOFT CORPORATION, MAXAR, CNES DISTRIBUTION AIRBUS DS.

CLIENT: Alberta

Klohn Crippen Berger

PROJECT: CENTRAL REGION GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE: Site Plan
C055-1 and 2 - Galahad Slide and Riverbank Erosion
Hwy 861:02, km 26.000

SCALE	PROJECT No.	FIG No.
1:2,500	A05116A02	1

File: Z:\AE\DM\A05116A02 ABT Central Region GRMP\400 Drawings\GIS\02_ProFiles\2024\Section B\AT_CentralRegion_SectionB_240627\AT_CentralRegion_SectionB_240627.aprx Date: Time: Creator: : EQuine

Photo 1 **The highway surface upslope of C055-1 is in good condition. Photo taken June 17, 2024, facing east.**

Photo 2 **The south (eastbound) highway ditch is well vegetated and appears to be in good condition. Photo taken June 17, 2024, facing east.**

Photo 3 **The regraded slope of C055-1 (repair completed in 2021) is well vegetated and appears to be in good condition. Photo taken June 17, 2024, facing east.**

Photo 4 **View of the south portion of the C055-2 site. Degree of erosion appears similar between the 2022 and 2024 inspections. Photo taken June 17, 2024, facing south.**

Photo 5 **View of the north portion of the C055-2 site. Degree of erosion appears similar between the 2022 and 2024 inspections. Photo taken June 17, 2024, facing north.**

Photo 6 **Stake 1 (northmost stake) installed approximately 1.6 m from the near-vertical erosion face to monitor rate of erosion. Photo taken June 17, 2024, facing west.**

Photo 7 **Stake 2 (middle stake) installed approximately 1.8 m from the near-vertical erosion face to monitor rate of erosion. Photo taken June 17, 2024, facing northwest.**

Photo 8 **Stake 3 (southmost stake, location indicated by red circle) installed approximately 1.7 m from the near-vertical erosion face to monitor rate of erosion. Photo taken June 17, 2024, facing southwest.**