June 9, 2017

Alberta Transportation
4th Floor, Provincial Building
4920 51 Street
Red Deer, Alberta
T4N 6K8

**Tony Penney, P.Eng.**
**Construction Engineer**

Dear Mr. Penney:

**CON0017608 Central Region GRMP Instrumentation Monitoring**
**Site C069; H583:02, km 35.087 East of Three Hills**
**Section C – 2017 Spring Readings**
**DRAFT**



# 1 GENERAL

Two pneumatic piezometers (PN037071 and PN037072) were read at geohazard site C069 on May 11, 2017 by Ms. Courtney Mulhall, E.I.T. and Lekan Mitchell, E.I.T. of Klohn Crippen Berger Ltd. (KCB). The site is located on Hwy 583, km 35.087, approximately 11 km east of Three Hills, Alberta. The site coordinates are 52°42.438' N, 113°5.184' E (NAD 83). A site plan is presented in Figure 1.

The geohazard at C069 is a slope failure along the north side of Hwy 583 that predominately affects the westbound lane. Following a slide in July 2016, the slope was excavated below the failure surface and reconstructed with geosynthetic reinforced compacted granular fill that was keyed into the native soil in November 2016. Drainage pipe was also installed in the granular fill. Previous remedial actions include regular patching.

In October 2016, KCB conducted a geotechnical site investigation at C069. Drilling was completed by Mobile Augers and Research Ltd. Based on the findings of the investigation, the stratigraphy was determined to consist of fill (granular overlying medium plastic clay) overlying medium plastic clay and medium plastic silty clay till. It also appears that organics materials were not stripped prior to fill placement.

## 1.1 Instrumentation

Instrumentation installation details are tabulated in Table 1.1. Instrument locations are shown in Figure 1.



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In October 2016, KCB installed two pneumatic piezometers (PNs) (PN037071 and PN037072) to monitor groundwater conditions. The PNs were installed in the same borehole, and are recessed below ground surface in a flush-mounted head box in the westbound lane of Hwy 597.

The PNs were read using a Slope Indicator Pneumatic Pressure Indicator (Model No. 256).

**Table 1.1 Instrumentation Installation Details**

| Instrument ID | Coordinates[1] | | Date Installed | Stick-up (m) | Depth Below Ground Surface (m) | Condition |
|---|---|---|---|---|---|---|
| | Northing (m) | Easting (m) | | | | |
| PN037071 | 5730545 | 355875 | Oct. 04, 2016 | N/A | 7.9 | Operational |
| PN037072 | 5730545 | 355875 | Oct. 04, 2016 | N/A | 4.0 | Operational |

[1]Coordinates were determined during installation with a handheld GPS.

# 2 INTERPRETATION

## 2.1 General

For PN037071 and PN037072, the water level data was plotted relative to ground surface elevation and each instruments tip elevation. The piezometer plots are appended in Appendix I, and discussed in the following subsections.

## 2.2 Interpretation of Monitoring Results

A summary of the instrumentation data is provided in Table 2.1.

Previous assessments of the slope failure suggest that movement is likely in response to periods of heavy or prolonged rainfall. In July 2016, after a period of heavy rainfall, movements along the north side of the highway resulted in the westbound lane of Hwy 583 being closed. Subequently, the site was repaired in November 2016. No instrumentation is installed onsite to monitor for movement in the embankment, but the pavement did not show signs of distress or cracking at the time of the spring reading (May 11, 2017). However, the asphalt patch appears to have settled.

KCB understands that historic rural road construction practices in Alberta often included placing poor quality and/or uncompacted fill beneath the slopes of the embankment and also did not include foundation preparation. As a result, there is a relatively high likelihood that the embankment slopes are weaker due to lack of compaction, and more susceptible to failure due to weak layers (e.g., soft and/or organic soils) left in the foundation.

The water level recorded in PN037071 has decreased 0.5 m since Novemeber 2016, and is currently 6.6 m below ground surface. The water level recorded in PN037072 has decreased 0.8 m since Novemeber 2016, and is currently 2.5 m below ground surface.

## Table 2.1 PN Readings Summary

| Instrument ID | Date Installed | Date of Previous Reading | Tip Depth (mbgs[1]) | Ground Surface El. (m) | Previous Water Level (mbgs[1]) | Current Water Level (mbgs[1]) | Change from Previous Reading (m) |
|---|---|---|---|---|---|---|---|
| PN037071 | Oct. 04, 2016 | Nov. 06, 2016 | 7.9 | 818.0 | 6.1 | 6.6 | -0.5 |
| PN037072 | Oct. 04, 2016 | Nov. 06, 2016 | 4.0 | 818.0 | 1.8 | 2.5 | -0.8 |

[1]meters below ground surface (mbgs)

# 3 RECOMMENDATIONS

## 3.1 Future Work

All operational instrumentation should continue to be read.

The site should continue to be inspected by the Maintenance Contract Inspector (MCI) and as part of the annual GRMP inspection program (Section B).

## 3.2 Instrument Repairs

None required.

# 4 CLOSING

This report is an instrument of service of Klohn Crippen Berger Ltd. The report has been prepared for the exclusive use of Alberta Transportation for the specific application to the Central Region GRMP (Contract No. CON0017608). The report's contents may not be relied upon by any other party without the express written permission of Klohn Crippen Berger. In this report, Klohn Crippen Berger has endeavoured to comply with generally-accepted professional practice common to the local area. Klohn Crippen Berger makes no warranty, express or implied.

This is a draft report only and we solicit your review and comments within 4 weeks of submission. Upon issue of the final report, we request that all draft reports be destroyed or returned to Klohn Crippen Berger Ltd. This draft report should not be relied upon as a final document for design and/or construction.

Please contact the undersigned if you have any questions or comments regarding this report.

**KLOHN CRIPPEN BERGER LTD.**

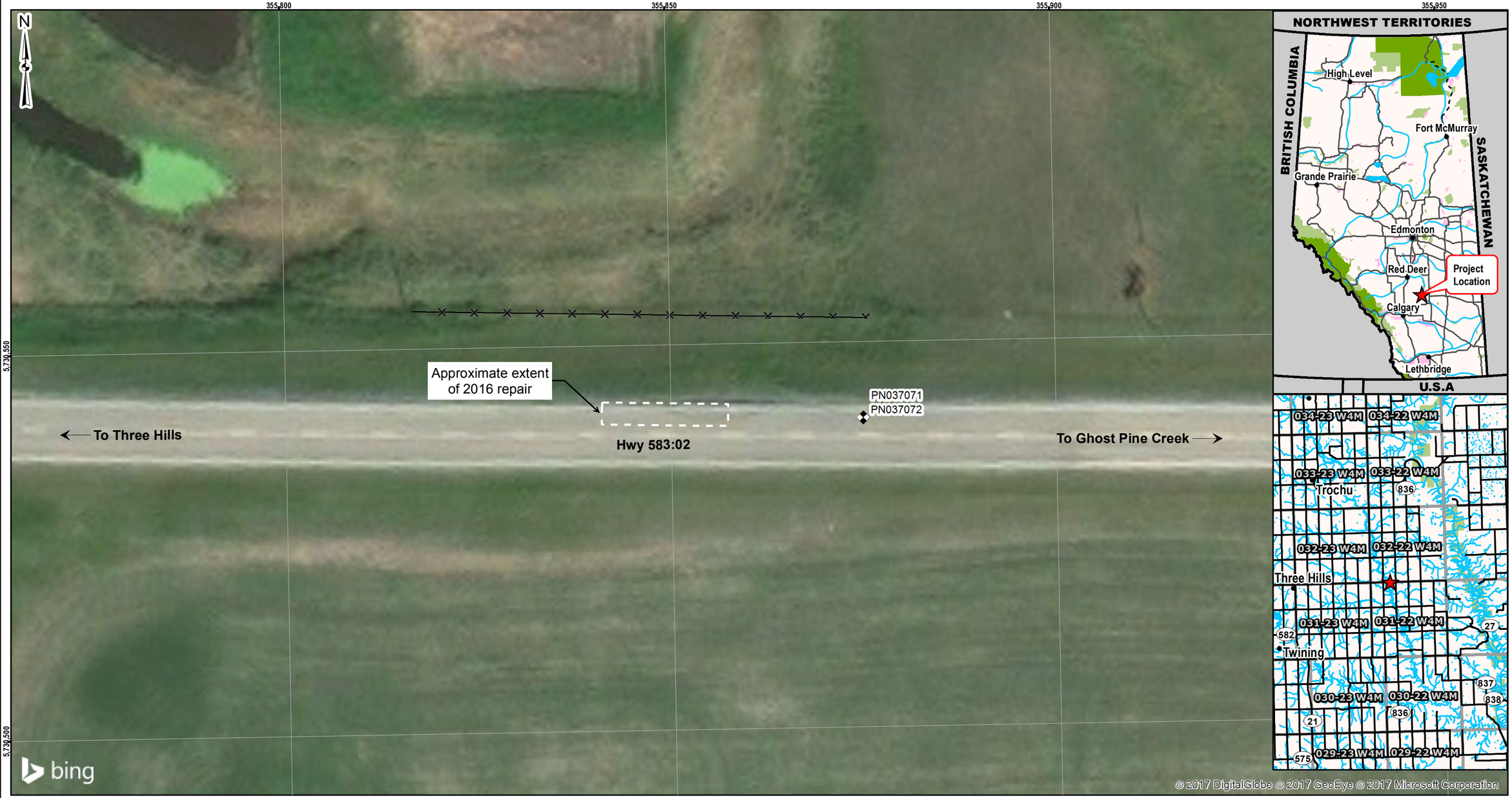


Chris Gräpel, M.Eng., P.Eng.
Senior Civil Engineer, Associate

CM:kc

**Attachment**
Figure
Appendix I Instrumentation Plots

# FIGURE




**Legend**

- Fence
- Pneumatic Piezometer (PN)

Metres
0 20

NOTES:
1. HORIZONTAL DATUM: NAD83
2. GRID ZONE: UTM Zone 12N
3. IMAGE SOURCE: Bing Maps 2016, Microsoft Corporation. Image dated August 2013
4. Location of instruments is approximate (not surveyed)

CLIENT: Alberta Transportation

Klohn Crippen Berger

PROJECT: CENTRAL REGION GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE: Site Plan
C069 - East of Three Hills
Hwy 583:02, km 35.087

| SCALE | PROJECT No. | FIG No. |
|---|---|---|
| 1:500 | A05115A02 | 1 |

Time: 16:35:39 PM
Date: June 06, 2017
File: Z:\AEDM\A05115A02 ABT Central Region GRMP\400 Drawings\2017\3. Section C Instrumentation\C069\170601 C69.mxd

# APPENDIX I

## Instrumentation Plots