THURBER ENGINEERING LTD.
GEOTECHNICAL ▪ ENVIRONMENTAL ▪ MATERIALS

December 7, 2006 15-85-32

Alberta Infrastructure and Transportation
North Central Region
Room 223, Provincial Building
4709 – 44 Avenue
Stony Plain, Alberta
T7Z 1N4

Attention: Mr. Randy Shaul

NORTH CENTRAL REGION GEOHAZARD ASSESSMENTS
(STONY PLAIN AREA)
CALL-OUT FOR SLIDE ON HWY 825:02 (NC54)
3.4KM NORTHEAST OF FORT SASKATCHEWAN, ALBERTA

Dear Sir:

This report presents the results of a call-out for the above noted site located on Highway 825:02 about 3.4 Km northeast of Fort Saskatchewan, Alberta. The work was undertaken by Thurber Engineering Ltd. (Thurber) in partial fulfillment of our Geotechnical Services Contract (CE142/2006) for Geohazard Assessment, Inspection, Monitoring and related work with Alberta infrastructure and Transportation (AIT). Mr. Don Proudfoot, P.Eng. and Mr. Mohammed Sakr P. Eng. of Thurber conducted the inspection on June 7, 2006 in the presence of Mr. Roger Skirrow, P.Eng. Mr. Randy Shaul and Mr. Rick Kowalik, all of Alberta Infrastructure and Transportation (AIT). Mr. Kowalik and Mr. Shaul made the request for the call-out.

1. BACKGROUND

It is understood that this is a new site, with no history of past instability. The guardrail posts were replaced in September 2002 and no signs of sliding were observed at that time. It is understood that water overtopped the road at this section of highway in the spring of 2005 due to a frozen condition that blocked the culvert. The slide was first observed in fall of 2005.

2. OBSERVATIONS

A sketch plan and approximate slope cross-section of the slide area are provided on Figure NC54-1, attached. Selected photos of the site are also attached. At the location of the slide area, the highway is 19 m wide and paved. The embankment is approximately 5.5 m high with a side slope angle of about 27° to the horizontal (approximately 2.0H:1V). During the site reconnaissance the following additional observations were made:

- Longitudinal paving joint cracks were observed along the middle of east bound of the road pavement.
- The guard rail installed in 2002 along the east side of the highway was about 70 m long and was straight.
- The creek is oriented approximately parallel to the east of the highway and bends sharply to the west passing through a 1200 mm CSP culvert. The creek was about 1.5 to 2 m wide. A 0.3 m deep scour was observed at the culvert outlet. No riprap was observed at the culvert outlet. Scour and erosion signs were observed in the east bank of the creek at the bend location.
- A slide scarp located to the north side of the existing 1200 mm CSP culvert was noticed. The slide scarp was about 3.5 m wide at the top of slope and about 15 m wide at the base of the slope at the creek. The backscarp of the slide was located at the edge of the paved road surface extending about 1 m in width. The toe of the shallow slide was located at about 11 m from the edge of the paved road at the creek bank. Sandy silt soil was noted in the slump area.
- Some fallen trees were observed along the creek flood plain as a result of beaver activity.

3. ASSESSMENT

The highway embankment failure appears to be due to failure of a relatively steep embankment triggered by erosion at the toe of the slope. The slide appears to be a shallow slide due to the presence of sandy silt soil. Beaver activity might have caused the lower portion of the slope to become saturated and contributed to the sliding. The slide may continue to grow in size and retrogress into the highway if remedial measures are not carried out.

4. RISK LEVEL

Based on the AIT Risk level rating system, the risk level to the highway is 36. This risk level was based on a Probability Factor (PF) of 9 (active with moderate steady rate of ongoing movement) and a Consequence Factor (CF) of 4 (moderate to high fill where partial closure of the highway could be the result of slide occurrence).

$$\text{Risk (36)} = \text{PF (9)} \times \text{CF (4)} \qquad \text{[Eq. 1]}$$

5. RECOMMENDATIONS

The slide is currently progressing at a slow rate and is not affecting the roadway at the present time. Therefore, the immediate action would to continue to visually monitor the slide on a regular basis. Due to the risk that the slide could continue to move and extend into the road surface or grow in length to the west, further geotechnical investigation should be carried out to determine the existing soil conditions and extent of the failure zone and develop suitable remedial options.

The possible long-term solutions are as follow;

- Option 1 - construct a short driven Steel “H” pile wall about 5 m in length with timber lagging to retain the edge of the highway and place heavy rip rap to protect a 20 m long section of the toe of the slope from creek erosion.

- Option 2 – excavate the slide zone and rebuild the embankment with a gabion wall at the toe of the slope.

- Option 3 – excavate the slide zone and rebuild the embankment slope with gravel reinforced with geogrid layers, complete with hard armour such as heavy rip rap or a product like Delta Lock along the toe of the slope.

Live willows should be planted in the rip rap or gabion baskets to enhance fish habitat.

It should be noted that for either of the solutions, a partial closure of the highway will be required during the construction period. However, Options #2 and #3 will also require excavation to about the centerline of the highway and paving the highway as part of the embankment reconstruction

The ball park cost of the work for either of the options, excluding engineering costs is $100,000 to $150,000.

6. FURTHER GEOTECHNICAL STUDY

We recommend drilling two test holes about 10 m to 12 m deep complete with standpipe piezometers at the proposed locations as shown on Figure NC54-1 to identify the subsoil stratigraphy and groundwater conditions for the design remedial options. A site survey will also be required for design.

7. CLOSURE

We trust that the above information is sufficient for your present requirements. However, if you have any questions or require any additional input please do not hesitate to call us.

Yours truly,
Thurber Engineering Ltd.
Don Proudfoot, P. Eng.
Review Principal

Mohammed Sakr, P.Eng.
Project Engineer
/dw

cc Mr. Roger Skirrow, P.Eng.
Director of Geotechnical Services, AIT

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SITE SKETCH PLAN AND CROSS SECTION

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SITE PHOTOS

Photo 1 - Looking north at longitudinal crack along pavement, June 7, 2006.

Photo 2 - Looking east at slide zone, June 7, 2006.

Photo 3 - Scour at the culvert outlet, June 7, 2006.

Photo 4 - Erosion along the east bank, June 7, 2006.

Photo 5 - Looking west at toe of slide zone, June 7, 2006.

Photo 6 - Scarp to the east of the creek, June 7, 2006.

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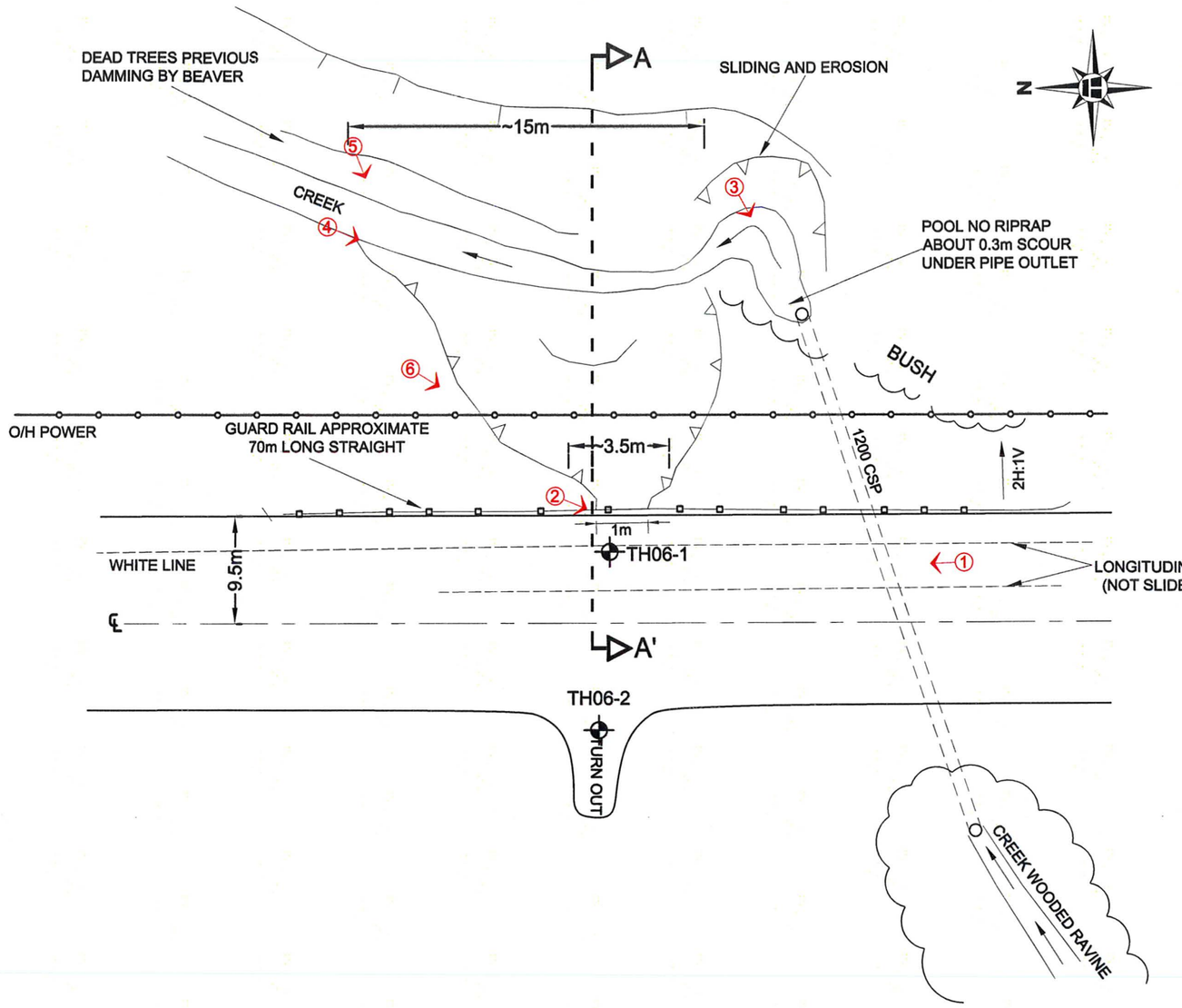

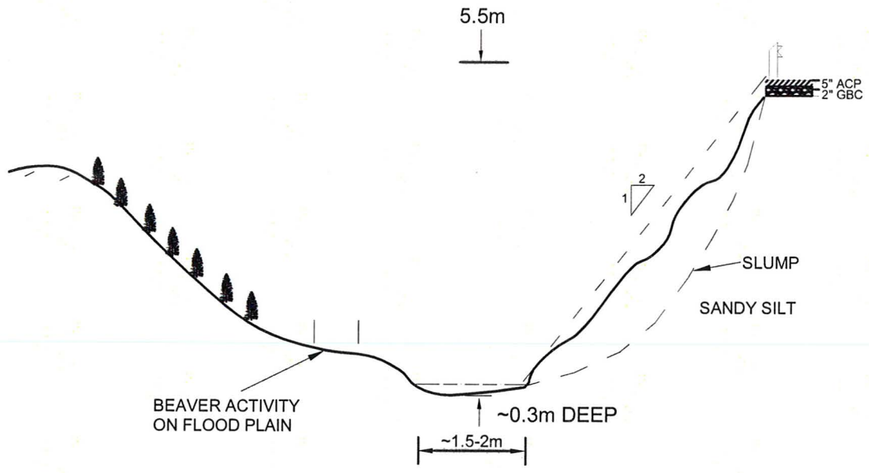

SECTION A--A'

NOTE:
FEATURE LOCATIONS ARE APPROXIMATE.

LEGEND

- PROPOSED TEST HOLE LOCATIONS
- ① PHOTO NUMBER AND DIRECTION

THURBER PROJECT #15-85-32

ALBERTA INFRASTRUCTURE AND TRANSPORTATION

APPROXIMATE SITE PLAN AND SECTION
HWY 825:02 NORTH OF FORT SASKACHEWAN

HWY 825:02 ~3.4km NORTH OF FORT SASKATCHEWAN, AB

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ENGINEER:	DRAWN:	APPROVED:
MMS	JW	DWP
DATE:	SCALE:	DRAWING No.
AUG. 2006	NTS	FIGURE NC54-1