THURBER ENGINEERING LTD.
GEOTECHNICAL ▪ ENVIRONMENTAL ▪ MATERIALS

November 25, 2005 File: 15-85-11

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

Attention: Mr. Michael Baik

NORTH CENTRAL REGION GEOHAZARD ASSESSMENT CALL OUT
NC38 HWY 47:06 EMBARRAS CREEK
2005 ANNUAL INSPECTION REPORT

Dear Sir:

This letter documents the 2005 annual inspection undertaken by Thurber Engineering Ltd. (Thurber) for the above noted site located approximately 2.6 km south of Robb, Alberta on Hwy 47:06 (km 4.2). The inspection was undertaken in partial fulfillment of our Geotechnical Services for Geohazards Assessment, Instrumentation Monitoring and Related Work contract (CE046/2004) with Alberta Infrastructure and Transportation (AIT).

The inspection was undertaken on June 1, 2005 by Mr. Don Law, P.Eng. of Thurber. The reconnaissance was carried out in the presence of Mr. Roger Skirrow, P.Eng. and Mr. Fred Cheng, P.Eng. of AIT.

1. BACKGROUND

The site is located approximately 4.2 km northeast of the southwest end of the control section (km 4.21), and about 2.1 km northeast of a bridge over Embarras Creek. The legal site description is 11-49-21-W5M.

Thurber last visited the site in June 2004 and the site condition at that time is described in our Part E (Call-out) assessment letter in the site binder.

2. RESULTS OF THE 2005 INSPECTION

The roadway surface, side slope and adjacent creek bank at the site were inspected during the site reconnaissance. Features observed at the site are shown on the site plan, Figure NC38-1 (Appendix F), and selected photographs taken during the site visit are attached. In addition, cross-sections through the

stream bank slope are presented on Figure NC38-2. Cross-Section A-A' provides an approximate slope profile through the slump area, and Cross-Section B-B' shows the typical slope configuration away from the slump area.

No signs of distress (cracks, depressions) were observed on the asphalt pavement surface or in the gravel side slope adjacent to the pavement in this area. The creek was about 0.4 m deep at the time of the site reconnaissance, which was similar to the level observed in June of 2004.

The erosion noted on the creek bank and the condition of the main slump and tension crack observed during the initial call out undertaken by Thurber in June of 2004 have not changed significantly since that time.

As noted in the 2004 call out assessment, the tension crack observed between the slump and the highway is linear and appears coincident with the abandoned Telus line, located between the highway surface and the top of bank as shown on the site plan. The Telus line had been abandoned in place since the last site visit, and a new surface line was present at the time of the site reconnaissance.

A new guardrail had been installed at the edge of pavement between the 2004 and 2005 site visits.

3. ASSESSMENT

As noted in last year's assessment, the cause of the slumping in the creek bank is erosion resulting from stream flow attack on the west bank of the creek. This is a natural occurrence as part of ongoing meander development of Embarras Creek. The erosion and potential for bank slumping is likely most prevalent during and after high flow events when the stream flow is fastest and the banks are saturated with water. The mechanism for slump development is likely a combination of the removal of toe support for the slope by erosion, combined with high water levels remaining in the soil after the creek level has dropped.

The slumping has not progressed since the previous site visit last year, and is not affecting the highway at the present time. Development of the slump toward the highway could however occur in the future.

4. RISK LEVEL

A risk level of 12 is considered applicable to the roadway at this location, based on a Probability Factor of 6 (inactive with moderate to high probability of remobilization) and a Consequence Factor of 2 (possibly affecting use of roadway and safety of motorists, but not requiring closure of the road). This risk level has

been reduced from a value of 18 provided in the 2004 assessment due to the lack of signs of active movement observed.

5. RECOMMENDATIONS

The erosion encountered at the site may adversely affect the highway in the future and hence intervention is recommended to stop the erosion.

As provided in the 2004 call-out assessment, erosion protection may consist of about 0.5 m to 1.0 m dimension rip rap placed at an outer slope angle of 2H:1V (27° to the horizontal) along the west creek bank over a length of about 30 m. Prior to placement of the rip rap, the slope should be trimmed to remove vegetation and topsoil and regraded to an angle of 1.5H:1V. A non-woven geotextile fabric should be placed on the slope to provide separation between the soil and the rip rap. The work should be undertaken during low flow to minimize the work required in the water, however fisheries windows may recommend that the work be conducted in midsummer. DFO approval will be required prior to construction.

Alternatively, stream bank stabilization utilizing alternative methods may be considered for this site. This may consist of the use of natural materials available on-site (such as deadfall, stones, etc.) combined with willow/poplar cuttings to create erosion protection. A benefit to these methods is that fish habitat creation can be incorporated into the works. Some recent (September 2005) experience with these techniques has been gained at the Pembina River Banks site on Hwy 744:02, however such methods are still considered experimental and hence the risk associated with their performance needs to be taken into consideration when selecting the appropriate remedial method.

Horizontal realignment of the roadway away from the affected area was also considered, however this is not considered a cost effective solution given the likelihood of success with erosion protection at relatively low cost.

It is recommended to continue monitoring the site on an annual basis as part of the Geohazards Assessment program prior to implementation of remedial measures. In addition, the MCI should observe the site as they are passing through the area. If regression of the slump toward the road occurs at a faster rate than observed in the past, earlier intervention may be required. Continued monitoring after erosion protection is in place should be undertaken to confirm the effectiveness of the remedial work.

6. CONSTRUCTION COSTS

The expected construction cost for the hard armour solution (i.e. rip rap erosion protection over a 30 m length of creek bank as described above) will be in the order of $30,000 to $40,000. The cost for an alternative streambank stabilization solution may be less, depending on the type of application chosen and the availability of experienced contractors to undertake the work.

It is expected that the hard armour solution can be undertaken by the Maintenance Contractor for the area, under the direction of the MCI. Rip rap may be sourced from the local quarry and potentially could be delivered by rail to a point near the site. Alternative sources/delivery methods (such as truck haul) should be evaluated to determine the most cost effective method.

Consideration may be given to undertaking the work in conjunction with similar erosion protection work required on the Pembina River Banks (Hwy 734:22, NC28) or other work in the area, which may result in cost savings.

7. CLOSURE

We trust this assessment meets with your needs at this time. Please contact the undersigned should questions or concerns arise.

Yours very truly,
Thurber Engineering Ltd.
D. Papanicolas, P.Eng.
Review Principal

D.J. Law, P.Eng.
Principal, Project Engineer
/slp

Attachments

N

TREES

TREES

BEAVER DAM

FLOOD PLAIN

EMBARRAS CREEK

WATER'S EDGE

ISLAND

TREES

B

A

TELUS LINE *(LOCATION APPROX.)

** ABANDONED
TELUS LINE (LOCATION APPROX.)

GRASSED AREA

GRAVEL SIDE SLOPE

MAIN SLUMP (6m LONG)

B'

A'

NO CHANGE IN 2005

TENSION CRACK (1.8 m LONG)

EDGE OF ASPHALT PAVEMENT

HWY 47:06 ℄

LEGEND

PATH OF STRONG CURRENT

NOTES:

* TELUS LINE NOT SHOWN IN VICINITY OF SLUMP FOR CLARITY. LINE MAY BE CONCIDENT WITH TENSION CRACK

** *SUBSURFACE LINE ABANDONED. NEW LINE PLACED ON SURFACE.*

2005 FEATURES/NOTES IN RED

0 5 10 15 20

SCALE (m)

TREES

HWY 47:06 - km 4.2 - EMBARRAS CREEK (NC38)

11-49-21-W5M

SITE SKETCH PLAN

SCALE 1:400 (APPROX.)

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FIGURE NC38-1

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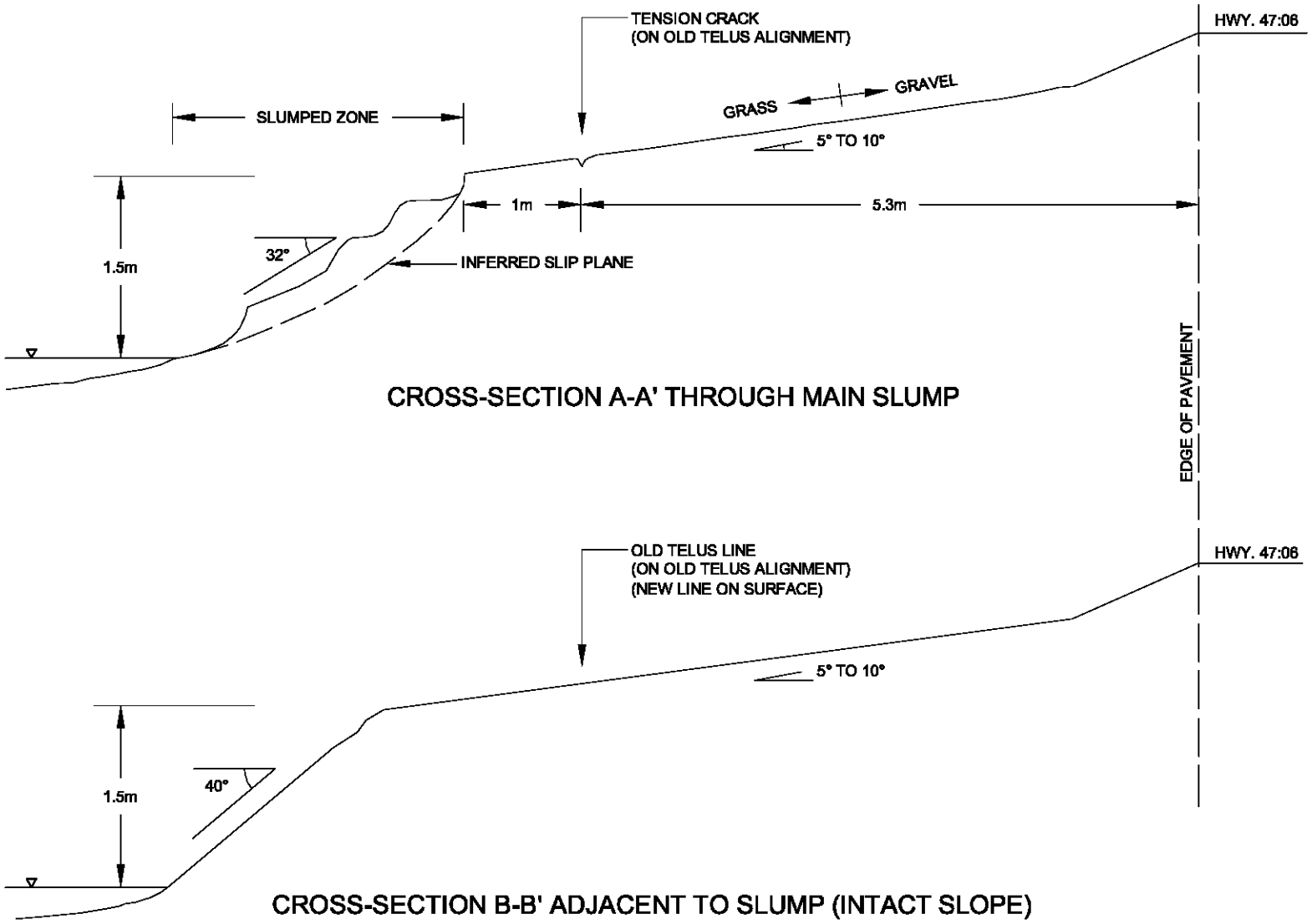

CROSS-SECTION A-A' THROUGH MAIN SLUMP

CROSS-SECTION B-B' ADJACENT TO SLUMP (INTACT SLOPE)

HWY 47:06 - km 4.2 - EMBARRAS CREEK (NC38)

11-49-21-W5M

CROSS-SECTIONS

SCALE N.T.S.

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FIGURE NC38-2

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Photo 1 - Looking north along west bank. June 1, 2005

Photo 2 – Looking north along Telus alignment. June 1, 2005

Photo 3 – Looking north along edge of pavement. June 1, 2005