



September 29, 2008

CG25277.B

Alberta Transportation
2nd Floor, 803 Manning Road NE
Calgary, AB T2E 7M8

Attn: Mr. Ross Dickson

**Re: Southern Region Geohazard Assessment Program
Site S1 – Jumpingpound Creek, Highway 1:04
2008 Annual Inspection Report**

This letter documents the 2008 annual site inspection of Site S1 – Jumpingpound Creek, on Highway 1:04, west of Calgary, AB and 6 km west of the interchange between Highway 1 and Highway 22. Highway 1 is a four lane, twinned highway in this area and this site consists of the abutment slopes of the eastbound and westbound bridges and adjacent areas where the highway crosses the Jumpingpound Creek valley.

AMEC Earth & Environmental (AMEC), a division of AMEC Americas Limited, performed this inspection in partial fulfillment of the scope of work for the supply of geotechnical services for Alberta Transportation's (AT's) Southern Region (AT contract CE061/08).

The site inspection was performed on June 19, 2008 by Mr. Andrew Bidwell, P.Eng., and Mr. Bryan Bale, EIT of AMEC in the company of Mr. Roger Skirrow of AT.

BACKGROUND

A general description of the geohazard conditions at this site along with the site geological setting and chronology of previous events, investigations, monitoring and repair work were provided in the Geotechnical File Review (Section A of binder) and summarized in previous annual inspection reports¹.

The geotechnical monitoring of this site was initiated when slope instability in the east abutment of the westbound lane bridge was first noted by AT in December 1986. Site assessments, installation and monitoring of slope inclinometers has been conducted at this site since early 1987. No significant geotechnical issues or repairs at this site have been reported since that time.

¹ AMEC report "Southern Region Geohazard Assessment, Annual Assessment Report, 2007", project number CG25263, submitted to AT on November 6, 2007.

SITE OBSERVATIONS

Key observations regarding changes in the site conditions since the 2007 inspection are summarized below. Please also refer to the attached site plan and photos.

- The erosion along the east bank of the creek channel upstream of the bridges that was first noted during the 2007 site inspection was noted again in 2008. The overall appearance of the bank erosion was similar to that in 2007 with an approximately 50 m long segment of the east bank along the outside of a bend in the creek channel exposing an approximately 1 to 1.5 m near-vertical soil bank. Photos S1-1 and S1-2 show views of this area. The amount of bank erosion in the past year could not be determined quantitatively from the visual inspection, but the area had the visual appearance of the bank having shifted up to 1 to 2 m in places in recent years. At the time of the site inspection, the majority of the creek flow was within a west sub-channel away from the erosion area, however the east sub-channel across the erosion area was also carrying flow and it appeared that during peak flows the east bank in this area would be prone to bank erosion and eastwards channel shifting towards the toe of the overall east valley slope.
- The localized oversteepening and surface erosion of the exposed shale bedrock beneath the east bridge abutments that was noted in previous site inspections did not appear to have changed significantly since 2007. Photo S1-3 shows this area.
- The following site features were noted again but did not appear to have changed significantly since the 2007 inspection:
 - The erosion in the west abutment slope of the eastbound land bridge.
 - The slumping at the crest of the east creek valley slope, downstream of the westbound lane bridge, that has been noted in each annual inspection since 2000 did not appear to have worsened significantly since the previous assessments. Photo S1-4 shows this area.

Also, the May 2008 reading of the slope inclinometer installed adjacent to the east abutment of the eastbound bridge showed continued movement in the uppermost 2 m of the SI.

ASSESSMENT

There does not appear to be any significant, active slope instability affecting the bridges at this time. Monitoring of SI #1A up to the spring of 2004 (when SI #1A became unreadable due to a blockage in the casing at a shallow depth – inferred to be debris falling into the open casing) did not show any significant movement in the east abutment slope for the westbound bridge up to a

depth of 15 m (comparable to the estimated height of the slope). Monitoring of SI #3A up to the spring of 2008 has not shown any significant movement in the east abutment for the eastbound lane bridge. The ongoing movement in the uppermost 2 m of SI #3A is judged to be of little concern with respect to the abutment stability. There have not been any visual indications of retrogressive landsliding seated in the bedrock during the annual inspections and no reports of problems with settlement or misalignment of the bridge decks in recent years.

The apparently ongoing and possibly worsening erosion of the east (right) creek bank a short distance upstream of the bridges is of concern because if the creek channel shifts significantly the creek flow may be able to erode or outflank the armouring along the toe of the east bridge abutment slope. This could possibly lead to bank erosion and loss of ground along the east bank below the bridges themselves, in turn possibly leading to scouring around the east piers of the bridges. This could occur over the next few years, but is not expected to happen in the short term. A hydrotechnical review of the channel alignment and flow conditions would help to assess this risk.

The geotechnical risks to the bridge abutments from the surface erosion in areas of concentrated runoff from the bridge decks and abutment slopes are still present but do not appear to have significantly changed or worsened in recent years. It may be that the ongoing maintenance of the bridges, presumably including clearing of accumulated soil and gravel debris in the drainage gutters below the bridge decks, is sufficient to ensure that surface runoff from the bridge decks is properly conveyed down to the creek elevation without ongoing erosion on the abutment slopes.

RISK LEVEL

The current recommended Risk Level for this site, based on AT's general geohazard risk matrix, is as follows:

- Probability Factor of 3 based on the continued lack of movement being detected in the remaining SI and the continued lack of visual evidence of active slope instability affecting the bridges.
 - The recommended value is unchanged from the 2007 inspection, after a reduction from the value of 4 recommended in 2006 and earlier.
 - This probability factor is also judged to be appropriate for the possibility of east bank erosion to encroach into the armoured area along the east bank below the bridges, i.e. not expected in the next few years however it cannot be entirely ruled out.
- Consequence Factor of 6 based on the potential for a reactivation of the 1980's slope instability and/or a worst-case scenario where new erosion and channel shifting along the east bank could lead to a scour hole in the creek channel adjacent to the east pier of

one of the bridges that could affect one of the bridge abutments, and possibly require at least temporary closure of one of the bridges on this very busy highway.

- This is a reduction from the value of 10 recommended in previous years. This reduction is judged to be appropriate, because a value of 10 indicates a site where rapid mobilization of a large scale slide is possible and it is judged that that is not the case at this site.

Therefore, the current recommended Risk Level for this site is 18, which is a reduction from the value of 30 recommended after the 2007 inspection.

RECOMMENDATIONS

Maintenance and Short Term Measures

The ongoing maintenance of the bridges, including cleaning of the gutters collecting the bridge deck runoff, should be continued in order to manage the amount of surface erosion on the abutment slopes from overflows from the gutters. AMEC understands that AT's operations personnel are responsible for this work and will ensure that it continues.

Long Term Measures

A hydrotechnical review of the creek channel upstream of the bridges should be performed in order to make an initial assessment of the possibility of continued erosion along the east bank leading to erosion beneath the bridges and possible destabilization of the east abutment slopes and/or the east piers of the bridges. Such a review may determine that there is little risk to the east bridge abutments from bank erosion. However, another possible outcome could be that the east creek bank at and upstream of the bridges will need to be protected with bioengineering measures or additional conventional armouring in order to minimize future risk to the bridges.

AMEC recommends that the annual inspections of this site under AT's Geohazard Assessment Program be discontinued. The recommended hydrotechnical review should be sufficient to assess the future risk to the bridges. If the bank erosion upstream of the bridges continues it may become worthwhile to resume the annual site inspections.

AMEC recommends that the semi-annual monitoring of the SI at this site be discontinued. This SI has not shown any signs of movement for several years, and it is judged that the monitoring can be discontinued at this point.

Investigation

The cost to perform the hydrotechnical review recommended above would be approximately \$5,000 to \$10,000, depending on the level of detail required with respect to the bridge piers beyond an initial assessment of the likelihood of continued bank erosion and channel shifting towards the bridges.

No other site investigation work is not recommended at this time. Some creek channel survey work may be recommended in the future based on the findings of the initial hydrotechnical review discussed above.

CLOSURE

This report has been prepared for the exclusive use of Alberta Transportation for the specific project described herein. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it are the responsibility of such third parties. AMEC Earth & Environmental, a division of AMEC Americas Limited, cannot accept responsibility for such damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This report has been prepared in accordance with accepted geotechnical engineering practices. No other warranty, expressed or implied, is made.

We trust that this meets your needs at this time. Please contact the undersigned if you have any questions or require any further information.

Respectfully Submitted,

**AMEC Earth & Environmental,
a division of AMEC Americas Limited**

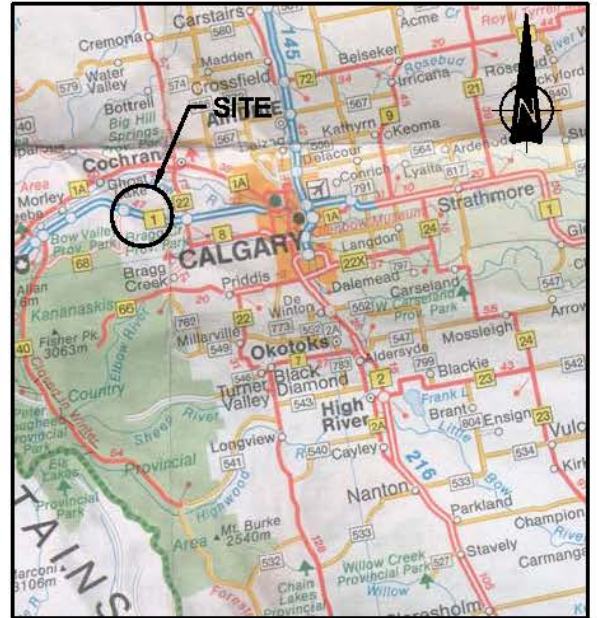
Andrew Bidwell, M.Eng., P.Eng.
Associate Geological Engineer

APEGGA Permit to Practice No. P-04546

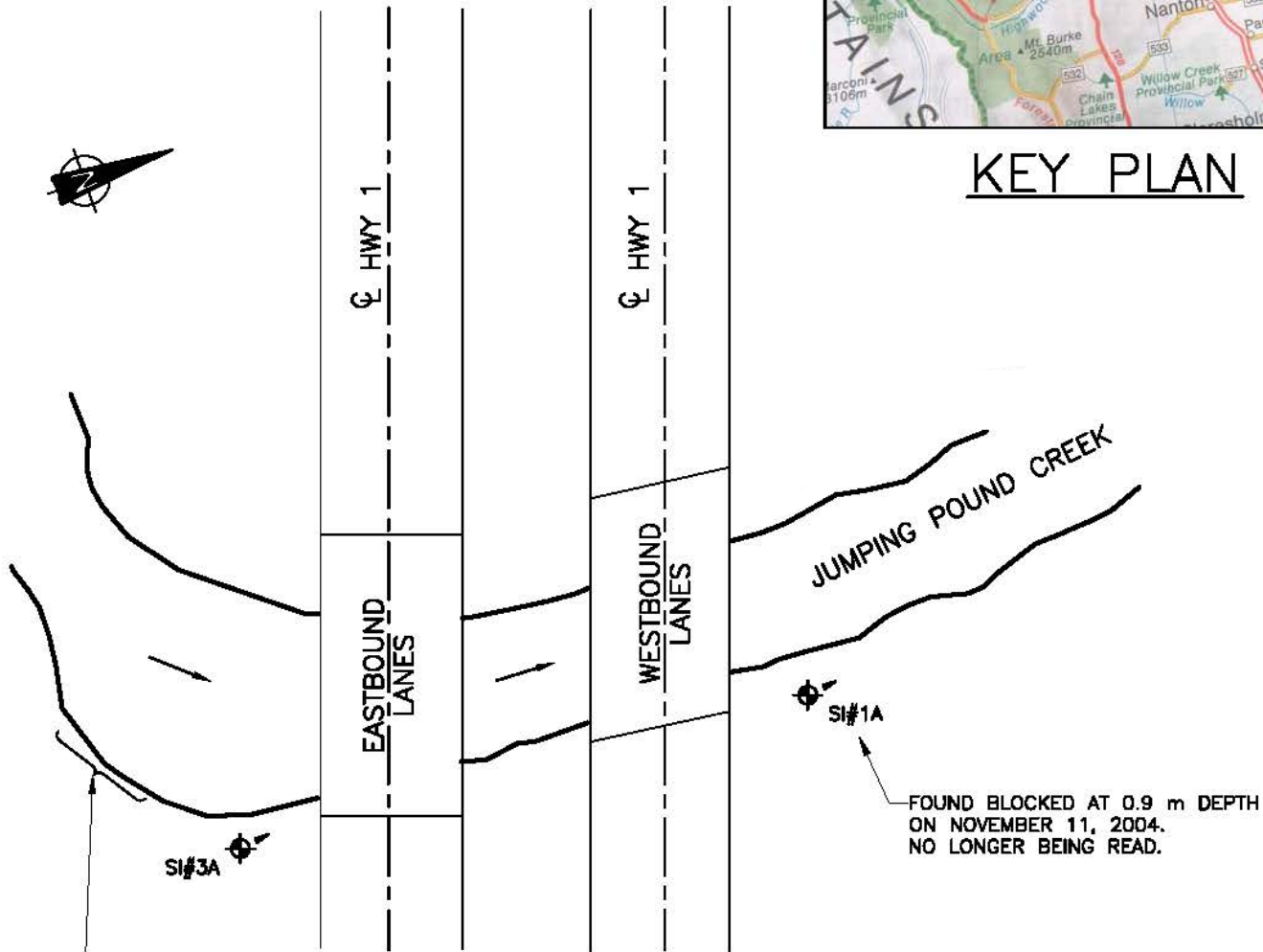
Reviewed by:

Pete Barlow, M.Sc., P.Eng.
Principal Geotechnical Engineer

Attachments: Site Plan
Photos



KEY PLAN



BANK EROSION
(See Photo S1-1)

FOUND BLOCKED AT 0.9 m DEPTH
ON NOVEMBER 11, 2004.
NO LONGER BEING READ.

APPROXIMATE SCALE
1:400
0 2 4 6 8 m

NOTE: SCHEMATIC SITE PLAN - SCALE IS APPROXIMATE

LEGEND

SI#1A SLOPE INCLINOMETER WITH A-GROOVE
ORIENTATION RELATIVE TO MAGNETIC NORTH.

I:\C\25252\2525200000.dwg - FIGURE S1-1 - Aug. 23, 2007 1:22pm - east.peters

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PROJECT: SOUTHERN REGION GEOHAZARD ASSESSMENT AND INSTRUMENTATION MONITORING				
TITLE: INSTRUMENTATION SITE PLAN S1- HWY 1 JUMPING POUND CREEK				
DATE:	JOB No.:	CAD FILE:	FIGURE No.:	REV.
AUGUST 2008	CG25277.B		FIGURE S1-1	A



Photo S1-1 – June 2008 (top)
Facing downstream along the right (east) creek bank, towards the east abutment of the eastbound lane bridge. Note the pronounced bank erosion visible where peak flows in the east creek sub-channel have created a 1 to 1.5 m high, near-vertical soil bank. It appears that segments of the east bank have eroded up to 1 to 2 m in the past couple of years.



Photo S1-2 – June 2008 (bottom)
Facing upstream from the middle of the eastbound lane bridge deck. The west sub-channel (on the right hand side of the photo) appeared to be carrying the majority of the flow at the time of the inspection. It appeared that earlier peak flows in the east sub-channel (left on photo, largely in shadow) had recently eroded significant volumes of soil from the east bank, as shown in Photo S1-1.



Photo S1-3 – June 2008 (top)
Surface erosion and gullying of the exposed shale bedrock in the east abutment slope of the eastbound lane bridge. It appears that the erosion is caused by overflow of bridge deck runoff from the collection gutters below the east end of the bridge. The appearance of the erosion and gullying has gradually worsened over time since the annual inspections began in 2000, but did not appear to have worsened significantly since the 2007 inspection.



Photo S1-4 – June 2008 (bottom)

Slope instability along the crest of the east creek valley slope, downstream of the westbound lane bridge. This instability has been noted since the first annual inspection in 2000, however it does not appear to have worsened significantly since that time nor retrogressed towards the highway.