

November 2012

CG25399

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

Attention: Mr. Ross Dickson

Dear Ross:

**Re: Southern Region Geohazard Assessment
2012 Annual Inspection Report
Site S22: Highway 762:02, "S" Curve Slide**

This letter documents the 2012 annual site inspection of Site S22 – "S" Curve Slide along Highway 762:02, south of Bragg Creek, AB and approximately 14 km southbound from the junction between Highway 22 and Highway 762. The site location is shown on Figure S22-1.

AMEC Environment & Infrastructure (AMEC), a division of AMEC Americas Limited, performed this inspection in partial fulfilment of the scope of work for the supply of geotechnical services for Alberta Transportation's (AT's) Southern Region (AT contract CON0013506).

The site inspection was performed by Georgina Griffin, P.Eng., Bryan Bale, P.Eng., and Tyler Clay, E.I.T., of AMEC; and Roger Skirrow, P.Eng., Ross Dickson, and Nathan Madigan, E.I.T., of AT during the 2012 Annual Tour.

1.0 BACKGROUND

A general description of the geohazard conditions at this site along with the site geological setting and chronology of previous events, investigations and monitoring work up to 2007 were provided in the 2007 annual inspection report¹ and are summarized and updated as follows:

- The highway is constructed on an approximately 4 m thick fill embankment on the south/southeast facing slope above the west bank of a small creek.
- Ongoing landslide movement in the native soils underlying the embankment has been causing cracking and settlement of the road surface that has been inspected and monitored by AT and AMEC since 2006.

¹ AMEC Earth & Environmental, 2007. *Southern Region Geohazard Assessment, Annual Assessment Report, 2007*, Project Number CG25263, submitted to AT November 6, 2007.

- Geotechnical borehole drilling, instrument installations and readings from the spring of 2007 onwards have shown that the landslide movement is occurring at or slightly below the elevation of the creek channel at the toe of the slope. The attached cross-section on Figure S22-2 shows the stratigraphy interpreted from the borehole logs and the depth of landslide movement measured by the instruments. The primary cause of the landslide movement is judged to be the piezometric pressures in the native clay/silt underlying the embankment in conjunction with the load of the embankment which is resulting in sliding occurring at the contact with the harder, underlying clay till soils. A number of repair options were evaluated in the site investigation and monitoring report² and it was judged that drainage trenches to attempt to lower the piezometric pressures in the landslide area would be the most effective option to try to reduce the rate and magnitude of future landslide movement.
- AMEC has submitted a report³ presenting the design of drainage trenches to attempt to lower the piezometric pressures in the landslide area and reduce the rate and magnitude of future landslide movement, and can prepare a draft tender package for the repair work upon AT's approval.

2.0 SITE OBSERVATIONS

Key observations from the June 2012 inspection were as follows:

- The road surface was milled and patched recently. Settlement and cracking of the road surface was present at the east end of the site, potentially due to subgrade failure caused by excessive milling (refer to Photo S22-1).
- The cracks in the road surface exposed by milling followed the same extent as has been observed in previous inspections, as is shown on Figure S22-1. Settlement of the road surface has continued.
- SI 2007-7, at the east end of the site, was raised slightly above ground surface, possibly due to ground settlement.

In general, the condition of the site has not changed in recent years, with ongoing slope movement causing continued damage to the road surface.

² AMEC Earth & Environmental, 2008. *S22 – Highway 762 "S" Curve Site, Assessment of Landslide Conditions and Repair Options*, Project Number CG25260, submitted to AT March 25, 2008

³ AMEC Earth & Environmental, 2010. *S22 – Highway 762 "S" Curve Site, Preliminary Design of Drainage Trenches*, Project Number CG25313, submitted to AT February 17, 2010

3.0 ASSESSMENT

The assessment of the hazard at this site has not changed since the 2008 inspection. The ongoing ground movement continues to cause cracking and settlement of the road surface. This has been treated as a maintenance issue since roughly 2005, with several overlays having been placed at the site to maintain the road surface. Despite maintenance efforts, the road surface at the site is often rough and likely requires periodic speed limit reductions.

The characterization and assessment of repair options presented in AMEC's March 2008 report remains valid. The 2008 report concluded that a drainage trench was the most suitable repair option. Following the 2010 annual inspection report, AT requested that AMEC proceed with the design of a drainage trench repair, which was described in the previously-referenced February 2010 report.

4.0 RISK LEVEL

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

- Probability Factor of 10 to reflect the active slope movement.
- Consequence Factor of 2 to reflect the impacts upon the road to date and the expected future damage to the road (i.e. annual to semi-annual repaving required to maintain a serviceable running surface).

Therefore, the recommended Risk Level for this site is 20, which is unchanged from the previous inspections.

5.0 RECOMMENDATIONS

5.1 Maintenance and Short Term Measures

AT's maintenance contractor should continue to place overlays as required to maintain the road surface. Signage ("Slide Area") and a reduced speed limit may also be required, depending of the magnitude of settlement between overlay placements.

5.2 Long Term Measures

The recommended drainage trenches should be installed, or AT should advise if an alternate repair method is to be pursued. Other potential repair options include a pile wall, embankment excavation and replacement, or lightweight fill.

The semi-annual readings of the functioning piezometer should be discontinued. The design report for the drainage trenches includes recommendations for instrument installations for post-construction monitoring of the effectiveness of the drainage trenches. Therefore, the installation

of any instruments to replace the non-functioning instruments at this site should be deferred until the repair construction work.

The annual inspections of this site should also be discontinued. Future inspections should only be performed if a significant change in the site conditions is noted by AT or maintenance contractor personnel. If the site is repaired, then it should be added back into the annual site inspection list for one to two years after repair in order to check the effectiveness of the repair work.

6.0 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 Environment & Infrastructure, 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 Environment & Infrastructure,
a division of AMEC Americas Limited**

ORIGINAL SIGNED AND STAMPED NOVEMBER 20, 2012

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Reviewed by:

APEGA Permit to Practice No. P-04546

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