December 2013

CG25399

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

Attention: Mr. Ross Dickson

Dear Ross:

Re: Southern Region Geohazard Assessment
2013 Annual Inspection Report
Site S38: Highway 22:08, Callum Creek Landslide

This letter documents the 2013 annual site inspection of Site S38 - Callum Creek Landslide Site on Highway 22:08. The site is 11 km north of the Oldman River Bridge and approximately 10 km south of the Highway 22 and Highway 520 junction.

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 Bryan Bale, P.Eng., and Tyler Clay, E.I.T., of AMEC; and Roger Skirrow, P.Eng., and Ross Dickson, of AT during the 2013 Annual Tour.

1.0 SUMMARY

The site condition is relatively unchanged from the 2012 inspection. Cracking and settlement was observed with similar shape and extent as previous inspections. The risk level is unchanged from the 2012 assessment. The pile wall repair is underway and is expected to be completed in 2014. The maintenance contractor should continue to patch and regrade the road surface and maintain the guardrail height during the repair construction. The performance of the completed repair should be monitored in the future through site inspections and instrument monitoring. The site should be inspected during the 2014 annual tour.

2.0 BACKGROUND

Minor tension cracking and settlement of the road surface at this site were first noted in 2005. The first inspection of this site under AT's Geohazard Risk Management Program was performed on March 3, 2011, after a member of the public notified AT of worsening conditions at this site. At the time of that site inspection, the road surface was exhibiting arc-shaped cracking and settlement across an approximately 80 to 100 m long segment of the road, which was interpreted to represent a landslide headscarp. The northern end of the affected road segment had a series of tension cracks in the pavement, roughly parallel to the road direction, and possibly indicating future expansion of the arc-shaped cracking. The landsliding did not appear to be linked to the slide area a short distance northbound from the site that was previously

repaired with a pile wall. The road at the site has two lanes and appears to be a cut/fill embankment along the natural valley slope. The slope below the road is at an angle of 17 to 18°.

Borehole drilling and instrument installations were recommended following the 2011 inspection to investigate the subsurface conditions and to provide a basis for the selection and design of a repair. This work was performed in April 2011[1]. A repair design, consisting of two rows of shear piles, was prepared in 2012 with construction beginning in 2013 and is scheduled to be completed in 2014. The completed repair is expected to significantly reduce the landslide hazard at the site. Refer to Figure S38-1 for an overall plan of the site features in relation to the proposed repair.

3.0 SITE OBSERVATIONS

Key observations from the May 2013 inspection are summarized as follows:

- Cracks had formed through the 2012 overlay, following the same pattern as previously observed cracking. The cracks that ran across the southbound lane had approximately 150 mm of vertical displacement and 40 mm maximum aperture. Refer to Photo S38-1.

- Shallow sliding was observed on the downslope near the north end of the site during the 2012 inspection. There appeared to be additional movement and expansion of the slide extents in 2013. The scarp started approximately 3 m south of S1 11-01 and ran north for approximately 45 m. The closest encroachment to the road was 5.0 m.There were several additional 300 to 500 mm high scarps downslope from the main scarp, which appeared to be due to 3 to 5 m deep rotational slide movements based on several bulges observed throughout the slide mass. The exposed soil was found to be wet, high plastic, medium brown clay. Refer to Photo S38-2.

- The guardrail, which was replaced in 2012, had deformed vertically by approximately 500 mm.

- The subtle scarp noted during the 2012 inspection at the south end of the site, assessed to be the flank of the site, was unchanged.

4.0 ASSESSMENT

The site assessment from 2012 is unchanged and is summarized below:

This site has active landslide movement, confirmed by the SI readings, that potentially encompasses the entire slope below the highway. The data from the vibrating wire piezometers

[1] AMEC Earth & Environmental. 2011. *S38 - Hwy 22:08 – Callum Creek Landslide Site 2011 Geotechnical Investigation, Instrument Installations and Initial Readings*, submitted to Alberta Transportation, June 2011, AMEC File No. CG25359

indicates that there is water in the upper soil layers that may contribute to the slope instability. There is a possibility that additional or accelerated landslide movement could lead to the loss of one or potentially both lanes of the highway. The construction of a temporary detour lane in the upslope road ditch would likely be required.

5.0 RISK LEVEL

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

- Probability Factor of 13 based on the active movement, possibly with an increasing trend in movement rates based upon the monitoring to date.

- Consequence Factor of 7 given that the landslide encompasses both lanes of the highway and failure would result in the closure of the road, possibly with a single detour lane in the upslope ditch with alternating one way traffic under a reduced speed limit and timed traffic lights.

Therefore, the current recommended Risk Level for this site is 91, which is unchanged from 2012. Note that the Risk Level is based on the condition as of May 2013 and does not consider the partially completed repair work.

6.0 RECOMMENDATIONS

6.1 Maintenance and Short Term Measures

- While the pile wall repair is constructed, the road should be maintained by milling of the road surface and placement of paving overlays to maintain a trafficable surface. The guardrail should be adjusted as necessary with successive overlays to maintain an effective height.

- Signage should be maintained (e.g. "Bump Ahead", "Slide Area") along with reduced speed limit as appropriate for the road surface conditions.

6.2 Long Term Measures

- The performance of the pile wall repair should be evaluated in the future by site inspections and instrument monitoring. AMEC recommends installation of at least one SI and piezometer along the east road shoulder above the pile wall. AMEC will submit the proposal for this work in 2014 for AT's consideration.

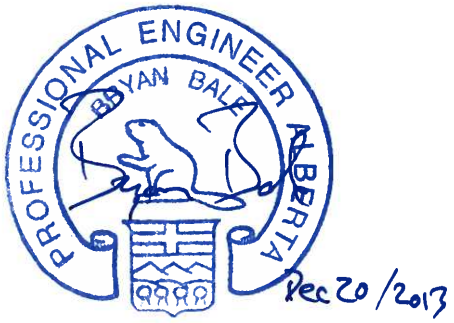
7.0 CLOSURE

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



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APEGA Permit to Practice No. P-04546

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