

December 2013

CG25399

Alberta Transportation  
2<sup>nd</sup> 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 S20: Highway 541:02, Highwood House Rock Cut**

This letter documents the 2013 annual site inspection of Site S20 – Highwood House Rock Cut, on the north side of Highway 541:02, approximately 800 m east of the junction between Highways 40, 541 and 940 at Highwood House.

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., Hui Wang, 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. The risk level is unchanged from the 2012 assessment. The ditches have been cleaned but some risk exists that could be mitigated by ditch improvements, roadside barriers or installation of a hanging barrier. As per all sites with ongoing rock fall risk, a standardized report form of large rock fall events to be filled out by road maintenance personnel is recommended. The site should be inspected next in 2014.

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## 2.0 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 2007 annual inspection report<sup>1</sup> and are summarized as follows:

- The site consists of a near-vertical rock cut slope with an estimated maximum height of more than 20 m, with natural soil and bedrock slopes up to 35° inclination above the crest of the cut slope. An approximate slope cross-section is attached as Figure S20-1.
- There is a rock fall hazard at this site that was first documented during the 2005 geohazards review of the Highway 40/541 corridor.
- Based on the “Ritchie ditch chart” rock fall catchment ditch design guidelines, the existing ditch adjacent to the cut slope is slightly undersized for the estimated maximum height of the cut slope.
- The rock fall debris typically consists of gravel sized rocks that have eroded out from the shale, coal and conglomerate beds exposed in the cut slope, or from the rocky soil at the crest. However, up to boulder-sized rock fall debris has been noted in the ditch and along the north edge of the pavement during past inspections. This included a boulder-sized rock that came to rest along the north edge of the paved surface.

## 3.0 SITE OBSERVATIONS

Key observations from the May 2013 inspection were as follows:

- The appearance of the cut slope had not changed significantly since the previous inspections. Photo S20-1 shows a general view of the cut slope taken from the south side of the highway.
- Up to boulder-sized rock fall deposits were accumulated in the north ditch and up to the paved edge (maximum rock fall size was 0.16 m<sup>3</sup> or about 380 kg). The distribution and maximum size of the rock fall debris was unchanged from recent years’ inspections. The rock fall debris accumulations were removed from the ditch in 2012 and the ditch capacity was good. There were also gravel sized rocks along the paved shoulder. Refer to Photos S20-2 and S20-3.
- No damage to the road surface was observed.
- The gully eroding into the rocky soil in the natural slope above the crest of the rock cut slope was visually reviewed from the highway and appeared to have retrogressed

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

slightly further upslope since the 2010 inspection. The rocky soil exposed in the gully appeared to continue to be the primary source of rock fall debris along the ditch line, based on the distribution of the accumulated debris along the ditch at the time of the inspection.

#### **4.0 ASSESSMENT**

The rock fall hazard at this site is unchanged from the 2012 inspection. In summary:

- There remains a risk that rock fall debris from the cut slope will bounce or roll onto the road surface. With the reduced size of the main debris accumulations noted, it is less likely that a larger boulder will reach the road surface in the short term. The probability will increase to previous levels as accumulation increases.

The risk to motorists is only somewhat mitigated by the “Watch for Fallen Rock” signs.

#### **5.0 RISK LEVEL**

The recommended Risk Level for this site, based on AT’s rock fall geohazard risk matrix, is as follows:

Probability Factor of 15 based on:

- The appearance of the debris that suggests that there is ongoing rock fall at this site. This is unchanged from the inspections since 2009.
- Volume of visible unsupported rock on the upper cut slopes.

Consequence Factor of 3 based on:

- The presence of large boulders that have landed on the road shoulder, and the fact that they would cause serious damage or accidents if they were struck.
- Clearing of the ditch has reduced the size of the previous debris accumulations and restored the capacity of the ditch. The consequence factor will increase as the ditch fills with rock fall.

Therefore, the recommended Risk Level for this site is 45 (i.e. 15 x 3). The risk level is the same as the 2012 inspection.

## **6.0 RECOMMENDATIONS**

### **6.1 Maintenance and Short Term Measures**

- As recommended following the previous annual inspections, AT's maintenance contractor should clean the accumulated rock fall debris from the ditch regularly. It may be possible to reduce the Consequence Factor if the ditch is consistently kept clean.
- A standardized report form should be implemented to document rock fall at this site. AMEC could provide a sample of such an inspection form. Data from these inspections forms could be collected by AT and the active consultant to give a better indication of the rock fall hazard.

### **6.2 Long Term Measures**

The following additional measures could be considered to reduce volume of rock fall reaching the road:

- Increase the ditch depth.
- Place a line of jersey barriers along the north shoulder of the highway to increase the effective ditch capacity.
- Scale the cut slope in order to attempt to reduce the volume of rock falls over the short term.
- Install a hanging rock fall barrier to confine rock fall to the ditch.

The annual site inspections by AT and AMEC personnel should be continued.

### **6.3 Investigation**

If AT would like to proceed with the trial application of the hanging rock fall barrier net, AMEC could provide a proposal and cost-estimates for different options, including a LiDAR survey suitable for determining the required size and location for the net.

AMEC could also prepare a draft tender package for rock slope scaling work for this and other sites at AT's discretion.

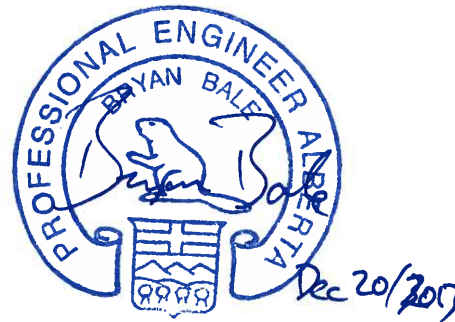
## 7.0 CLOSURE

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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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