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 S18: Highway 40:12, Galatea Creek Rock Cut

This report documents the 2012 annual site inspection of Site S18 – Galatea Creek Rock Cut, along Highway 40:12, approximately 32 km south of the junction between Highway 40 and Highway 1 and just north of the Galatea Creek Provincial Recreation Area.

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, monitoring and repair work were provided in the 2008 annual inspection report[1] and are summarized as follows:

- The site consists of a through-cut in bedrock along this segment of the highway. The East Cut Slope is near vertical with a maximum height of approximately 16 m. The West Cut Slope is near-vertical to vertical with a maximum height of approximately 10 m.

- There is a rock fall hazard at this site that was first documented during a June 2004 call-out site inspection by AMEC.

[1] AMEC Earth & Environmental, 2008. *Southern Region Geohazard Assessment Program, Site S18 – Galatea Creek Rock Cut, Highway 40:12, 2008 Annual Inspection Report,* Project Number CG25277, submitted to AT September 8, 2008.

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- The east ditch does not meet the sizing guidelines from the Ritchie Ditch Chart and during past inspections up to cobble sized rock fall debris has been noted on the road surface across the northbound lane and onto the centerline. Figure S18-1 shows a typical slope and ditch cross-section around the maximum East Cut slope height.

- There is also a hazard of rock block sliding, wedge or toppling failures from the East Cut Slope because the East Cut Slope is oriented unfavourably relative to the bedrock structure at this site. Numerous rockbolts were installed in the East Cut Slope during construction in order to mitigate the risk to the highway from these hazards.

- The west ditch meets the sizing guidelines from the Ritchie Ditch Chart. No evidence of rock fall reaching the road from the West Cut Slope has been noted during past inspections. Figure S18-2 shows a typical slope and ditch cross-section around the maximum west cut slope height.

2.0 SITE OBSERVATIONS

The site conditions have not changed significantly in recent years (see comparison photos S18-2 and S18- 3). Observations from the 2012 inspection are summarized as follows:

- There continued to be an accumulation of rock fall debris in both the east and west ditches. The rock fall debris included material up to cobble size and small boulder size, which is consistent with observations from past inspections. Numerous cobbles were observed on the road surface and the west shoulder. Significant gravel accumulations were also noted on the west shoulder.

- A significant gravel slide occurred onto the west shoulder, likely during the winter of 2011/2012. Some minor damage to the road surface was noted at this area (see Photo S18-5).

- Several areas along the East Cut Slope had rocks that were judged poised to fall (see Photo S18-6).

3.0 ASSESSMENT

The assessment of the hazard conditions at this site has not changed in recent years. In summary:

- The rock fall conditions have not changed at this site since the previous inspection. There remains a risk that rock fall debris from the East Cut Slope will bounce or roll onto the road surface. The risk is somewhat mitigated by the “Watch For Fallen Rock” signs in place on either side of the through-cut to warn users of the highway along with the available catchment capacity of the east ditch, but the hazard of large rocks being deposited on the pavement remains.

- As noted in the previous inspection reports, the risk from potential rock block sliding, wedge, or toppling failures in the East Cut Slope is judged to be lower than the rock fall risk because of the rockbolts installed in the East Cut Slope.

- The risk to the highway from rock fall from the West Cut Slope is low because the west highway ditch is larger and able to contain virtually all of the rock fall debris from the West Cut Slope.

4.0 RISK LEVEL

The current recommended Risk Levels for this site, based on AT's rock fall geohazard risk matrix, are as follows:

East Cut Slope

- A Probability Factor of 15 is recommended based on the apparent frequency of rock fall reaching the road surface.

- A Consequence Factor of 3 is recommended based on the history of cobble-sized rocks rolling onto the pavement at this site which could damage a vehicle or cause a collision.

Therefore, the recommended Risk Level for the East Cut Slope is 45. This value is unchanged from the previous site inspection.

West Cut Slope

- A Probability Factor of 12 is recommended based on the apparent frequency of rock fall from the West Cut Slope.

- A Consequence Factor of 1 is recommended because there has been no evidence of rock fall debris from the West Cut Slope reaching the road.

Therefore, the recommended Risk Level for the West Cut Slope is 12. This value is unchanged from the previous site inspection.

5.0 RECOMMENDATIONS

5.1 Maintenance and Short Term Measures

- AT's maintenance contractor should clean the accumulated rock fall debris from the east and west ditches often in order to maintain maximum catchment capacity. This should be treated as an ongoing maintenance issue.

- The road surface should be inspected daily by the maintenance contractor, and any rock fall should be removed from the road surface.

- A standardized report form should be implemented for this site and other rock fall hazard sites. The form would be used for inspections by the MCI to note any significant (cobble sized or larger) rock falls onto the road surface. The form would prompt the inspector for information such as rock size, location, damage to road surface, etc. AMEC could provide a sample of such an inspection form. Data from these inspections forms would be collected by AT and the active consultant to give a better indication of the rock fall hazard.

- If the debris is not cleaned out and kept off the road as described above, the Consequence Factor for the rock fall risk from the East Cut Slope will increase.

5.2 Long Term Measures

- The Consequence Factor for the East Cut could be reduced by increasing the capacity of the east ditch to contain rock fall debris. The ditch sizing criteria on the Ritchie Ditch chart or more recent guidelines based on work by the British Columbia Ministry of Transportation should be used as a guide.

- Alternatively, a line of jersey barriers could be placed along the east shoulder of the road in order to increase the effective depth of the ditch.

- Scaling at this site should reduce the Probability Factor at least for the short term.

- The annual inspections at this site should be continued.

5.3 Investigation

No further investigation work for this site is recommended at this time.

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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