



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 S15: Highway 3:02, Crowsnest Lake Rock Fall Barrier**

This report documents the 2012 annual site inspection of Site S15 – Crowsnest Lake Rock Fall Barrier, along Highway 3:02 on the southeast shore of Crowsnest Lake, west of Coleman, AB and a short distance east of the border between Alberta and British Columbia. There is a rock fall hazard to the highway at this site that is being mitigated by a rock fall barrier net.

AMEC Environment and 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 2007 annual inspection report¹.

The rock fall hazard at this site was first identified by AT in the late 1990's. Subsequent work by AT and their geotechnical consultants culminated in the installation of the current rock fall barrier net in November 2005. The annual inspections of the site have been continued since the barrier net was installed in order to monitor the effectiveness of the barrier net and troubleshoot

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

its required maintenance. A call-out site inspection to assess the rock fall hazard along the segment of the highway immediately west of the barrier net was also performed in June 2008².

2.0 SITE OBSERVATIONS

A summary of the observations from the 2012 inspection is presented below:

- A replacement rock fall barrier was installed by AT in the spring of 2012. The previous barrier was difficult to access for removal of rock fall debris, which resulted in the barrier net often left disconnected and ineffective. The replacement barrier was constructed with two offset barriers, with space between them for equipment to access. The replacement barrier also does not have cables supporting the posts. Refer to Photo S15-1 and Figure S15-1.
- It is understood that the design capacity of the replacement barrier is 2,000 kJ for a 4 m high barrier. The replacement barrier is 5 m high, but the capacity is not known. The capacity of the previous barrier was 1,500 kJ and the height was 5.5 m. Also, the staggered barrier alignment has resulted in the north panel being placed closer to the rock face, which increases the chance that rock fall will bounce over the barrier. Rock fall modeling to assess the replacement barrier has not been performed.
- The new rock fall barrier was in good condition during the 2012 inspection. No significant rockfall strikes were apparent.
- Many gravel to cobble size rock fragments were found along the west guardrail (across the road from the barrier), with evidence of impact damage on the guardrail. This damage may have occurred during construction of the replacement barrier when there was no barrier in place (see Photo S15-2).
- The largest rock found at the barrier was approximately 30 x 30 x 30 cm. No significant amounts of rock fall had accumulated.
- Numerous recent impact marks were present on the road surface.
- The head of the gully in the talus slope rock fall source area appeared wider than was observed during previous inspections. The gully also appeared to have retrogressed towards the upslope, and had reached the rock face above. The base of the gully exposed bare bedrock. Refer to Photos S15-3 and S15-4 for a comparison of the gully from the 2011 inspection.
- Rock fall along the segment of the highway to the west of the barrier net remains a concern with predominantly gravel to cobble sized rock fall. Most of the rock fall is contained in the

² AMEC Earth & Environmental, 2008. *Report On June 3, 2008 Site Inspection, Highway 3:02 Crowsnest Lake, Alberta*, Project Number CG25277.D, submitted to AT June 16, 2008.

ditch however some rocks are deposited on the road edge. The rock fall conditions along this segment of the highway are largely unchanged from the June 2011 annual inspection.

3.0 ASSESSMENT

Several factors have changed at the site which affects the risk of rock fall reaching the highway:

- The ongoing headward retrogression of the gully in the talus slope and the bare bedrock surface within the gully will create a higher-energy rock fall path. Also, the gully appears to be retrogressing to the northwest into a higher talus slope. Rock fall is expected to continue for the foreseeable future, potentially with higher energy. This increases the risk at the site.
- The previous barrier was often left improperly setup, which resulted in a high risk rating for the site. The replacement barrier does not require disassembly for removal of accumulated rock fall, which should allow the barrier to be properly setup at all times. This lowers the risk at the site, as compared to the previous barrier when it was not properly connected.
- The north panel of the rock fall barrier is closer to the rock face and may be more easily over-topped by rock fall. This increases the risk at the site.

In general it is estimated that the replacement barrier will be slightly less effective than the properly assembled previous barrier, but more effective than the previous barrier has been in recent years.

4.0 RISK LEVEL

The recommended Risk Level to the highway at the barrier net location based on AT's rock fall risk matrix is as follows:

- The Probability Factor for this site should be set at 16 to reflect the active rock fall.
- The Consequence Factor for this site should be set at 2 to reflect the restored capacity of the new barrier net installation and removal of accumulated rock fall debris. This factor may increase as rock fall debris accumulates behind the current barrier net and reduces its capacity to stop or effectively dissipate the energy of falling rock.

Therefore, the current recommended Risk Level at the barrier net site is 32, which is reduced from the level of 112 assigned in 2011, and reflects the result of recent mitigation work performed at this site.

5.0 RECOMMENDATIONS

5.1 Maintenance and Short Term Measures

The maintenance contractor should clean out the rock fall debris as required in order to keep the volume of accumulated debris behind the net to a practical minimum.



5.2 Long Term Measures

The barrier net should be regularly inspected and maintained as recommended in the manufacturer's guidelines. The annual site inspections by AT and geotechnical consultant personnel should be continued.

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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