



October 28, 2011

CG25352.200

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

Attn: Mr. Ross Dickson

**Re: Southern Region Geohazard Assessment Program
S25 - Highway 3, Km 29.45, Near Monarch, AB
2011 Annual Inspection Report**

This letter documents the 2011 annual site inspection of Site S25 – Monarch, on Highway 22:14, near Monarch, AB.

AMEC Environment & Infrastructure (AMEC), a division of AMEC Americas Limited, performed this inspection in partial fulfillment of the scope of work for the supply of geotechnical services for Alberta Transportation's (AT's) Southern Region (AT contract CE061/08).

The site inspection was performed on June 21, 2011 by Mr. Bryan Bale, P.Eng., Mr. Andrew Bidwell, P.Eng., and Mr. Tyler Clay, E.I.T., of AMEC in the company of Mr. Ross Dickson and Mr. Neil Kjelland, P.Eng., of AT.

BACKGROUND

The site is located at Km 29.45 of Highway 3, on the east side of the Oldman River valley near Monarch, AB (refer to Figure S25-1). AMEC understands that the current alignment of Highway 3 at this site, a divided highway with a total of four lanes, was constructed in either 1995 or 1997. The highway at the site transitions from a large through-cut in the upper portion of the east Oldman River valley slope to a fill over the lower portions of the valley slope. Inactive landslide terrain is visible near the current highway right-of-way on the valley slope.

AMEC performed a call-out inspection of this site at AT's request on March 9, 2007. Settlement was noted in both the east and westbound lanes at the site. The settlement was thought to be caused by reactivation and/or ongoing creep of landsliding of the natural valley slope that existed before the construction of the highway and/or settlement or other instability of the highway fill at this location. For further details of the observations and assessment from this site

visit, please refer to the report on the call-out inspection¹. AMEC also submitted a proposal and cost estimate for a geotechnical investigation for the site, including the installation of monitoring instrumentation² in March 2011 at AT's request.

SITE OBSERVATIONS

The June 2011 inspection at the site was the first since the 2007 call-out inspection. Key observations regarding changes in the site conditions since the 2007 inspection are summarized as follows:

- An overlay had been placed at the previously noted settlement areas in the east and westbound lanes, likely in 2010. Refer to Figure S25-2 and Photo S25-1. Cracking had formed through the recent overlay following a similar pattern as was observed in 2007.
- The cracking was relatively minor and did not follow a definitive pattern that would be associated with landslide movement. There was settlement in the area near the cracking, but the settlement encompassed a broad area, and was not localized at the crack locations. The settlement was subtle and was noted by observing suspension compression of vehicles as they travelled through the site area. Refer to Photos S25-2 and S25-3.

ASSESSMENT

The settlement of the road surface is near the cut/fill transition at the westbound end of the through-cut and roughly coincides with the former valley slope face position. This suggests that the settlement may be due to one or a combination of the following factors:

1. Reactivation and/or ongoing creep of landsliding of the natural valley slope that existed before the construction of the highway. This is not considered to be the likely cause of the settlement because the pre-construction airphotos of the valley slope do not show well-defined landslide terrain across the current highway right-of-way.
2. New landsliding (i.e. starting after construction of the current highway, in the natural valley slope that is now covered by the highway fill). This is possible but not expected because the construction of the through-cut would have resulted in a net unloading of the underlying slope and the volumes of fill placed during highway construction across the lowermost portion of the former valley slope face are relatively minor.

¹ AMEC report "Call-Out Request: Highway 3, Km 29.45, Near Monarch, AB" submitted to AT October 30, 2007, AMEC project number CG25239.

² AMEC report "Proposal and Cost Estimate for Geotechnical Investigation, S25 - Highway 3, Km 29.45, Near Monarch, AB" submitted to AT March 9, 2011, AMEC project number CG25352.600.

3. Settlement and/or other instability within the highway fill at this location. It is not expected that there would be significant and ongoing settlement of the fill many years after construction, and there did not appear to be any signs of fill embankment instability on the fill slope below (north) of the westbound lanes. Relative to the other possibilities listed above, this is considered to be the probable cause of the cracking and settlement; however, the observations to date do not definitively indicate it to be the case.

RISK LEVEL

AMEC recommends the following Risk Level for this site based on AT's general geohazard Risk Level Criteria.

- Probability Factor of 5 to reflect the apparent active settlement of the road surface but with a very slow movement rate and/or indeterminate movement pattern.
- Consequence Factor of 1 because there does not appear to be an immediate threat to driver safety and to date the settlement has been manageable as a maintenance issue.

Therefore, the recommended Risk Level is 5, which is unchanged from the 2007 assessment.

RECOMMENDATIONS

The available information on this site does not indicate an immediate threat to driver safety and it is judged to be reasonable to continue to treat the settlement as a maintenance issue.

AMEC has submitted a cost estimate and proposal to perform a geotechnical investigation and instrument installations for this site. The data from the boreholes and instruments may provide a better understanding of the cause of the damage to the highway surface, and allow consideration of the cost-benefits of continued maintenance vs. attempting a more permanent repair. AMEC would be pleased to undertake the site investigation work if requested by AT.



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
OCTOBER 28, 2011

Tyler Clay, B.A.Sc., E.I.T
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Bryan Bale, M.Sc, P.Eng.
Geotechnical Engineer

APEGGA Permit to Practice No. P-04546

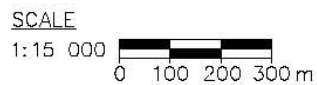
Reviewed by:

Andrew Bidwell, M.Eng., P.Eng.
Associate Geological Engineer

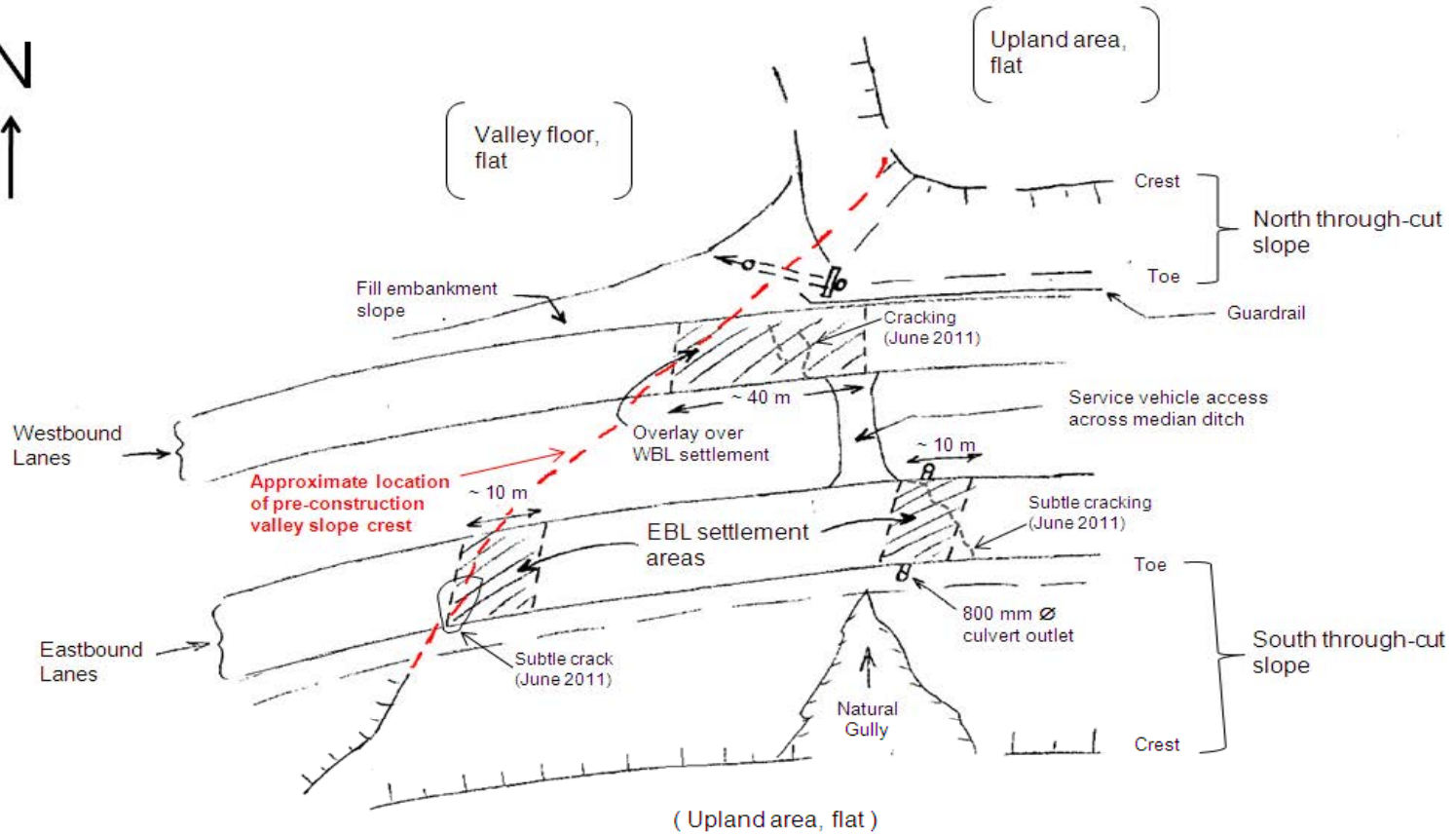
Attachments: Site Location
Site Plan
Photos



AIR PHOTO REFERENCE: AS5160B 24, LN-2, 01/08/21, 1:20000



CLIENT: Alberta Transportation	PROJECT: SOUTHERN REGION GEOHAZARD ASSESSMENT AND INSTRUMENTATION MONITORING			
	TITLE: SITE LOCATION HIGHWAY 3 - MONARCH			
DATE: SEPTEMBER 2011	JOB No.: CG25352.200	CAD FILE: 25352L01.dwg	FIGURE No.: FIGURE S25-1	REV. A



Schematic
Not to Scale

Client	Alberta Transportation		Figure S25-2	
Project	Southern Region Geohazard Assessment		Date:	Revision
	S25 - Hwy 3:29.45 - Monarch		Sep-11	
	Site Plan Schematic		Job No.	CG25352.200
			File No.:	AT_Monarch_siteplan(2011).xlsx



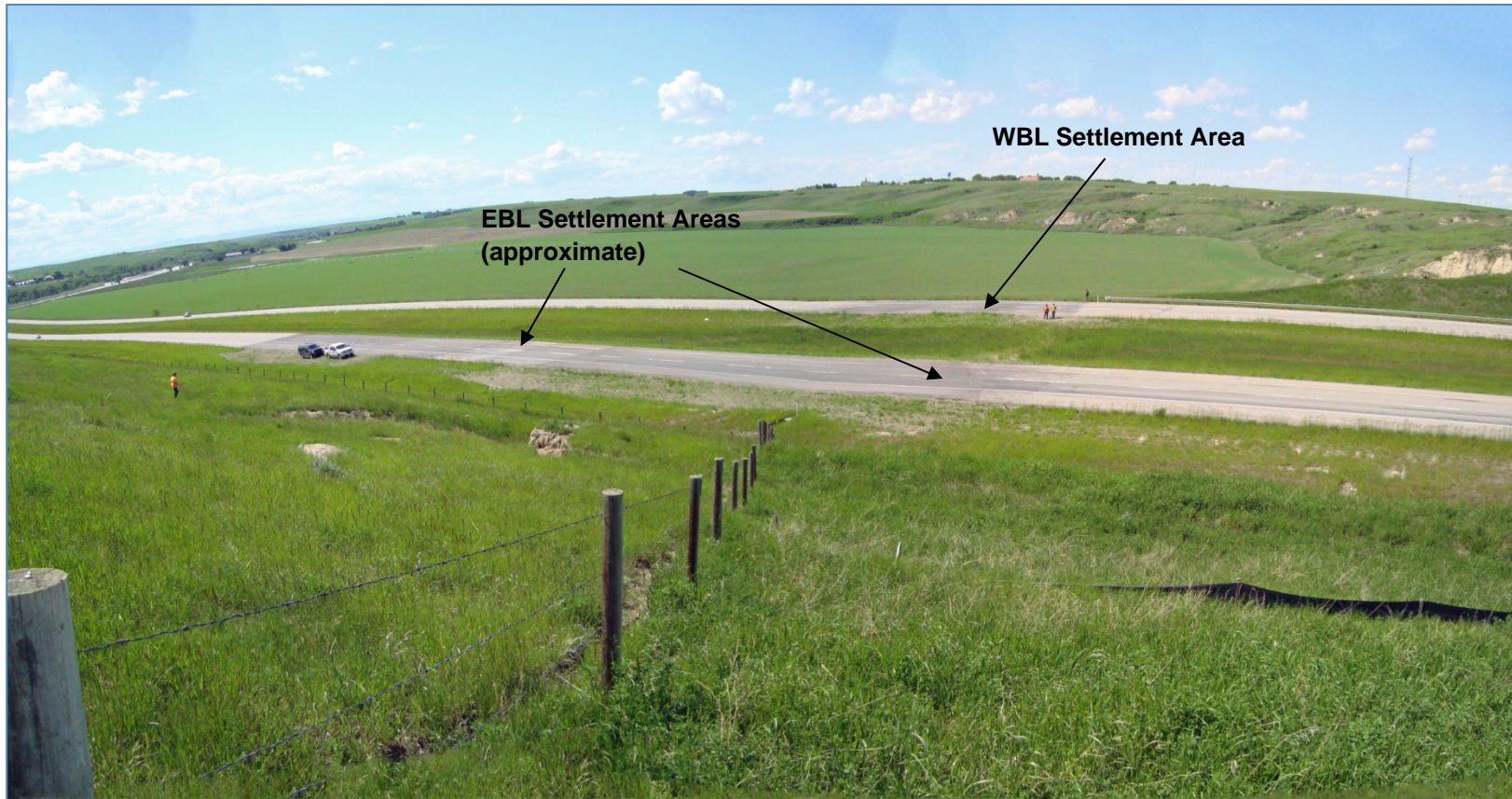


Photo S25-1 (June 2011)

Facing northwards across the site. The settlement areas are visible within the patched areas on both the eastbound and westbound lanes.



Photo S25-2 (June 2011)

Facing northwest across the eastbound lane. Diagonal cracking is visible across the patched area where subtle settlement has occurred.



Photo S25-3 (June 2011)

Facing northwest from the south shoulder of the westbound lane. Similar cracking as was observed in the eastbound lane settlement area was visible in this recently patched area of the westbound lane. The amount of settlement was subtle at the time of inspection, but was noticeable when driving across the area at highway speed.