



January 2015

CG25399

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

Attention: Mr. Ross Dickson

Dear Ross:

**Re: Southern Region Geohazard Assessment
2014 Annual Inspection Report
Site S45: Highway 549:02, Threepoint Creek**

This report documents the 2014 annual site inspection of the Threepoint Creek encroachment sites, along Highway 549:02, 6 km from the junction of Highway 549 and Highway 22 and approximately 6.2 km west of Millarville, Alberta.

AMEC Environment and 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 CON0013506).

The site inspection was performed on May 14, 2014 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 2014 Annual Tour.

1.0 SUMMARY

The site condition at the East Site is relatively unchanged from the 2013 inspection. The risk level for the East Site has been reduced to 14 to reflect the low rate of erosion and low flow conditions. There has been retrogression at the West Site and the minimum offset has reduced to 3.5 m. The risk level has increased to 22 for the West Site as the offset from the road has decreased by approximately 1.3 m since the 2013 inspection. A hydrotechnical assessment is recommended to better understand channel conditions and potentially aid in the design of any future mitigation. Mitigation involving a gabion basket wall could provide long term stability or bank armouring could slow the encroachment rate towards the highway. A guardrail or temporary barriers should be installed at the West Site due to reduced ditch clearance. The site should be inspected next during the 2015 Annual Tour.

AMEC Environment & Infrastructure
A Division of AMEC Americas Limited
140 Quarry Park Boulevard SE
Calgary, Alberta, CANADA T2C 3G3
Tel: +1 (403) 248-4331
Fax: +1 (403) 248-2188
www.amec.com

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2.0 BACKGROUND

The sites were first inspected by AMEC and AT personnel during the 2012 Annual Tour on June 19, 2012 following a call-out request made by AT.

A meandering creek (Threepoint or Fisher Creek) runs to the south of the highway and has encroached towards the highway at two locations. The sites are approximately 1.5 km apart and will be referred to as the East and West sites. Figures 1 and 2, attached, show the overall site layouts and the relative location of the highway to the creek erosion. Refer to AMEC's 2012 call-out report¹ for a general description of the geohazard conditions and geological setting at the site.

3.0 SITE OBSERVATIONS

Key observations from the May 2014 inspection were as follows:

East Site (Figure S45-1)

- The river flow was low at the time of the inspection with almost no flow through the channel.
- Flood damage was noted across the plain and the creek was observed to now flow to the south within a different channel.
- Seepage was observed coming from the near the bottom of the exposed bank.
- The crest was marked with stakes offset 1 m to monitor retrogression. There was no significant retrogression observed at the site during the inspection.
- The minimum offset measured between the bank crest and road shoulder was approximately 7.9 m, unchanged from 2013.
- Overall, the site area appeared very similar to the 2013 conditions. Refer to Photos 1 and 2 for a comparison.

West Site (Figure S45-2)

- There was recent bank instabilities and flows that appeared to be fresh. Nine of the fence posts were undermined due to bank erosion. Refer to Photos 3 and 4 for a comparison to the 2013 conditions.
- The ditches were wet and a shallow translational slide was observed in the backslope. Refer to Photo 5.

¹ AMEC Environment & Infrastructure, 2012. *Southern Region Geohazard Assessment, Call-Out Report, 2007*, Project Number CG25263, Report submitted to AT on November 6, 2007

- The new minimum offset measured between the bank crest and road shoulder was approximately 3.5 m, representing a retrogression of approximately 1.3 m since 2013. The minimum offset area was located approximately 10 m east of the 2013 location.
- There was seepage noted approximately 2 m above the bottom of the bank.
- There was no observed flood damage on the plain.

4.0 ASSESSMENT

The hazard to the highway at both sites is ongoing as bank erosion continues; however, the progression of the hazard for each of the sites has changed relative to the 2013 observations.

There was approximately 1.3 m of bank retrogression at the West Site since the 2013 inspection indicating steady and possibly an increased rate of encroachment towards the highway. Therefore the Risk Level at the West Site has been increased relative to the 2013 assessment.

There was no significant retrogression observed at the East Site since 2013 due to an apparent lack of flow within the secondary channel that is encroaching the highway at this location (flow is now contained within the primary channel to the south). The hazard to the highway at the East Site still exists however the rate of retrogression is expected to remain low and occur in increments as the creek flow returns to the side channel during flood events. It is possible that channel training or armouring work at the meander inlet could prevent flow towards the highway encroachment altogether; however, this process will potentially occur naturally over time. Further hydrotechnical assessment would be required to determine the feasibility of directing river flow away from the highway at the East Site.

The overall rate at which this hazard develops is dependent on the number of flood events and channel migration. Evaluation of these criteria could be improved by performing a hydrotechnical assessment and looking at historic channel movements. If it is determined that the risk to the highway will continue to increase then mitigation involving bank armouring or channel diversion should be considered. This is considered to be more critical for the West Site since the encroachment appears to be part of the main river channel and could likely not be diverted (like at the East Site); however, there are potential old abandoned channels south of the current channel within the West site area

5.0 RISK LEVEL

AMEC recommends the following Risk Levels for these sites, based on AT's general geohazard risk matrix:

East Site

- Probability Factor of 7, based on the inactive or low rate of erosion observed since the previous inspection. The scarp of the bank is expected to continually retrogress at a low

rate or in potentially larger increments during high water conditions. Erosion and retrogression rates will likely increase during years of high precipitation.

- Consequence Factor of 2, reflecting the fact that a large sudden failure is unlikely and only one lane of the highway would be likely affected. To date the highway appears unaffected by the erosion and bank encroachment due to sufficient offset.

Therefore, the recommended Risk Level is 14 (i.e. 7×2) and is lowered from the previous risk level of 18 given in 2013.

West Site

- Probability Factor of 11, ongoing erosion at a moderate but increasing rate since the previous inspection. The bank scarp is expected to continually retrogress and cause settlement or damage to a portion of the road. Erosion and retrogression rates will likely increase during years of high precipitation.
- Consequence Factor of 2, reflecting the fact that the ditch clearance has been reduced which affects the safety of motorists. A large sudden failure is unlikely and only one lane of the highway would likely be affected. Partial closure of the road is not expected. The consequence factor may increase as the offset decreases and cracks are potentially observed near or within the road surface.

Therefore, the recommended Risk Level is 22 (i.e. 11×2) and is increased from the 2013 assessment of 18.

6.0 RECOMMENDATIONS

AMEC recommends the following as a result of the 2014 site observations and assessment:

Short Term and Ongoing Maintenance

- A guard rail should be installed at the West Site, or a temporary barrier until a permanent repair is implemented, as the ditch clearance has been reduced.
- A hydrotechnical assessment should be performed to better understand channel conditions, occurrence of flood events and to potentially aid in the design for any future mitigation.
- The bank should be armoured to prevent further erosion during high water events.
- The site should be inspected during the 2015 annual tour to check changing channel conditions and to measure the minimum bank offset from the road edge conditions. The site should be inspected every other year during the annual tour with the inspection frequency adjusted based on the observed site conditions.

- The MCI should provide notification if significant cracking in the ditch or road surface is observed.

Long Term

As erosion is expected to continue, a more permanent repair to the areas should be considered. One option would be to install a gabion basket wall which would provide long term stability. Bank armouring and construction of Longitudinal Peak Stone Toe Protection (LPSTP) is a secondary option. Alternatively, the feasibility of channel re-alignment could be evaluated further. Upon AT's request, AMEC can provide a mitigation design after a hydrotechnical assessment has been completed.

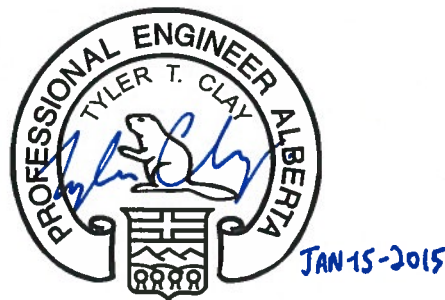
7.0 CLOSURE

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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**



Nicole Wilder, B.Eng., E.I.T.
Geotechnical Engineer

Tyler Clay, B.A.Sc., P.Eng.
Geological Engineer

APEGA Permit to Practice No. P-04546

Reviewed by:
Georgina Griffin, M.Eng., P.Eng.
Associate Geotechnical Engineer