S8 – FISHER CREEK

Background

The Fisher Creek site is located on Secondary Highway 762:02, approximately 2 km north of the junction with SH 549 and approximately 900 m north of the Fisher Creek bridge.

The highway runs north-south on a cross-slope down to the west in this area. Settlement and cracking of the road surface at this site was first noted in 1988. Several geotechnical investigations have been performed by the Municipal District, AT and consultants working for AT since that time. These investigations generally concluded that the settlement and cracking of the road surface was the result of surface drainage percolating into poor-quality fill and remnant organic matter underlying the road alignment. Remedial measures including lime/gravel columns and the installation of a drainage blanket are understood to have been installed, however the available records of this work are discontinuous and incomplete. Please refer to Section A of the site binder for further discussion.

The most recent geotechnical investigations at this site were performed by AMEC in 2001 and 2002 in response to continued settlement and cracking at the north end of the site and the observation of additional cracking at a previously undisturbed area at the south end of the site. AT has requested that AMEC prepare a design for remedial measures for the currently-observed cracking and settlement areas. This design work is underway at the time of this writing.

Site Assessment

The site assessment was performed on May 25, 2004. The weather at the time of the site assessment was clear and calm.

Please refer to Appendix S8 for a site plan illustrating the layout of the site. The assessment covered the highway surface through the settlement and cracking areas as well as the slope face below (west) of the highway.

Observations

The following points summarize the observations made during the site assessment. Please also refer to Appendix S8 for a site plan and annotated photographs illustrating key observations. Please note that the instruments at this site were read after the May 25, 2004 site assessment, therefore the current instrumentation data was not available at the time of the field work.

- The road surface at the north end of the site showed signs of recent and ongoing settlement and cracking. The location and pattern of the deformation was the same as noted in previous assessments. Photos S8-1 to S8-3 show various views of this area. The downwards vertical displacement of the west edge of the road was approximately 50 to 60 mm at the time of the assessment.

- The south end of the site did not show any signs of cracking in the July 2003 overlay (Photos S8-4 and S8-5). The Spring 2004 instrument readings at the south end of the site indicated that the previously-noted downslope movement zones in the native clay at approximately 5 to 6 m depth continue to be active.

Also, the entire site was repaved some time between the May 25, 2004 site assessment and the June 3 and 4, 2004 instrument readings. The SI in Borehole 2002-3 was paved over, however the other instruments on the road (Boreholes 2002-1 and 2002-2) remained accessible.

Discussion

The stability problems at the north end of the site are continuing and the southbound lane requires repair to mitigate the settlement. This is the same situation as noted in previous assessments.

The road surface at the south end of the site does not show any signs of cracking since the July 2003 overlay was placed. The spring 2004 readings of the SI's in Boreholes 2002-1 and 2002-4 indicate that the previously-noted slope movement towards the west/southwest at approximately 5 to 6 m depth below ground surface at each location has been ongoing at relatively constant rates of 3 to 6 mm/year since the fall of 2002(note that the SI in Borehole 2002-3 was paved over and therefore not read in June 2004). This raises the possibility that:

- The ongoing slope movement at approximately 5 m depth may not be directly connected to the road surface cracking observed in this area during the July 2002 assessment

- The road surface cracking noted in the July 2002 assessment may have been caused by the underlying slope movement, however there may have been a lag time between the displacement at approximately 5 m depth and the cracking at surface. The lag time may be such that the road surface has not re-cracked since the July 2003 repaving (and now the June 2004 repaving).

The June 2004 repaving of the site has effectively "re-set" the road surface and will provide a good benchmark for the future observations of the crack development and settlement at both the north and south ends of the site.

Assessment and Risk Level

Based on the current observations, AMEC recommends two separate Risk Levels for the north and south ends of the site.

North End

- The Probability Factor should be set at 11 in order to reflect the rate of ongoing cracking and settlement.

- The Consequence Factor should be set at 4 to reflect the magnitude and extent of damage to the road surface at the north end of the site.
- Therefore, the recommended Risk Level for the north end of the site is equal to 44, which is the same as recommended after the 2003 assessment.

South End

- The Probability Factor should be set at 6 in order to reflect apparent inactivity and moderate uncertainty related to the cause-and-effect connection between the slope movement measured in the SI's and the cracking previously observed in the road surface prior to the July 2003 repaving.
- The Consequence Factor should be set at 3 in order to reflect the relatively minor impacts of the magnitude of cracking and settlement noted in the road surface prior to the July 2003 repaving.
- Therefore, the recommended Risk Level for the south end of the site is equal to 18. This is the first time that a Risk Level has been recommended specifically for the south end of the site.

Recommendations

AMEC recommends the following future work for this site:

Remedial measures should be implemented for the north end of the site. The design of the remedial measures will be completed by AMEC during the summer of 2004.

Consideration should be given to deferring the implementation of remedial measures for the south end of the site. As discussed above, the SI's in the south end of the site continue to measure steady movement at a rates of approximately 3 to 6 mm/year at depths in the order of 5 to 6 m below the road surface. However, no additional cracking has developed in the road surface since the July 2003 repaving, during which time approximately 3 to 6 mm of displacement has occurred along the underlying slide surfaces. Therefore, the cause-and-effect relationship between the slope movement and the road surface cracking noted in 2002 is somewhat uncertain. Furthermore, if there is a direct connection then the consequences of the cracking (i.e. the magnitude of differential settlement within the road surface) do not appear to be very significant to date.

The semi-annual readings of the instrumentation at the south end of the site should be continued.
The paved-over SI in Borehole 2002-3 should be recovered and read.
The road surface at the south end of the site should be checked for fresh cracking and the pattern of any cracking compared to that noted in the July 2002 assessment.

Annual assessments should be continued. A series of follow-up site visits will be recommended as part of the remedial measures design. These follow-up site visits should be

incorporated/transitioned into the annual site assessments after the remedial measures have been completed.