

4.19 S22 – HIGHWAY 762 “S CURVE” SITE

Site Description and Background

This site is located on Secondary Highway 762, approximately 14 km south of the junction with Highway 22X (as measured along the highway). The highway is oriented northeast/southwest at this site, which is located within an overall “S” curve as the highway follows a curving creek channel that flows eastwards through a gap between two north/south oriented ridges. Figure S22-1 in Appendix S22 shows the site layout.

The highway is constructed on an approximately 4 m thick fill embankment on the south/southeast facing slope above the west bank of the creek. The southeast fill embankment slope is approximately 11 to 12°. The elevation difference between the highway and the creek channel is approximately 7 to 8 m and the west bank of the creek channel is approximately 50 m from the highway. The overall crest-to-toe slope inclination between the highway and the creek channel is typically in the order of 8 to 10°.

The creek channel is undersized relative to the broad, flat base of the valley and as a result it has a low gradient and meanders significantly. The outside of one of the meander bends is along the toe of the slope below the road, however it does not appear that the creek channel is eroding aggressively towards the highway.

This site was inspected for the first time by AIT and AMEC personnel in May 2006 after AIT personnel had noted that cracking and settlement of the road surface had formed repeatedly at this site in recent years. The ongoing damage to the road surface had been treated as a maintenance issue with patching and overlays as required to maintain a smooth road surface. Prior to the May 2006 site inspection, an overlay had been placed in early May 2006 to repair damage to the road surface that had occurred since the previous overlay in the fall of 2005. The May 2006 overlay confirmed that the settlement and cracking of the road surface had continued since the previous damage to the road noted by AIT, however it also prevented any observations of the cracking and damage to the road for an assessment of the risk to the highway. It was judged that slope movement towards the creek and/or settlement was causing the damage to the road surface.

One of the recommendations from the 2006 site assessment was to drill a series of boreholes and install SI's and piezometers to gather information on the subsurface conditions at this site and confirm the depth of the apparent slope movement. This work, along with a site survey, was completed by AMEC in the spring of 2007. Four boreholes (numbered 2007-7 to 2007-10) were drilled at the locations shown on Figure S22-1. Two SI's and two pneumatic piezometers were installed in the boreholes. Please refer to AMEC's report⁶ on the borehole drilling and instrument installations for further details.

Site Assessment

⁶ “Highway 762, Borehole Drilling and Instrumentation For S8 – Fisher Creek, S-Curve Site, S10 – Site A”, AMEC report submitted to AIT, July 2007, AMEC project number CG25260.

The site assessment was performed on June 18, 2007. The weather at the time of the site assessment was partly cloudy and there had recently been a rain shower at the site.

Observations

The following points summarize the key observations made during the site assessment. Please also refer to Appendix S22 for a site plan and annotated photographs.

- An overlay had recently been placed across the entire road surface. This overlay would be at least the first one since the May 2006 overlay. However, it is not known if an overlay was required in the fall of 2006.
- A well-defined crack had formed through the recent overlay, as shown in Photos S22-1 and 2. There was no settlement across the crack at the time of the inspection. This crack location and pattern was similar to previously-noted damage to the road, as shown in Photos S22-3, 4 and 5.

Discussion

The overlay that was placed shortly before the June 2007 inspection prevented observations of any fully-developed cracking and settlement damage to the road. However, it appeared that the previously-noted pattern of settlement and cracking of the road surface was re-forming through the recent overlay. This is consistent with the reported ongoing damage to the road at this site in recent years.

To date, the SI's that were installed in March 2007 have shown downslope movement in the native, medium to high plastic clay soils underlying the road embankment fill. The movement zones were around 983 to 984 m elevation (relative to assumed local elevation benchmark of 1000 m), which is at or slightly below the elevation of the creek channel and in the order of 8 to 10 m below the road surface. The SI's will be read again in the fall of 2007.

The pressures measured by the two piezometers that were installed in March 2007 indicate that there is in the order of 80 kPa of piezometric pressure around the movement elevation noted in the SI's, which is equivalent to a groundwater table approximately 8 m above the movement zone and within 2 m of the ground surface at the highway.

Assessment and Risk Level

The settlement and cracking of the road surface is continuing and appears to be requiring one to two overlays per year to maintain a smooth road surface. The instrumentation installed in the March 2007 boreholes shows that downslope movement is occurring in the native soils underlying the road embankment fill. The slope movement is occurring within medium to high plastic clay soils and the relatively high groundwater pressure may be one of the causes of the movement.

AMEC recommends the following Risk Level factors for this site:

- The Probability Factor should be set at 10 to reflect the active slope movement confirmed by the SI's with a rate judged to be "moderate". This is an increase from the value of 5 recommended after the 2006 inspection.
- The Consequence Factor should be set at 2 to reflect the impacts upon the road to date, i.e. annual to semi-annual repaving required to maintain a smooth running surface. This value is unchanged from the recommendations after the 2006 inspection.

Therefore, the recommended Risk Level for this site is 20, which is an increase from the value of 10 calculated after the 2006 inspection. This increase is due to the recommended increase to the Probability Factor based on the borehole and instrument data that has confirmed active slope movement in the native soils underlying the road.

Recommendations

AMEC recommends the following future work for this site:

Develop repair options for this site based on the borehole and instrument data. AMEC has an approved scope of work for this task and will be completing it in the near future. AIT can then review the repair options and select one for detailed design, tendering and implementation.

AIT and/or maintenance contractor personnel should check the settlement and cracking conditions at this site regularly. This would provide a level of due diligence in case the rate of settlement accelerates and cautionary signage and/or repaving is required promptly.

The planned semi-annual instrument readings should be continued.

The annual site assessments should be continued.