1.0 Site Visit

The Annual Inspection site visit was conducted on July 8, 2003. At the time of the visit, the weather was partly cloudy and calm.

2.0 Significant Observations

The following observations, considered to be relevant to the stability of the slope were made:

- No significant changes since the May 2002 inspection.
- Loss of ground around the pile wall along the downslope edge of the road continues to be evidenced by the cracked and distressed pavement surface in the slide area.
- Noticeable further sagging and deformation of the guardrail since May 2002 through the slide area (Photos 1, 3, and 4)
- The toe lobe of the landslide near the small creek north of the fenceline appears to have undergone additional movement since the May 2002 inspection (Photos 5 and 6).

3.0 Changes from Previous Visits

The continued cracking and subsidence of the road surface/deformation of the guardrail indicates that the slope movement at this site is continuing at a relatively slow rate. This is also evidenced by the observations of additional movement at the toe of the slide, north of the fenceline. Overall, there have been no fundamental changes to the site condition since the May 2001 and May 2002 site inspections.

The slope inclinometer readings taken in May 2003 measured ongoing movement in SI BH2 and SI 6, both near the toe of the slope (but above and south of the fenceline). No significant movement was measured in the SI's along the north shoulder of the road. Please refer to the Spring 2003 monitoring report for further discussion.

Artesian groundwater flow from the standpipe in AMEC BH-6, near the fenceline at the toe of the slope, has been noted during previous inspections, however no such flow was observed on July 8, 2003. The standpipe showed continued staining and precipitates from artesian groundwater flow, therefore it was judged that the artesian flow had continued since the previous inspection, likely during wetter times of the year.

4.0 Discussion

Significant slope movement does not appear to have occurred at this site since the 2001 assessment, however, the overall stability conditions have not improved either. The previously installed remedial measures (namely the pile wall along the downslope edge of the road) continue to only be partially effective in mitigating the slide. Relatively slow, ongoing movement of the overall slide has caused continued cracking of the road surface and deformation of the guardrail through the slide area. This has required repaving of the north shoulder of the road in

the summer of 2002. It is also understood that maintenance personnel were scheduled to once again repave the north shoulder later in the day on July 8, 2003.

As noted during previous inspections, the slide at this site extends approximately 150 m north of the highway and "toes out" in the small stream that is in the forested area north of the fenceline. It is understood that AT owns the property north of the fenceline, at least as far at the small stream. The scope of the slide appears to be such that the toe of the road fill is losing support and it is considered likely that such movements will continue over time. Periodic reconstruction of the road shoulder and regular surface patching will be effective in handling the effects of the movement in the short term, but at some point it is likely that significant repairs will be required.

In order to adequately mitigate this slide with respect to the road it will be required to improve the support below the toe area of the road fill. AMEC performed a site investigation and preliminary analysis of remedial options in 2001 and recommended a tied-back pile wall to support the road. During the July 2003 site inspection, the possibility of performing a numerical analysis to optimize the detailed design of the recommended tied-back pile wall was discussed. It is hoped that the numerical analysis would allow for a reduction in the number and/or size of piles from the values estimated during the preliminary, limit-equilibrium analysis of the pile wall option.

5.0 Assessment

The previous assessment for this site remains valid – namely, the area extending at least 150 m downslope of the highway fill embankment is an active translational/spreading slide area. It is likely that this landslide extends below the road fill and is responsible for a loss of support below the fill, which is, in turn, causing rotational failures in the fill. The existing pile wall along the downslope edge of the road appears to be partially effective in reducing the ongoing settlement and damage to the road surface. However, the fill material downslope of the pile wall is not supported. The geotechnical site investigation and preliminary analysis in 2001 indicated that a new, tied-back pile wall located on the slope below the road would be the most effective option for supporting the fill material downslope of the existing pile wall. During the 2002 site inspection, the installation of a row of pumping wells on the slope face below the road in order to lower the artesian groundwater levels in this area was also discussed.

The Probability Factor with respect to this slide should be kept at 9 in order to reflect the ongoing, relatively minor slope movements measured in the instruments since the Spring 2000 readings, albeit with some continued settlement and cracking of the road surface and deformation of the guardrail since that time.

It is likely that in the short term continuing movements will result in repairs and patching being required to the north shoulder and a portion of the westbound lane. However, larger movements are possible and likely in the longer term, which would effect a significant portion of the highway. On this basis a Consequence Factor of 5 is assigned to this slide.

Based on the above, the Risk Level at this site is calculated as 45.

6.0 Recommendations

The monitoring programs currently in place should be continued.

Annual Assessments at this site should be continued.

The surface conditions of the road at this location, as well as the guardrail alignment, should be carefully monitored by maintenance personnel. This would be in conjunction with slope indicator and piezometer monitoring to provide as early detection of potential problems below the road as possible.

Significant additional mitigative works be considered for this site;

and/or

Installation of replacement instrumentation along the toe of the slope (and possibly the north shoulder of the road) should be considered if repair measures are to be deferred.

As discussed on-site, it would be worthwhile to perform a numerical analysis as part of the detailed design of the recommended tied-back pile wall option to stabilize the slope below the road. The numerical analysis would allow for optimization of the pile wall (e.g. number and size of piles) during detailed design, and therefore an optimized estimated cost for the work.

Depending on the timing that AT is considering for the eventual implementation of mitigative measures for this site, consideration should be given to replacing SI 6, SI 7 and SI 8 near the toe of the slope. As noted in the Spring 2003 monitoring report, each of these SI's has either sheared off or are no longer readable due to ongoing slope movement, therefore currently only SI BH2 is providing monitoring data from the toe area. If the existing monitoring program is to be continued for some time prior to mitigative measures being implemented, new instrumentation should be installed on the slope face below the road in order to restore the effectiveness of the existing monitoring program. If any of the SI's on the road surface are also lost or rendered ineffective by continued repaving the north shoulder, replacement instrumentation may also be required on the road itself.