

4.2 S2 – PRIDDIS

Background

The Priddis site is located on Highway 22:14, approximately 11 km west of the Priddis turn-off and approximately 10 km southeast of Bragg Creek (as measured along Highway 22). At this site the highway is oriented east-west as it ascends out of the Priddis Creek valley. The highway is located on a sidehill, with the south side upslope and the north side downslope.

The slope instability at this site consists of a moderately deep-seated (in the order of up to 10 m below road surface elevation) rotational failure (possibly with a translational component) encompassing the north shoulder of the road and extending nearly to the toe of the slope face to the north of the road. This is combined with a translational/spreading movement extending approximately 150 m downslope (north) from the toe of the highway embankment. The translational/spreading slide appears to be seated in relatively shallow, soft, wet soils, but is likely causing a loss of foundation support below the road embankment fill.

No details of the first occurrence of the slide were included in the site file previously reviewed by AMEC, however it would have pre-dated November 1992 because the second batch of SI's (#5 to 10) were installed at that time. It is not known if the original slide encompassed the road, although it appears likely based upon the oversteepened slope face immediately adjacent to the north shoulder of the road and the fact that a pile wall is understood to have been installed along the north shoulder of the highway above the slide area, presumably to arrest movement extending beneath the road surface. No design or as-built information on the existing pile wall along the north shoulder has been available during the previous information review for this site.

Site assessments, installation and monitoring of slope inclinometers has been conducted at this site since at least the early 1990's. Please refer to Section A of the site binder for a more detailed discussion of the site background.

Site Assessment

The site assessment was performed on May 30, 2006. The weather at the time of the site assessment was sunny and clear.

Please refer to Appendix S2 for a site plan illustrating the layout of the site. The highway surface, upslope ditch and the slope face below the road were inspected down to the toe thrust of the translational movement north of the fenceline. The ground traverse downslope of the highway extended to just north of the small creek flowing along the toe of the overall slope, approximately 20 to 30 m north of the fenceline below the road.

Observations

The following points summarize the observations made during the site assessment. Please also refer to Appendix S2 for a site plan and annotated photographs illustrating key observations.

- There is continued cracking and settlement along the downslope edge of the road surface that appears to outline the existing pile wall and shows that the guardrail is pulling away from the road (Photo S2-1). The pattern of the cracking is similar to that noted during the 2005 inspection (Photo S2-2). As illustrated on Photo S2-1, it appears that the guardrail had to be realigned and moved back inwards (i.e. towards the centerline of the road) since the 2005 inspection.
- The slope face in the slide area below the road appeared to be relatively unchanged since the 2005 inspection, however the thick grass and vegetation cover would have obscured any recent subtle cracking or deformation. Photos S2-3 and S2-4 show typical views of this area.
- There was a groundwater spring and an associated area of standing water in the upslope road ditch approximately 60 m east of the piezometers and just downgradient from the ditch block at the inlet of the culvert below the road that discharges just east of SI #4 on the north side of the road. This groundwater spring and standing water may have been from the discharge from the pumping wells installed further west along the ditch (see site plan on Figure S2-1), however the actual outlets from the pumping wells could not be located.

Based on discussions on site during the assessment, AMEC understands that:

- AIT owns the forested area to the north of the fenceline and therefore has access to this area if required for the construction of stabilization measures.
- AIT has not been able to locate design or as-built information on the existing pile wall and/or the pile wall may have been a “field fit” design with limited construction records that have not been located in AIT’s archives.
- It is possible that this highway may be twinned in the future but the functional planning study has not yet been commissioned.

Assessment and Risk Level

The Spring 2006 instrument readings for this site showed that active slope movement is continuing around the toe of the slope north of the road. The annual inspections of this site have shown that the year-over-year impact on the highway from this slope movement has consisted of ongoing settlement and cracking along the downslope edge of the road. This settlement and cracking is being treated as a maintenance issue with patching and guardrail realignment required at least annually in recent years. It is judged that the continued slope movements to the north of the highway will eventually directly destabilize the road embankment. The existing pile wall along the downslope edge of the road may be effective in protecting against such destabilization, however without any design or as-built information (e.g. pile depths, size, spacing) on this pile wall it is not possible to confirm its effectiveness beyond ongoing visual observation of surface conditions and continued monitoring of the remaining

geotechnical instrumentation (both upslope and downslope of the existing pile wall). As discussed in the Spring 2006 monitoring report, the remaining geotechnical instrumentation is limited and it is expected that continued landslide movement and patching of the road surface will render the remaining instruments non-functioning or inaccessible in the next one to two years.

Therefore, AMEC recommends the following Risk Level factors for this site:

- Probability Factor of 9 in order to reflect the ongoing slope movements measured in the instruments since the Spring 2000 readings, along with the continued settlement and cracking of the road surface.
- Consequence Factor of 5 given that larger movements are possible and the degree of effectiveness of the pile wall is uncertain without additional information. It is possible that larger movements could occur and affect a significant portion of the highway surface.

Therefore, the current recommended Risk Level for this site is equal to 45. The recommended Risk Level is unchanged since the 2002 assessment.

Discussion and Recommendations

AMEC has previously recommended that additional geotechnical investigation and design work be performed for this site with the objectives of installing supplementary instrumentation to replace instruments that are no longer functioning, to further characterize the slope movement and to gather survey information for the area to the north of the fenceline. This information could be used to develop a conceptual design for earthworks to stabilize the highway. Based on discussions on-site during the 2006 inspection, AMEC understands that AIT's opinion is that restoring the instrumentation on the slope below the pile wall would add relatively little value versus continued visual monitoring of the road surface condition because the existing instruments have already provided some information on the stratigraphy and depth of landslide movement. Furthermore, AIT's preference is to direct future effort towards verifying that the existing pumping wells are functioning and to recover the instruments on the road surface that have been paved over during maintenance work.

The concept of upgrading the existing pile wall by adding a wailer and tie-back anchors was also discussed as a possible option to manage the landslide risk to the road.

Based on the above, AMEC recommends the following future work for this site:

The monitoring programs currently in place should be continued. The maintenance contractor should be instructed to avoid paving over the existing instruments on the north shoulder of the road.

AIT should instruct the maintenance contractor to locate the existing instruments that have been paved-over and restore access to them for future monitoring.

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 the recommended instrumentation monitoring to provide as early detection of potential problems below the road as possible.

The maintenance contractor should confirm that the existing pumping well(s) are functioning and effective. It is understood that the power consumption at the pumps is currently being used as a indirect check on whether or not the pumps are functioning. The outlets from the pumps should be located and daylighted to allow for direct observation and measurement of their discharge. As part of this effort, the ditch gradient should be restored around the area of standing water noted to the east of the pump(s). If the pump outlet(s) cannot be located, it may be more effective to install new pump(s) in order to eliminate uncertainty regarding the installation details and effectiveness of the existing pump(s).