



January 15, 2006

15-85-13

Alberta Infrastructure and Transportation
Room 301, Provincial Building
Bag 900, Box 29
9621 – 96 Avenue
Peace River, Alberta
T8S 1T4

Attention: Mr. Ed Szmata

**PEACE REGION (PEACE RIVER / HIGH LEVEL)
GEOHAZARD ASSESSMENT
(CE049/2004)
CALL-OUT FOR EMBANKMENT FAILURE
ON HWY 690:02, PH 47 DEADWOOD SLIDE**

Dear Sir:

This report presents the results of a call-out for the above noted slide site located on Hwy 690:02 approximately 2.2 km east of the intersection with Highway 35, and about 8.8 km west of town of Deadwood. Mr. Don Proudfoot, P. Eng. and Mr. Vedran Bijeljanin, E.I.T. of Thurber Engineering Ltd. conducted the inspection on June 21, 2005. Mr. Ed Szmata of Alberta Infrastructure and Transportation (AIT) made the request for the call-out, and was present during the site reconnaissance along with Ms. Amanda Russell and Mr. Roger Skirrow, P. Eng. of AIT.

1. BACKGROUND

Embankment instability was originally observed near the existing 1500 mm diameter culvert prior to the pavement of the Hwy during the mid 1990's. In the fall of 2004, significant slide movement was noted west of the culvert location (BF 73271), prompting a callout request, which was cancelled due to the presence of snow cover.

2. OBSERVATIONS

The roadway surface, back slope ditch and side slope areas south-southeast of the highway alignment were inspected during the reconnaissance. Selected photographs taken during the site reconnaissance are attached. A sketch plan showing the locations of the active scarp, creek alignment, patched highway

section, and the existing culvert is provided on Figure 1, along with a cross-section through the slide.

At the time of the site inspection, tension cracking outlining the active slide scarp on the roadway surface was observed crossing the highway diagonally. The backscarp crack showed a lateral movement of up to 60 mm and a vertical drop of about 50 mm. Due to ongoing creep movements within the slide mass, a number of smaller cracks in the longitudinal direction were noted on the patched highway surface east of the main back scarp location, requiring continuous patching and sealing. A subdued scarp was observed approximately 34 m south-east of the highway shoulder along cross-section A-A'.

Telus pedestals and highway crossing signs for the North Peace Gas Co-op line were noted during the site reconnaissance. In addition, there was an overhead power line running in the east-west direction along the north highway backslope.

3. ASSESSMENT

Creek erosion destabilizing the toe of the slope appears to be the most probable cause of the slide movement. The creek bed has been realigned by the slide as shown on Figure 1. It is expected that, if left untreated, the slope movements will continue and require ongoing roadway patching maintenance.

4. RISK LEVEL

Based on the AIT's Risk level rating system, the risk level for this site has been assessed as follows:

$$\text{Risk (39)} = \text{PF (13)} \times \text{CF (3)} \quad [\text{Eq. 1}]$$

This risk level was based on a Probability Factor (PF) of 13 (active with high rate of movement, steady or increasing) and a Consequence Factor (CF) of 3 (site having a shallow fill, where partial closure of the road or a detour is a direct result of the slide movement).

5. RECOMMENDATIONS

In the short term, the roadway surface should be patched and cracks sealed in order to maintain the traffic safety. The slide should be inspected on a regular basis so that additional measures such as traffic warning signs can be set up if the slide worsens.

Based on the objective to re-establish embankment stability below the highway three options have been identified as possible long term solutions:

- a) The Installation of a 1500 mm diameter CSP culvert along the toe of the slide, which would prevent further creek erosion of the toe of the slope. In addition to the culvert installation, a toe berm would be constructed and the slide mass regraded to a uniform slope in order to re-establish slope stability.
- b) Use of a pile wall to stabilize the highway side slope.
- c) Excavation of the slide mass, construction of a deep shear key, and reconstruction of the highway sideslope. This option would also involve the lining of the creek bed with rip rap in order to prevent further toe erosion.

The ball park cost of the proposed repairs excluding land and engineering costs, ranges from about \$350,000 to \$500,000.

A topographic survey, detailed design and tender package will be required prior to carrying out the remedial measures. Proposed test hole and instrumentation locations are shown on Figure 1.

6. CLOSURE

We trust that the above information is sufficient for your present requirements. However, if you have any questions or require any additional input please do not hesitate to call us.

Yours truly,
Thurber Engineering Ltd.
Don Proudfoot, P. Eng.
Review Principal



Vedran Bijeljanin, E.I.T.
Project Engineer
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cc: Mr. Roger Skirrow, P. Eng.
Geotechnical Director, Alberta Infrastructure and Transportation