

June 25, 2001

Alberta Transportation
Central Region
#401, 4902 – 51 Street
Red Deer, Alberta
T4N 6K8

Mr. Melvin Mayfield, P.Eng.
Construction Services Coordinator

Dear Mr. Mayfield:

Central Region Landslide Assessment Site C16
H11:08 Frost Heave @ Ch 17.6
2001 Annual Inspection Report

Alberta Transportation has initiated a process of risk management at site-specific slope movement sites that includes a 3-ring binder document control system. This Annual Inspection report forms Section B of the document control system for the above site. The annual site inspection was undertaken on June 12, 2001 by Mr. Darren Ratcliffe, P.Eng., of Klohn Crippen Consultants Ltd. Mr. Ratcliffe was accompanied by Mr. Melvin Mayfield, P.Eng., and Mr. Fred Cheng, P.Eng., of Alberta Transportation.

This report was prepared by Klohn Crippen Consultants Ltd. for Alberta Transportation Central Region under Contract No. CE053/2000.

1. PROJECT BACKGROUND

Highway 11:08 was constructed in 1977. Seasonal frost heave problems have been noted at two sites along this stretch of highway: Ch 17.6 and Ch 40.5. The frost action typically caused humps, depressions and serious cracking problems resulting in speed restrictions being initiated. It is understood that springs were noted in the ditches at both of these sites.

At Ch 40.5, successful remedial work was undertaken in the summer of 1999 and involved 3 m deep longitudinal trench drains installed over a length of about 500 m in both highway ditches. It is understood that cross drains had been tried in previous years but with little success. The drains comprise a perforated pipe surrounded by gravel.

At Ch 17.6, no remedial work has been undertaken, except for some minor ditch re-grading performed in 1995.

The site plan for Ch 17.6 is shown on Figure 1 and illustrated in the attached photographs.

2. SITE OBSERVATIONS

At Ch 17.6, the site is immediately east of a deep valley fill. Significant longitudinal and transverse cracks in the pavement extend over a length of highway of about 95 m and have necessitated a speed restriction with bump warning signs. There is one noticeable depression in the westbound lane of about 150 mm deep with radial cracks leading from it.

There is standing water in both ditches, but this is more noticeable in the north ditch. The ditches are also well vegetated that is also indicative of a high groundwater level. At least two damaged culvert ends were located in the north ditch, but no corresponding culvert ends in the south ditch could be located.

3. SITE ASSESSMENT

It is understood that there is significant vertical displacement in the distressed pavement areas in the winter with little or no displacement in the summer. This would support the conclusion that frost heaving rather than slope movements/fill settlement is causing the majority of the cracks. The heaving likely takes the form of immediate freeze with heaving, steady state deformation, thaw and settle.

Based on the risk level criteria provided by Alberta Transportation, a risk rating of 7 has been assigned to this site. This is based on a probability factor of 7 for an active feature but with defined zones of movement, and a consequence factor of 1 as closure of the highway is unlikely.

4. RECOMMENDATIONS

It is recommended that the drainage in the area be improved. The most practical way to achieve this is by the use of free-draining gravel filled french drains running in both ditches beside the highway. At the base of the drains, it is recommended that a filter fabric wrapped perforated PVC pipe (say, 150 mm diameter) be provided to reduce the risk of the drain clogging with fines. The gravel drain should be a minimum of 1 m wide by about 3 m deep below the ditch invert and should also be wrapped in geotextile filter

fabric. The gravel drain can be covered with native soil backfill to reduce the backfill cost and to prevent frost penetration into the drain. The gravel should be free draining and of high permeability. Precautionary measures are required to ensure that the drain is constructed as a continuous layer, and is not contaminated by the native materials or backfill.

The perforated pipe should be laid at a grade of about 2% and would daylight in the valley slope. A rip rap apron with dimensions of about 2 m wide by 5 m long should be provided at the pipe outlets to prevent erosion of the slope.

The total length of drain required is about 260 m and requires about 400 m³ to 650 m³ of gravel to complete. Determining the exact groundwater location can optimize this gravel quantity. It is recommended that 2 to 3 test pits be dug for this purpose prior to construction.

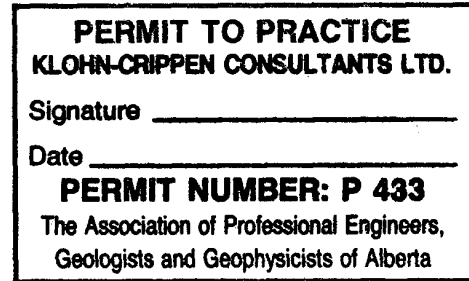
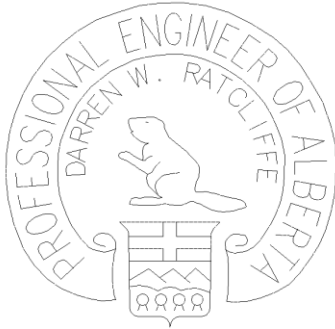
The north side drain will have to cross the property access road, which will require reinstatement upon the completion of this section.

An estimated cost for this work is about \$18,000 to \$25,000 depending on the amount of excavation and gravel quantity required.

Please contact the undersigned if you have any questions regarding this report.

Yours truly,

KLOHN CRIPPEN CONSULTANTS LTD.



Darren Ratcliffe, P.Eng.
Senior Geotechnical Engineer

Brian Rogers, P.Eng.
Manager, Alberta

FIGURE

Looking west – north ditch





North ditch – drop into valley



Looking east – south ditch



Looking west – south ditch





Standing water in north ditch







Looking west – north ditch





North ditch – drop into valley

Looking west – south ditch



Looking east – south South





Standing water in north ditch



North





