



June 1, 2004

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

Mr. Melvin Mayfield, P.Eng.
Project Engineer

Dear Mr. Mayfield:

Central Region GeoHazard Assessment Site C22
H22:20 Pavement Dips
May 2004 Annual Inspection and Instrumentation Report

Alberta Transportation has initiated a process of risk management at specific geohazard sites that includes a 3-ring binder document control system. This Annual Inspection report forms Section B and C of the document control system for the above site. The annual site inspection was undertaken on May 12, 2004 by Mr. Darren Ratcliffe, P.Eng. of Klohn Crippen Consultants Ltd. Mr. Ratcliffe was accompanied by Mr. Roger Skirrow, P.Eng., and Mr. Melvin Mayfield, P.Eng., of Alberta Transportation. The instruments were read by Mr. Joel Hilderman, EIT, of Klohn Crippen Consultants Ltd. on May 14, 2004.

This report was prepared by Klohn Crippen Consultants Ltd. for Alberta Transportation Central Region under Contract No. CE045/2004.

1. PROJECT BACKGROUND

Over approximately the last 6 years, two gentle dips have been observed across the full width of Highway 22. The dips are about 150 m apart and are located approximately 12 km south of Highway 54 or about 5 km north of the intersection with Highway 587. The highway was built in 1989 with a 50 mm thick lift of cold mix and, in 1993, a 110 mm thick layer of asphalt concrete pavement was added. The highway is not currently scheduled for resurfacing until 2008. The two areas of settlement were first

observed in 1996 and have progressively settled since that time. No patches have been placed in order that the settlement is not accelerated by the increased weight of pavement.

The areas of settlement coincide with natural depressions about 10 m to 15 m deep that were infilled during the road construction. The bases of the depressions are typically wet with standing water. The dips are about 150 m apart and have a maximum differential settlement of 200 mm to 250 mm.

Four solid stem auger holes (designated as SI03-01, AH03-02 to AH03-04) were drilled on July 23, 2003 at the two settlement sites. Typically, the embankment fill material comprised low plasticity, stiff to very stiff silty clay with occasional pockets of sand and silt. The fill thickness ranged from about 3 m to 11 m thick and was observed to have an average moisture content of about 20%. Underlying the fill, organic zones were encountered and are assumed to be original lakebed deposits. The organic layers were observed to be about 1 m to 3 m thick and comprised fibrous and woody, partially decomposed material. The observed moisture content varied from 330% to 390%. The organic material was underlain by low to medium plasticity, stiff clay till.

The site plan, instrument location plan and cross sections are illustrated on Figures 1 and 2. The site features are illustrated in the attached photographs.

2. SITE OBSERVATIONS

Based on a visual inspection only, it would appear that the settlement has increased noticeably over the last 12 months. However, no cracking or other distress of the pavement was noted. No apparent bulging of the slopes was observed. Due to the gradual nature of the dips, they do not at present form a dangerous hazard to vehicles traveling at the posted speed limit.

Comments on the SI data obtained on May 14, 2004 are provided below:

SI 03-01

A distinct horizontal movement zone has become apparent in the embankment at about 2 m below the pavement surface. The total movement is about 5 mm since August 2003.

3. SLIDE ASSESSMENT

It is believed that the areas of settlement in the highway fill have been on going since construction, but were not noticeable until 1996. It is considered that the consolidation of the organic sediments is very slow due to confinement provided by the low permeability of

the fill above and clay till below, and decomposition of the organic material. Simple consolidation analyses based on published parameters indicate a likely total settlement at Dip 1 of about 500 mm and at Dip 2 a total settlement of about 850 mm. The amount of total settlement versus the observed differential settlement is unknown. It is considered that the settlements will continue due to creep and decomposition of the organic soils.

In conjunction with the vertical movement due to settlement, there is also some apparent lateral deformation of the embankment at a relatively high level close to the pavement surface. This movement does not indicate a deep-seated failure of the embankment. The movement is likely a result of varying stress levels within the embankment as a result of the differential settlement.

Based on the risk level criteria provided by Alberta Transportation, a risk rating of 36 has been assigned to this site. This is based on a probability factor of 9 for an active feature, and a consequence factor of 4 due to the possible affect on the safety of highway traffic.

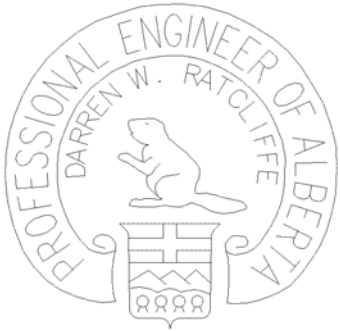
4. RECOMMENDATIONS

Based on the very slow nature of the settlement, it is recommended that the highway grade be restored in the dip areas with asphalt as required, or addressed in a future overlay project. The areas should be monitored by AT Operations personnel to observe further settlement or lateral spreading. Any significant changes should be reported to AT Construction staff for review. As such, it is recommended that this site be deleted from the annual site inspection tour, but that instrumentation monitoring should continue.

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

Reviewed by Thomas K. Murray, P.Eng.
Manager, Geotechnical

APEGGA Permit to Practice No. 433

FIGURES