



August 5, 2005

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

Mr. Alain Momed, P.Eng.
Project Engineer

Dear Mr. Momed:

Central Region Geohazard Assessment Site C22
H22:20 Pavement Dips
May 2005 Instrumentation Monitoring Report

Alberta Infrastructure & Transportation has initiated a process of risk management at specific geohazard sites that includes a 3-ring binder document control system. This Bi-annual Instrumentation Monitoring report forms Section C of the document control system for the above site. The instruments were read by Ms. Alena James, EIT, of Klohn Crippen Consultants Ltd. on May 26, 2005.

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

1. PROJECT BACKGROUND

Over approximately the last 9 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 about 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.

2. SITE OBSERVATIONS

One inclinometer is operational as noted on the attached "Field Summary of Instrumentation Monitoring Form". The following data plots are provided for Section D of the document control system for SI03-01:

- Cumulative and incremental displacement in A direction on same page.
- Cumulative and incremental displacement in B direction on same page.
- Resolved single movement vector plot

Comments on the SI data obtained on May 26, 2005 are provided below:

SI 03-01

A distinct horizontal movement zone has become apparent in the embankment approximately 2 m below the pavement surface within the highway fill. Approximately 8 mm of total cumulative movement has been recorded since August 2003. The rate of movement appears to be about 3 mm/year.

3. SLIDE ASSESSMENT

It is believed that sections of the highway fill have been settling 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 typical 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.

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.

Based on the risk level criteria provided by Alberta Infrastructure & Transportation, a risk rating of 27 has been assigned to this site. This is based on a probability factor of 9 for an active feature, and a consequence factor of 3 due to the possible affect on the safety of highway traffic.

4. RECOMMENDATIONS

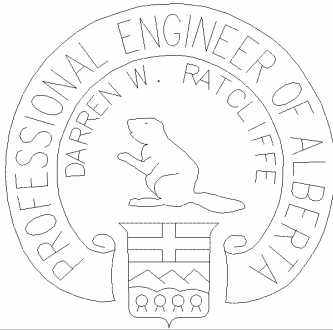
Based on the very slow nature of the settlement, it is recommended that the highway grade be restored in the dip areas with asphalt as required, or addressed in a future overlay project.

The areas should be monitored by AIT Operations personnel to observe further settlement or lateral spreading. Any significant changes should be reported to AIT 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.
Project Manager

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