

GEOHAZARD RISK ASSESSMENT  
CENTRAL REGION

## SITE C61: Frost Heave

LEGAL LOCATION: **NE 28-39-1-W5**

REFERENCE LOCATION

ALONG HIGHWAY: km 12

UTM COORDINATES: **N52° 23' 30"**, **W114° 4' 26"** (NAD83)

AT FILE: **H20:02**

AT PLAN & PROFILE: Highway 20:02 about 8 km north of H11A  
near Sylvan Lake

Date of Initial Observation: 2011

Date of Previous Inspection: May 17, 2011

Inspected By: Klohn Crippen Berger Ltd.

Date of Current Inspection: June 18, 2012

Inspected By: Klohn Crippen Berger Ltd.

Instruments Installed: none

Instruments Operational: none

Date of Last Reading: n/a

Read By: n/a

Risk Assessment: PF(9) \* CF(6) = **54**

Last Updated by: Klohn-Crippen Berger Ltd.

Date: June 18, 2012

### Location and General Description of Instability

A 75 m long section of Highway 20:02 about 8 km north of H11A near Sylvan Lake (approx. 4 km northeast of Birchcliff) suffers severe pavement distress, in the form of transverse cracks, due to frost heave in winter months creating a significant hazard to traffic. The topography is generally flat in a east-west direction and gently slopes to the north. A topographic high is located about 1 km to the south. The highway embankment is about 1.5 m high.

### Geotechnical Conditions

The KCB investigation indicated that the road structure typically consists of about 100 mm to 200 mm of asphalt over a thin sandy base course, typically about 100 mm thick, but was not observed at all drilling locations. The road subgrade typically comprises varying thicknesses of medium to high plasticity clay till (with a relatively high moisture content), silty sand, and silt. In general, the surface materials were firm to stiff to a depth of about 5 m below the road surface, and very stiff to hard below 5 m. Test hole drilled at the location of the maximum observed heave indicated an organic zone between about 0.75 m to 1.2 m below the road surface (0.45 m thick). The observed groundwater levels were about 1.4 m to 1.7 m below the road surface or about at the base of ditch elevation.

Test hole logs and additional information are provided in Section G.

### Chronology (Refer to Section G for Further Information)

#### May to September 2011

The area of distressed pavement was marked by warning diamonds by Alberta Transportation staff. At the time of the inspection, no vertical displacement of the pavement was observed indicating the temperature sensitive nature of the heave issue. Significant transverse cracks were observed across the highway that generally corresponded with the hazard markers. Longitudinal cracking was also observed in the pavement.

The field investigation was conducted on September 20, 2011 which included seven test holes that were advanced on the shoulders of the highway. Laboratory testing included natural moisture content and Atterberg limits.

It is considered that the frost heave at this location is related to the freezing and expansion of wet high plasticity clay soils with the presence of a high groundwater table. It was assessed that the existing site grades do not permit effective drainage of the surface water or below-grade groundwater conditions. Based on a cost comparison of material replacement or providing insulation, it is recommended to adopt the insulation remediation method at this site.