# SITE C22: H22:20 Settlement

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| LEGAL LOCATION: | **SW9-35-5-W5** |
| REFERENCE LOCATION ALONG HIGHWAY: | **21+500** |
| UTM COORDINATES (NAD 83): | **N 5761985 E 660135** |
| AT FILE: | H22:20 |
| AT PLAN & PROFILE: | S. of SH587 – Jct. H54 (Sheet 2 of 6) |
| Date of Initial Observation: | 1996 |
| Dates of Previous Inspections: (Inspected By) | May 28, 2002 (KCCL)<br>May 23, 2003 (KCCL)<br>May 12, 2004 (KCCL) |
| Instruments Installed: | 1 Slope Inclinometer (July 2003) |
| Instruments Operational: | 1 Slope Inclinometer |
| Reading Dates: (Read by) | August 1, 2003 (KCCL)<br>November 25, 2003 (KCCL)<br>May 14, 2004 (KCCL) |
| Risk Assessment: | PF(9) * CF(4) = **36** |
| Last Updated by: | Klohn Crippen Consultants Ltd. (KCCL) |
| Date: | May 2004 |

Location

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 two areas of settlement were first observed in 1996 and have progressively settled since that time. 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.

General Description of Site Conditions

The dips are about 150 m apart and are described separately: Dip #1 (south) and Dip #2 (north).

Dip #1

Dip #1 is about 40 m long with settlement at the east road edge of about 250 mm. The ditch to the west is relatively high while to the east the ground is low and wet. One transverse tension crack was observed across the pavement south of the dip.

Dip #2

Dip #2 is of similar dimensions but appears to have two components: “A” to the east and “B” to the west as the ground surface on both sides of the highway at this point is low and wet. The vertical displacements at this location are about (A) 150 mm and (B) 190 mm at the highway edge. Dip #2A does exhibit some degree of toe bulging that could be related to 3-dimensional effects of the consolidation.

Geotechnical Conditions

The regional geology is described as a stagnation moraine with strongly developed hummocky topography with generally round well-defined knobs and dimpled kettles or doughnut shaped hills and kettles, and a local relief of 5 m to 20 m. The till is of uneven thickness with local water sorted material. Due to the nature of the topography, the highway alignment passed through a number of small lakes. It is unlikely that drilling was performed to determine the condition of the lakebed sediments and it is not known what level of sub-excavation was undertaken prior to the construction of the road embankment.

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 the 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 clay till.

Chronology (Refer to Section G for Further Information)

1989
The highway was constructed with a 50 mm thick lift of cold mix.

1993
A 110 mm thick layer of asphalt concrete pavement was added.

1996
First observations of settlement.

July 2003
Site investigation and recommendations provided by Klohn Crippen.

Reports and Documents

May 2002 (KCCL) Inspection Report
May 2003 (KCCL) Inspection Report
May 2004 (KCCL) Inspection and Instrumentation Monitoring Report

Geotechnical Investigation & Proposed Remediation Report (KCCL), November 26, 2003

Air Photos (1979, 1997)
Plan & Profile Sheets (1982)