

LANDSLIDE RISK ASSESSMENT  
CENTRAL REGION

**SITE C8: BLACKFALDS SLIDE**

LEGAL LOCATION: **NE 9-39-26-4**

REFERENCE LOCATION  
ALONG HIGHWAY: **Sta. 305+00 to 309+00**

UTM COORDINATES: **N 5,803,030**            **E 317,080**            (NAD83)

AI FILE: **SH597:02**

AI PLAN & PROFILE: **Jct. Hwy No. 2A to Jct. SR 815, Sheet 3 of 6**

Date of Initial Observation: **March 1979**

Date of Previous Inspection: **August 1999**

Inspected By: **Thurber Engineering Ltd.**

Date of Current Inspection: **May 26, 2000**

Inspected By: **Klohn-Crippen Consultants Ltd.**

Instruments Installed: **2 slope inclinometers, 1 pneumatic piezometer,  
3 standpipe piezometers (1983)  
3 slope inclinometers, 2 standpipe piezometers (1999)**

Instruments Operational: **3 slope inclinometers, 2 standpipe piezometers**

Date of Last Reading: **December 1999**

Read By: **Thurber Engineering Ltd.**

Risk Assessment: **PF(9) \* CF(2) = 18**

Last Updated by: **Klohn-Crippen Consultants Ltd.**  
Date: **July 12, 2000**

### Location and General Description of Instability

From Sta. 305+00 to 309+00 of SH597 (about 5 miles west of Blackfalds), the grade line for the highway fill is a side hill crossing of a bowl shaped valley. A creek is located at the toe of the fill, which flows to the Red Deer River approximately 1 km away. Shortly after construction in 1977, settlement and pavement cracking was observed between Sta. 306+35 to 307+81. Further subsidence was observed in the ditch on the north side of the road in 1982. Instrumentation measurements indicated that the highway fill was failing along the bedrock contact and moving southwards towards the creek. Remedial works installed in 1983 included a key trench, a toe berm and horizontal drains.

From 1993 to 1996, about 100mm to 150mm of asphalt was added each year to maintain the road surface. Movements were typically noted following periods of heavy rain. In 1996, a section of pavement about 50 m long was excavated to a depth of about 8 m. The excavation was backfilled with compacted pitrun gravel, with a filter cloth and perforated pipe drainage system, which was overlain with compacted clay fill. A 3 m deep drainage curtain about 200 m long was installed below the north ditch.

The highway was re-paved in 1998. No movements were observed in the period 1996 to August 1999. In August 1999, following a heavy rainfall, significant cracking in the slope was observed and this was attributed to settlement of the fill placed in 1996. To confirm this theory, instrument installation was performed in 1999.

### Geotechnical Conditions

Prior to fill placement at this location, the soil conditions consisted of about 4 m of silty clay with occasional lenses of fine sand and organic material overlying shale bedrock. To construct the embankment about 20 m of clay fill was placed. A back analysis of the slide indicated clay strength parameters of  $\phi' = 16^\circ$  with  $c' = 10$  kPa. The groundwater profile is about 4 m below the ditch level on the north side and closely follows the contact surface between the natural ground and the fill material towards the toe of the side slope.

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

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

December 1975

Site investigation for proposed highway alignment indicated the soil conditions in the area to be silty sand to sandy clay.

January 1976

Design for new highway includes an embankment through a deep coulee: proposed height about 20 m high with 2.5H:1V side slopes. A culvert was also proposed.

Winter 1977

Highway construction during winter months.

Fall 1978

A slope instability about 35 m long extending to centerline of highway required repairs to the pavement. Severe erosion to slope caused by 24" pipe discharging water.

March 1979

Inspection report. A flume was constructed to carry the culvert flows to the creek.

December 1982

Inspection report and pavement survey.

July 1983

A site investigation was undertaken including instrumentation installation and lab testing. 3 standpipe piezometers were installed in the ditch on the north side of the road. 2 slope inclinometers and 1 pneumatic piezometer were installed in the fill slope south of the highway. The failure was found to be occurring along the contact surface between the silty clay and the shale bedrock.

It was recommended that the following be provided between Sta. 305+75 to 308+50: a key trench excavated to bedrock with a base width of 3 m and backfilled with pit run gravel; a 15 m wide toe berm of compacted pit run gravel; and horizontal drains installed to lower the water level in the fill.

November 1983

Toe berm and drains installed.

1993 to 1996

About 100mm to 150mm of asphalt was added each year to maintain the road surface. Movements were typically noted following periods of heavy rain.

September 1996

A section of pavement about 50 m long was excavated to a depth of about 8 m. The excavation was backfilled with compacted pitrun gravel, with a filter cloth and perforated

pipe drainage system, which was overlain with compacted clay fill. A 3 m deep drainage curtain about 200 m long was installed below the north ditch.

1998

Highway was repaved. No movements were observed in the period 1996 to August 1999.

August 1999

Following a heavy rainfall, significant cracking in the slope was observed and this was attributed to settlement of the fill placed in 1996.

October 1999

The slope was re-graded and instrumentation was installed including 3 slope inclinometers and 2 standpipe piezometers.