

SITE C5: CREAM COULEE

LEGAL LOCATION: SW 17/NW 8-31-22-4

REFERENCE LOCATION
ALONG HIGHWAY: 9+870

UTM COORDINATES (NAD83): N 5,724,122 E 354,751

AI FILE: H27:10

AI PLAN & PROFILE: Jct. Hwy 21 – West of Red Deer River, Sheet 3 of 6

Dates of Previous Inspections:
(Inspected By) May 12, 2000 (KCCL)
May 22, 2001 (KCCL)
May 16, 2002 (KCCL)
May 21, 2003 (KCCL)
May 18, 2004 (KCCL)

Instruments Installed: 1 Slope inclinometer, 1 standpipe piezometer (2001)

Instruments Operational: None

Reading Dates:
(Read by) May 29, 2001 (KCCL)
November 16, 2001 (KCCL)
June 4, 2002 (KCCL)

Risk Assessment: PF(11) * CF(4) = 44 (Before remediation)

Last Updated by: Klohn Crippen Consultants Ltd. (KCCL)
Date: May 2004

Location and General Description of Instability

The slide is located on the north side of the Highway 27 embankment across the Cream Coulee valley. The slide occupies most of the fill height (about 6 m to 8 m high) and is about 60 m to 70 m wide. The failure is relatively shallow (upper 1.5 m to 2 m of material) and appears to have occurred after an extended period of wet weather in a relatively steep slope (2H:1V). The highway remains unaffected by the series of 3 slides in the same location over the period 1994/5 - 1999. After each of the previous slides, the slope was rebuilt typically adding new drainage measures and berms (refer to Chronology).

Geotechnical Conditions

The soil conditions were observed to be silty to sandy clay fill overlying about 3 m of saturated soft sandy clay with organic material and saturated sand lenses. This is in turn underlain by shale bedrock.

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

Chronology (Refer to Section G for Further Information)

1970's

Installation of culvert and original road fill.

May 1995

A failure on the 3H:1V north side slope was observed. The slide was observed to be a shallow failure within the fill material with the bottom of the slump about 1 m above creek bed level. The area of the slide is about 24 m wide at the base and about 12 m long down the slope face. 3 test pits were excavated and encountered generally silty to sandy clay. The bottom of the coulee was found to be soft and wet. It was recommended to strengthen the toe area by placing gravel before widening the highway shoulders and reconstructing the side slope at about 2H:1V. Offset guardrails (about 8 m offset) were installed on both sides of the highway.

July 1996

Another slope failure at the same location. The slide appeared to be shallow and rotational (about 15 m to 20 m wide) with a scarp drop of about 1.5 m. The fill slopes were observed to be sparsely vegetated with erosion gullies. No cracks in the pavement or deflection of the guardrails was noted. The trigger appears to be heavy rainfall saturating the fill. It was recommended to dress up the slope to its original configuration and re-vegetate.

October 1996

Slide was repaired with a layer of gravel (0.5 m deep by 3 m wide by 40 m long), 4 evenly spaced perforated drain pipes, and a small toe berm. Additional failures occurred during the repairs requiring a larger berm (constructed in November 1996).

July 1999

Another failure of the slope after several days of heavy rain. On this occasion, the slide has extended east and is now 60 m to 70 m wide. The slide appears to be more deep-seated than before, with the toe of the slide at or slightly below the creek bed. The upstream end of the culvert has been deflected by the movement. The highway remains unaffected by the slide.

Some movement and cracking was observed in fall 1998 and water may have infiltrated these cracks contributing to the slide. However, the following issues were considered to be the most significant:

- Relatively steep slope
- Relatively weak fill materials
- Relatively poor drainage conditions

It was recommended that the slope be flattened to at least 3.5H:1V, replacing the fill with sand and gravel, and excavating a trench down the centre of the slide area to drain the slope face to the toe.

September 1999

The contractor attempting to repair to slope encountered significant difficulties as the slope is still unstable. The embankment was left in a failed state.

2001-2003

The 2003 repairs to the slope required excavation and removal of slide debris in the failure zone and re-construction of the slope at a flattened grade of 3.5H:1V. A subcut excavation was also required at the toe of slope to remove soft sediments and further stabilize the new slope. A borrow site was provided on site for embankment fill construction, however a portion of the embankment slope was designated as free draining pit run gravel and so off site borrow material was also provided. Although flattening of the slope would normally require extension of the existing multi-plate culvert, Alberta Transportation required that the culvert remain at its current length as the culvert may be replaced in the near future. Therefore, geo-grid reinforced slopes were incorporated around the culvert inlet area at a grade of 1H:1V.

The design and estimated material quantities for the slope repair were originally described in the Klohn Crippen design report dated April 2001 based on a site survey conducted in December 2000. This report was updated and re-issued on September 26, 2002. Alberta Transportation prepared the tender documents with an approved budget of \$275,000 in July 2003. The construction period was approximately 3 weeks and the

contract was substantially complete by October 21, 2003. The final contract cost was \$296,856.46.

Reports and Documents

May 2000 (KCCL) Inspection Report

May 2001 (KCCL) Inspection and Instrumentation Monitoring Report

November 2001 (KCCL) Instrumentation Monitoring Report

May 2002 (KCCL) Inspection and Instrumentation Monitoring Report

May 2003 (KCCL) Inspection Form

May 2004 (KCCL) Inspection Form

Cream Coulee Slide Repair Project Summary Report (EBA), December 1996

Cream Coulee Slide Repair Design (KCCL), April 2001 updated September 26, 2002

Cream Coulee Slide Repair As-Built Report (KCCL), January 7, 2004