

## SITE C4: BACKSLOPE SLIDE (W. of RED DEER RIVER)

LEGAL LOCATION: NE 9-31-22-W4

REFERENCE LOCATION  
ALONG HIGHWAY: km 22.8 (about 1.2 km west of the Red Deer River)

UTM COORDINATES(NAD83): N 5,723,418 E 367,256

AT FILE: H27:10

AT PLAN & PROFILE: E. of Jct. H837 – E. of Red Deer River, Sheet 2 of 5

Date of Initial Observation: September 1998

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: None

Instruments Operational: None

Risk Assessment: PF(9) \* CF(4) = 36

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

### Location

The slide area is located approximately 25 km northwest of Drumheller at Kilometre 22.8 of Highway 27 (about 1.2 km west of the Red Deer River). The highway follows a wide natural coulee that descends from the prairie (about elevation 800 m) to the Red Deer River (about elevation 700 m). The failure is located on a curved section of the highway, approximately one third of the way up the west approach. The slide is approximately 175 m wide and encompasses the lower half of the 75 m to 80 m high north coulee wall. The slide affects the eastern portion of a 350 m long, up to 50 m high, 2H:1V cutslope constructed in the mid-1980's.

### General Description of Instability

The extent of the instability is well defined with a 150 m long very steep headscarp, about 5 m to 10 m high. A reverse scarp has formed with a gently sloping to depressional graben. The toe of the slide is about 175 m long, with the west half encroaching into the north side of the highway ditch.

The highway was unaffected by the slide and a backhoe was used for only 30 minutes to remove the small quantity of slide debris which blocked the drainage ditch along the north side of the road.

The likely cause of the slope failure can be attributed with the cutting back of the slope in 1984 combined with the abnormally high precipitation levels in recent years. The result of the slide is that the factor of safety for the lower portion has improved while for the upper portion the factor of safety has decreased. This may result in future upslope retrogression of the slide, but the potential for further major movements is considered to be low.

### Geotechnical Conditions

The bedrock in the area consists of interbedded sedimentary strata of the Upper Cretaceous Horseshoe Canyon Formation. The lithologic units in this formation comprise clayey sandstone, bentonitic mudstone, and carbonaceous shale, with minor ironstone, coal and bentonite beds. The slide material appears to consist of fine-grained, soil-like material, typical of badly disturbed, weak to very weak, poorly indurated, clay-rich bedrock strata. No seepages or saturated soils were observed.

### Chronology

1983-84

The highway was widened and realigned requiring the removal of old slide debris from the toe of the slope and an extensive 2H:1V cutslope in the north coulee wall. Problems prior to the slide mainly consisted moderate to locally severe erosion in the highway ditches, however, it is apparent that the coulee has a long history of slope instability. Old slide terrain exists immediately east of the slide area, while large scale landsliding has occurred in the past on the south coulee wall.

1997-98

The region experienced higher than normal precipitation.

September 1998

The large slide occurred on the north side of the coulee at the east end of the 2H:1V cutslope. The slide likely resulted from the highway realignment cut and the high precipitation levels.

December 1998

Site inspection by Golder Associates.

August 1999

Site inspection by Geo-Engineering. As part of the report, Geo-Engineering performed parametric stability analyses indicating that the stability of the lower portion of the slope had increased and a small amount (2 m) of slide debris could be removed without affecting the factor of safety. The recommendations included re-grading the area to facilitate surface drainage, to prevent water infiltration into the slide mass, and to prevent the sloughing of material that would accumulate in the highway ditch. The potential of further major instability was considered to be low, except for upslope retrogression since the upper slopes now have less support. It was recommended that the headscarp be trimmed back to help minimize any retrogression.

2000-2001

In 2000, major drainage improvement works were undertaken on Highway 27 including the installation of gabion mats in both ditches. At this time, the slide area was cleaned and re-graded. In July 2001, a slide about 40 m wide by 10 m high occurred in the steep re-graded lower slope (about 1H:1V) immediately above the ditch. The highway ditch was partially blocked for a length of about 10 m.

Reports and Documents

May 2000 (KCCL) Inspection Report  
May 2001 (KCCL) Inspection Report  
May 2002 (KCCL) Inspection Report  
May 2003 (KCCL) Inspection Form  
May 2004 (KCCL) Inspection Form

Air Photos (1997)  
Geological Reconnaissance (Golder), December 24, 1998  
West Approach Slide (Geo-Engineering), November 30, 1999