

**THURBER ENGINEERING LTD.**

Suite 200, 9636 - 51st Avenue  
EDMONTON, Alberta T6E 6A5  
Phone (780) 438-1460  
Fax (780) 437-7125  
www.thurber.ca



**ALBERTA TRANSPORTATION  
LANDSLIDE RISK ASSESSMENT**

**SECTION A: GEOTECHNICAL FILE REVIEW**

**NORTH CENTRAL REGION**

**SITE NC11: 5.5 KM NORTH OF HWY 16 NEAR HINTON**

LEGAL LOCATION: **NW1-51-26-W5M**

NEAREST LANDMARK: **5.5 km NORTH OF HWY 16 NEAR HINTON**

Highway Control Section: **HWY 40:30 km 5.5<sup>17</sup>**

Date of Initial Observation: **Prior to 1982**

Date of Last Inspection: **2004**

Last Inspected By: **Thurber Engineering Ltd. (Thurber)**

Instruments Installed: **3 Slope Inclinometers (1999)**

Instruments Operational: **3 Slope Inclinometers (2004)**

Risk Assessment: **PF(4) · CF(4) = 16**

Last Updated: **July 2004 – Thurber Engineering Ltd.**

## 1. LOCATION

The site is located on Highway 40:30 about 5.5 km north of the junction Highway 16 west of Hinton. The site location is shown on Figure NC11-1, Section F.

## 2. GENERAL DESCRIPTION OF SLOPE INSTABILITY

The site is located on the west side of the Athabasca River crossing about 5.5 km north of the junction with Highway 16 and is a sidehill cut/fill section descending to the river bank to the east. Immediately to the northwest of the site is the junction with Twp Rd 510A. A waste transfer site is located to the north east on a separate access road from Twp Rd 510A. Details of the site are shown in Figure NC11-1, Section F.

This site has a history of instability going back to before 1982. At that time, significant erosion from groundwater flow (0.6 to 0.8 L/sec) and a small slumped area were observed just uphill and to the west of the bridge. The crescent-shaped crack was about 100 m long with an east-west orientation moving downhill (south) from the centreline. An approximate differential drop across the crack of 100 to 300 mm was observed at that time. Considerable maintenance had been ongoing prior to this time to clear the sloughed backslope material from the ditch line. The highway had been shifted closer to the backslope but that had little effect on the slide. The repairs done in 1982 and 1983 involved the installation of a filter blanket, subdrain system, and "Big O" drain pipe. The backslope was cut back to approximately 3H:1V. Information regarding this investigation and repair is included in Section G.

Four slope inclinometers were installed at the site in 1983 by AT to monitor ground movements. The locations of the instruments are shown on Figure NC11-1, Section F. Thurber has been performing annual instrumentation monitoring since 2000. In that time, little distress has been observed at the site. Old cracks that had reopened were observed during the Spring 2003 and 2004 monitoring. Three SI's are still functional and the latest readings are provided in Sections C and D.

Based on the recent slope inclinometer readings, the slide appears to have a failure plane between 9.8 and 12.6 m deep; however, less than 4 mm of movement has occurred since October 1999 and almost all of that movement took place between May and September 2000. No movement has been observed on the north side of the road and no discernable movement has occurred on either side of the highway in the last few years. Prior inclinometer readings, 1982 to 1983, indicated movement at about 15 m below ground surface.

### 3. GEOLOGICAL/GEOTECHNICAL CONDITIONS

**Physiographic Region:** Rocky Mountain Foothills of the Western Cordillera (1969, Atlas of Alberta, University and Government of Alberta).

**Bedrock Geology:** The bedrock at the site is sandstone, shale, conglomerate, ash beds, and coal of the Cretaceous Brazeau Formation. Depth to bedrock is not known though it was encountered within 1995 slope inclinometer installation depths.

**Surficial Geology:** The site passes through a glacio-fluvial meltwater deposit while descending in the alluvial river deposits of the Athabasca River valley. Surficial soils are expected to be gravels and sands in both depositional areas.

**Hydrogeology:** The near-surface sand and gravel deposits at the site may be able to provide up to 2 L/s of groundwater flow. The underlying Brazeau Formation would be limited to 0.4 L/s groundwater flow. The site is in a groundwater discharge area with flow directions are expected to be horizontal or upward toward the Athabasca River immediately to the south. However, an area of artesian flow is located beneath the south portion of this site.

**Stratigraphy:** The only information available on the stratigraphy at this site is the discussion (included in Section G) of the 1982 test holes for which the logs were not available. The test hole logs indicated that soils were gravelly clay-shale deposits with some interbedding of silt and sand.

### 4. CHRONOLOGY

#### 1982/1983

Two areas of distress were observed at the site. At 250 m uphill from the bridge was significant erosion problems from the 15,000 to 20,000 gallons/day (0.6 to 0.8 L/sec) flow from water-bearing strata. The second area, 450 m uphill of the bridge, had a crescent-shape crack near the centreline of the highway with up to 150 mm of differential settlement. A geotechnical investigation was performed in November. A total of nine test holes were drilled: four were completed as slope inclinometers and five as pneumatic piezometers. A drainage system ("Big O"), horizontal subdrains, and vertical drain wells were also installed and completed in 1983. The remediation work cost \$329,300. See the report and selected photographs in Section G for more details.

#### 2002 – 2004

Annual instrumentation readings were undertaken by Thurber.

### REFERENCES

1. Research Council of Alberta, 1969. "Map 33, Surficial Geology, Edson, NTS 83F."
2. Alberta Transportation and Utilities, February 8, 1983. Internal Report: "Hinton Slide Area 40:30."
3. Alberta Research Council, 1983. "Earth Sciences Report 79-7, Hydrogeology of the Edson area, Alberta." Included "Hydrogeological Map, Edson, Alberta, 83F."
4. Survey and Mapping Branch, Department of Energy, Mines and Resources, 1977. NTS 1:50,000 Topographic Map, 83 F/5: "Entrance, Alberta."
5. University and Government of Alberta, 1969. "Atlas of Alberta."