

PART A: FILE REVIEW
LANDSLIDE RISK ASSESSMENT
PEACE REGION (PEACE RIVER VALLEY/HIGH LEVEL)

SITE PH9: SHAFTSBURY TRAIL

LEGAL LOCATION: 31-83-21-W5M

Location along Highway: Shop Slide, along old highway, near ATU warehouse
Shaftsbury Trail Overpass at CNR crossing of Hwy. 2
Shaftsbury Trail Slide 20 km south of Peace River

AI FILE: SH697:02

Date of Initial Observation: 1982

Date of Last Inspection: June 1999

Instruments Installed: 9 slope inclinometers at overpass, 1 slope inclinometer at Shop Slide, 2 slope inclinometers at Brick Hill Slide

Instruments Operational: Unknown

Risk Assessment: Shaftsbury Trail Overpass: PF(9) * CF(4) = 36
Shop Slide: PF(9) * CF(2) = 18
C B A BRICK SLIDE (?) (1) (4) 36

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INTRODUCTION

This section is a review of files made available by Alberta Infrastructure for the site. The file review was prepared prior to the site visit. The description of the sites is based on the information that was present in the file, topographical and geological information was added if it was not present in the file and if the site was familiar, previous observations were also included. A risk assessment, solely based on the file review is provided. The risk assessment may change once the observations made during the site visit are incorporated.

A number of slides have occurred along Shaftsbury Trail. The following sites have been identified (see Figures 1 and 2):

- Shop Slide: a slide between the old Hwy. 2 and the railway to the west of the Peace River bridge, near ATU's warehouse;
- Shaftsbury Trail Overpass: movement of the bridge structure on Hwy. 2 crossing Shaftsbury Trail (Bridge File 76061);
- Shaftsbury Trail Slide: slide that occurred along Brick Hill, approximately 20 km south of the Town of Peace River, in 1986. The slide was repaired and is considered inactive.

At the Shop Slide, the old highway was in cut and fill as it climbs the valley wall of the Peace River. The file contains a number of photographs which appear to have been taken after regrading of the site.

The Shaftsbury Trail Overpass was constructed in 1982. Movement of the western abutment was noted soon thereafter, resulting in distress of the structure. In 1986, fill was removed and additional spans were added to the overpass.

At the Shaftsbury Trail Slide the highway is in cut and fill as it climbs the valley wall of the Peace River towards Grimshaw. The slide experienced large movements in 1986.

GEOTECHNICAL CONDITIONS

In the vicinity of the Town of Peace River, the Peace River occupies a preglacial valley, infilled with lacustrine clay and clay till. Generally, the lacustrine clay and clay till are medium to high plastic. Erosion of the present valley was accompanied with extensive landsliding. Thus, the lacustrine clay and clay till are commonly pre-sheared.

CHRONOLOGY

Table A1 provides the chronological background of the slides.

DESCRIPTION OF INDIVIDUAL SITES

In the following, the individual sites are described.

Shop Slide

Beyond a few photographs, there is no information available in the file on the Shop Slide.

Description of Instability

At the Shop Slide, the road is in cut and fill, constructed along the side hill in the lower parts of the Peace River valley. The slope is approximately 30 m high, inclined at approximately 4H:1V. It appears that the slope below the road experienced instability in 1985 and 1986, which required patching of the road. The documents in the file do not describe the instability.

There is insufficient data on file to describe the soil conditions at the Shop Slide.

Past Investigation

There is no data in the file on past investigations.

Remedial Measures

Based on the air photos (1985) and the photographs (1986) in the file, it appears that the slope has been regraded and that the road has been patched. In addition, gabion mattresses have been installed in the uphill ditch.

Monitoring Results

No monitoring data is in the file.

Assessment

Shop Slide: $PF(9) * CF(2) = 18$ the site is active on a moderate fill.

Shaftsbury Trail Overpass

Description of Instability

Highway 2, on the west approach to the bridge across the Peace River, passes over Shaftsbury Trail and a railway line. The Shaftsbury Trail Overpass is located at the base of the valley slope of the Peace River. The overpass was constructed in 1982 and a slide of the western abutment occurred in 1984, or possibly earlier.

At the Shaftsbury Trail Overpass the soil conditions consist of a sequence of clay till, lacustrine clay and sand and gravel layers. These soil units appear to have been disturbed, because the sequence varies from borehole to borehole. The clay till is typically medium plastic and the lacustrine clay is high plastic. Slickensides were reported in the clay till and the lacustrine clay. It appears that the abutment was constructed of fill.

Based on slope inclinometer data the rupture surface cut through the clay till and the lacustrine clay.

Remedial Measures

The ground water level was apparently high, and horizontal drains were installed to lower it in 1984. At the time, lime and flyash were also injected, presumably to strengthen the clay. However, none of these measures stabilized the slide. In 1986, a volume of fill was removed at the western abutment to reduce the load on the slide and two spans were added to the bridge (at the west side).

Monitoring Results

It appears that nine slope inclinometers were installed. The slope inclinometer data was not available, but a cross section of the slide indicating the depth of shearing is in the file.

Assessment

A slide occurred at the western abutment of the Shaftesbury Trail Overpass. The slide appears to have occurred in the pre-sheared lacustrine clay and clay till. Drainage measures and injection of lime and flyash did not stabilize the slide. It appears that the movement has slowed down after removal of fill from the abutment and addition of two spans.

Risk Assessment:

Shaftesbury Trail Overpass: $PF(9) * CF(4) = 36$. The site appears active, and the bridge deck appears to be affected. A bridge engineer should provide an indication of the risk associated with this site, because the nature or the consequences of a failure depend on the behaviour of the structure, rather than on the slide.

Shaftesbury Trail Slide

Description of Instability

The Shaftesbury Trail Slide was located on SH694, near the top of the valley of the Peace River at Brick Hill, 20 km south of Peace River. Cracking was observed in 1985 and a sudden drop of the road surface occurred in 1986. The slide occurred where the road crosses a gully.

At the Shaftesbury Trail Slide, the soil conditions consisted of clay till (probably road fill) overlying clay, in turn overlying sand. The clay and sand were interpreted by EBA from on ATU borehole logs as weathered bedrock of the Shaftesbury Formation, based on high blow counts. The water table in the slide mass was high, especially in the toe area.

The surface of rupture was interpreted to be in the clay shale underlying the road fill, as shown on the drawings, it was inclined at approximately 7 degrees.

Remedial Measures

EBA proposed installing a toe berm and a drain. They also proposed to shift the road uphill. It is not clear what remedial measures were installed, but it appears that the road was not shifted uphill. In the file is a sketch that indicates that a berm was constructed at the location of the slide.

Monitoring Results

A number of slope inclinometers and piezometers were installed in the slide mass. The slope inclinometer records are not in the file, but EBA's report refers to the data. Two slope inclinometers indicated shear movement (at 3 m and 13.7 m depth). Pore water pressures were a few metres below ground surface.

Assessment

It appears that the slide was a translational slide in clay shale. It is our understanding that the slide was stabilized in 1986 and that no more significant movement has occurred since then. This is an inactive site.

TABLE A1: CHRONOLOGY

Shop Slide

1987, 11 Note to file by J. Miller. The note describes erosion control measures (probably) for the Shop Slide. The erosion control measures consist of Gridlock and gabion baskets and mattresses.

Shaftsbury Trail Overpass

- 1982 The bridge and overpass were constructed in 1982. Slope movement affecting the bridge deck was noticed soon thereafter.
- 1984, 09 Letter from D. Quapp to R. Foster. Plane of slipping at elevation 365 m, at 49' depth. 9 slope inclinometers were installed. 19 horizontal drains were installed into the western abutment.
- 1985, 07 Letter by M. Pariti to R. Foster. Lime and flyash were injected in 1984. Includes a figure with the interpreted slide movement. Movement is continuing. Option to remove fill and add two additional spans.
- 1986 Fill removed and two spans constructed.
- 1996 Slope inclinometer monitoring between 1993 and 1996 does not indicate distinct shear zones or even slope movement.

Shaftsbury Trail Slide

- 1985, 12 Cracking and settlement of road surface at Shaftsbury Trail Slide. Plan sketch of slide area and photographs.
- 1986, 02 ATU drilled boreholes and installed slope inclinometers at the Shaftsbury Trail Slide.
- 1986, 04 Extensive movement at Shaftsbury Trail Slide, requiring a detour around the slide.

- 1986, 05 Note to file by V. Diyaljee. Field inspection of Shaftsbury Trail Slide. Slide is 50 m wide. The slide resulted in a vertical drop of the pavement of 0.6 m to 1 m. The rupture plane was at a depth of 2 to 3 m. A vertical scarp was present in the lower part of the slide. The soil stratigraphy consisted of till to a depth of 6 m underlain by fine sand. Water was observed seeping out of the sand layer. Towards the toe of the slide, the material was very soft and wet.
- 1986, 05 Report by EBA Engineering Consultants Limited presenting two options for the repair: road realignment and reinforced slope and trench drains. It is not clear whether either of these options was implemented.