

CASE HISTORIES: TRANSLATIONAL LANDSLIDES (22)

I Main Topics

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<http://www.frankslide.com/boulder.html>

<http://www.frankslide.com/>

<http://cgrg.geog.ovic.ca/abstracts/ReadGeotechnicalThe.html>

<http://www.calgaryopera.com/NewFiles/TWrelease.html>

The Frank rockslide occurred in the southern Canadian Rockies of Alberta on 4:10 AM, April 29, 1903. The 30 million cubic meter rockslide occurred on the east flank of Turtle Mountain. The side dimensions are impressive: 150 m deep, 425 m long and 1 km wide. The slide destroyed the southern end of the coal mine town of Frank and claimed 70 lives - about one of every nine residents. The slide lasted 100 seconds, and covered an area 3 km² to an average depth of 14 m. The natural geologic conditions at the Frank slide were highly conducive to sliding: slopes were steep (~30°), precipitation in the years preceding the slide was relatively high, and the bedding dipped parallel to the slope. The rock consists mostly of highly fractured and faulted limestone. Bedding surfaces, and pre-existing faults and fractures all were exploited during the slide event. Human activity might also have played an important role in triggering the slide: extraction of coal was at the base of the east slope of Turtle Mountain weakened the slope to some degree, and explosives used in the mining generated seismic waves. Miners in Frank apparently did not recognize that the slope was prone to sliding or that their activities might contribute to destabilization of the slope, although a rock fall in 1853 had killed about 100 Blackfoot Indians during a battle. A series of geologic investigations after the slide to characterize the geologic structure at Turtle Mountain have yielded decidedly different interpretations of the site geology. An accurate characterization of the site certainly did not exist in 1903 (or for many years later). The lack of recognition and characterization of the site precluded an adequate evaluation and assessment of the level of risk in 1903. Recent research to characterize, and evaluate the level of risk at the site indicates that the old coal mining activities will likely continue to destabilize the slope as mine workings collapse due to rotting timbers, caving of open rooms, and the burning of coal by the fire which cause the mine to close.

III Love Creek Landslide

(Cotton, W.R., and Cochrane, D.A., 1982, Love Creek landslide disaster, January 5, 1982, California Geology, June issue, p. 153- 157).

In terms of lives lost (10), the most destructive naturally-occurring landslide in the history of California occurred on January 5, 1982. On January 3, the San Francisco Bay area was visited by a “500-year storm” that dropped as much as 0.6 m of rain in the next 24-hours. The storm triggered ~18,000 landslides in the San Francisco Bay area, caused 26 deaths and nearly 300 million dollars in damage. The most massive slide, the Love Creek slide, happened at ~1:00 AM, shortly after the storm cleared. The slide occurred on the west-facing slope of Love Creek, about 16 km (10 miles) north of the city of Santa Cruz. It was about 600m wide (maximum), 250m long (maximum), and 10 m thick, with a volume of about 500,000 cubic meters. The slide and an accompanying debris flow dammed Love Creek, forming a lake about 300 meters long that flooded several homes. The landslide occurred on the northern flank of what has been mapped as an ancient landslide. The rock involved consisted of fractured, weathered sandstone and shale. The site is located on the west-dipping limb of a synclinal fold, and the surface of sliding coincided with a bedding plane, and locally with a thin clay layer. The January 5 slide occurred in a region known for landslides, and at a site prone to sliding, but the specific site was not recognized or characterized as having the potential for a slide as large as the one that occurred. The slide was judged to have removed enough support from the adjacent slope material to justify the evacuation of nearly 30 homes adjacent to the slide.