Jewell Instruments

Landslide Migration Monitoring

- **Objectives:** Judge repair efficacy and provide warning
- **Solution:** Jewell Instruments **A906** Little Dipper
- **Benefits:** Durability and versatility
- **Results:** Extended and reliable monitoring of repair

Overview

Green Valley Road was built in Watsonville, California in the 1960s on a fill embankment placed over the sand and clay of the Pleistocene Aromas Formation. The original ground surface sloped to the east. The four-lane artery performed well until September 1988, when a contractor excavated part of the base of the embankment during grading of lots for a housing subdivision.

Within a day, cracks appeared in the road pavement above the subdivision. Within a few days, it was apparent that a large slump was underway, moving easterly. The landslide geometry was established by: 1) visual observation of the landslide scarp in the road; 2) the location of the toe of the landslide, and; 3) analysis of a core sample containing material characteristic of a slip surface.

Jewell Instruments A906 Little Dipper

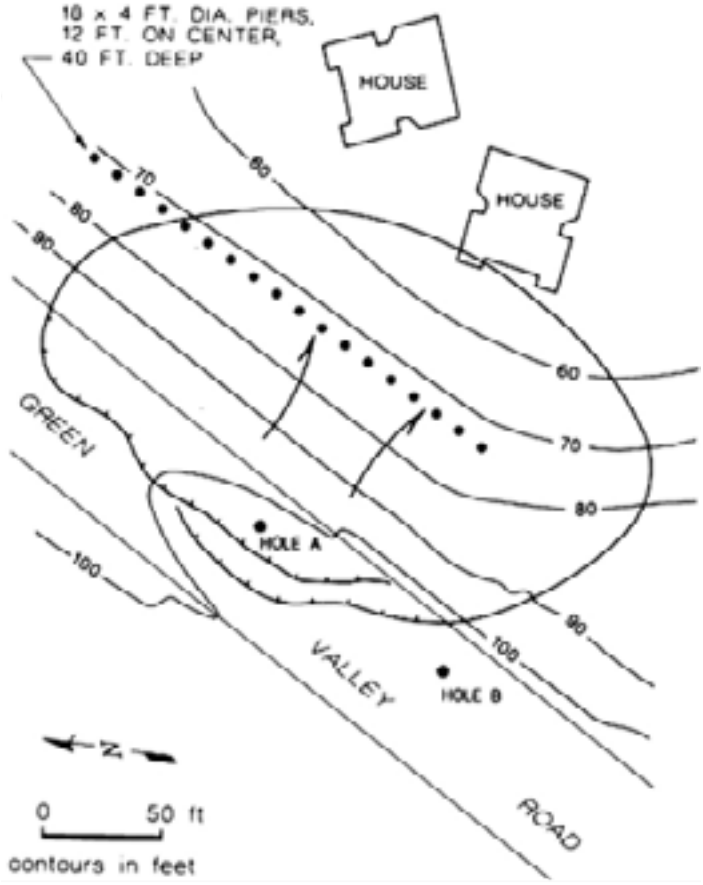

Figure 1. Green Valley Road landslide, plain view

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Project

The project used Jewell borehole tiltmeter model A906 Little Dipper, and the three objectives were: 1) define the upslope extent of unstable ground and assure early detection of headward landslide migration; 2) provide advance warning of accelerated slide movement; 3) establish a quantitative basis for judging the effectiveness of landslide repairs.

Following surface mapping of the landslide, three borehole tiltmeters were installed in two holes drilled in the road (Figure 1). One hole was drilled through the slide mass; Tiltmeter A2 was installed below the slip surface, and Tiltmeter Al was then placed within the slide mass. Tiltmeter B was installed in a second borehole in stable ground, 20 feet to the south of the active slide mass. Figures 1 and 2 show the approximate slide geometry and instrument locations.

The three tiltmeters were connected to a continuously-recording and battery powered data logger in order to obtain an uninterrupted record of ground behavior over several months. A field technician retrieved the data biweekly and plotted it on a PC for review and analysis.

Figure 3 shows plots of the Y-direction tilt data (rotation perpendicular to Green Valley Road) collected from Tiltmeters Al and B. Tiltmeter Al in the slide mass detected the greatest movement. The Y-direction plot of Tiltmeter Al shows continuous rotation until late March 1989, when a cast-in-place reinforced concrete caisson wall (Figure 1) was completed. Movement essentially stopped at this time, attesting to the effectiveness of the repair. Accelerated movement in early January 1989 corresponded to a period of heavy rainfall.

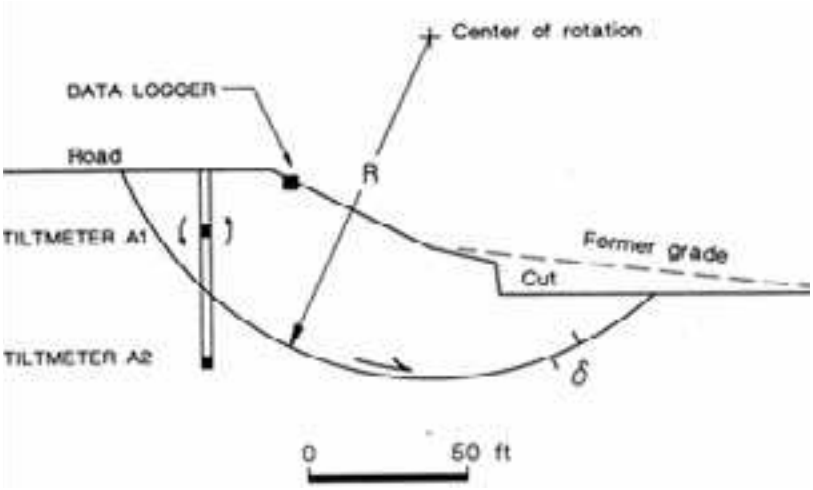

Figure 2. Idealized cross-section of Green Valley Landslide

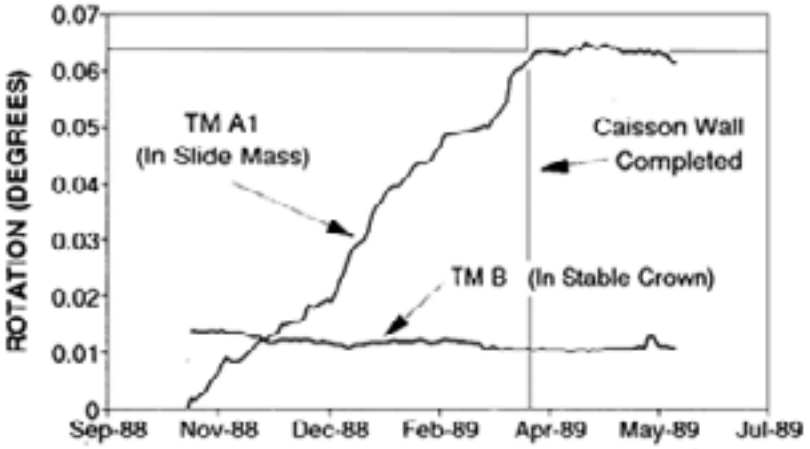

Figure 3. Green Valley Road landslide, tilt data plot

Further Consideration

If your application requires higher precision, we also offer our self-leveling LILY borehole tiltmeter, which has exceptional resolution to 5 nanoradians and is fully submersible to 3000 psi (Titanium is also available for +5000 psi applications).

Jewell Instruments LILY Borehole Tiltmeter

About Jewell Instruments

Jewell Instruments is a world leader in the design, manufacture, and distribution of high-precision products. Our expertise includes acceleration and tilt sensors, electronic compasses, avionics components, solenoids, and panel meters. The extensive application knowledge we have obtained through decades of experience allows us to provide custom solutions for a diverse group of industries. In fact, customers from all over the globe contact us for solutions to aerospace, medical, industrial, and telecommunications applications - to name a few.

To find out more, visit our website!

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