Hog Back: A grossly stable prehistoric translator rock block slide, San Antonio Canyon, southern California

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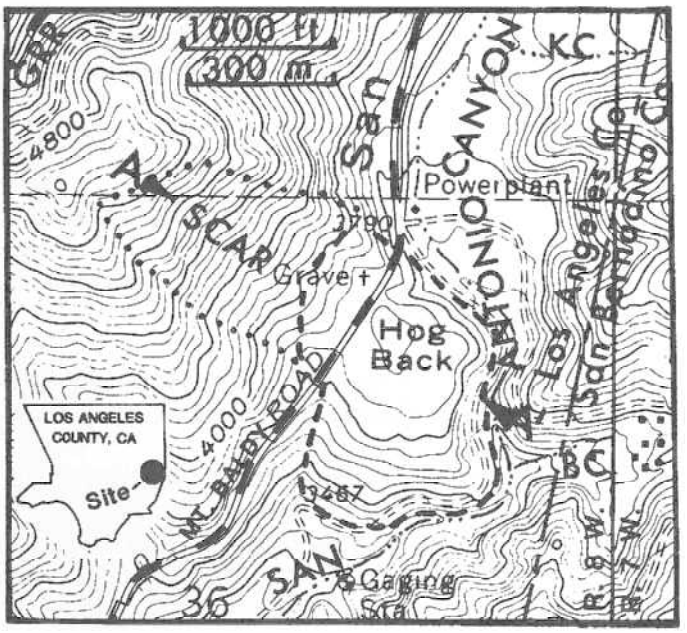

Figure 1. Index Map of Hog Back slide. BC, Barrett Canyon; KC, Kerkhoff Canyon; GRR, Glendora Ridge Road; Cross section A-A'.

LOCATION AND ACCESSIBILITY

Hog Back, as named on the 7½-minute Mt. Baldy, California, Quadrangle, lies in San Antonio Canyon (NE¼Sec.36, T.2N.,R.8W.) in the Angeles National Forest 1.1 mi (1.8 km) south of Mt. Baldy Village (Fig. 1). Hog Back appears as a large obstruction nearly choking off the canyon when looking upstream (Fig. 2). Looking south from Glendora Ridge Road, it appears as a low, rounded lump in the canyon floor (Fig. 3; Shelton, 1966).

Mt. Baldy Road crosses the head of Hog Back, providing easy access, and a roadside parking area suitable for large buses is near the head of the slide mass. A switchback footpath descends from the parking area to the old Mt. Baldy Road (abandoned) excavated across the toe of the slide. A l-mi (1.6-km) hike along the footpath, abandoned road, and return to parking area via Mt. Baldy Road yields good cross-sectional views of the toe and head of the slide mass.

SIGNIFICANCE

Hog Back is a well-preserved translator rock block slide in crystalline rock with good exposures of a thick shear zone across its toe and intact rock at its head, and is a natural for studying geomorphic effects of large slides, including major changes of the valley profile, a displaced stream, narrow bedrock gorge, and a 30-ft (l0-m) waterfall with plunge pool.

Figure 2. South face of Hog Back looking north. Mt. Baldy Road cut at upper left comer.

SITE INFORMATION

Hog Back is one of hundreds of major slides (Morton and Streitz, 1969) in the rugged, early mature San Gabriel Mountains. The bedrock slope along the south side of Hog Back rises 1,600 ft (490 m) at a slope angle of 31° from the canyon floor to the ridgeline above the scar. Three other large bedrock slides with a combined scar/slide surface area from 55 to 320 acres occur within 2 mi (3.5 km) of Hog Back.

Estimated slide parameters are surface area, 40 acres; length, 1,870 ft (570 m); width, 1,600 ft (490 m); thickness, 300 ft (90 m) maximum, volume, $5 \times 10^6 m^3$; forward movement, 1,150 ft (350 m); elevation drop, 1,000 ft (300 m) maximum.

The fresh, randomly and pervasively fractured source area rocks for Hog Back consist largely of coarsely layered hornblende-plagioclase gneiss and lesser biotite-plagioclase gneiss. Both are locally migmatized and part of the pre-Tertiary San Antonio Canyon migmatite unit (Baird, 1956). Poorly layered gneissic diorite and a few dikes of latite and basalt also occur. Green epidote and randomly oriented slicks are common on fracture surfaces. Layering in the gneiss strikes N30° to 55°W and dips 30° to 45°S, defining a homoclinal structure and a corresponding neutral slope. Bedrock exposures are limited largely to the head and flanks of the scar and show no basal shear surface nor discontinuities dipping out of slope that could correspond to a slide-slip surface. The rock comprising the head of the slide mass along the Mt. Baldy Road cut correlates with the source area rock but has not been significantly disrupted or rotated. Thus, Hog Back is a coherent slide, but with slight internal disruption suggested by its jumbled surface layer.

Figure 4 shows the inferred four-layer anatomy of Hog

Figure 3. Hog Back looking south from Glendora Ridge Road is framed by Mt. Baldy Road at lower middle right and S-shaped road at center. Broadened valley floor at lower left, and Barrett Canyon Road at left.

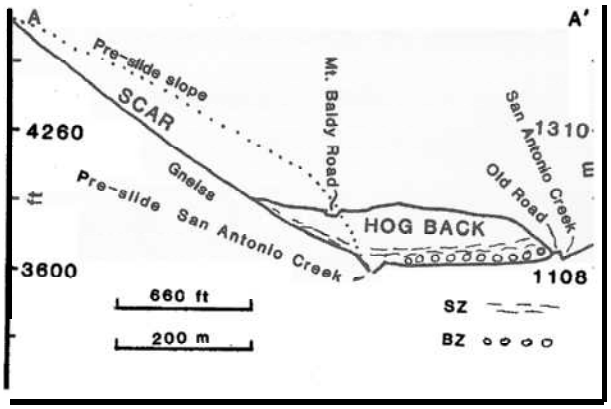

Figure 4. Cross section A–A'. BZ, Bulldozed zone; SZ, Shear zone.

Back. Layers 1 and 2 are visible along the toe, and layer 3 at the head of the slide mass along Mt. Baldy Road.

1. Bulldozed zone. Loose, gray, unlayered, fresh stream gravels 15 ft (5 m) thick with rounded cobbles and boulders dragged along during forward motion of the slide. It overlies undeformed old brown silty terrace gravels.

2. Shear zone. Gray to greenish gray crushed and sheared gneiss up to 65 ft (20 m) thick. The basal section, 3 to 7 ft (1 to 2 m) thick, is the main shear zone and has been crushed to a fine gravel size with a rock flour matrix. Angular blocks show upward coarsening to 10 ft (3 m) near the top of the zone.

3. Body of slide. Central coherent mass of slide.

4. Jumbled surface layer. This layer forms most of the slide surface, except for the head area, and is a jumble of angular gneiss blocks with little soil development. The surface at the head, including the higher elevations of the slide mass, is relatively smooth, dips gently toward the slide scar, and shows a few small, gentle depressions. It represents the shortest transport away from the source rock area, and minimal surface and internal deformation. The jumbled layer is characterized by disoriented fresh angular rock blocks up to 15 ft (5 m), which locally enclose spaces to form small caves, or are loosely linked forming small steep depressions. Decreased lateral confining pressures, high basal shearing resistance, and severe vibrations accompanied catastrophic slide movement away from the source rock area across the irregular alleviated valley floor. The resulting deformation (rotation and small translations) caused slight internal disruptions leading to the jumbled surface with its small depressions.

Earthquakes from nearby active faults or saturation of the steep, highly fractured bedrock slopes may have triggered sliding. The active San Andreas, San Jacinto, and Cucamonga faults are only 9 to 4 mi (15 to 7 km) from Hog Back.

San Antonio Creek was forced to cut into its west slope by Kerkhoff Canyon Creek 1,800 ft (550 m) upstream and by the protruding north wall of Barrett Canyon (Fig. 1). A steep, unstable 60° slope perhaps 410 ft (125 m) high was cut into the toe of a 30° slope 1,800 ft (550 m) high (Fig. 4).

The slide moved southeasterly across the canyon floor ramping part way up a bedrock ridge projecting southwesterly into the canyon (the north wall of Barrett Canyon, Fig. 1). Hog Back dammed San Antonio Creek, and up to 200 ft (60 m) of coarse alluvial gravels were deposited against its upstream face. The gravels raised and broadened the valley floor (Fig. 3), and lake waters flowed across the toe of Hog Back at its lowest point when surface flows exceeded underflow through and below the slide. This nearly doubled the gradient to perhaps 1,000 ft/mi (190 m/km), dramatically increasing the erosive powers of the newly displaced San Antonio Creek. Rejuvenated, it rapidly sawed headward through the buried bedrock ridge without detour or deflection. The deep narrow bedrock gorge and remaining 30-ft (l0-m) waterfall attest to vigorous downward and headward erosion, which in turn exposed the toe anatomy of Hog Back. Grading for the old Mt. Baldy Road significantly enlarged the exposure without obvious major damage to the gorge or falls, and provides a comfortable observation platform.

Despite its location across a major canyon, Hog Back is remarkably well preserved except for erosion of its toe and burial of its upstream edge by stream gravel. The silicate rock composition and porous surface layer of Hog Back preclude rapid weathering and erosion. In addition, San Antonio Creek confined itself to a bedrock gorge that protein the critical, easily erodible upstream toe area-a fortunate circumstance as this is the only spot where Hog Back's anatomy is on display.

REFERENCES CITED

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