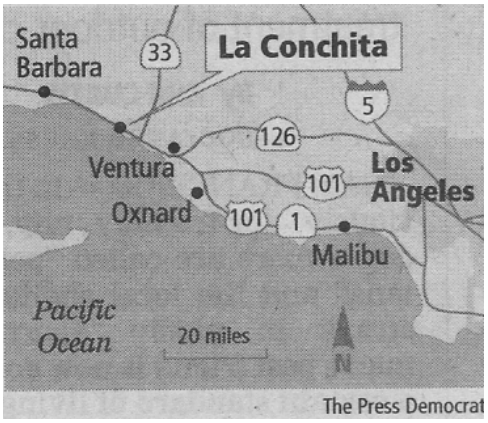
La Conchita Landslide

President of GT International Consultants
Naohiko Noguchi

INTRODUCTION

A record breaking winter storm drenched southern California causing flooding and triggering numerous slope failures and landslides. The most tragic event was a landslide (mudslide) at La Conchita, a coastal community about 112 km west of Los Angeles.



At 2:05 pm on Monday January 10, 2005, a steep slope behind the housing development at La Conchita, failed cascading approximately 400,000 tones of debris, and killed 10 people, buried 13 homes and damaged 18.

HISTORY OF INSTABILITY

The stretch of coast from Ventura to Carpinteria has a history of hillside instability. Topography shows a typical landslide morphology indicating most of the bluff is of landslide origin. In this area, the height of the bluff is about 180 m. La Conchita was built on ground that had been graded by the Southern Pacific Railroad after a 1909 landslide slid into the railroad tracks and killed four people. The land was intended to be a buffer zone between the retreating and eroding cliff and the Pacific Ocean. However, it was subdivided into smaller residential lots in 1924. The narrow strip of land directly below a towering cliff and the Pacific Ocean became a weekend retreat community, and eventually turned into a permanent home for many.

In 1975, La Conchita Ranch Co. started to farm the plateau, a marine terrace above the community, for citrus and avocado. The operation required heavy irrigation.

During a storm in March 1995 a failure occurred at almost same location as the current failure, destroying nine homes. Early signs of landslide movement were first reported during the summer of 1994 as evidenced by surface cracks in the upper portion of the landslide (O'Tousa, 1995). Smaller failures had occurred between the summer of 1994 and the main failure of March 4, 1995. These failures occurred in a canyon which existed prior to the failure, located along the left flank of the landslide. Slope inclinometers were installed and monitored up to within a few weeks of the March 4 failure by the owners of the avocado orchard on the bluff top (O'Tousa, 1995). Rainfall data at Sea Cliff (3.2 km south of La Conchita) indicates a total of 633 mm of rainfall in the first three months of 1995 (1/1 through 3/21, 1995). The 27 year average annual rainfall at Sea Cliff is 385 mm. The record indicates that the January 1995 rainfall alone exceeded the average annual rainfall.

Residents signed waivers after the 1995 slide releasing Ventura County from liability in future slides.

The homeowners sued the bluff-top rancher blaming the rancher for over watering avocado trees thereby weakening the bluff. Fearing a much larger judgment against the rancher if the case should go to a trial, La Conchita Ranch Co. settled one suit two years later for tens of millions of dollars.

The slide led to years of recriminations between the property owners and Ventura County. Each blamed others for wrong-doing. Homeowners blamed the county for allowing the construction of homes and failing to safeguard the community. The County blamed the homeowners for building in the path of an unstable hillside. The county eventually constructed a 20 foot long $450,000 retaining wall, which slid with the current slide of January 10. The county quickly made a statement that the retaining wall had been intended to stop debris, not to stop another landslide.

GEOLOGY

The upper plateau where the avocado orchard exists is underlain by marine terrace deposits consisting of unconsolidated silt, sand and gravel. Along the bluff face above La Conchita where the 1995 and 2005 landslide occurred, the upper portion of the bluff is underlain by the Monterey Formation while the lower portion of the bluff is underlain by Pico Formation (O'Tous, 1995). The Monterey Formation is marine, early to late Miocene in age, and consists of white-weathering , thin bedded, hard, platy to brittle siliceous shale, siltstone and sandstone to soft, fissile clay shale with interbeds of hard siliceous shale and thin limestone beds (Dibblee, 1988). The Pico Formation is marine, early Pleistocene to possibly late Pliocene age, and consists of massive gray mudstone which includes light gray sandstone and conglomerate with pebbles of hard sandstone and white siliceous shale (Dibblee, 1988).

The two formations are separated by an active Red Mountain Fault as mapped by the California Geological Survey (formally, California division of Mines and Geology), and designated as an Alquist-Priolo Earthquake Fault Zone in accordance with the Alquist-Priolo Act of 1972 (Chapter 7.5 of division 2 of the California Public Resources Code)(www.consrv.ca.gov/). The Red Mountain Fault, a thrust fault is responsible for placing the older Monterey Formation on top of the younger Pico Formation.

RAINFALL DATA

The climate in California is typical of Mediterranean climate with dry and hot summers, and cool to cold and wet winters. In winter, storms originating in the Gulf of Alaska move down to

California and bring precipitation. As storms move southward and eastward moisture falls in the form of rain and snow. Furthermore, as the air mass rises along the mountain ranges, it drops more moisture (orographic precipitation). Consequently, in general, the western part of the state receives more precipitation than the eastern, and the higher elevations receive more than the lower elevations.

However, if there is tropical moisture from Hawaii in the west, the storms originating in Alaska could drag the tropical moisture (Pineapple Express) along with the Alaskan storms. This condition will bring very heavy rainfall to southern California. Furthermore, if the Pineapple Express should approach the land perpendicular to the mountain ranges, coupled with the orographic precipitation, the effect is severe. Most of the historical flooding and sedimentation disasters have occurred under such conditions.

The storm which caused the La Conchita Mudslide was no exception. Meteorologists detected the moist tropical air masses in the west and predicted heavy precipitation in southern California. Elsewhere in southern California rainfall records were broken. For example, in the five day period (1/7 to 1/11), Nordhoff Ridge in the Ventura County Mountains received more than 660 mm; Opids Camp in the San Gabriel Mountains received 701 mm; San Marcos Pass in Santa Barbara County Mountains received 602 mm. The average 30 years annual rainfall in downtown Los Angeles is 358 mm. The total rainfall for this season to the morning of January 10 is 559 mm (rain season starts on October 1). No official rainfall data at or near La Conchita is available yet. However, according to Ventura County Star, a cumulative rainfall two weeks prior to the January 10 mudslide near La Conchita is reported to be about 356 mm while the average 30 years annual rainfall in Ventura is 390 mm.

REFERENCES:

Dibblee, Thomas w.,Jr, 1988, Geologic map of the Ventura and Pitas Point Quadrangles, Ventura County, California: Dibblee Geological Foundation Map, scale: 1/24000.

O'Tousa, James, 1995, La Conchita landslide, Ventura County, California: Association Engineering Geologists News, Fall, 1995, p 22-24.