Role of geologic maps in assessing earthquake and landslide hazards near the San Andreas fault and Range-front Thrust Zone, southwestern San Francisco Bay Area, California

In the southwestern San Francisco Bay region, where expanding urbanization is increasingly encroaching on the San Andreas and related active faults and upon steep hillside areas, geologic maps provide critical first order information for determining the locations of earthquake and landslide hazards. Recent geologic mapping in the area of the 1989 Loma Prieta earthquake (U.S. Geological Survey Miscellaneous Field Investigation Map Report MF-2373, http://geopubs.wr.usgs.gov/map-mf/mf2373) is here used to illustrate the role of the geology in delineating these hazards.

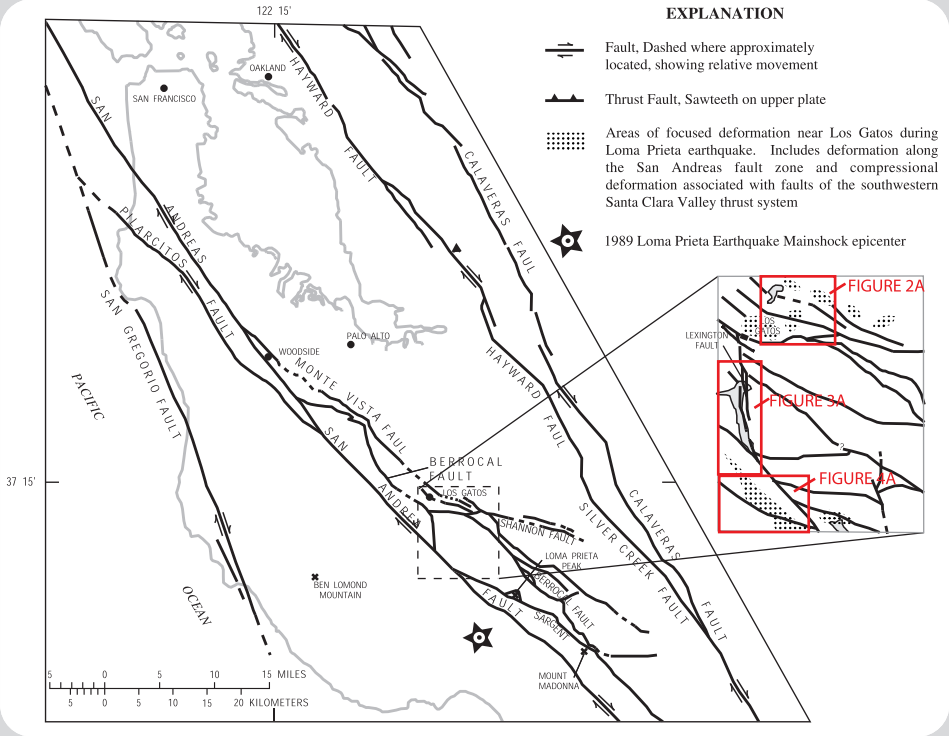

Figure 1. Index map of the southwestern San Francisco Bay region showing location of the Los Gatos 7.5′ Quadrangle, active strike-slip faults, thrust faults, epicenter of the M 7.1 Loma Prieta earthquake, and distribution of focused surface deformation during the Loma Prieta earthquake. Also shown are locations of Figures 2, 3 and 4.

MAP UNIT SYMBOLS IN FIGURES 2 - 4

Qh - Holocene alluvium
Qp - Pleistocene alluvium
Qls - Landslide deposits
Q - Quaternary alluvium, undivided
QT - Pliocene and Pleistocene non-marine deposits
P - Pliocene marine
Tm - Miocene marine
Tl - lower Tertiary marine
T - Tertiary marine, undivided
M - Mesozoic rocks

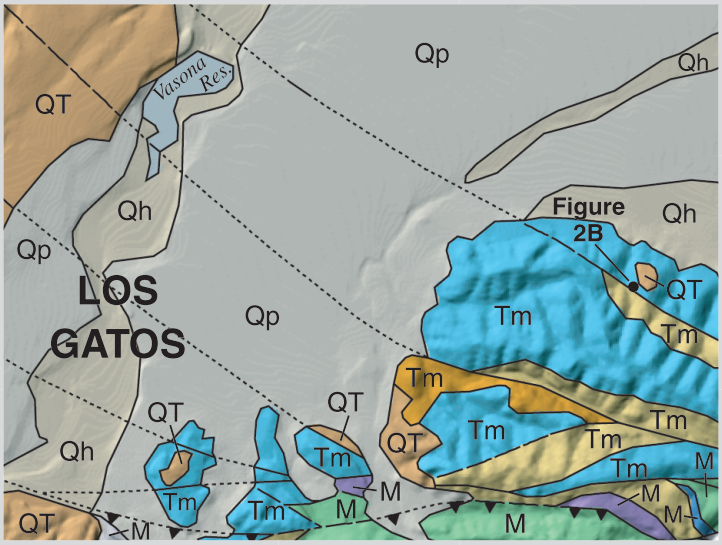

Figure 2A. Geologic map of area surrounding the town of Los Gatos, at the base of the Santa Cruz Mountains, showing thrust faults along Santa Clara Valley-Santa Cruz Mountains interface. This belt of thrust faults are inclined beneath the mountains. Distribution of aftershocks and compressional deformation during the Loma Prieta earthquake (**Fig. 1**) indicate these faults may merge with the San Andreas fault at depth and that earthquakes on the San Andreas fault trigger slip on the range front faults.

Figure 2B. View SE at thrust fault exposed in 2003 excavation. Fault thrusts Miocene marine shale (right) over Pliocene and Pleistocene non-marine gravel (left). Location of photo indicated in **Fig. 2A**.

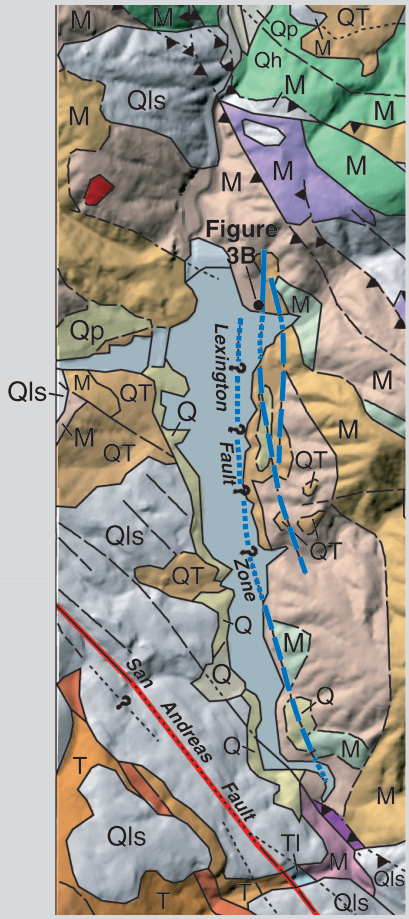

Figure 3A. Geologic map of the late Cenozoic Lexington fault zone (blue faults), first recognized in 1989-90 while mapping the Los Gatos 7.5′ Quadrangle. This fault splays northward from the San Andreas fault, and thus might rupture during earthquakes along the San Andreas fault. Proximity of the fault to Lexington reservoir has prompted engineering investigations of the earth fill dam.

Figure 3B. View N at exposure of the Lexington fault zone east of Lexington dam. Steep dipping 3-4 MA gravels (right) are faulted here against older disrupted bedrock of Mesozoic age (left). Photo location shown on **Fig. 3A**.

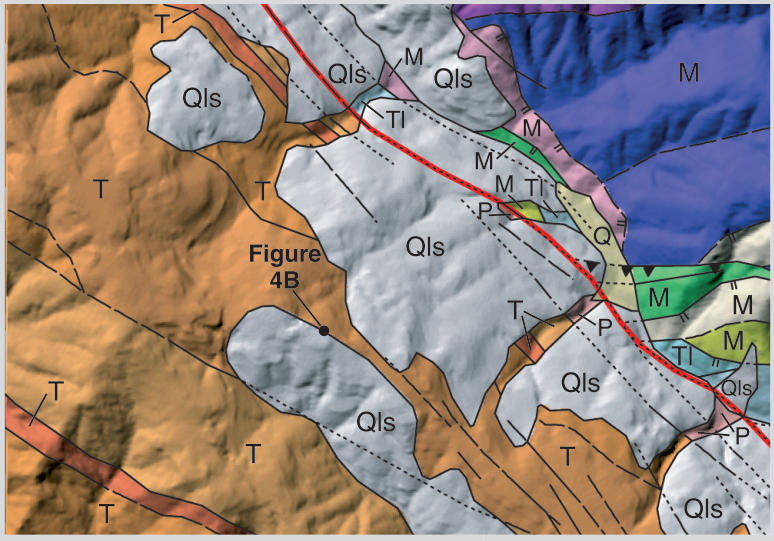

Figure 4A. Geology in area of large rotational landslides mapped along the San Andreas fault, which were the sites of large fissures both during the 1989 Loma Prieta earthquake and the 1906 San Francisco earthquake. The fissuring has been attributed to seismic shaking-induced slope failure and ridge-top spreading. Curvature of the main trace of the San Andreas fault (red fault) over landslide area could reflect deep-seated slope failures. The ~ 1.5 km wide hazard zone delineated by the seismically activated landslides is notably wider than a hazard zone defined merely from location of the San Andreas fault.

Figure 4B. View NW at structure damaged by shaking-induced fissuring during Loma Prieta earthquake. Location of photo shown on **Fig. 4A**.