DAMAGE IN SANTA CLARA AND SANTA CRUZ COUNTIES, CALIFORNIA CAUSED BY THE EARTHQUAKE OF 18 APRIL 1906

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INTRODUCTION

Santa Clara and Santa Cruz Counties were greatly affected by the earthquake of 18 April 1906, with significant earthquake damage. But because the earthquake and fire damages in San Francisco were much more spectacular, the 1906 damage in Santa Clara and Santa Cruz Counties have been relatively neglected in the past. This report is a compilation of the 1906 earthquake damage within Santa Clara and Santa Cruz Counties. A similar report has been prepared for San Mateo County (Nason, 1980).

This listing is part of a general study to improve the seismic intensity maps of the 1906 earthquake. Many of the data come from the detailed report on the effects of the 1906 earthquake by Lawson and others (1908). Additional data have been obtained from a search of many local and regional newspapers of April and May 1906.

The geologic setting at each of the localities and the distance from the locality to the 1906 earthquake fault have been carefully determined, so that the importance of geology and distance from the fault on the earthquake damage can be analyzed. The damage descriptions are given as direct quotations of the original sources. The seismic intensity rating at each locality has been determined using both the Rossi-Forel scale, which was used in 1906, and the later Modified Mercalli scale.

This compilation shows in detail what happened in the great 1906 earthquake in Santa Clara and Santa Cruz Counties, and thus shows what could happen in any future earthquake of great size in the same region. Thus the listing is useful for both improved understanding of earthquake disaster and disaster planning by communities and by individuals.

LOCATION AND GEOLOGIC SETTING

The location of Santa Clara and Santa Cruz Counties in California is shown on the inset map of Figure 1. Santa Clara County is at the south end of San Francisco bay, and Santa Cruz County is south and west of Santa Clara County.

The eastern and western parts of Santa Clara County are mostly mountainous. The mountains consist of sedimentary rocks of Mesozoic and Tertiary ages. The central part of the county, which has most of the population, is an alluvial valley alongside and south of San Francisco Bay. The alluvium is several hundred feet thick in many places near the bay (Goldman, 1969), but decreases to zero thickness at the edge of the hills. The boundary between the hills and the central alluvial valley is shown by a dotted line in figure 1.

Santa Cruz County is mountainous except immediately along the coast. The mountains consist mostly of sedimentary rocks of Teriary age, with granitic rocks in some areas. The coastal region has alluvial marine terraces cut on the sedimentary bedrock. The Watsonville area in eastern Santa Cruz county is founded on alluvium of unknown thickness alongside the Pajaro River.

The San Andreas fault, on which the 1906 earthquake rupture occurred, passes through the mountains along the northwest-southeast boundary between Santa Clara County and Santa Cruz County. In 1906, the earthquake rupture occurred along all parts of the San Andreas fault within Santa Clara and Santa Cruz Counties.

Local geology classification. The geology at each locality is classified in the compilation according to the following categories, based on the age and type of rock:

A. Alluvium;

B. Sediments of Early Quaternary age;

C. Sedimentary rocks of Middle and Late Tertiary age (Oligocene, Miocene and Pliocene);

D. Sedimentary rocks of Cretaceous and Early Tertiary age (Cretaceous, Paleocene and Eocene);

E. Detrital sedimentary rocks of pre-Cretaceous age;

F. Carbonate sedimentary rocks of pre-Cretaceous age;

G. Igneous and metamorphic rocks.

Subdivision of the alluvium

The alluvium has been further subdivided into several sub-types according to the local configuration of the alluvium, as the different types and configurations of alluvium may have different types of seismic response characteristics. For instance, the seismic response characteristics of the thin alluvium that occurs on a coastal terrace or in a narrow river valley may be very different from the seismic characteristics of the thick alluvium in a large valley. Categories of alluvium are:

A. In a large alluvial valley, not near to bedrock;

Am. Estuarine mud along the edge of San Francisco Bay;

Ae. Alluvium near the edge of a valley, within 0.5 km of surface bedrock;

An. Alluvium in a narrow valley (less than 3 km wide);

At. Alluvium in terrace deposits over bedrock.

Where the alluvium is thin, the type of underlying bedrock may also be important, so the type of bedrock under thin alluvium is noted in the geologic classifications by a slash and the underlying rock type, as in these examples: At/D (terrace alluvium above Type D bedrock) or An/C (narrow alluvial valley over Type C bedrock).

The local geology of the bedrock and alluvium in Santa Clara and Santa Cruz counties has been determined from the geologic maps of Brabb (1970), Clark and Rietman (1973), and Rogers and Williams (1974), with detailed information on alluvium from Helley and others (1979).

Distance from the fault rupture. The distance given for each locality is the perpendicular distance to the locality from the 1906 earthquake rupture on the San Andreas fault, as shown by Lawson and others (1908). Since all parts of the earthquake fault rupture can be considered as a source for the earthquake, the distance from the fault rupture can be considered as a measure of the distance from the earthquake source (except for the unknown effect of earthquake source depth).

DAMAGE LISTING

The damage is compiled by locality and listed alphabetically by locality in Tables 3, 4, 5, 6 and 7. For convenience, a two-letter code has been assigned to each locality for use on the reference map (figure 1). The first letter of the code is the first letter of the locality name.

In Tables 3 and 4, the types of damage are listed in sequence from building damage to injuries. As much as possible, the damage is indicated by direct quotations from the original source, so that the damage listing is free of major interpretations by the compiler. The quotations have been simplified by leaving out some words, as indicated by dots. Additions and insertions are indicated by double parentheses ((...)). In general, all available information on the significant damage has been included. However, at some places, for instance at San Jose, the local newspapers give a more complete listing of the damage, and only the major damage is listed in this compilation.

SEISMIC INTENSITY SCALES

For mapping and comparison, the earthquake damage has been rated for apparent seismic intensity. As used here, the seismic intensity system is a progressive rating of the disturbance of the earthquake shaking, with the intention that a higher intensity rating indicates a greater severity of shaking. In this report, the rating is assigned to the damage that is caused directly by the earthquake shaking, and not to secondary damage that is not a direct result of the earthquake shaking.

Rossi-Forel Intensity Scale

The Rossi-Forel (RF) intensity scale (Table 1) was used in the maps of the report by Lawson and others (1908). The RF scale is basically simple in content, as used in 1906 . At the level of significant damage (as in Santa Clara and Santa Cruz counties) the RF scale is based primarily on the damage to chimneys and buildings. As shown in Table 1, intensity RF VII is indicated by the fall of some (but not many) chimneys; intensity RF VIII is indicated by the fall of many chimneys; and intensity RF IX is indicated by the partial or complete collapse of some buildings (usually large brick buildings in this region).

The shifting of house foundations is another type of damage that can be used when reported, although it is not specifically listed in the RF scale. Correlation of foundation damage with other types of damage at several places in 1906 indicates that the shifting of a few foundations correlates with intensity RF VIII.

In this compilation, intensity ratings are not assigned to the occurrence of landslides or other ground failures, as the proper intensity rating of such ground failures is not certain (Nason and Espinosa, 1977). In the 1906 version of the RF scale (Table 1), the occurrence of landslides is listed at intensity RF X. This may be because landslides can cause great secondary damage; buildings and people were buried at several places in Santa Cruz county in 1906. However, this high rating for landslides is often inconsistent with the direct building damage caused by shaking in areas of landslides. For instance, landslides occurred at many places in the hills of Santa Clara and Santa Cruz counties, but the shaking damage to buildings indicates only seismic intensity RF VIII in most of the area.

Another major problem in the usage of the RF scale is that the only criteria for intensity RF IX is the partial or complete collapse of some buildings. This applies mainly to brick or masonry buildings, because simple wood buildings are comparatively resistant to earthquake damage. Thus the RF scale cannot give intensity RF IX ratings in areas where large brick buildings are uncommon or absent, as in hill localities. Therefore there can be few or no RF IX ratings in the hills, even though the shaking may actually have been intensity RF IX.

Modified Mercalli Intensity Scale

Beginning in 1931, most seismic intensity studies in the United States have used the Modified Mercalli (MM) intensity scale of Wood and Neumann (1931). The MM scale is basically similar to the Rossi-Forel scale in most criteria, but makes some additions and changes. The most important improvement in the MM scale was the recognition that buildings of different types have different earthquake resistance, such that weak buildings will be damaged more than strong buildings for the same severity of seismic shaking. The MM scale clearly indicates that great damage to weak buildings is equivalent to slight damage to strong buildings. Thus it is evident that the MM scale is intended as an indicator of the strength of seismic shaking.

The investigation of the 1906 earthquake damage has shown that there are problems in the use of the MM scale, similar to the problems with the Rossi-Forel scale. A major problem is that the position of ground failures and their effects on the MM scale is inconsistent with the building damages due to shaking. Also, there is difficulty in determining ratings of MM IX in small localities because there are only a few buildings at such places.

Intensity Rating of Ground Failures

In both the Rossi-Forel and Modified Mercalli intensity scales, the occurrence of ground failures such as landslides and ground deformation are given very high intensity ratings. This is probably because of the severe damage that ground failures can cause. But recent evaluation has shown that the ratings of the effects of ground failures in the seismic intensity scales are

inconsistent with the building damages that are directly due to shaking (Nason and Espinosa, 1977). Because of this inconsistency, the intensity ratings of Tables 3 and 4 are made only on the building damage caused by the shaking and not on the damage that is due to ground failures such as landslides, liquefaction or compaction. Instead, the occurrences of ground failures are noted separately in Tables 5 and 6 and in Figure 3.

Fault Rupture

Another type of ground failure is the rupture along the earthquake fault, which is rated as intensity X on the maps of the Lawson report. Actually, the Rossi-Forel scale does not list fault rupture zones in the intensity criteria; but the modified scale used by H.O. Wood in San Francisco does list fault rupture at the highest rating (Wood intensity A). It has been suggested that the assignment of a high intensity rating along the fault zone was simply because of the occurrence of ground failure there. However, the equivalent ground failures by landslides are not given intensity ratings on the Lawson maps. Therefore, in this compilation the occurrence of the earthquake fault rupture is not used for intensity rating. It appears that the seismic shaking damage to buildings alongside the 1906 earthquake fault rupture was not significantly different than at many places at a distance from the fault (Nason, 1978). Within Santa Clara and Santa Cruz Counties there were several localities near to and at the fault rupture.

The only remaining criteria for intensity RF X is "great disaster", which would be much worse than RF IX. According to this criteria, there were not any places in either Santa Clara County or Santa Cruz County that rate as intensity RF X or MM X.

SEISMIC INTENSITY ASSIGNMENTS OF THIS STUDY

As noted in the previous section, there are difficulties with some parts of the existing Rossi-Forel and Modified Mercalli intensity scales. Therefore, several operating procedures have been introduced for assigning the intensity ratings in this report. These operating procedures are:

1). The occurrences of ground failures such as landslides or liquefaction have not had any intensity value assigned to them and have not been used in the intensity ratings of Tables 3 and 4 or Figure 2. Instead, the occurrences of ground failures are listed separately and are shown on a separate map (Figure 3).

2). The occurrence of ground rupture along the earthquake fault has not been used for intensity rating. In any case, the earthquake rupture zone is only 10 meters wide in most places (Lawson and others, 1908), which is too narrow to show on the maps.

3). Where the reported damage only indicates a minimum value for the intensity rating, because there is an absence of suitable buildings for indicating possible higher intensities, or an absence of descriptions that would indicate the maximum intensity, the intensity value is underlined to indicate that the actual seismic intensity may have been greater than this minimum value.

4). At localities where the intensity rating was either intensity VII or intensity VIII, but was definitely not any intensity greater than VIII, the intensity rating is given as VII/VIII. This is different than VII because the underlined value does not exclude intensity IX, while the VII/VIII value does exclude intensity IX.

5). Where there is information that indicates that unusual damage was apparently due to poor quality of construction rather than severe shaking, or if there is a conflict in the intensity rating of different types of damage, or if there are other uncertainties, the difficulties are specially discussed and the intensity rating is given with a question mark (?).

6). At localities where all or nearly all chimneys have fallen, which is more than the usual damage for intensity VIII but is not definite for intensity IX in the Rossi-Forel or Modified Mercalli scale, an intensity rating of VIII/IX is used. A rating of MM VIII/IX is also used where there has been the collapse of a building that was probably weak in design or construction, as discussed in the listing.

EARTHQUAKE-CAUSED FIRES

The occurrence of fires that were caused by the earthquake shaking or damage has been reported at several localities. Such fires are reported at two places is Santa Clara County (San Jose and Santa Clara) and at two places in Santa Cruz County (Soquel and Watsonville). Because the occurrence of post-earthquake fires represents a special earthquake hazard, these occurrences are specially listed in Table 7.

SEISMIC INTENSITY MAPS

Seismic intensity maps are useful both for showing the geographic pattern of seismic shaking effects of an earthquake, as judged from the damage and disturbance caused by the shaking, and for showing how the shaking may be related to geographic and geologic features. The seismic intensity map is also useful for earthquake hazard studies, as the amount of damage to be expected from a future earthquake of the same type can be estimated when the seismic intensity is known.

One purpose of this investigation is to independently evaluate the intensity ratings shown on the intensity maps by Lawson and others (1908). This is necessary because questions have arisen about some of the fundamental features of the seismic intensity scale used in the 1906 earthquake investigation, as discussed in an earlier section. Therefore a thorough examination of the earthquake damage and intensity data is made in this report to determine how and if the intensity maps of the Lawson report should be updated.

The seismic intensity ratings shown on the map (Figure 2) are compiled directly from the listings of Tables 3 and 4.
It is noteworthy that the resulting map (Figure 2) is different in many important ways from the map shown by Lawson and others (1908), particularly in the hill regions. The Lawson report does not indicate what the map rating at any one site was based on, so it is not possible to directly evaluate the difference between the maps. But it is clear that the listed earthquake damage is significantly greater at many places in the hills than is indicated on the Lawson maps. Similarly, many places in the Santa Clara valley had a lower seismic intensity than is indicated on the Lawson maps.

SEISMIC GROUND FAILURES

Several types of ground failures were triggered by the 1906 earthquake. The known instances of ground failure are listed in Tables 5 and 6 and shown on Figure 3. The report by Youd and Hoose (1978) contains more detail on the occurrences of ground failures.

Landslides were common in the steep areas of the Santa Cruz mountains. In some places a deformation of the ground was described without indicating the cause of the deformation. In mountain areas the cause was probably an adjacent landslide in most instances. In alluvial areas there might be several causes, with settlement and compaction or liquefaction of weak alluvial fills being common.

A major cause of ground failure in earthquakes is the process of "liquefaction," which is a loss of strength (and thus "liquefaction") in a sandy material because of earthquake-caused movement of water in the sand. The processes and mechanisms of liquefaction were not recognized or understood in 1906, so there were not any direct descriptions of the occurrence of liquefaction. However, some of the instances of ground deformation may have been due to liquefaction processes. In some instances there is a description of a flow of sand and water out of a crack; these are considered to be reliable indicators of the occurrence of liquefaction.

REFERENCES

Aitkin, F.R., and Hilton, Edward, 1906, A history of the earthquake and fire in San Francisco: Edward Hilton Co., San Francisco, 285p.

Alameda Daily Argus, 1906, First report of Santa Cruz: Alameda, Calif., 23 April 1906, p. 1.

Berkeley Daily Gazette, 1906, Nine are killed near Santa Cruz: Berkeley, Calif., 24 April 1906, p. 8.

Brabb, E.E., 1970, Preliminary geologic map of the central Santa Cruz mountains, California: U.S. Geol. Survey, Open-file Report.

Butts, Wendell M., 1929, Earthquakes and building construction: Clay Products Institute of California, San Francisco, 110 p.

Chico Daily Express, 1906, Fourteen men were engulfed: Chico, Calif., 23 April 1906, p. 1.

Clark, J.C., and Rietman, J.D., 1973, Oligocene stratigraphy, tectonics, and paleogeography southwest of the San Andreas fault, Santa Cruz mountains and Gabilan range, California Coast Ranges: U.S. Geol. Survey, Prof. Paper 783, 18 p.

Daily Palo Alto Times, 1906, Greater Palo Alto is now the slogan: Palo Alto, Calif., 1 May 1906, p. 5.

Derleth, Charles, Jr., 1907, The destructive extent of the California earthquake, in Jordan, D.S., ed., The California earthquake of 1906: A.M. Robertson Co., San Francisco, p. 81-212.

The Evening Post, 1906, Circuit of shaken region: New York, N.Y., 20 April 1906, p. 3.

Goldman, H.B., 1969, Geology of San Francisco Bay: Calif. Div. Mines Geology, Spec. Report 97, p. 9-29.

Gridley Herald, 1906, Gridley young man helps rescue insane: Gridley, Calif., 27 April 1906, p. 1. (Available at the library of University of California, Berkeley).

Helley, E.J., Lajoie, K.R., Spangle, W.E., and Blair, M.L., 1979, Flatland deposits of the San Francisco Bay Region -- their geology and engineering properties, and their importance to comprehensive planning: U.S. Geological Survey, Prof. Paper 943, 88 p. with 3 maps.

Humphrey, Richard L., 1907, The effects of the earthquake and fire on various structures and structural materials, in Gilbert, G.K., and others, The San Francisco earthquake and fire of April 18, 1906: U.S. Geol. Survey, Bull. 324, p. 14-61.

Lawson, A.C., and others, 1908, The California earthquake of April 18, 1906; report of the California State Earthquake Investigation Commission: Carnegie Inst., Washington, pub. 87, 451 p.

Nason, Robert, 1978, Seismic intensities in the 1906 earthquake fault zone: Seism. Soc. Am. East. Sect., Earthquake Notes, v. 49, no. 1, p. 1.

Nason, Robert, 1980, Damage in San Mateo County, California in the earthquake of 18 April 1906: U.S. Geolog. Survey, Open-file report 80-176, 52 p.

Nason, Robert, and Espinosa, A.F., 1977, Proposed revision of the Modified Mercalli intensity scale: Geol. Soc. Am. Abs. with Prog., v. 9, no. 4, p. 473.

Oakland Tribune, 1906, Santa Cruz, city said to be wiped out, is found safe: Oakland, Calif., 22 April 1906, p. 5.

Palo Alto Tribune, 1906a, Loss in Palo Alto given in detail: Palo Alto, Calif., 27 April 1906, p. 1.

_____, 1906b, Mayfield escaped with slight loss, Water and light service intact: Palo Alto, Calif., 27 April 1906, p. 2.

Ransome, F.L., 1906, The probable cause of the San Francisco earthquake: Natl. Geog. Mag., v. 17, no. 5, p. 280-296.

Redding Courier-Free Press, 1906, Letter from Watsonville: Redding, Calif., 23 April 1906, p. 4. (Available at the library of the University of California, Berkeley).

Redwood City Times-Gazette, 1906, Palo Alto: Redwood City, Calif., 21 April 1906, p. 3.

Rogers, T.W., and Williams, J.W., 1974, Potential seismic hazards in Santa Clara County, California: Calif. Div. Mines Geology, Spec. Report 107, plate 1.

Sacramento Bee, 1906a, San Jose is severely stricken: Sacramento, Calif., 19 April 1906, p. 2.

_____, 1906b, The damage at Santa Clara: Sacramento, Calif., 19 April 1906, p. 10.

_____, 1906c, Beautiful edifices at Stanford fall into shapeless heaps: Sacramento, Calif., 30 April 1906, p. 11.

_____, 1906d, Collapse of a building due to big earthquake: Sacramento, Calif., 1 May 1906, p. 4.

Sacramento Union, 1906a, San Jose had bad jolt: Sacramento, Calif., 25 April 1906, p. 7.

_____, 1906b, Stanford ruin must wait: Sacramento, Calif., 27 April 1906, p. 2.

_____, 1906c, Los Gatos not badly crippled: Sacramento, Calif., 30 April 1906, p. 2.

Salinas Daily Index, 1906, Earth cracked at Gonzales: Salinas, Calif., 19 April 1906, p. 3.

San Francisco Call, 1906, Agnews asylum trustees want aid from state: San Francisco, Calif., 12 May 1906, p. 8.

San Francisco Chronicle, 1906a, Ruin and death at Stanford: San Francisco, Calif., 21 April 1906, p. 2.

_____, 1906b, Mountain View is shaken up: San Francisco, Calif., 7 May 1906, p. 13.

San Francisco Examiner, 1906, Didn't plan against a temblor: San Francisco, Calif., 2 May 1906, p. 2.

San Jose Herald, 1906a, Beautiful Stanford buildings are shattered in desolation, Santa Clara suffers more than other towns: San Jose, Calif., 19 April 1906, p. 2.

_____, 1906b, Many buildings are in ruins at the surf city: San Jose, Calif., 19 April 1906, p. 3.

_____, 1906c, Boulder Creek: San Jose, Calif., 19 April 1906, p. 4.

_____, 1906d, Considerable damage is caused at Soquel, Fire destroys big Watsonville school: San Jose, Calif., 20 April 1906, p. 1.

_____, 1906e, Losses at Gilroy will reach half a million, Santa Clara damage greater than supposed: San Jose, Calif., 20 April 1906, p. 5.

_____, 1906f, Property in second ward that was destroyed, Baby killed, Water pouring from immense fissures: San Jose, Calif., 20 April 1906, p. 8.

_____, 1906g, Mountain View suffered heavily by the earthquake, Report conditions to be good in Santa Cruz: San Jose, Calif., 20 April 1906, p. 12.

_____, 1906h, Declares smoke is rising from peak: San Jose, Calif., 21 April 1906, p. 2.

_____, 1906i, Loss sustained by Morgan Hill people: San Jose, Calif., 24 April 1906, p. 4.

_____, 1906j, Relief measures by Sunnyvale citizens: San Jose, Calif., 27 April 1906, p. 9.

_____, 1906k, Flow of artesian wells has been doubled by earthquake: San Jose, Calif., 29 April 1906, p. 4.

_____, 1906l, Evergreen: San Jose, Calif., 29 April 1906, p. 10.

_____, 1906m, San Martin: San Jose, Calif., 5 May 1906, p. 9.

_____, 1906n, Sargent: San Jose, Calif., 12 May 1906, p. 8.

San Jose Mercury, 1906a, Losses at Gilroy will reach half a million: San Jose, Calif., 20 April 1906, p. 1.

_____, 1906b, Gravity of property loss is now being realized, Property in the second ward that was destroyed, San Jose high school is almost demolished: San Jose, Calif., 20 April 1906, p. 7.

_____, 1906c, Details of damage at the university: San Jose, Calif., 21 April 1906, p. 2.

_____, 1906d, News from the coast towns: San Jose, Calif., 21 April 1906, p. 3.

_____, 1906e, Santa Clara damage greater than supposed: San Jose, Calif., 21 April 1906, p. 4.

_____, 1906f, Mountain View suffered heavily by the earthquake: San Jose, Calif., 21 April 1906, p. 7.

_____, 1906g, Houses razed to the ground about Rucker: San Jose, Calif., 21 April 1906, p. 12.

San Jose Mercury and Herald, 1906a, Santa Clara suffers more than other towns: San Jose, Calif., 19 April 1906, p. 2.

_____, 1906b, Seven people are crushed in house, Gardner school house was badly wrecked in interior, Greatest loss was in heart of city: San Jose, Calif., 19 April 1906, p. 8.

Santa Cruz Evening Sentinel, 1906a, Most terrible and destructive earthquake: Santa Cruz, Calif., 18 April 1906, p. 1.

_____, 1906b, Earthquake notes: Santa Cruz, Calif., 19 April 1906, p. 2.

_____, 1906c, Earthquake paragraphs: Santa Cruz, Calif., 20 April 1906, p. 3.

Sawyer, E.T., 1922, History of Santa Clara county, California: Historical Record Co., Los Angeles, 1692 p.

Signs of the Times, 1906, Mountain View's experience: Mountain View, Calif., 2 May 1906, p. 14. (Available at the San Mateo Historical Society).

_____, 1906b, Some disasters of the present year: Mountain View, Calif., 2 May 1906, p. 15.

Taber, Stephen, 1906, Some local effects of the San Francisco earthquake: Journ. of Geology, v. 14, p. 303-315.

Weatherbee, D'Arby, 1906, Effects of the earthquake: Mining and Sci. Press, v. 92, no. 24, p. 402.

Wood, H.O., and Neumann, Frank, 1931, Modified Mercalli intensity scale of 1931: Seism. Soc. Am. Bull., v. 21, p. 277-283.

Youd, T.L., and Hoose, S.N., 1978, Historic ground failures in northern California triggered by earthquakes: U.S. Geol. Survey, Prof. Paper 993, 177p.

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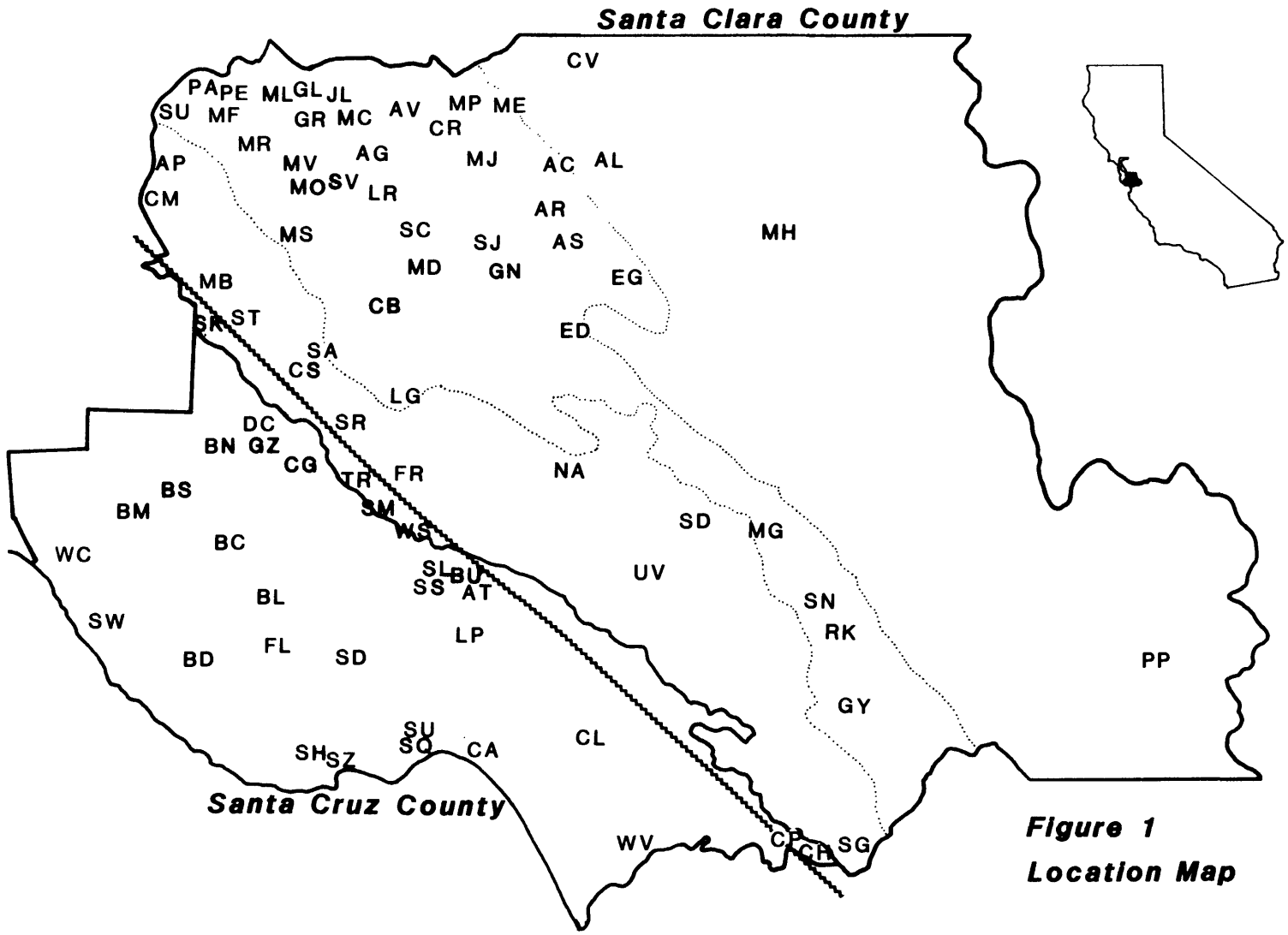

Figure 1
Location Map

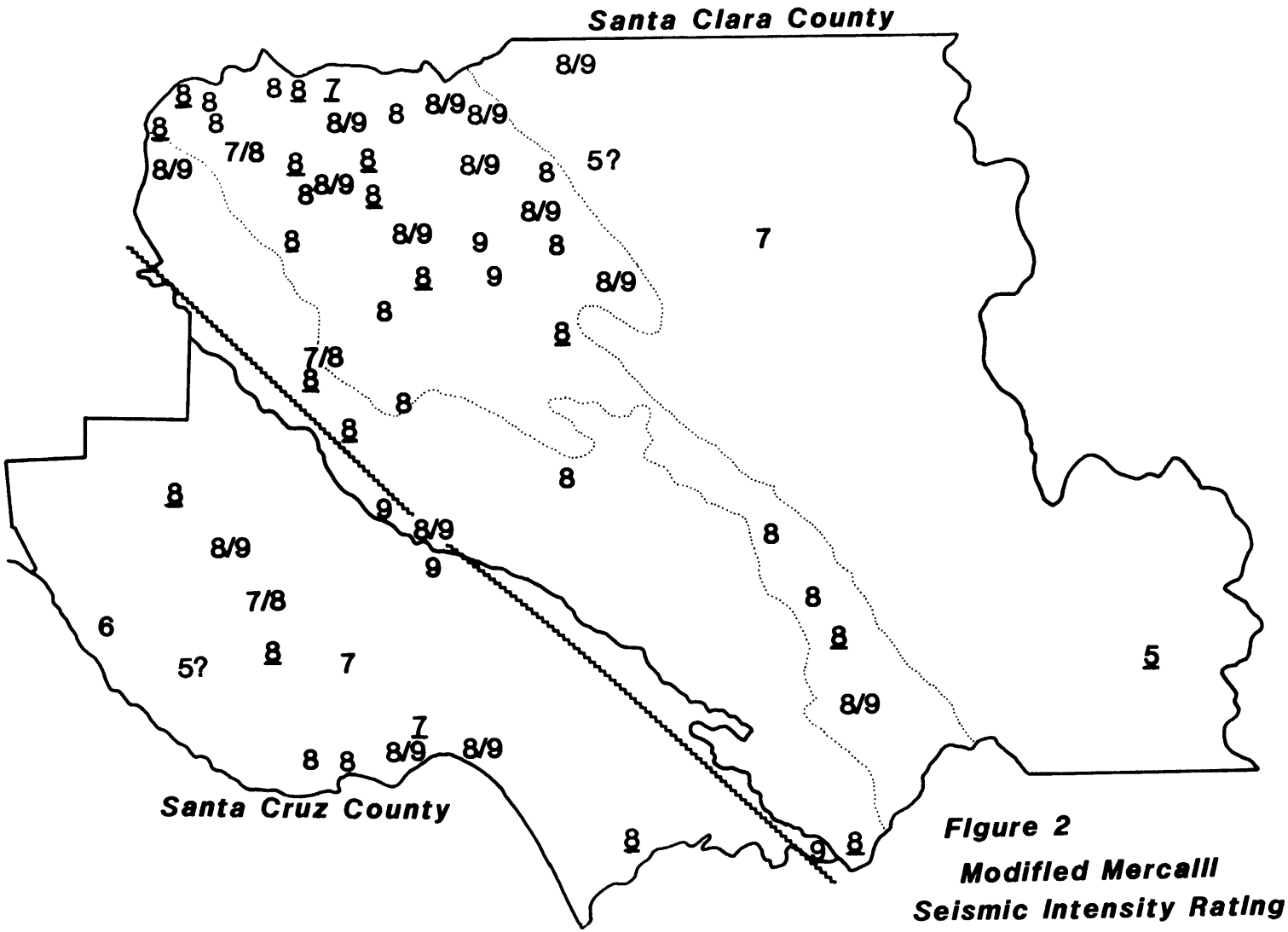

Figure 2
Modified Mercalli
Seismic Intensity Rating

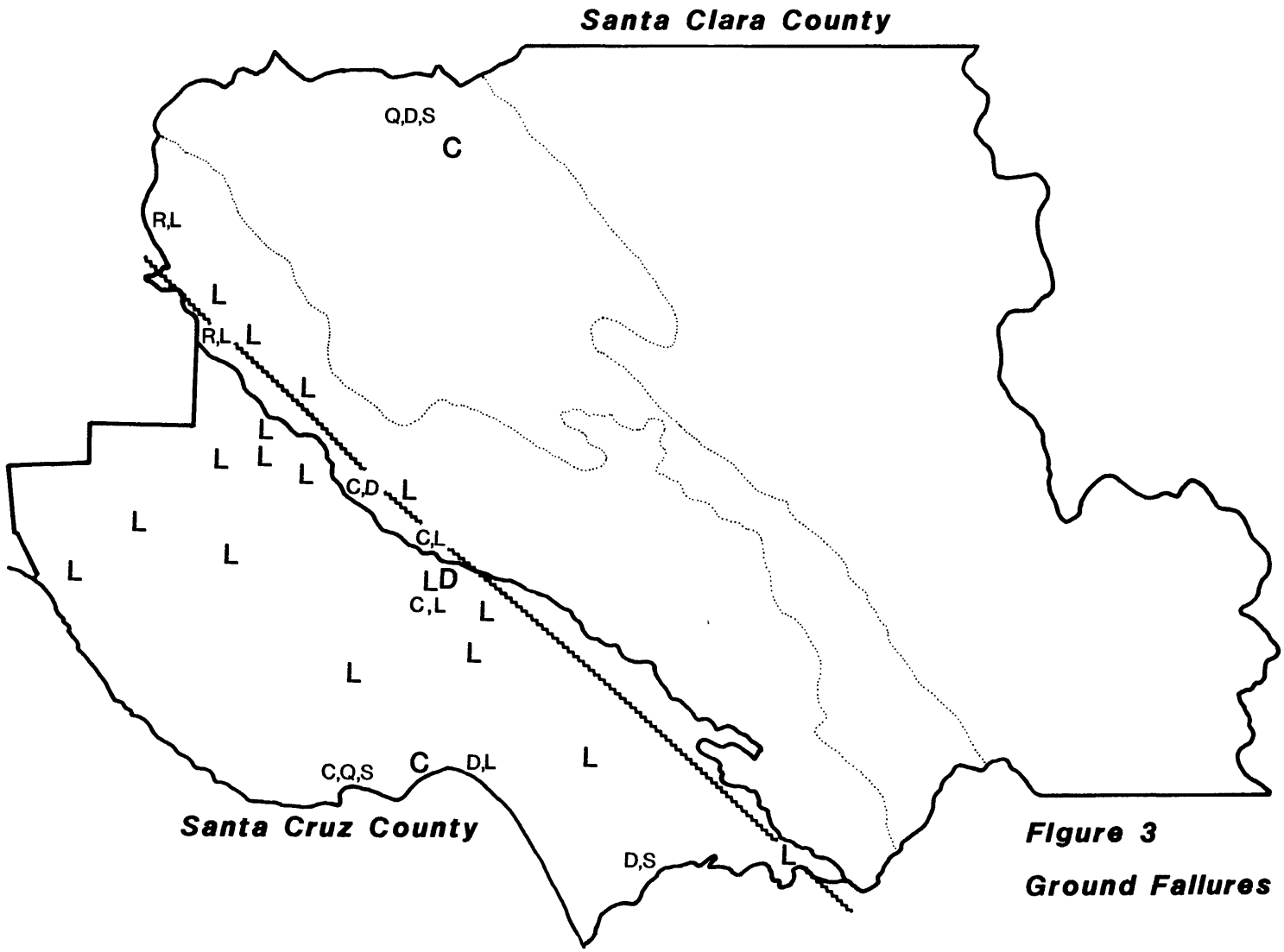

Figure 3

Ground Failures

TABLE 1: ROSSI-FOREL INTENSITY SCALE

INTENSITY VI. Severe shock; general awakening of sleepers, stopping of clocks, some window glass broken.

INTENSITY VII. Violent shock; overturning of loose objects; falling of plaster; some chimneys fall.

INTENSITY VIII. Fall of chimneys; cracks in the walls of buildings.

INTENSITY IX. Partial or total collapse of some buildings.

INTENSITY X. Great disasters; overturning of rocks; fissures in surface of earth; mountain slides.

ADDITIONAL INTENSITY RATING IN THIS REPORT (1980):

INTENSITY VIII/IX. All or nearly all chimneys fall (more than 90%).

TABLE 2: MODIFIED MERCALLI INTENSITY SCALE
(effects of ground failure removed)

INTENSITY VI. Felt by all; many frightened and run outdoors. Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys.

INTENSITY VII. Damage neglible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly-built or badly designed structures; some chimneys broken.

INTENSITY VIII. Damage slight in specially designed structures; considerable in ordinary substantial buildings with partial collapse; great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.

INTENSITY IX. Damage considerable in specially designed structures; well designed frame structures thrown out of plumb; (damage) great in substantial buildings, with partial collapse. Buildings shifted off foundations.

INTENSITY X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations.

ADDITIONAL INTENSITY RATING IN THIS REPORT (1980):

INTENSITY VIII/IX. All or nearly all chimneys fall (more than 90%), or a building of apparent weakness collapses.

TABLE 3

1906 EARTHQUAKE DAMAGE IN SANTA CLARA COUNTY

AGNEWS
Location: AG, 10 km northwest of San Jose.
Distance: 18 km east of the earthquake fault.
Geology: Type A.

Buildings. "The insane asylum, consisting of three tall and three minor brick buildings and some small frame structures, suffered very severely. Every one of the brick buildings was damaged beyond repair and will have to be entirely rebuilt. The main buildings were long, three story brick structures oriented north and south, with large projecting bay windows at their north and south ends. These were destroyed, so that both buildings are open at their ends. The fall of these walls caused the caving in of the roof, and the sagging down in some places of the floors. ...The administration building was partly wrecked by the fall of its tower, which crashed through the roof and all the floors." (Lawson and others, 1908, p. 280-281).

"Perhaps the worst example of poor design, bad workmanship and poor materials...is the insane asylum at Agnew...consisting of a main building surrounded by a number of others -- all flimsily constructed brick structures with timber frames. The construction of these buildings, with their thin walls (in many places devoid of mortar) and light, insufficient wooden framing, indicates a criminal negligence that is appalling." (Humphrey, 1907, p. 22).

"((There was a)) lack of tie between the ((brick)) walls and the interior wood frame." (Butts, 1929, p. 21).

Smokestack. "The power house, built of brick, and its high brick chimney, collapsed." (Derleth, 1907, p. 188).

"The tall brick chimney of the engine house (100 feet high) broke off 20 feet above the ground and fell." (Lawson and others, 1908, p. 280-281).

Windows. "Frequently window panes remained unbroken in the lower parts of walls whose upper parts had been completely demolished." (Lawson and others, 1908, p. 280-281).

Injuries. "One hundred and seventeen patients and attendents ((of perhaps 1100 total)) lost their lives, principally from the fall of the central tower of the main building." (Humphrey, 1907, p. 22).

"101 patients were reported dead. Eleven officers were also killed." (San Francisco Call, 1906).

Comment. "The extent of the destruction is in some measure due to the use of weak mortar, the bricks, as a rule, fallen separately rather than in aggregates." (Lawson and others, 1908, p. 280-281).

Intensity discussion. Apparently the brickwork was weakly built, and the main buildings had only partial collapse, so the Modiefied Mercalli intensity rating is VIII.

Intensity: Modified Mercalli VIII, Rossi-Forel IX.

ALPINE ROAD
Location: AP, southwest of Palo Alto.
Distance: About 2 km east of the earthquake fault.
Geology: Exact locations are uncertain, but geology types C, D, E, An/C and An/D occur in the area.

Foundations. "Judge Allen's in the valley, and several smaller houses, were thrown from their foundations and otherwise badly damaged." (Lawson and others, 1908, P. 264).
Chimneys. "All the brick chimneys along the upper part of this road were thrown down." (Lawson and others, 1908, p. 264).

Intensity: Modified Mercalli VIII/IX; Rossi-Forel VIII/IX.

ALVISO
Location: AV, 12 km north of San Jose.
Distance: 21 km east of the earthquake fault.
Geology: Type Am and A.

General. "Evidences of the earthquake...are shown by fallen chimneys and cornices and by cracked walls of the brick warehouses. No buildings were demolished and little serious damage of any kind was to be noted." (Lawson and others, 1908, p. 281).

Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

ALUM ROCK CANYON
Location: AC, 8 km east of San Jose.
Distance: 27 km east of the earthquake fault.
Geology: Type Ae/D.

Chimneys. "At the mouth of Alum Rock canyon, a count of the fallen chimneys revealed the fact that the percentage ((of fallen chimneys)) had dropped to 50 ((percent))." (Lawson and others, 1908, p. 282).

Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

ALUM ROCK ROAD
Location: AR, 3 to 7 km east of San Jose.
Distance: 26 km east of the earthquake fault.
Geology: Type A.

Chimneys. "At least 90 per cent of the chimneys were thrown." (Lawson and others, 1908, p. 284).
Cemetery. "At the Catholic cemetery, about halfway between San Jose and Alum Rock, only a few monuments were overturned." (Lawson and others, 1908, p. 284).

Intensity: Modified Mercalli VIII/IX; Rossi-Forel VIII/IX.

ALUM ROCK SOUTH
Location: AS, in the valley east of San Jose.
Distance: 26 km east of the earthquake fault.
Geology: Type A.

Chimneys. "In the region between Alum Rock and Evergreen, about 50 per cent of the chimneys were thrown down." (Lawson and others, 1908, p. 283).
General. "None of the buildings were materially damaged." (Lawson and others, 1908, p. 283).

Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

ALUM ROCK SPRINGS
Location: AL, 9 km east of San Jose.
Distance: 28 km east of the earthquake fault.
Geology: Type D.

General. "No chimneys were damaged nor had any moveable objects been overturned." (Lawson and others, 1908, p. 282).

Intensity discussion. Because this is apparently a single site (a resort hotel), the intensity rating is uncertain.
Intensity: Modified Mercalli V?; Rossi-Forel VI?.

CALAVERAS VALLEY
Location: CV, 15 km north of San Jose.
Distance: 33 km east of the earthquake fault.
Geology: Type An/D and An/E.

Chimneys. "All the brick chimneys were thrown down, tho there were only a few in this valley." (Lawson and others, 1908, p. 282).
General. "No damage to houses is reported." (Lawson and others, 1908, p. 282).

Intensity discussion. The fall of all the brick chimneys indicates intensity VIII/IX, but the apparent absence of other damage to the buildings indicates that the intensity is not greater.
Intensity: Modified Mercalli VIII/IX; Rossi-Forel VIII/IX.

CAMPBELL
Location: CB, 7 km southwest of San Jose.
Distance: 11 km east of the earthquake fault.
Geology: Type A.

Chimneys. "68 per cent (51 out of 89) of the chimneys fell." (Lawson and others, 1908, p. 287).

Plaster. "The plastering in the houses was not badly injured." (Lawson and others, 1908, p. 287).

Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

CONGRESS SPRINGS
Location: CS, in hills southwest of Saratoga.
Distance: 3 km east of the earthquake fault.
Geology: Type B.

Building. "The 2-story stone building of the Saratoga Wine Company was partially thrown down." (Lawson and others, 1908, p. 262).

General. "Tanks were intact and very little timber seemed to have fallen." (Lawson and others, 1908, p. 262).

Intensity: Modified Mercalli VIII; Rossi-Forel IX.

EDENVALE
Location: ED, 12 km southeast of San Jose.
Distance: 17 km east of the earthquake fault.
Geology: Type Ae/E.

Building. "A well-constructed brick building...had the roof loosened and the end walls were cracked. ...All the walls ((of the large brick canning factory)) were badly cracked and the tops of the walls fell. The top of the fire-wall above the roof was shaken down." (Lawson and others, 1908, p. 286-287).

Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

EVERGREEN
Location: EG, 10 km southeast of San Jose.
Distance: 23 km east of the earthquake fault.
Geology: Type A.

Foundations. "Several houses were thrown from foundations." (San Jose Herald, 1906e).

General. "All the chimneys, all the road tanks, and nearly all of the windmills...fell. None of the houses were demolished, but some were shifted on their foundations." (Lawson and others, 1908, p. 283).

Intensity: Modified Mercalli VIII/IX; Rossi-Forel VIII/IX.

GARDNER
Location: GN, 2 km south of central San Jose.
Distance: 18 km east of the earthquake fault.
Geology: Type A.

Foundations. "The residence of Mrs. Martini was...thrown four feet off the foundations and has landed in a pile of wrecked splinters. ...There is not a house...that is not out of plumb." (San Jose Mercury and Herald, 1906b).

Chimneys. "Every brick chimney is down." (San Jose Mercury and Herald, 1906-).

Intensity: Modified Mercalli IX; Rossi-Forel IX.

GILROY
Location: GY, 46 km southeast of San Jose.
Distance: 13 km east of the earthquake fault.
Geology: Type A.

Buildings. "Fire-walls of brick buildings were thrown down." (Lawson and others, 1908, p. 287-288).

"The greatest damage done in Gilroy was to the many one-story frame structures which adjoin the brick buildings. Great portions of the upper walls of these latter tumbled down through the roofs of the adjoining business houses." (San Jose Mercury, 1906a).

Chimneys. "Nearly every chimney fell." (Lawson and others, 1908, p. 287-288).

Articles. "Shelf goods were largely shaken down." (Lawson asnd others, 1908, p. 287-288).

Cemeteries. "In the Masons and Odd Fellows Cemetery, out of 120 stones over 3 feet tall, 31 fell. ...In the Catholic cemetery 10 stones out of 67 fell." (Lawson and others, 1908, p. 287-288).

Injuries. "So far no fatalities have been reported." (San Jose Mercury, 1906a)

Intensity: Modified Mercalli VIII/IX; Rossi-Forel VIII/IX.

GUTH LANDING
Location: GL, 8 km east of Palo Alto.
Distance: 14 km east of the earthquake fault.
Geology: Type Am.

Building. "There was a large brick warehouse, with its ends parallel to the fault-line. The upper half of each end toppled over, but the side walls, although badly cracked, were left standing." (Taber, 1906, p. 278).

Intensity discussion. This is a single site, so the intensity rating is uncertain.

Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

GUTH LANDING ROAD
Location: GR, From Guth Landing southward into Mountain View.
Distance: 11 to 14 km east of the earthquake fault.
Geology: Type A and Am.

Chimneys. "Chimneys were down with two exceptions." (Lawson and others, 1908, p. 260).
Plaster. "There was little or no damage to plaster." (Lawson and others, 1908, p. 260).

Intensity discussion. It is not said how many chimneys there were along this road.
Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

JAGEL LANDING
Location: JL, at the edge of San Francisco bay east of Palo Alto.
Distance: 15 km east of the earthquake fault.
Geology: Type Am.

General. "There was but little damage. One chimney was unhurt, and another was slightly twisted." (Lawson and others, 1908, p. 261).

Intensity discussion. This is apparently a single site, so the apparent intensity is a minimum value.
Intensity: Modified Mercalli VII; Rossi-Forel VII.

LAWRENCE
Location: LR, about 12 km northwest of San Jose.
Distance: 14 km east of the earthquake fault.
Geology: Type A.

Buildings. "Between Sunnyvale and Lawrence a brick winery was destroyed." (Lawson and others, 1908, p. 261). "The brick warehouse back of the depot is in ruins." (San Jose Mercury, 1906d).
Watertank. "A tank and windmill were thrown to the ground." (Lawson and others, 1908, p. 261).

Intensity discussion. The description does not indicate the amount of damage in the word 'destroyed', nor is the weakness of the building known.
Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

LOS GATOS
Location: LG, 15 km southwest of San Jose.
Distance: 6 km east of the earthquake fault.
Geology: Type Ae/E.

Buildings. "Brick fronts were nearly all cracked, and one fell out." (Lawson and others, 1908, p. 274, 287).

"The Merritt Hotel is unsafe, owing to an ugly break in the wall over the front. ...The Jones block is badly wrecked by the falling of the front wall. ...The Rankin block was shaken and the coping on the west and south sides shaken off." (Sacramento Union, 1906c).

Chimneys. "Chimneys fell in many different directions, and nearly half the damaged chimneys left standing were twisted. About 80 per cent of all the chimneys were destroyed or damaged. ...78 per cent (67 out of 86) of the chimneys fell." (Lawson and others, 1908, p. 274, 287).

General. "Nearly all business houses were damaged, and about one-third of the plate glass fronts were broken. Much plaster fell. ...There were about a dozen upheavals of sidewalks, mostly on north and south streets. Grocers and druggists lost quite heavily in breakable goods." (Lawson and others, 1908, p. 274, 287).

Cemetery. "Only two stones in the Los Gatos Cemetery were shifted." (Lawson and others, 1908, p. 274, 287).

Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

MASCOT GUN CLUB
Location: MC, in the low lands northeast of Mountain View.
Distance: About 13 km east of the earthquake fault.
Geology: Type A and Am.

Chimneys. "All the chimneys except one...had been thrown down." (Lawson and others, 1908, p. 261).

Watertanks. "Watertanks had fallen except where they had been especially well braced." (Lawson and others, 1908, p. 261).

Intensity: Modified Mercalli VIII/IX; Rossi-Forel VIII/IX.

MAYFIELD
Location: MF, 3 km southeast of Palo Alto.
Distance: 10 km east of the earthquake fault.
Geology: Type A.

Buildings. "A few brick buildings were badly cracked, and the fire-walls were all thrown off." (Lawson and others, 1908, p. 260). "Martin's two-story brick building...was badly shattered." (San Jose Mercury, 1906d).

"An artificial stone building that was being erected...fell with the second shock and is a complete ruin." (Palo Alto Tribune, 1906).

Chimneys. "Out of a total of 258 chimneys 183 fell - about 70 per cent." (Lawson and others, 1908, p. 260).

Watertanks. "Most were overturned." (Palo Alto Tribune, 1906).

Plaster. "The plaster in the small buildings was somewhat cracked, while in the larger buildings the damage done to plaster was more marked." (Lawson and others, 1908, p. 260).

Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

MAYFIELD ROAD
Location: MR, between Mayfield and Mountain View.
Distance: 10 km east of the earthquake fault.
Geology: Type A.

Chimneys. "The smaller or more solidly built chimneys ((are)) uninjured." (Lawson and others, 1908, p. 260).
Watertanks. "Watertanks were left standing." (Lawson and others, 1908, p. 260).

Intensity discussion. The statement that some chimneys were unijured suggests that other chimneys were damaged, although this fact is not positively stated.
Intensity: Modified Mercalli VII/VIII; Rossi-Forel VII/VIII.

MERIDIAN
Location: MD, 5 km west of San Jose.
Distance: 15 km east of the earthquake fault.
Geology: Type A.

Foundations. "Several cottages were shifted from their foundations." (Lawson and others, 1908, p. 287).
Water-tanks. All water tanks on open frames fell, those that were boarded in stood." (Lawson and others, 1908, p. 287).

Intensity discussion. The foundation damage indicates MM VIII or more.
Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

MILPITAS
Location: MP, 11 km north of San Jose.
Distance: 25 km east of the earthquake fault.
Geology: Type A.

Adobe house. "A small adobe house...was fairly demolished; it was known to be an old and weak structure." (Lawson and others, 1908, p. 280, 282).
Foundations. "Three frame buildings ((were thrown down)). The hotel fell from its underpinning." (Lawson and others, 1908, p. 280, 282).
Chimneys. "Nearly all chimneys were here thrown down, a few...being left intact." (Lawson and others, 1908, p. 280, 282).

Water-tanks. "A water-tank and wind-mill were thrown down. ...Several other tanks...were found intact." (Lawson and others, 1908, p. 280, 282).

Intensity discussion. That an adobe building was 'demolished' does not indicate whether it collapsed or was badly cracked. The apparently small amount of damage to foundations suggests less than intensity RF IX.
Intensity: Modified Mercalli VIII/IX; Rossi-Forel VIII/IX.

MILPITAS EAST
Location: ME, 11 km north of San Jose.
Distance: 26 km east of the earthquake fault.
Geology: Type Ae/C.

Chimneys. "Chimneys were all thrown down in the flat lands." (Lawson and others, 1908, p. 282).

Intensity: Modified Mercalli VIII/IX; Rossi-Forel VIII/IX.

MILPITAS TO SAN JOSE ROAD
Location: MJ, north of San Jose.
Distance: About 22 km east of the earthquake fault.
Geology: Type A.

Chimneys. "About 90 per cent of the chimneys were thrown down." (Lawson and others, 1908, p. 282).
Plaster. "In all houses that were plastered considerable plaster fell." (Lawson and others, 1908, p. 282).
Articles. "Articles in the houses were thrown over." (Lawson and others, 1908, p. 282).
Liquids. "Much water and milk was spilt." (Lawson and others, 1908, p. 282).

Intensity: Modified Mercalli VIII/IX; Rossi-Forel VIII/IX.

MORGAN HILL
Location: MG, 32 km southeast of San Jose.
Distance: 15 km east of the earthquake fault.
Geology: Type Ae/E.

Buildings. "A 1-story concrete-block building was badly damaged, the whole front having fallen out. A 2-story reinforced concrete-block building was not damaged." (Lawson and others, 1908, p. 287).
"((The)) new bank stone building ((has)) one side torn out. ...((At a)) stone building, top of wall off and building badly cracked." (San Jose Herald, 1906i).
Chimneys. "64 per cent (18 out of 28) of the chimneys fell."

Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

MOUNT HAMILTON
Location: MH, 20 km east of San Jose.
Distance: 35 km east of the earthquake fault.
Geology: Type E.

Chimneys. "Only 1 of a dozen or more chimneys was thrown. Some other chimneys...were cracked and shifted." (Lawson and others, 1908, p. 306).

Furniture. "Book-cases were moved out about an inch from east and west walls." (Lawson and others, 1908, p. 306).

Articles. "Things overturned fell east and west." (Lawson and others, 1908, p. 306).

Plaster. "Not much plaster fell." (Lawson and others, 1908, p. 306).

Intensity: Modified Mercalli VII; Rossi-Forel VII.

MOUNTAIN VIEW new
Location: MV, 18 km northwest of San Jose.
Distance: 11 km east of the earthquake fault.
Geology: Type A.

Buildings. "6 brick structures, including the Pacific Press and the cannery buildings, were seriously injured." (Lawson and others, 1908, p. 260).

"The building of the Pacific Press Publishing Company was...ruined as to its walls. ...Fortunately the plant itself was but little damaged, and its machinery was in operation a short time after the earthquake. ...Allen's two-story brick furniture store was laid in ruins. The store of Rogers and Rogers, the post office building, Olympic Hall and the fruit factory are all total wrecks, while a number of buildings were so badly racked that they will have to be torn down." (San Francisco Chronicle, 1906b).

"Our town is fortunate in having but few brick houses. Of these few, four are in heaps of ruins, and the others are seriously damaged. ...One building with a general merchandise store and the post-office on the first floor, and a lodging house upstairs, was thrown into a miscellaneous heap. Some of the lodgers were injured, but none fatally. Another building, containing two stores below and a large hall above, was mostly tumbled into the street. A large two-story furniture establishment fell flat to the earth. A large fruit-drying and packing house was also totally wrecked." (Signs of the Times, 1906a).

General. "Two two-story frame buildings were ruined, and many others more or less damaged. Broken windows, dishes, or furniture were the order common to all houses. Many windmills and water tanks were thrown down, and fallen chimneys are to be seen anywhere, as also broken plaster in plastered houses. ...Our working material ((at Pacific Press)) is practically uninjured ((except for two linotype machines, which))...were broken by a portion of the brick wall falling in upon them." (Signs of the Times, 1906a).

Smokestack. "Broken smokestack...fell through roof of the ((Pacific Press)) building." (Signs of the Times, 1906b).

Chimneys. "Out of 271 chimneys, 206, or 76 per cent, fell." (Lawson and others, 1908, p. 260).

Water-tanks. "Out of 46 large water-tanks 20, or 43 per cent, fell." (Lawson and others, 1908, p. 260).

"The tanks at the waterworks have entirely collapsed and the town is supplied with water by keeping the pumps going night and day and turning the pumps directly into the water mains." (San Jose Mercury, 1906f).

Cemetery. "In the Mountain View cemetery there were 26 large monuments; of these 11 fell and 7 were shifted, while 13 slab headstones out of 27 were thrown down." (Lawson and others, 1908, p. 260).

Injuries. "Eleven persons were injured, but there were no fatalities." (San Francisco Chronicle, 1906b).

Intensity discussion. The building damage indicates RF IX or possibly MM VIII if the buildings were weak; the chimney damage indicates only RF VIII or MM VIII.

Intensity: Modified Mercalli VIII; Rossi-Forel IX?

MOUNTAIN VIEW old
Location: MO, 18 km northwest of San Jose.
Distance: 11 km east of the earthquake fault.
Geology: Type A.

Chimneys. "75 per cent of the chimneys (31 out of 41) fell." (Lawson and others, 1908, p. 260).

Watertanks. "33 1/3 per cent of the water-tanks (3 out of 9) fell." (Lawson and others, 1908, p. 260).

Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

MOUNTAIN VIEW south
Location: MS, 6 km south of Mountain View.
Distance: 7 km east of the earthquake fault.
Geology: Type B.

Building. "A 3-story brick wine distillery...was totally destroyed by the shock. This building was on the side of a hill." (Lawson and others, 1908, p. 261).

House and chimney. "A 3-story frame house near it ((the winery)) lost its chimney and was tipt to one side." (Lawson and others, 1908, p. 261).

Intensity discussion. It is not clear whether the damage involved collapse of the building, and the strength of the building is also unknown.

Intensity: Modified Mercalli VIII; Rossi-Forel IX?

MOUNTAIN VIEW LANDING

Location: ML, 4 km north of Mountain View.
Distance: 14 km east of the earthquake fault.
Geology: Type Am.

Chimneys. "There were fallen or damaged chimneys." (Lawson and others, 1908, p. 260).

Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

NEW ALMADEN

Location: NA, 18 km south of San Jose.
Distance: 10 km east of the earthquake fault.
Geology: Type E.

Smokestacks. "The tops of 2 brick furnace chimneys, about 50 feet tall, were broken off." (Lawson and others, 1908, p. 288).
Chimneys. "About 70 per cent (16 out of 23) of the chimneys were broken off." (Lawson and others, 1908, p. 288).

Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

PACHECO PASS

Location: PP, 60 to 70 km southeast of San Jose.
Distance: 35 to 45 km east of the earthquake fault.
Geology: Type E.

General. "At the ((western)) entrance to the canyon...only a few dishes had been broken and milk was thrown only from pans well filled. At Bell's Station no damage was done beyond the loss of milk. High bottles and dishes standing upon shelves were uninjured. ...((At Mountain House)) no dishes were thrown from shelves, nor milk splashed from pans." (Lawson and others, 1908, p. 316).

Intensity discussion. These localities are each single sites, so the intensity rating is a minimum value.
Intensity: Modified Mercalli V; Rossi-Forel VI.

PALO ALTO
Location: PA, 27 km northwest of San Jose.
Distance: 9 km east of the earthquake fault.
Geology: Type A.

Buildings (partial list). "Three concrete-block buildings were either wholly or partly destroyed. ...The Thiele Building, a partially completed three-story structure...was entirely wrecked. ...The Fuller Building, a two-story structure, also collapsed. The concrete-block walls, 13 inches thick, laid in cement mortar, were not braced in any way -- the joists...simply resting upon the wall. When the building vibrated, the wall was pushed out and collapsed because there was nothing to restore it to its normal position." (Humphrey, 1907, p. 24).

"In town proper all brick buildings more or less damaged, several total wrecks." (Redwood City Times-Gazette, 1906).

"((At)) the Frazer block...the four walls of the second story were thrown down. The debris and a broken water pipe damaged the stock." (Daily Palo Alto Times, 1906).

Foundations. "A number of buildings moved toward the southeast 1 to 6 inches or more. Some buildings were left out of plumb. ...The same ((twisting)) is true of several houses that collapsed. ((10 buildings with damaged foundations are listed in a special list))." (Lawson and others, 1908, p. 257-258).

"In a few instances houses were removed from their foundations and more or less racked." (Palo Alto Tribune, 1906a).

((Five houses are listed as moving from foundations)) "and perhaps a few others were moved from their foundations." (Palo Alto Tribune, 1906a).

Frame house. "The Palo Alto Academy, an old two-story frame house, completely collapsed, falling toward the southeast and apparently twisted counter-clockwise." (Lawson and others, 1908, p. 257-258).

Chimneys. "In several cases the chimneys were apparently twisted. ...Chimneys were mostly knocked down." (Lawson and others, 1908, p. 257-258).

"Scarcely a chimney escaped a fallen top, and where they were built to the ground they almost without exception crushed at the base, the portion from basement to roof being intact." (Palo Alto Tribune, 1906a).

Water system. "Palo Alto was extremely fortunate in that the earthquake did not put the water supply out of service." (Palo Alto Tribune, 1906a).

Injuries. "No lives were lost in town and but few even injured." (Sacramento Union, 1906b).

Comment. "Faulty construction, a failure to have the walls properly reinforced, and the use in many instances of a poor quality of mortar and cement, were largely the cause of the destruction." (Palo Alto Tribune, 1906a).

Intensity discussion. Probably the few buildings that collapsed were comparatively weak, and the listed foundation damage is not great, so the MM intensity rating may be MM VIII.

Intensity: Modified Mercalli VIII; Rossi-Forel IX.

PALO ALTO EAST
Location: PE, 25 km northwest of San Jose.
Distance: 11 km east of the earthquake fault.
Geology: Type A.

Chimneys. "About half the brick chimneys had been thrown down." (Lawson and others, 1908, p. 260).

Plaster. "Plaster on first-floor walls cracked, but it was not injured to any extent in the upper stories. Many houses showed little damage to plaster, even on the first floor." (Lawson and others, 1908, p. 260).

Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

RUCKER
Location: RK, 40 km southeast of San Jose.
Distance: 14 km east of the earthquake fault.
Geology: Type A.

Buildings. "The stone packing house which was erected...last fall is in ruins, and the schoolhouse is badly injured." (San Jose Mercury, 1906g).

Foundations. "Houses were shaken off their foundations. ...The house of S. Graves was razed to the ground." (San Jose Mercury, 1906g).

Chimneys. "Brick and terra-cotta chimneys have fallen." (San Jose Herald, 1906g).

General. "The school building was badly damaged, and several windows were broken by the twisting of the frames." (Lawson and others, 1908, p. 287).

Watertanks. "Windmills and tanks are lying on the ground." (San Jose Mercury, 1906g).

Intensity discussion. It is not indicated what percentage of buildings were shaken off foundations.

Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

SAN JOSE
Location: SJ.
Distance: 18 km east of the earthquake fault.
Geology: Type A.

Buildings (partial list). "The earthquake threw down many brick and stone buildings, and with the exception of 4 or 5, damaged all the rest of the brick buildings, more or less. The damage done to frame houses was proportionally far less." (Lawson and others, 1908, p. 284).

"It is feared that many buildings...which do not show plainly the effect of the quake have suffered by the severe wrenching to which they were subjected. Not a few of them may be seen leaning off their center." (Sacramento Bee, 1906d).

"The remarkable feature of it all is that in the main the older buildings stood the shock better than did the more modern structures. On one block, for example, are the Court House, Hall of Records, and Hall of Justice. The Court House is regarded as one of the old buildings of the town, the Hall of Records was built about fifteen years ago, while the Hall of Justice was but recently completed and had not, I understand, been occupied. But, though badly shaken up and seriously damaged, the Court House does not appear to be half so likely to come down as the Hall of Records, the west outer wall of which bulges far out of plumb. The fine new Hall of Justice is badly cracked, and report was current that it might have to be condemned." (Sacramento Union, 1906a).

"The old Fifth Street Cannery, a large brick building...is in ruins; walls and roof utterly collapsed." (San Jose Mercury, 1906b).

"The shock...peeled off the brick wall on the entire upper portion of the ((High School)) building, leaving the bare wooden studding standing, but twisted and warped out of shape. The roof was totally demolished. Portions of it fell through upon the upper floor. Other parts slid off to the ground." (San Jose Mercury, 1906b).

"The ((Victory)) theater building collapsed...and the Angelus building ((next door)) was so badly wrecked that...had some difficulty in getting out of their rooms." (Woodland Democrat, 1906).

Buildings, fire and injuries. "The big three-story Phelan Building...fell flat and three persons were buried in the ruins. ...The large three story building...became a shapeless pile of brick and mortar. ...The three-story brick Martin building had been hurled to the ground and instantly flames burst from the wreckage. ...There was but one other fire. It broke out in the El Monte lodging house on Locust Street and seven people were roasted to death. ...Following the quake martial law was declared and kept in force for several days." (Sawyer, 1922, p. 174).

"The lodging house...a rather flimsy affair, collapsed and the fifty inmates fled for their lives. Seven were unable to escape the falling timbers and were pinioned within. Almost immediately flames burst out and the victims were caught like rats in a trap." (San Jose Mercury and Herald, 1906b).

Foundations. "Forty buildings were counted...that were thrown off their foundations. ...In many instances these buildings were completely demolished." (Lawson and others, 1908, p. 284).

"The houses set up on wooden mudsills and struts have yielded to the shock much more frequently than those provided with solid foundations." (San Jose Mercury, 1906b).

"Buildings were turned on their foundations...to the extent of 2 or 3 inches. This occurred with many frame houses, and in the case of certain large buildings." (Duryea, 1907, p. 296).

Chimneys. "At least 95 per cent of the brick chimneys thruout the town fell." (Lawson and others, 1908, p. 284).

Watertanks. "Numerous wind-mills and tanks capsized." (Lawson and others, 1908, p. 284).

Injuries. "By the falling of the rear wall of the Native Sons Hall baby Higuera was killed. The Higuera home was located near the rear of the hall and was crushed by the falling bricks. The mother was also seriously injured." (San Jose Herald, 1906f).

"Nineteen lives were...snuffed out by the falling and burning buildings. Numerous persons also were seriously injured." (San Jose Mercury, 1906b).

Comment. "All about the business district the streets were filled with debris to an extent rendering them impassable to ordinary traffic." (Sacramento Bee, 1906a).

"One peculiarity in the effects of the temblor - in some instances houses which are virtually wrecked ((moved off foundations)) have had little loss in the way of crockery, glassware, bric-a-brac, etc., while in other dwellings which are almost intact structurally there is not a whole dish or ornament on the premises." (San Jose Herald, 1906b).

Ground deformation (absence). "San Jose's water works...was not injured; its sewers also were left intact, showing that there was no unequal displacement of the ground." (Derleth, 1907, p. 188).

Pre-earthquake. "On the east side of Delmas Avenue, just south of San Carlos street, there is a well that has not produced a drop of water for 25 years up to the day before the earthquake, when it suddenly started to flow. The stream kept growing constantly in size until the capacity of the pipe was taxed. ...The well was capped, but such was the force of the water that it was burst off." (San Jose Herald, 1906k).

Intensity discussion. Although San Jose is a large town, there were only a few buildings that completely or partially collapsed. Thus it appears that only the weakest buildings were badly damaged, and perhaps the intensity was MM VIII.

Intensity: Modified Mercalli IX; Rossi-Forel IX.

SAN JOSE RESERVOIR AREA
Location: SR, 9 km southwest of San Jose.
Distance: Near to the earthquake fault.
Geology: Type D or E.

General. "The walls of a stone barn had been thrown down, 1,000 gallon wine tanks in a cellar had been shifted, and people in houses were thrown down while trying to get outdoors. ...In a house close by...the first floor plaster fell. Poorly built foundations fell. Southeast of the reservoir the chimneys and water tanks were down." (Lawson and others, 1908, p. 267).

Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

SAN MARTIN
Location: SN, 38 km southwest of San Jose.
Distance: 15 km east of the earthquake fault.
Geology: Type A.

General. "Many tanks, windmills and brick chimneys were thrown down. ...The hotel was somewhat damaged." (San Jose Herald, 1906m).

Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

SANTA CLARA
Location: SC, 5 km west of San Jose.
Distance: 15 km east of the earthquake fault.
Geology: Type A.

Buildings (partial list). "Most of the brick buildings were damaged." (Lawson and others, 1908, p. 283-284).

"The Pacific Manufacturing Mill fell." (San Jose Herald, 1906e).

"The Odd Fellows building was so badly damaged that it has been condemned and will be torn down. ...The top story of the Whitney block is gone." (Sacramento Bee, 1906b).

"The large Methodist Church...is a total wreck and but a small portion of the side walls and a huge mass of bricks, wood and twisted iron tell where the church once stood. The Union Club, S.A. Elliott's plumbing establishment, Robinson Drug Store and Relief Saloon were total wrecks. The entire roof and in the former two, the walls caved in burying everything in the buildings. ...The Raney stables were badly demolished, the roof being splintered. ...The old adobe building used by the Sodality Club is badly damaged." (San Jose Herald, 1906e).

"((At the University)) one side of the Senator's Hall...was down." (Gridley Herald, 1906).

Adobe. "The Catholic Church ((Santa Clara Mission)), a historic relic of the early padres, considerably over 100 years old, and built by Christianized Indians out of adobe, was scarcely injured, only some of the images being tumbled over." (Sacramento Bee, 1906b).

"An old adobe wall in the rear of the P.J. Riley residence ...is the oldest in the county. ...It stood well until yesterday, when it became badly cracked in many places." (San Jose Mercury, 1906e).

Chimneys. "Nearly all the brick chimneys were thrown down." (Lawson and others, 1908, p. 283-284).

Cemeteries. "In the Santa Clara Cemetery...twenty-five headstones were down. ...At Oak Hill Cemetery...34 monuments ((were)) overthrown." (Lawson and others, 1908, p. 283-284).

"In the Protestant cemetery, 0.75 mi. southwest of Santa Clara, 31 monuments were thrown down and mostly broken. ...In the Catholic cemetery, 0.25 mile nearer Santa Clara, 26 monuments fell. ...Three monuments were turned on their bases, two clockwise and one counter-clockwise." (Lawson and others, 1908, p. 275).

Watertank. "The large steel tower holding the four 180,000 gallon water tanks...collapsed...flooding the surroundings. As a result the town is without water or gas." (San Jose Mercury and Herald, 1906a).

Injuries. "((A woman)) was badly injured by a chimney crashing through the house and striking her in bed. Her arms and legs were broken, and she is internally injured." (San Jose Herald, 1906a).

"Mrs. P.S. Walpraple was badly injured by the large water tank at the P. M. mill falling on her house." (San Jose Mercury and Herald, 1906a).

Intensity discussion. Although the collapse of several buildings indicates RF IX, the rating of MM intensity is uncertain, as the possible weakness of the buildings is not known. That the adobe buildings did not collapse suggests MM VIII.

Intensity: Modified Mercalli VIII/IX; Rossi-Forel IX.

SARATOGA
Location: SA, 15 km west of San Jose.
Distance: 4 km east of the earthquake fault.
Geology: Type Ae/B.

Chimneys. "Some chimneys were knocked off." (Lawson and others, 1908, p. 261).

Intensity: Modified Mercalli VII/VIII; Rossi-Forel VII/VIII.

SARGENT
Location: SG, 55 km southeast of San Jose.
Distance: 5 km east of the earthquake fault.
Geology: Type C.

Chimneys. "The chimneys at the depot and the Sargents family house was wrecked." (San Jose Herald, 1906-) 12my p8

Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

STANFORD UNIVERSITY
Location: SU, 2 km southwest of Palo Alto.
Distance: 6 km east of the earthquake fault.
Geology: Type Ae/D.

Buildings (partial list). "Some were unhurt while others were completely wrecked. ...As a rule, the older the buildings were the better they withstood the shock. ...The stone tower of the church was shaken to pieces, and in falling destroyed the parts of the roof immediately around the tower. The north gable end of the church was thrown outward. ...The top of the memorial arch was broken off. ...The 1-story buildings in the outer quadrangle...were somewhat cracked. ...The higher buildings of the outer quadrangle were more seriously damaged, especially those situated on the corners. ...Walls were thrown down from every face of the ((Geology)) building. The tower at the northeast corner was badly cracked and part of it fell. ...The new gymnasium, a stone-faced brick building, was totally wrecked ((photo 104-B shows part of the roof and a wall collapsed)). The new library, also a stone-faced brick structure, was completely wrecked ((photo 104-A shows that the roof collapsed into the building)). ...The new brick portions of the ((museum)) building were almost all thrown down. ...The ornamental stone gateway at the entrance to the university...was thrown down." (Lawson and others, 1908, p. 255-257).

"I remember dimly seeing the new library and the church spire go. They didn't fall exactly, they just settled as if they had been made of sand." (L.M. Klauber. 1 May 1906, letter on file at the California Historical Society).

"The heavy spire of the chapel dropped through the roof; the elaborately ornamented gable ends fell out. The library and gymnasiun, newest of Stanford's buildings, became shapeless wrecks. The dainty arched gateways at the entrance of the campus spread themselves out flat on the ground. The original buildings, erected in 1891, were practically unharmed - all but the museum, part of which was destroyed." (Aitkin and Hilton, 1906, p. 58).

"Part of ((the museum)) was of concrete; but in order to finish it for the opening of the university ((in 1891)), part of it was built of brick. The earthquake wrecked the brick part; the concrete part stood." (Aitkin and Hilton, 1906, p. 58).

"The brick portion of the ((original residence)) structure was badly shattered. ...A large 2-story brick winery had the 4 gable ends thrown down." (Lawson and others, 1908, p. 255-257).

"The newer buildings conformed rather to the modern commercial standard of building construction; the older ones approached the monumental. The newer buildings suffered more than the old." (Sewell, 1907, p. 113).

"Near the University buildings a bookstore which was made of brick collapsed." (Jenkins, 1980).

Arcades. The arcade along the south side of the outer quadrangle...was completely wrecked. ...Parts of ((other)) arcades fell." (Lawson and others, 1908, p. 255-257).

"A large percentage of keystones and arches, running at right angles to the fault, were dropped while practically no keystones were dropped in arches that ran parallel to the fault. Walls, running parallel to the fault, toppled over either toward or away from the fault and the stones on the ground retained the same relative positions that they had occupied when in the walls. On the other hand, walls built at right angles to the fault fell as a resultof shearing stresses and the stones fell in irregular piles." (Stephen Taber in Freeman, 1932, p. 74).

Foundations. "The swaying of ((a fraternity)) building threw it off ((4 foot high)) supports. ...Wooden additions ((to the original Stanford residence)) stood upon wooden uprights 4 feet in length. The southeastern wooden addition was thrown from its supports." (Lawson and others, 1908, p. 255-257).

Smokestack. "The 150 foot stone chimney of the power plant was thrown down. ...The double-flued 60 foot chimney of the assay laboratory fell." (Lawson and others, 1908, p. 255-257).

Chimneys. "Out of 140 chimneys on these ((campus residence)) buildings, 104 were thrown down, or 74 per cent." (Lawson and others, 1908, p. 255-257)

Plaster. "The plaster was generally badly broken on the first floors of these buildings, and less injured tho generally more or less cracked in the second floor rooms." (Lawson and others, 1908, p. 255-257).

Statues. "The impetus of falling bodies was illustrated by the fall of the statue of Agassiz from the front of the Zoology building. The statue was hurled from a height of thirty feet. It struck the pavement head first and remained buried to the chest." (San Jose Mercury, 1906c).

Comment. "In the words of President David Starr Jordan, 'All the ornamental buildings have been demolished and only the working buildings remain.'" (Sacramento Bee, 1906c).

"The first buildings erected here were of solid stone and were built to withstand earthquakes. The later buildings were cheaper. ...'We were not building for earthquakes,' said he ((contractor J.D. McGilvray)) 'when we constructed these ((recent)) buildings. We were building according to the practice of the times.'" (San Francisco Examiner, 1906).

Injuries. "In Encina Hall...a large stone chimney fell through...all four floors, at a width of two rooms, down to the basement. Six students were dropped to the bottom under a vast pile of debris. ...Five of the sufferers were hauled out after nearly two hours work. All had received painful injuries. The last man to be reached, at the very bottom of this heap of ruins, was J.R. Hanna...who roomed on the second floor. Hanna's neck was broken and one of his legs was badly crushed." (San Francisco Chronicle, 1906a).

Intensity discussion. The partial collapse of several of the buildings requires RF IX, but the buildings were apparently more weakly built and the chimney damage indicates only intensity VIII.

Intensity: Modified Mercalli VIII; Rossi-Forel IX?

SUMMIT

Location: SM, 25 km south of San Jose.
Distance: At the earthquake fault.
Geology: Type D.

Foundations. "At Summit, a summer resort, the new hotel and several small cottages were all thrown toward the north." (Lawson and others, 1908, p. 275-276).

Trees. "Several redwood trees were snapt off." (Lawson and others, 1908, p. 275-276).

Intensity: Modified Mercalli IX; Rossi-Forel IX.

SUNNYVALE REGION

Location: SV, 13 km northwest of San Jose.
Distance: 14 km east of the earthquake fault.
Geology: Type A.

Building. "A brick winery was destroyed." (Lawson and others, 1908, p. 261).

Smokestack. "((At S.N. Goldy's factory)) the cement chimney 85 feet high snapped off about 20 feet from the ground, and, striking the cement engine room, broke the roof and wall." (San Jose Herald, 1906j).

Chimneys. "A few chimneys were left standing." (Lawson and others, 1908, p. 261).

Water-tank. "A tank and wind-mill were destroyed." (Lawson and others, 1908, p. 261).

Intensity discussion. Unfortunately, it is not clear whether the winery building collapsed or not, or what percentage of chimneys were fallen.

Intensity: Modified Mercalli VIII/IX; Rossi-Forel IX?

WRIGHT STATION
Location: WS, 24 km south of San Jose.
Distance: 1 km west of the earthquake fault.
Geology: Type D.

Buildings. "Most good buildings were wrecked, while barns and shaky buildings stood." (Lawson and others, 1908, p. 276).

Chimneys. "All brick chimneys on the ridge fell." (Lawson and others, 1908, p. 276).

Water-tanks. "Water was thrown out of tanks, but the tanks were not overthrown." (Lawson and others, 1908, p. 276).

Intensity: Modified Mercalli VIII/IX; Rossi-Forel VIII/IX.

TABLE 4

1906 EARTHQUAKE DAMAGE IN SANTA CRUZ COUNTY

BEN LOMOND
Location: BL, 15 km north of Santa Cruz.
Distance: 13 km west of earthquake fault.
Geology: Type An/C.

Chimneys. "Broken chimneys were the only evidence." (Lawson and others, 1908, p. 268).

Absence of ground failure. "At Ben Lomond no fissures nor other such evidences of the earthquake were to be seen. Inquiry showed this condition to continue in the country about town." (Lawson and others, 1908, p. 268).

Intensity discussion. The description does not indicate if 'broken chimneys' means fallen chimneys or not.

Intensity: Modified Mercalli VII/VIII; Rossi-Forel VII/VIII.

BONNIE DOON
Location: BD, 13 km northwest of Santa Cruz.
Distance: 21 km west of earthquake fault.
Geology: Type C.

General. "Chimneys were unharmed, plaster was intact, clocks did not stop, and even the milk had not spilt from the pans." (Lawson and others, 1908, p. 270).

Intensity discussion. It is uncertain if this is a community report or the report of a single house. If it is the report of a single house, then the intensity rating is a minimum value.

Intensity: Modified Mercalli V?; Rossi-Forel V?

BOULDER CREEK
Location: BC, 20 km north of Santa Cruz.
Distance: 12 km west of earthquake fault.
Geology: Type An/C.

Smokestacks. "The large manufacturing plants ((were)) put out of business by the fall of their smokestacks." (San Jose Herald, 1906c).

Chimneys. "All chimneys were down except those on some 1-story cottages; these were cracked, however." (Lawson and others, 1908, p. 268).

Plaster. "Some plaster had fallen, and plaster was cracked everywhere." (Lawson and others, 1908, p. 268).

Windows. "All the plate glass fronts in the business houses were shattered." (San Jose Herald, 1906c).

Trees. "Three dead redwoods had been snapt off from 30 to 50 feet above the ground." (Lawson and others, 1908, p. 268)

Aftershock damage. "Another shock, not so severe as the first, was felt here at 6:25, completing the previous work of destruction." (San Jose Herald, 1906c).

Intensity: Modified Mercalli VIII/IX; Rossi-Forel VIII/IX.

BOULDER CREEK NORTH
Location: BN, 12 km north of Boulder Creek.
Distance: 7 km west of the earthquake fault.
Geology: Type C.

Trees. "A few trees were torn up by the roots. Cordwood ((broken branches)) had been thrown down in several instances along here. ...In the gulch the tops of a number of redwood trees had been broken off from 50 to 100 feet from the ground, the diameters at the point of fracture measuring from 10 to 14 inches." (Lawson and others, 1908, p. 268).

Intensity discussion. The damage to the trees cannot be rated on the seismic intensity scales.

BOULDER CREEK SAWMILL
Location: BS, 7 km northwest of Boulder Creek.
Distance: 10 km west of the earthquake fault.
Geology: Type C.

General. "At the house...the inside furniture was overturned, the stove moved, and the terra-cotta chimney split and fell." (Lawson and others, 1908, p. 268).
Trees. "Branches were broken from redwood trees. ...Tops of live trees, from 6 to 8 inches in diameter at the fracture, were broken off." (Lawson and others, 1908, p. 268).

Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

CAPITOLA
Location: CP, 6 km east of Santa Cruz.
Distance: 15 km west of earthquake fault.
Geology: Type At/C.

Chimneys. "Nearly all the chimneys...fell." (Lawson and others, 1908, p. 292).
Plaster. "Considerable plaster was shaken from the north walls of the first floor of the hotel." (Lawson and others, 1908, p. 292).

Intensity: Modified Mercalli VIII/IX; Rossi-Forel VIII/IX.

CHITTENDEN
Location: CH, 37 km east of Santa Cruz.
Distance: 1 km east of the earthquake fault.
Geology: Type C.

Foundations. "The cottage of the foreman was moved 5 inches westward. ...A large frame dairy building on underpinning was moved 3 feet northward, as was a smaller building. ...The railroad office was not moved from its foundation." (Lawson and others, 1908, p. 279).

Railroad cars. "Three freight cars on the side-track...were tipt over. ...At the time of the shock a north-bound freight train was running at about 30 miles an hour. ...About 10 cars in the middle of the train were thrown off on both sides of the track." (Lawson and others, 1908, p. 279).

Intensity discussion. Of the four buildings that are mentioned, three have moved off their foundation.

Intensity: Modified Mercalli IX; Rossi-Forel IX.

FELTON
Location: FL, 10 km north of Santa Cruz.
Distance: 15 km west of earthquake fault.
Geology: Type An/C.

Chimneys. "The damage consisted of the destruction of brick chimneys." (Lawson and others, 1908, p. 272).

Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

SANTA CRUZ
Location: SZ, on the southern coast of the county.
Distance: 18 km west of earthquake fault.
Geology: Type An/C and At/C.

Buildings. "The court-house roofs and towers were wrecked. ...Many buildings had their walls shaken down. ...Several brick and stone buildings were partly shaken down." (Lawson and others, 1908, p. 271).

"No two or three story brick buildings were shaken down in Santa Cruz. A one-story brick cottage was. ...The court house is almost completely wrecked. Part of the cupola fell thru the ceilings and landed in the basement." (San Jose Herald, 1906b).

Foundations. Two old wood buildings are several inches out of plumb. (San Jose Herald, 1906b).

Smokestack. "The 90 foot brick smoke-stack...which is about 18 feet in diameter at the base, was unharmed by the shock." (Lawson and others, 1908, p. 271).

Chimneys. "Many brick chimneys were down." (Lawson and others, 1908, p. 271).

General. "The concert house and some other brick buildings were cracked, groceries and crockery were thrown on the floor, and a few dozen chimneys were more or less injured." (Oakland Tribune, 1906b).
Injuries. "Personal injuries were not sustained by any person in town." (Oakland Tribune, 1906).

Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

SANTA CRUZ HIGH GROUND
Location: SH, near Santa Cruz.
Distance: 17 km west of earthquake fault.
Geology: Type C.

Chimneys. "On the high ground in Garfield Park, and also in the northwest part of the city, only about one-fourth of the chimneys fell." (Lawson and others, 1908, p. 271).
Plaster. "A little plastering was cracked." (Lawson and others, 1908, p. 271).

Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

SCOTT VALLEY
Location: SD, 9 km north of Santa Cruz.
Distance: 14 km west of earthquake fault.
Geology: Type An/C.

Chimneys. "Chimneys were sometimes cracked but were still standing." (Lawson and others, 1908, p. 272).
Plaster. "Plaster did not fall." (Lawson and others, 1908, p. 272).

Intensity: Modified Mercalli VII; Rossi-Forel VII.

SKYLAND
Location: SL, 18 km northeast of Santa Cruz.
Distance: 2 km west of earthquake fault.
Geology: Type D.

Houses. "Some houses in the neighborhood fell completely, and some collapsed on their foundations." (Lawson and others, 1908, p. 278).
Chimneys. "The two chimneys of his ((Mr. Wightman's)) house were thrown, one coming through the roof." (Lawson and others, 1908, p. 278).

Intensity discussion. The damage to the houses indicates intensity RF IX.
Intensity: Modified Mercalli IX; Rossi-Forel IX.

SOQUEL HIGH
Location: SU, 5 km east of Santa Cruz.
Distance: 13 km west of earthquake fault.
Geology: Type C.

Chimneys. "Most ((chimneys)) on high ground stood." (Lawson and others, 1908, p. 292).

Intensity discussion. The description 'most chimneys stood' indicates that some chimneys fell, but the percentage of fall is not clear.
Intensity: Modified Mercalli VII; Rossi-Forel VII.

SOQUEL LOW
Location: SQ, 5 km east of Santa Cruz.
Distance: 13 km west of earthquake fault.
Geology: Type An/C.

Foundations. "Several houses are moved eastward two inches on their foundations." (San Jose Herald, 1906b).
Chimneys. "Nearly all the chimneys fell." (Lawson and others, 1908, p. 292).
Plaster. "Much plaster fell." (Lawson and others, 1908, p. 292).
Articles. "Goods were thrown from shelves." (Lawson and others, 1908, p. 292).

Intensity: Modified Mercalli VIII/IX; Rossi-Forel VIII/IX.

SWANTON
Location: SW, 21 km northwest of Santa Cruz.
Distance: 23 km west of earthquake fault.
Geology: Type An/C.

General. "Dishes on a shelf...were thrown off. ...Terra-cotta chimneys did not fall. Glasses and bottles remained on the shelves in a bar-room." (Lawson and others, 1908, p. 269).

Intensity discussion. This is apparently a single site, so the intensity rating is a minimum.
Intensity: Modified Mercalli VI; Rossi-Forel VI.

WATSONVILLE
Location: WV, 25 km east of Santa Cruz.
Distance: 9 km west of earthquake fault.
Geology: Type A.

Buildings. "Parts of a few brick walls...fell." (Lawson and others, 1908, p. 292).

Foundations. "In the surrounding country many houses were moved from their foundations." (Chico Daily Enterprise, 1906).

Chimneys. "About 90 per cent of the chimneys were broken off at the roof-line. ...Several were cracked and twisted but not thrown down." (Lawson and others, 1908, p. 292).

Intensity discussion. It is not certain if chimneys 'broken off' means fallen or not.

Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

TABLE 5

EARTHQUAKE GROUND FAILURES IN SANTA CLARA COUNTY

ALVISO
Location: AV, 12 km north of San Jose.
Distance: 21 km east of the earthquake fault.
Geology: Type A or Am.

Liquefaction. "The district between Milpitas and Alviso is seamed with immense fissures from which water is pouring. The country is being rapidly inundated. The road between Milpitas and Alviso is beneath water in many places, making passage impossible. ...Sections of land varying from small plots to entire fields have sunk to depths of six inches to five feet." (San Jose Herald, 1906f).

Ground deformation. "On Alviso slough two rows of trees in an orchard had parted off and slid into the slough." (Salinas Daily Index, 1906).

"((Railroad grade subsidence of several feet)) is reported from Alviso" (Ransome, 1906, p. 294).

"From San Jose to Alviso the road is lowered in places by the shocks, and the front of the principal hotel at Alviso has sunk at least ten feet." (The Evening Post, 1906).

Ground failure: Liquefaction, deformation, and settlement.
Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

CONGRESS SPRINGS
Location: CS, in hills southwest of Saratoga.
Distance: 3 km east of the earthquake fault.
Geology: Type B.

Landslides. "((About 2 miles south of Congress Springs)) cracks 4 or 5 inches wdie opened near Grizzley Rock and several large slides occurred in its neighborhood." (Lawson and others, 1908, p. 109).

"Following the Stevens Creek road down toward Congress Springs, several landslides were noted, mostly small ones due to the caving in of the banks of the creek. Just west of the springs the road was badly broken, twisted, and shoved up in places." (Lawson and others, 1908, p. 109).

Ground failure: Landslides.
Intensity: Modified Mercalli VIII; Rossi-Forel IX?

CORTE MADERA CREEK (now named Matadero Creek)
Location: CM, south of Palo Alto.
Distance: 2 km east of the earthquake fault.
Geology: Type E.

Rockfall and landslide. "At many places on the south side of Corte Madera Creek, huge masses of rock had been thrown down from the steep bluffs into the road, completely blocking it. About a mile from the summit of the ridge, where Alpine Road enters the Page Mill Road, a slide carried away the entire roadbed for a distance of about 300 feet." (Lawson and others, 1908, p. 389).

Ground failure: Rockfall and landslide.

COYOTE RIVER
Location: CR, 13 km north of San Jose.
Distance: 22 km east of the earthquake fault.
Geology: Type A.

Ground cracks. "Along the levee paths following the Coyote River north...large fissures, as much as eight feet wide and of nearly equal depth, have been opened." (Weatherbee, 1906, p. 402).

Ground failures: Cracks.

FREELY PLACE
Location: FR, 24 km south of San Jose.
Distance: Near to the earthquake fault.
Geology: Type D and E.

Landslide. "Some 15 acres of woodland have slid into Los Gatos Creek, making a large pond. There are many slides in the neighborhood and many broken trees." (Lawson and others, 1908, p. 278).

Ground failure: Landslide.

MONTE BELLO RIDGE
Location: MB, northwest of Saratoga.
Distance: 1 km east of the earthquake fault.
Geology: Type E.

Landslide. "There was a large landslide about 0.5 mile long and terraced from the top of the mountain. ...Fallen trees have rendered the road impassible." (Lawson and others, 1908, p. 262).

Ground failure: Landslide.

MONTE BELLO RIDGE
Location: MB, northwest of Saratoga.
Distance: 1 km east of the earthquake fault.
Geology: Type E.

Landslide. "There was a large landslide about 0.5 mile long and terraced from the top of the mountain. ...Fallen trees have rendered the road impassible." (Lawson and others, 1908, p. 262).

Ground failure: Landslide.

SAUNDERS RANCH
Location: SD, 26 km southeast of San Jose.
Distance: 14 km east of the earthquake fault.
Geology: Type E.

Rockfall. "Portions of what appeared to be quite solid and massive rock outcrops were thrown from the steep hills near the house." (Lawson and others, 1908, p. 283).

Ground failure: Rockfall.

STEVENS CREEK
Location: ST, 18 km south of Palo Alto.
Distance: Near to the earthquake fault.
Geology: Type C.

Landslides. "At the southeast corner of the ((San Antonio)) grant...across Stevens Creek ((from the road)), there was a landslide 100 feet in width on the steep face of a bluff. ...The bridge over Stevens Creek...was rendered unsafe for horses by being shoved a foot out of place. ...There were numerous slides along Stevens Creek, due chiefly to the caving of the creek banks." (Lawson and others, 1908, p. 261-262, 389).

Ground failure: Landslides.

STEVENS CREEK, southwest ridge
Location: SK, 18 km south of Palo Alto.
Distance: Near to the earthquake fault.
Geology: Type D.

Rockfall and landslides. "Along the ridge southwest of Stevens Creek...there were some cracks due to landslides. Sandstone blocks, some of them 6 feet in diameter, had rolled down the hills toward the creek." (Lawson and others, 1908, p. 264).

Ground failure: Rockfall and landslide.
Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

TEVIS RANCH
Location: TR, 10 km south of Saratoga.
Distance: 1 km west of the earthquake fault.
Geology: Type C.

Cracks and deformation. "Where the ground is rolling and wooded, the ground was fissured and the bottom of an artificial lake was upheaved. The cracks and fissures...vary in length up to 100 feet, and in width from 0.5 inch or less to 20 inches. ...A good many of the openings were parallel to the slopes and were caused by the ground starting to slide. ...The upheaval of the lake was caused by a closing together of the sides. ...The rise of the lake bottom is roughly 10 feet." (Lawson and others, 1908, p. 275).

Ground failure: Cracks and deformation.

UVAS
Location: UV, 27 km south of San Jose.
Distance: 8 km east of the earthquake fault.
Geology: Type E.

Ground settlement. "In wet places there was a noticeable settling of the ground." (Lawson and others, 1908, p. 288).

Ground failure: Settlement.

WELCH RANCH
Location: WR, 3 km southwest of Saratoga.
Distance: At the earthquake fault.
Geology: Type E.

Landslide. "On the ranch of Judge Welch...the soil on the northwest side of a small creek coming down from Castle Rock ridge, was shaken down for perhaps 0.5 mile, tho not continuously. In places the slide material filled up the creek-bed and totally changed the contour. It destroyed the road to the ranches farther up the canyon, and wrecked some bridges." (Lawson and others, 1908, p. 389).

Ground failure: Landslides.

WRIGHT STATION
Location: WS, 24 km south of San Jose.
Distance: 1 km west of the earthquake fault.
Geology: Type D.

Landslide. "Just north of Wright's Station, on the west bank of Los Gatos Creek, there was as landslide 0.5 mile wide which had slid into the creek and dammed it." (Lawson and others, 1908, p. 276).

Ground failures: Ground cracks and landslides.
Intensity: Modified Mercalli VIII/IX; Rossi-Forel VIII/IX.

TABLE 6

EARTHQUAKE GROUND FAILURES IN SANTA CRUZ COUNTY

APTOS CREEK
Location: AT, 17 km northeast of Santa Cruz.
Distance: 7 km west of the earthquake fault.
Geology: Type D.

Landslide. "Great slides on both sides of Aptos Creek have almost made a valley of the canyon for fully 0.75 mile." (Lawson and others, 1908, p. 110).

Ground failure: Landslide.

BEN LOMOND MOUNTAIN
Location: BM, 25 km northwest of Santa Cruz.
Distance: 15 km west of the earthquake fault.
Geology: Type D.

Landslide. "At the north end of Ben Lomond Mountain, a slide carried trees and brush down to the creek." (Lawson and others, 1908, p. 389).

Ground failure: Landslide.

BOULDER CREEK
Location: BC, 20 km north of Santa Cruz.
Distance: 12 km west of earthquake fault.
Geology: Type An/C.

Landslides. "A large portion of the soil was shaken loose from an abrupt hill 150 feet high, and fell to the level of the creek, carrying trees with it. ...At the north end of Ben Lomond Mountain, a slide carried trees and brush down to the creek." (Lawson and others, 1908, p. 389).

"The San Lorenzo River was dammed by a fearful landslide that came down from the bluffs opposite town. The Boulder Creek road leading to Los Gatos is blocked by huge fissures in the earth, while the road is blocked by many slides." (San Jose Herald, 1906c).

Ground failure: Landslides.
Intensity: Modified Mercalli VIII/IX; Rossi-Forel VIII/IX.

BOULDER CREEK NORTH
Location: BN, 12 km north of Boulder Creek.
Distance: 7 km west of the earthquake fault.
Geology: Type C.

Landslide. "A small landslide had moved across the road. ...Up the road to the summit of Castle Rock Ridge no slides nor cracks were observed." (Lawson and others, 1908, p. 268).

Ground failure: Landslide.

BURRELL CREEK
Location: BU, 19 km north of Santa Cruz.
Distance: 0.5 km west of the earthquake fault.
Geology: Type D.

Deformation. "Gulches appear to have been squeezed, as the bridges crossing them show that they were squeezed. The banks of Burrell Creek appear to have approached each other, so that the creek has become very much narrowed. Water pipes were broken and twisted, and filled with dirt." (Lawson and others, 1908, p. 276).

Ground failure: Deformation.

CAPITOLA
Location: CP, 6 km east of Santa Cruz.
Distance: 15 km west of earthquake fault.
Geology: Type At/C.

Landslide. "Much earth fell from bluffs near the town." (Lawson and others, 1908, p. 292).
Ground deformation. "At the county bridge across Soquel Creek, the ground at the east abutment shoved inward." (Lawson and others, 1908, p. 292).

Ground failure: Deformation, landslides.
Intensity: Modified Mercalli VIII/IX; Rossi-Forel VIII/IX.

CAULEY GULCH
Location: CG, 23 km north of Santa Cruz.
Distance: 3 km west of the earthquake fault.
Geology: Type C.

Landslide. "Here a huge rock mass, which embraces an area of about 12 acres at the headwaters of Cauley Gulch, broke away from a ledge and dropt, leaving a vertical scarp of 40 feet or more." (Lawson and others, 1908, p. 388).

Ground failure: Landslide.

CHITTENDEN PASS (Pajaro Gap)
Location: CP, 35 km east of Santa Cruz.
Distance: 0 km from the earthquake fault.
Geology: Type C.

Landslide. ((There was a landslide)) "on the north side of a short but deep canyon...close to the line of the fault. ...The slope rises very steeply for about 500 feet. ...At the time of the earthquake several earth-avalanches were started, and these slid suddenly down the slope, part of the material filling the bottom of the canyon and part remaining on the less steep lower portions of the slope. The larger masses were broken off up near the brink of the canyon. ...The result was to gorge completely the lower part of the canyon with rock debris, to widen the upper part of the canyon, and to expose extensive surfaces of unweathered rock." (Lawson and others, 1908, p. 388).

Ground failure: Landslide.

CORRALITOS
Location: CL, 18 km east of Santa Cruz.
Distance: 0-3 km east of earthquake fault.
Geology: Type D and C.

Landslides. "The mountain roads east and northeast of Corralitos were rendered impassable by landslides and by bridges being injured." (Lawson and others, 1908, p. 110).

Ground failure: Landslides.

DEER CREEK
Location: DC, 8 km northeast of Boulder Creek.
Distance: 3 km west of earthquake fault.
Geology: Type C.

Landslide, injury. "An extensive earth-avalanche started near Grizzley Peak and moved westward down a steep, narrow canyon for about 0.25 mile. ...A fine growth of redwood, some 200 feet in height, was mowed down, and covered to the extent of 10 acres or more with from 30 to 60 feet of debris. The trees were from 3 to 10 feet in diameter. The main canyon was filled with earth and rock for an average width of 80 yards and a length of 400 yards. The entire area of the slide was about 25 acres. The difference in altitude between the point where the slide started and the shingle mill, where it stopt, is 500 feet. ...Near the mill a man was killed by a tree that fell as the avalanche was advancing." (Lawson and others, 1908, p. 388).

Ground failure: Landslide.

GRIZZLY ROCK
Location: GZ, 25 km north of Santa Cruz.
Distance: 3 km west of the earthquake fault.
Geology: Type C.

Landslide. "Several large slides occurred in its neighborhood." (Lawson and others, 1908, p. 109).

Ground failure: Landslide.

LOMA PRIETA LUMBER MILL
Location: LP, 15 km northeast of Santa Cruz.
Distance: 4 km west of earthquake fault.
Geology: Type C.

Landslide and fatalities. "The mountains on both sides gave way under the shock of the earthquake, came together and fell into the ravine. Under the mountain of loosened earth nine millmen, who were sleeping in their cabins, were buried." (Berkeley Daily Gazette, 1906).

"The mill, boarding house and other buildings of the plant were situated in a gulch, and were overwhelmed by a portion of the mountain -- 1500 feet long, 400 feet wide and 100 feet deep which slid down upon them. The mill and everything in the gulch were forced up the opposite side of the mountain and there buried to a depth of one hundred feet. ...Nine men were killed." (Salinas Daily Index, 1906-).

Ground failure: Landslide.

SANTA CRUZ
Location: SZ, on the southern coast of the county.
Distance: 18 km west of earthquake fault.
Geology: Type An/C and At/C.

Liquefaction. "The lowlands along the river opened and spouted water like geysers. Some wells went dry or were filled with sand." (Lawson and others, 1908, p. 448).

"At the Riverside Hotel, ground in the orchard opened and river bottom sand and water were thrown up upon the surface of the ground." (Santa Cruz Evening Sentinel, 1906c).

Ground cracks, settlement. "At the Southern Pacific ((railroad)) bridge, crossing the San Lorenzo River, there is a network of fissures varying from 2 to 15 inches in width, running thru the sandy soil. ...The ground has settled about 10 inches from the abutments and piers of the bridge." (Lawson and others, 1908, p. 271).

"Along the San Lorenzo River...this settling action...took place for a mile or more upstream from its mouth." (Lawson and others, 1908, p. 294).

"The railroad embankment extending from Casino to river has sunk." (Santa Cruz Evening Sentinel, 1906a).

"The bed of the river is also said to have sunk several inches. ...A 6-inch water-main, running east and west across the river at the covered bridge, was broken at each end of the bridge and moved 5.5 inches eastward." (Lawson and others, 1908, p. 271).

"Along the waterfront...the earth along the esplanade was opened in places and left gaping wide." (Santa Cruz Evening Sentinel, 1906b).

Bridge deformation. "The water street bridge has moved out of plumb eight inches." (Alameda Daily Argus, 1906).

Ground failure: Cracks, liquefaction, and settlement.
Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

SCOTT VALLEY
Location: SD, 9 km north of Santa Cruz.
Distance: 14 km west of earthquake fault.
Geology: Type An/C.

Landslides. "Landslides and cracks are reported between Scott Valley and Felton." (Lawson and others, 1908, p. 272).

Ground failure: Landslides.
Intensity: Modified Mercalli VII; Rossi-Forel VII.

SKYLAND
Location: SL, 18 km northeast of Santa Cruz.
Distance: 2 km west of earthquake fault.
Geology: Type D.

Landslides. "On the western slope of the ridge just west of Skyland, several earth-avalanches were caused by the shock, and great slides of a similar character occurred on both sides of Aptos Creek for 0.75 mile. Besides these, there were many similar earth-avalanches in many parts of the Santa Cruz Mountains." (Lawson and others, 1908, p. 389).

"The slides which obliterated Fern Gulch...seem to lie to the west of the ((fault)) crack." (Lawson and others, 1908, p. 278).

Ground failure: Landslides.
Intensity: Modified Mercalli IX; Rossi-Forel IX.

SKYLAND SOUTH
Location: SS, 16 km northeast of Santa Cruz.
Distance: 4 km west of the earthquake fault.
Geology: Type C.

Cracks, landslides. "The ridge...was full of cracks, ranging up to 2 and 3 feet in width, and in length from a few rods to 0.25 mile, all trending west of north to northwest. ...The canyon south of us was filled with landslides. In this canyon the stratification of the rocks

is plainly shown. ...The cracks coincide in direction with the strike of the strata. Cold water was following from some of the cracks." (Lawson and others, 1908, p. 278).

Oil. "Several hundred gallons having run out of the ground since the earthquake, where there had been no sign of oil before." (Lawson and others, 1908, p. 278).

Ground failure. Landslides.

SOQUEL LOW
Location: SQ, 5 km east of Santa Cruz.
Distance: 13 km west of earthquake fault.
Geology: Type An/C.

Cracks, water. "On the main street there are deep and wide cracks from which water is flowing from broken pipes." (San Jose Herald, 1906d).

Ground failure: Cracks.
Intensity: Modified Mercalli VIII/IX; Rossi-Forel VIII/IX.

WADDELL CREEK
Location: WC, 27 km northwest of Santa Cruz.
Distance: 23 km west of earthquake fault.
Geology: Type C.

Landslide. "A long, narrow landslide above a house 0.75 mile northeast of the mouth of Waddell creek had landed against the end of the house." (Lawson and others, 1908, p. 274).

Ground failure: Landslide.

WATSONVILLE
Location: WV, 25 km east of Santa Cruz.
Distance: 9 km west of earthquake fault.
Geology: Type A.

Ground settlement and deformation. "Evidence of settling is found at the broad-gage railway bridge at Watsonville, the southeast end of which sank more than a foot. The track was also twisted into an S-shape. The concrete foundation under the engine and stack at the powerhouse at the northwest end of the bridge settled." (Lawson and others, 1908, p. 294).

"Considerable settling of the ground took place in Chinatown on the southern side of the river." (Lawson and others, 1908, p. 292).

"The side rods of the narrow-gage bridge 1 mile south of Watsonville are buckled as by a compressive force, and the roadbed at both approaches has settled at least 2 inches." (Lawson and others, 1908, p. 294).

"The bridge across the Pajaro River at the foot of Main Street...is closed to traffic, owing to its foundations being rendered insecure by the peculiar upheaval of the river bed. The approaches to the Santa Cruz side of the bridge have dropped two feet, while on the Monterey side there are large crevasses, some six feet deep." (Redding Courier-Free Press, 1906).

"The track at Laguna Station, near Watsonville, has sunk several feet." (San Jose Herald, 1906d).

Ground failure: Deformation and settlement.
Intensity: Modified Mercalli VIII; Rossi-Forel VIII.

TABLE 7

EARTHQUAKE-CAUSED FIRES IN

SANTA CLARA AND SANTA CRUZ COUNTIES

SAN JOSE
Location: SJ.
Distance: 18 km east of the earthquake fault.
Geology: Type A.

Buildings, fire and injuries. "The three-story brick Martin building had been hurled to the ground and instantly flames burst from the wreckage. ...There was but one other fire. It broke out in the El Monte lodging house on Locust Street and seven people were roasted to death." (Sawyer, 1922, p. 174).

"The lodging house...a rather flimsy affair, collapsed and the fifty inmates fled for their lives. Seven were unable to escape the falling timbers and were pinioned within. Almost immediately flames burst out and the victims were caught like rats in a trap. ...Would-be rescuers heard the cries for help issuing from the heap of wreckage but were beaten back by the flames." (San Jose Mercury and Herald, 1906b).

Fire. "The earthquake shook the Martin building...to the ground. ...It was but a short time after the blaze broke out at the Martin building before it spread to the north and south. South of it the cornice on the Dougherty building took to fire and soon the flames were blazing through the great structure. In a few minutes the Louise building on the corner was fiercely burning. In the meantime the building ((with))...the Dellwig bakery took fire and it was communicated to the adjoining structure. ...These structures were soon consumed. The fire wall of the Richmond building stopped the progress of the fire to the north. The fire in the Dougherty building and the Louise building threatened for a while to communicate itself to the structures across the street. Four engines were put to work and the conflagration was confined to the buildings on the corner." (San Jose Mercury and Herald, 1906b).

"Mr. Miner had just got up and lighted a lamp when the shock came. The lamp was overturned, in a few seconds the building collapsed and was entirely destroyed ((a pile of ashes)). The occupants had a narrow escape for their lives." (San Jose Herald, 1906f).

Intensity: Modified Mercalli IX; Rossi-Forel IX.

SANTA CLARA
Location: SC, 5 km west of San Jose.
Distance: 15 km east of the earthquake fault.
Geology: Type A.

Explosion. "The boilers in the lumber mills had exploded, scattering lumber for a block around, and caving in the side of a nearby residence." (Gridley Herald, 1906).

Intensity: Modified Mercalli VIII/IX; Rossi-Forel IX.

SOQUEL LOW
Location: SQ, 5 km east of Santa Cruz.
Distance: 13 km west of earthquake fault.
Geology: Type An/C.

Fire. "The upsetting of a lamp at the paper mills caused a fire which was extinguished with difficulty." (San Jose Herald, 1906d).

Intensity: Modified Mercalli VIII/IX; Rossi-Forel VIII/IX.

WATSONVILLE
Location: WV, 25 km east of Santa Cruz.
Distance: 9 km west of earthquake fault.
Geology: Type A.

Fire. "The Moreland Academy...caught fire and was badly burned. This was a handsome three-story structure." (San Jose Herald, 1906d).

Intensity: Modified Mercalli VIII; Rossi-Forel VIII.