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Intensity of the 18 April 1906 earthquake in and near San Jose, California

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INTENSITY OF THE 18 APRIL 1906 EARTHQUAKE
IN AND NEAR SAN JOSÉ, CALIFORNIA

A Thesis

Presented to

The Faculty of the Department of Geology
San José State University

In Partial Fulfillment
of the Requirements for the Degree
Master of Science

by

Nancy C. Shostak

May 2009

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SAN JOSÉ STATE UNIVERSITY

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INTENSITY OF THE 18 APRIL 1906 EARTHQUAKE
IN AND NEAR SAN JOSÉ, CALIFORNIA

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ABSTRACT

INTENSITY OF THE 18 APRIL 1906 EARTHQUAKE IN AND NEAR SAN JOSÉ, CALIFORNIA

by Nancy C. Shostak

Intensities of shaking for previously untapped, historical sources of damage data from the 1906 earthquake in and near San José, California, were developed with a refined and expanded version of the Modified Mercalli intensity (MMI) scale designed to bring out rich detail in the dense data. Sanborn fire insurance maps provide construction details and precise locations for 80 percent of the 607 intensity data points. Intensity values for 1906 range from MMI 6 to 9, with an average of 7.4. For damage data grouped by modern census blocks, the small variation in intensity within blocks indicates the 1906 intensity values estimated here reflected true ground motion. Within the 12-km by 12-km study area, different microzones from about 1.0 to 16.8 km² in size had characteristic 1906 intensities ranging from 6.6 to 8.2.

Variations in 1906 intensity over small areas were correlated with site-specific geologic factors, primarily slowness of shear-wave velocity in the top 30 m ($1/V_s^{30}$), thickness of unconsolidated sediment, proximity to buried basin edges, and likely resonance between shallow ground layers and buildings. Distance to the San Andreas fault and 1906 epicenter, depth to bedrock basement, surficial geologic map unit, and liquefaction did not control 1906 intensity. Agreement with modern ground-motion studies suggests that areas of high or low intensity have persisted through time.

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Many people have generously given their time to improve this study. I am extremely grateful to the members of my thesis committee: John Williams of San José State University for his inspiration, unerring guidance, and patience; Richard Sedlock, also of San José State, whose advice and comments tremendously improved this paper; and Mary Lou Zoback of RMS, Inc., who first pointed me toward the Santa Clara Valley and has very patiently and firmly guided the project ever since. I owe much to two other friends at San José State: Dave Andersen, for his encouragement, sage counsel, editing, and teaching me how the Santa Clara Valley works; and Karen Locke, for her much-valued graphics and moral support. To Brad Aagaard, Jack Boatwright, Luke Blair, Tom Brocher, Howard Bundock, Bob Jachens, Tom Noce, Carl Wentworth, and Rob Williams of the U.S. Geological Survey, I give heartfelt thanks for data, time, advice, and technical support. In particular, the many conversations with Jack Boatwright helped give shape to this paper, and Howard Bundock made the ShakeMap interpretation of my data. I could not have finished without Jim Reed, archivist at History San José, who shared my enthusiasm for the project and never tired of helping track down yet another damage report or photograph. A huge thank you goes to James Baker, geologist for Santa Clara County, without whom the GIS portion of this project could never have been done.

Finally, I tremendously appreciate the assistance of Charlene Duval and the Sourisseau Academy for State and Local History at San José State University, whose generous grant aided immeasurably in the completion of this project.

The Research Library at History San José graciously provided access to most of the historical materials used in this study: Sanborn fire insurance maps, both original and on microfilm, photographs, city directories, newspapers, and other primary and secondary sources.

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INTRODUCTION

The M_w 7.8 San Francisco earthquake of 18 April 1906 was the most destructive seismic event in the San Francisco Bay Area in the historical record. In its landmark study of this earthquake, the California State Earthquake Investigation Commission led by Andrew Lawson detailed more than 600 reports of damage throughout California and into Oregon and Nevada (Lawson report, Lawson et al., 1908). Boatwright and Bundock (2005) recently reinterpreted these damage points using the Modified Mercalli intensity (MMI) scale, provided correct locations for some localities that no longer have names, and supplemented the original data with additional sites to produce a detailed ShakeMap for the entire “felt” area of the 1906 earthquake. The ShakeMap clearly shows attenuation (decrease in ground motion) with distance from the San Andreas fault, and it importantly highlights *hot spots*, areas of greatly amplified ground motion, such as Santa Rosa, California.

Although San José in 1906 was one of the larger cities in northern California, the Lawson report offered relatively incomplete coverage of earthquake damage in this city. A detailed investigation of damage in San José was not carried out after 1906, and since then work near San José has been of relatively broad geographic scope (Nason, 1980b; Topozada et al., 1982; Stover and Coffman, 1993; Boatwright and Bundock, 2005).

In addition to anticipating a repeat of the 1906 earthquake, the San Francisco Bay Area is currently bracing for a M_w 6.8-7.0 earthquake on the Hayward fault (Fig. 1). San José sustained major damage in the most recent major earthquake on this fault in 1868 (Boatwright and Bundock, 2008b; U.S. Geological Survey, 2008). Today the population

Figure 1. Historical earthquakes in northern California. Map shows major San Francisco Bay Area faults, place names mentioned in text, and epicenters of earthquakes felt strongly in San José, California, 1818-1989. Locations shown in italics are approximate epicenters of historical earthquakes. The southern portion of the 1906 rupture of the San Andreas fault extended from offshore San Francisco to San Juan Bautista.

of the San José metropolitan area, more than one million (City of San José, 2008), lives with increasing seismic hazard. Careful planning for the next major earthquake can help save lives and limit property damage. If specific areas susceptible to stronger shaking are known in advance, emergency personnel can plan for optimal deployment of scarce resources, and seismic building codes can be strengthened on a neighborhood, rather than citywide, basis to minimize property damage.

Variations in intensity on the scale of several kilometers or less can be estimated from ground-motion studies for modern earthquakes. Fletcher et al. (2003) found that site amplifications vary by a factor of 6.8 across the northern Santa Clara Valley (Fig. 2). The San José dense seismic array measured site response that varies by a factor of more than 2.5 over a distance of 2 km eastward from downtown San José (Hartzell et al., 2003) and ranges from “high” to “low to moderate” across the width of the present study area (Hartzell et al., 2006).

Estimates of shaking intensity, based on damage reports from major historical earthquakes, provide insights crucial to earthquake hazard reduction and preparedness efforts. Computer modeling of ground motion is one of the most effective seismic hazard prediction tools currently available. Because direct measurement of ground motion for historical earthquakes is not possible, shaking intensities as interpreted from historical reports can be an extremely important constraint on ground-motion models (Aagaard et al., 2008). If microzonation (variation in ground motion over a small geographic area) exists today in San José, similar variation should also have occurred in the 1906 earthquake and, therefore, be evident from 1906 intensity data, if the data are sufficiently

Figure 2. Northern Santa Clara Valley. The study area is in the gray box. The dotted areas mark the deep, sedimentary Cupertino and Evergreen basins. The northern Santa Clara Valley comprises the area from the hills in the southwest to the hills in the north-east, i.e., the Cupertino basin, the Evergreen basin, and the intervening area in which the center of San José is located. The shallower Santa Clara basin is superimposed over the older Cupertino and Evergreen basins and consists of the Quaternary deposits overlying the two deep basins and the bedrock basement high separating the basins. The Silver Creek fault forms the southwestern edge of the Evergreen basin. SJC is the San José International airport.

detailed. To help improve modeling of ground motion for a repeat of the 1906 earthquake, it is important to map shaking intensity for this earthquake in detail and attempt, wherever possible, to improve on existing data. This study provides new data from untapped historical sources to supplement 1906 damage data from the Lawson report (1908) and later studies in order to paint a detailed picture of shaking intensity and earthquake damage in the vicinity of San José.

It is not sufficient merely to describe the patterns of damage in San José in 1906. To understand the causes of these patterns, the relationship between intensity of shaking and geologic conditions must be examined. Only when the natural controls over patterns of damage are well understood can microzonation be successfully anticipated for future earthquakes.

The purpose of this study is twofold: to provide the most detailed assessment to date of 1906 earthquake damage in the vicinity of San José, California, and to help understand the causes of variation in damage from the 1906 earthquake in this area.

SETTING

Tectonic Setting

The study area, shown in Figure 2, is an 11.8-km by 11.8-km square surrounding San José, California, in the northern half of the Santa Clara Valley. This area forms part of the boundary between the North American and Pacific tectonic plates, which move past

each other with 40 mm/yr of horizontal slip (WGCEP, 2003). The mostly strike-slip movement along the plate boundary is not smooth and requires constant readjustment of the Earth's crust, generally in an abrupt manner that causes earthquakes.

The most significant feature of this diffuse plate boundary is the San Andreas fault, a strike-slip fault at least 480 km long that runs most of the length of California and is divided into along-strike segments that differ in rate of slip. The San Andreas fault lies ca. 12 km to the southwest of the study area at the closest point; the horizontal component of slip for this segment is 17 mm/yr (WGCEP, 2003).

The remaining slip ($40 \text{ mm/yr} - 17 \text{ mm/yr} = 23 \text{ mm/yr}$ horizontal component) must be taken up on other faults within the plate boundary. The Hayward and Calaveras faults are subsidiary strike-slip faults subparallel to the San Andreas fault that make up much of the remaining slip; these two faults lie to the northeast and east, respectively, of San José (Fig. 1) and have lower slip rates than the San Andreas fault. In addition, ca. 3 mm/yr of convergent displacement (WGCEP, 2003) has formed the hills flanking the San Francisco Bay Area and the many thrust faults running subparallel to the hills. These three major strike-slip faults and the other less well-known faults in the vicinity of San José are capable of producing earthquakes that damage buildings and claim lives.

Historical Earthquakes near San José

The period of historical written records in California, which began with the founding of the first Spanish missions in California in 1769, has frequently been punctuated by

earthquakes ranging in severity from minor to extremely damaging. In the San Francisco Bay Area, a few of these earthquakes ruptured the San Andreas fault, but most occurred on the related plate-boundary faults. Figure 1 shows the locations of earthquakes strongly felt in San José from 1818 to 1989.

In 1818, the first recorded, damaging seismic event affecting the area of present-day San José destroyed Mission Santa Clara, in the city of Santa Clara (California Mission Site, n.d.). A series of strong shocks probably centered near Monterey, California, occurred in 1836; a contemporary account stated that the earthquake of 10 June 1836 “caused havoc” at Santa Clara as well as Monterey (Louderback, 1947).

The event of June 1838 was the first major earthquake ($M_W \sim 7.0$ or greater) in historical time in northern California; it damaged buildings from San Juan Bautista to San Francisco (Townley and Allen, 1939). A trenching study and scarce contemporary records suggest an epicenter near Woodside, California, between San José and San Francisco (Hall et al., 1999, Topozada et al., 2002). A house was “shaken down” in the small town of San José and walls were badly damaged at both Mission Santa Clara and Mission San José (Louderback, 1947).

Throughout the 1850s and 1860s, San José, like most of the San Francisco Bay Area, was shaken but not badly damaged by several swarms of earthquakes. In October 1865 a $M_W \sim 5.9$ event in or near the Santa Cruz Mountains—possibly on one of the thrust faults located east of and dipping into the San Andreas fault at depth (Yu and Segall, 1996)—caused widespread damage. Townley and Allen (1939) stated that “the shock was felt severely at San Jose.” This earthquake not only toppled church steeples and damaged

brick buildings in San José and Santa Clara but also caused damage in San Francisco (Townley and Allen, 1939; Toppozada et al., 2002).

The M_W 6.8-7.0 “Great San Francisco Earthquake” of 21 October 1868, on the southern Hayward fault, had a likely epicenter near Fremont, only ca. 14 km from downtown San José (U.S. Geological Survey, 2008). This earthquake damaged most of the brick buildings in San José and toppled many chimneys (Lawson et al., 1908; Boatwright and Bundock, 2008b). In 1868, the population of San José was ca. 9,000 (population 9,089 in the 1870 census; U.S. Census Bureau, 1872), and structural damage was confined to the commercial blocks in the center of the city (Boatwright and Bundock, 2008b).

In 1903, a pair of earthquakes on 11 June and 2 August with epicenters slightly east of San José shook the city. The stronger earthquake of 2 August damaged nearly all the large buildings in the city (Townley and Allen, 1939). The M_W 7.8 San Francisco earthquake of 18 April 1906, which is the subject of this paper, was the most damaging to San José since 1868, although the epicenter was just offshore San Francisco, ca. 75 km away. The closest point of rupture along the San Andreas fault was ca. 19 km from the center of San José.

Earthquakes have continued, although much abated, since 1906. On 1 July 1911, a $M \sim 6$ earthquake on the Calaveras fault rocked San José, cracking plate glass windows and brick walls and destroying some chimneys (Townley and Allen, 1939; Bakun et al., 1984). The M_W 6.2 Morgan Hill earthquake of 24 April 1984, centered ca. 19 km southeast of San José on the Calaveras fault, was strongly felt in San José. Because of

the southward directivity of the rupture, damage was minimal in San José (Bakun et al., 1984) and injuries minor (U.S. Geological Survey, 2008).

The M_w 6.8 Loma Prieta earthquake of 17 October 1989, with epicenter on the San Andreas fault ca. 34 km south of San José, was the most destructive in the Santa Clara Valley since 1906. This earthquake caused one death and moderate property damage in San José—broken chimneys, destruction of most of the unreinforced masonry buildings remaining after 1906, and shaking of wood-frame houses off their unattached foundations (U.S. Geological Survey, 2009).

The tectonic and geologic settings of the northern Santa Clara Valley have not changed appreciably in historical time. This area can expect strong shocks to continue into the indefinite future. In 1957, seismologist Charles Richter warned, “in California we must learn to live with the constant possibility of a serious earthquake” (Virtual Museum of the City of San Francisco, 2007). Let history be our guide.

Geologic Setting

Geologic Structure of the Santa Clara Valley

The northern Santa Clara Valley lies between two major members of the San Andreas fault system, the San Andreas fault on the west and the Hayward and Calaveras faults on the east (Fig. 2). Reverse-oblique faults subparallel to the major faults form hills at the eastern and western edges of the Valley. These secondary faults dip away from the valley into their respective major strike-slip faults at depth (Graymer et al., 2005). The

valley is ca. 27 km wide between the western and eastern hills; the San Andreas and Calaveras faults are ca. 42 km apart at this latitude. Figure 2 shows the extent of the study area within the Santa Clara Valley.

The Silver Creek fault, the major through-going fault in the eastern Santa Clara Valley, trends north-northwest where it lies concealed directly east of downtown San José (Fig. 2). Although the Silver Creek fault shows no clear evidence of Holocene activity, high-resolution seismic reflection suggests deformation on the fault in sediment of late Pleistocene age, ca. 270-140 ka or later (Williams et al., 2005b). The Silver Creek fault has also been shown to offset 3-4 Ma Silver Creek gravels south of downtown San José (Graymer and DeVito, 1993; DeVito, 1995; Wills, 1995). On its western side, the fault currently exhibits seasonal uplift and subsidence of ca. 35 mm in total, probably related to recharge and discharge of groundwater (Schmidt, 2005).

Basin Structure and History

The Santa Clara Valley (Fig. 2) comprises three buried sedimentary basins: the Miocene Cupertino basin in the southwest of the valley; the likely Pliocene Evergreen basin in the northeast; and the superimposed Quaternary Santa Clara basin. The Cupertino basin may have been formed as a result of the passage of the Mendocino Triple Junction around 17-14 Ma. Miocene sandstone with oil accumulations has been recovered from fill of the Cupertino basin, which may be as deep as ca. 2.5-3 km (Stanley et al., 2005). The younger Evergreen basin, shown by a 40-km-long isostatic gravity low as having 4-6 km of basin fill, may be a Pliocene pull-apart basin created in a right step-

over between the Silver Creek and Hayward faults ca. 12-2.5 Ma (Stanley et al., 2005). From 2000 to 2003, the United States Geological Survey and the Santa Clara Valley Water District drilled eight boreholes up to 407 m (1335.5 ft) deep (Fig. 3) in the northern Santa Clara Valley (Newhouse et al., 2004). Five of the six boreholes in the study area were partially cored. Reconstructions from core samples, geophysical data, and seismic profiles suggest that the sedimentary layers of the superimposed Quaternary Santa Clara basin are relatively flat. The alluvial deposits, 200-300 m thick beneath much of present-day San José, represent ca. 800 ky of alluvial deposition, from mid-Pleistocene to Present (Mankinen, 2005; Wentworth et al., 2005; Williams et al., 2005b).

Mesozoic rocks, primarily of the Franciscan complex, form a bedrock basement under the alluvial deposits, and a northwest-trending ridge of this bedrock in the center of the valley separates the two older basins. In the three-dimensional geologic model of Jachens et al. (2001; 2005b), based on combined gravity, magnetic, geologic, and seismic data (Roberts and Jachens, 2003; Roberts et al., 2004; Stanley et al., 2005; Wentworth et al., 2005; Williams et al., 2005), the bedrock basement surface (Fig. 3) varies in relief by more than 5 km under the study area.

Local Ground Conditions

The northern Santa Clara Valley has little topographic relief. Streams from the eastern, western, and southwestern hills flow axially north to the San Francisco Bay, and the topography of the valley follows the gentle gradient of these streams from the Pleistocene alluvial fans at the edges of the valley to the Bay at sea level. Only at the

Figure 3. Geology of the northern Santa Clara Valley. The map includes Quaternary geologic units (Witter et al., 2006), major faults, bedrock basement contours (after Hartzell et al., 2006), and the outline of the study area. Cross-section A-B shows bedrock topology and basins. Boreholes: CCOC (Coyote Creek Outdoor Classroom), GUAD (Guadalupe), MGCY (McGlinchey), STGA (Saratoga), STPK (Santana Park), and WLLO (Willow) (Newhouse et al., 2004). SJC is the San José International airport.

southern end of the northern Santa Clara Valley does bedrock outcrop (Fig. 3) provide ca. 60 m of relief above the valley floor (Wentworth et al., 1999).

Surface deposits within the study area are typical of a fluvial depositional environment: interbedded, lenticular stream channel deposits, terrace deposits, levees, and interchannel or floodplain deposits (Fig. 3). The common avulsion of streams (sudden change in course, usually during a flooding event) is recorded in the pattern of stream levees on the Quaternary geologic map (Witter et al., 2006); a historical example is the 1867 avulsion of Los Gatos Creek upstream of its confluence with the Guadalupe River (Ames, 1996). Within the study area, almost all of the surficial units (Fig. 3) are mapped as Holocene in age (Witter et al., 2006).

The subsurface of the valley records the variations in the composition and grain size of the alluvium over time. The response of the fluvial system to flooding events and changes in sea level and climate are preserved, buried in the sedimentary record. In map view, Quaternary levee deposits outline the modern and recent courses of the frequently-avulsing streams. These surficial levee deposits provide minor topographic relief as they fan out over the gently sloping alluvium. Thus, the subsurface above bedrock consists of lenticular, discontinuous deposits of coarser (stream bed-load), coarsening-upward (levee), and finer (flood-plain) sediment.

Sediment cores from the deep boreholes (up to 407 m deep; Fig. 3) drilled from 2000 to 2003 indicate that the discontinuous deposits continue at depth within a secular, layered depositional pattern (Wentworth et al., 2005; Wentworth and Tinsley, 2005a). Wentworth and Tinsley (2005b) divided the alluvium into eight depositional sequences

that record variations in sea level and climate for ca. 800 ky. The uppermost sequence (sequence one) was deposited following the most recent glacial maximum ca. 18 ka; the eighth and lowest sequence began ca. 710 ka (marine oxygen-isotope stage 18). In the Wentworth-Tinsley model, each glacio-eustatic cycle is represented in the Santa Clara Valley sediment by a single fining-upward sequence with unconformable upper and lower boundaries representing hiatus in deposition. Within each sequence are a lower and upper interval defined by grain size and controlled by cyclical climatic conditions; the lower interval consists of coarser sediment (primarily sand and gravel), the upper of finer sediment (primarily silt and clay).

Cultural and Demographic Setting

In 1906, the vicinity of San José consisted of an urban commercial district with surrounding mixed commercial/residential neighborhoods, residential-only neighborhoods, outlying villages, and single dwellings typically on 10-acre orchard plots. San José was an agricultural and transportation center with a population of approximately 26,000 (U.S. Census Bureau, 2006a, 2006b) within a 15 km² area surrounding the city center. In contrast, San Francisco in 1906 had a population of about 390,000 (U.S. Census Bureau, 2006a, 2006b) in an area of approximately 122 km² and, therefore, a population density 84 percent higher than that of San José. Commercial and mixed commercial/residential building inventory in downtown San José in 1906 consisted primarily of unreinforced masonry (URM buildings), typically two or three stories in

height (Fig. 4). Large public buildings, such as San José city hall and the United States post office, were generally constructed of masonry reinforced with iron or steel.

San José and San Francisco were developed with substantially different building practices. The first steel-frame high-rise building in San José was under construction in April 1906 (Fig. 5). Downtown San Francisco had not only the older-style URM buildings but also taller, reinforced masonry structures built to more modern standards (Derleth, 1907; Gilbert et al., 1907; Tobriner, 2006). Whereas residential construction was typically dense in San Francisco, many houses in San José had yards with stables for horses. Ordinary frame dwellings were of similar construction styles in the two cities. In San José, grand residences were built following the same construction practices used for ordinary frame dwellings (Sanborn-Perris Map Company, 1891, revised 1901; Sanborn Map Company, 1915); in San Francisco, the great mansions commonly were built of masonry, but some were of wood-frame construction.

PREVIOUS WORK

Shaking Intensity in the 1906 Earthquake in San José, California

The Lawson report (Lawson et al., 1908) was the first investigation of damage over the entire “felt” area of the 18 April 1906 earthquake. The report documented earthquake effects felt by people and damage to structures in over 600 locations throughout California, southern Oregon, and western Nevada; it also included a series of regional

Figure 4. One block of downtown San José in 1901. Sanborn fire insurance maps show exact locations and construction details of buildings. Pink color is for brick (URM), green for concrete (URM), blue for stone (the U.S. post office, except for the tower, was reinforced), brown for adobe (URM), and yellow for wood-frame construction. Dashed lines show locations of water pipes under streets. Original scale: 1 inch = 50 feet. Ruler is in inches. Permission to photograph original Sanborn (1891, revised 1901) courtesy of History San José.

Figure 5. View south on First Street, San José, after the 1906 earthquake. The Phelan Building (center), a soft-story, corner, URM structure, collapsed, killing one person and injuring two others (intensity 8.0). The adjoining building (middle of photograph) suffered little structural damage other than the loss of the shared wall. Note, however, the insufficient connection between brick wall and framing and the undamaged edge of the front wall, which was not attached to the side wall (intensity 7.5). By contrast, the building in foreground (right side) was constructed with interlocking corners and lost only a corner and cornice of brickwork (apparent intensity 7.0). The seven-story steel frame under construction (left background) was the first “high rise” to be built in San José; construction was finished after the earthquake. The fire engine (left, middle distance) had sufficient water pressure at the hydrants to extinguish fires ingited after the earthquake. The Phelan Building was located at the southwest corner of South First and Post Streets. Photograph courtesy of History San José (accession number 1997-290-7).

isoseismal intensity maps according to the then-current Rossi-Forel scale. Toppozada et al. (1982) relied on the earlier work of Lawson et al. (1908) and Nason (1980a, 1980b, 1982), as well as newspaper reports of damage, to interpret intensities at the scale of towns and cities. Based on these previous studies, Stover and Coffman (1993) employed a recalibrated 1931 Modified Mercalli Intensity (MMI) scale (Wood and Neumann, 1931) to produce a small-scale isoseismal map for the 1906 “felt” area. More recently, Boatwright and Bundock (2005) relocated more than 600 damage points from the Lawson report and used their recalibrated MMI scale to create a ShakeMap for the 1906 earthquake. Their inventory in the vicinity of San José consists of seven individual and composite damage points, not all of which are buildings. In all of these studies, intensity assigned to the vicinity of San José is MMI 8-9.

The only local intensity study for 1906 comparable to the present investigation in scale and resolution of detail is H.O. Wood’s intensity map for San Francisco in the Lawson report (1908). Building damage from the earthquake was, however, partially obscured by the effects of fire in San Francisco. San José was fortunate to have escaped major fire damage following the 1906 earthquake; shaking caused most of the damage in San José in 1906.

Other Intensity Studies Using Historical Sources

Outside the United States, notably in Europe but also in other countries, archival sources have been used for numerous historical studies of earthquake damage. Records

from more than a millennium of earthquakes in Italy have been parameterized and made public (e.g., Monachesi and Stucchi, 1997; Working Group CPTI, 1999; Camassi, 2004). European seismologists have grappled with issues of quantifying and parameterizing historical (sometimes ancient) documents (Castelli and Monachesi, 1996; Moroni et al., 1996) and have developed numerous methods, each uniquely designed to optimize available data, to evaluate these documents. In Europe, scales developed for assignment of intensity to earthquake damage, ancient to modern, are the MSK-64 (Medvedev-Sponheuer-Karnik), first used in 1964, and the EMS-98 (European Macroseismic Scale), most recently updated in 1998 (European Seismological Commission, 1998) and designed to replace the MSK-64 scale. The EMS-98 differs from the Modified Mercalli Intensity (MMI) scale by quantifying both degree of damage to and vulnerability class of structures; MMI quantifies degree of damage to structures but differentiates vulnerability in a more general sense.

Several European intensity studies since the mid-1990s based on historical sources are pertinent to the present study. In all cases, methods for evaluating the historical data in terms of intensity or other designation of damage have been fitted to the specific case at hand—there is no standardized approach. Esposito et al. (1995) evaluated descriptions of damage from a personal journal for the 26 July 1805 earthquake in Isernia, southern Italy. They ranked the damage status of 84 individual buildings using three categories of damage. Gutdeutsch and Hammerl (1996) used detailed administrative records compiled in lower Austria after the earthquake of 27 February 1768 to quantify damage cost and damage class for individual buildings and develop a relationship between the data and the

EMS-92 intensity scale (version preceding the EMS-98). Finally, a trio of studies on 19th-century earthquakes in Mexico used rich archival sources and newspaper articles to construct maps of damage to individual buildings in Mexico City for the 8 March 1800, 19 June 1845, and 7 April 1858 earthquakes (Márquez, 2001; Molina, 2001, 2004). Categories of damage differed for these three studies, depending on the quality of the damage descriptions in the historical data sources.

METHODOLOGY AND DATA

Interpretation of damage reports and assignment of shaking intensity to specific locations are primary tools for assessing damage from historical earthquakes. Until now, no building-by-building investigation of earthquake damage in the vicinity of San José, California, has been carried out for the best-known earthquake in the United States. The present study offers a new set of high-density data for 1906 and a methodology, applicable in San José and elsewhere, for developing and mapping shaking intensity in high resolution.

Methodology

The methodology for this study is based on the premise that an intensity estimate can be calculated from the damage to a single building, provided the extent of damage and style of building construction are sufficiently well known. The methodology applies a

refinement of the Modified Mercalli Intensity scale developed for the present study to richly detailed damage data for the 1906 earthquake in the vicinity of San José. After intensities are assigned to individual damage data points, points can be aggregated geographically without loss of the basic relationship between intensity and damage-causing ground motion.

Variations in the intensity data may occur over very short distances. Two types of factors help explain such variation: (1) site-specific effects actually influencing ground motion, and (2) other factors not reflected in the data, such as variation in construction materials or condition of buildings. Variability of intensity (range of intensity) helps to distinguish between the two types of factors. When the intensity range within a small geographic area is large, building-related factors (or errors in characterizing damage) may account for the difference between measured intensity and expected ground motion. On the other hand, a small range of intensity in an area suggests that buildings responded similarly to ground shaking and that a real, unanticipated, site-specific effect may explain the difference between damage-based intensity and the expected ground motion.

Data

The data supporting this study offer a unique picture of 1906 damage in the vicinity of San José, California. The post-earthquake, building-by-building, professional inspections underlying 80 percent of the 607 damage data points compiled for this study document an outstanding new detail of damage; 69 additional sources contribute to the

damage data (Appendix A). Sites of damaged buildings are pinpointed geographically; with few exceptions, data points are located within the footprints of 1906 buildings. In almost all cases, building size, height, and construction material are known. The density of data is high for a historical intensity study, averaging 4.4 data points/km² over the study area of 138 km². Of the 607 damage points, 486 (80%) are within the 1906 city limits of San José. Data density in the center of downtown San José peaks at 684 points/km² in a 0.5 km by 0.5 km square and 1422 points/km² in the densest city block. In the commercial district of the city, data points are spaced between 4 m and 70 m apart. This high density contrasts strongly with the typical assignment of one data point to all of central San José in traditional intensity studies. Clarity of the picture of damage, combined with sensitivity of the 1906 buildings in the upper midrange of the MMI scale (MMI 6-9), permits fine resolution of intensity.

From 20 through 28 April 1906, the official Special Building Inspection Committee of the Board of Police and Fire Commissioners, composed of 20 local architects and builders, personally inspected and recorded their professional assessments of damaged buildings citywide. The *San Jose Daily Mercury* and *San Jose Mercury and Herald* printed the Inspection Committee reports in their entirety. These inspection reports constitute the core data for the present study (Appendix A). As an example, on 24 April 1906, the Inspection Committee reported on damage to the Bank of San José building at the northeast corner of First and Santa Clara streets in downtown San José:

Bank of San José Building -- The northeast corner of the banking room brick wall is in bad condition, crushed and unsafe. Basement and all foundations under the bank and under the entire building are in good condition.

Front on Santa Clara Street and First Street first story, the iron work and supports of same are racked and out of its [*sic*] original position. Brick wall on north side of the stairway is broken on east and west ends. North party wall with Knox-Goodrich Building in good condition.

The building is not safe for occupancy in its present condition and should be heavily shored up at each column on both streets, which, if properly done, would render the building temporarily safe and [*sic*] until the entire building is remodeled and repaired, as the upper stories are somewhat out of plumb. The east wall of said building is condemned and should not be used.
(*San Jose Daily Mercury*, 1906a)

For a given earthquake and site conditions, the construction material and construction technique largely determine vulnerability of a structure to ground shaking (Freeman, 1932; Tobriner, 2006). Three editions of the *Fire Insurance Map Book for San José* (Sanborn-Perris Map Company, 1884; Sanborn-Perris Map Company, 1891; Sanborn Map Company, 1915), originally owned and used by fire-insurance agencies and updated annually by subscription, provide locations and construction detail for individual buildings. The present study takes details for location and building construction primarily from the two-volume set from 1891, as revised (updated) to August 1901. Other Sanborn map editions used are: 1891, unrevised, revised to August 1906, and revised to February 1921; and 1915, unrevised, revised 1917-1930, revised to March 1929, and revised to June 1930 (Appendix A). These original volumes reside in the archives of the Research Library at History San José (<http://www.historysanjose.org/research/library/>). Historical Sanborn maps without updates are commonly available online through libraries. For a fee, unrevised maps for ca. 12,000 cities in North America, digitized from the Sanborn map collection in the Library of Congress, are available from Environmental Data Resources, Inc. (www.edrnet.com/sanborn.htm).

Sanborn map books offer a wealth of detail: street address, precise location and dimensions of lot and building footprint within the lot, use of building, and construction details such as construction material, number of stories, location and height of fire walls, and positions of doors, windows, porches, parapets, and awnings. Figure 4 shows a portion of a Sanborn map for one city block of San José in August 1901.

Construction materials for the structures in this study are either URM (unreinforced masonry—primarily brick, but a few structures of stone, adobe, or concrete) or wood (frame). URM may be subdivided by construction quality into URM C (ordinary construction with no extreme weaknesses) and URM D (weak horizontally; having extreme weaknesses; failing to tie in at corners), according to Richter's (1958) classification. Damage descriptions and photographs indicate that nearly all URM buildings in San José in 1906 were URM D (Fig. 5). Some large public buildings were the more seismically resistant URM C. It is more difficult, but in many cases possible, to classify frame structures according to standard or substandard quality of construction; standard is the default. The nature of the foundation, if any, is not commonly known but can in some cases be inferred from available information, such as photographs. Frame structures, in any case, were not anchored to their foundations.

One of the chief challenges in using historical data is relocating old structures on modern maps. Verification of damage reports by independent sources, particular by photograph, helps minimize questions of geographic location and calibration of damage assessment. For buildings identified only by name of business or owner, city directories are the main resource for finding street addresses within the city limits of San José and

Santa Clara (e.g., Husted, 1905). Most buildings in outlying areas appear on historical maps. Careful reading of the Inspection Committee reports commonly enables the location of buildings by interpolation of the inspectors' paths as they walked through the city. Geolocation, spatial analysis, geostatistical analysis, and geographic depiction of data were performed with ArcGIS™ geographic information system software from ESRI.

The database for this study, reproduced in Appendix A, consists of the following fields for each intensity data point: entry number (record locator), location (latitude/longitude and street address), construction material, size of building footprint (qualitative), number of stories, use of building, assigned intensity value, data sources, and summary of reported damage.

Refinement of the Modified Mercalli Intensity Scale

The intensity scale used in the present study (Table 1) is refined from the Stover and Coffman (1993) recalibration of the 1931 Modified Mercalli Intensity (MMI) scale, in order to bring out the rich detail of the damage data (Appendix B). Seven distinct levels of damage are discernible in the data over the range MMI 6-9. In Table 2, the scale from this study is compared with intensity scales used in previous studies of the 1906 earthquake.

A note on intensity notation is necessary. Although traditional intensity studies, including that of Stover and Coffman (1993), employ Roman numerals for values of intensity, this document uses Arabic numerals for analysis and ease of presentation,

TABLE 1. MODIFIED MERCALLI INTENSITY SCALE REFINED FOR THIS STUDY

Intensity	Observations of damage
Less than 6.0	No discernible damage to structure
Intensity 6.0	<p>Dishes, glassware, windows broken Items knocked off shelves Weak plaster cracked Fallen plaster—small amount Damaged chimney—cracking or loss of bricks URM C or D—Masonry cracked Adobe—Walls cracked Frame—No discernible damage to structure Toppling of nonstructural brick or stone wall Collapse/toppling of URM D steeple</p>
Intensity 6.5	Fallen plaster—substantial amount; cracked plaster walls
Intensity 7.0	<p>Fallen plaster—extensive Damaged chimney—partial or complete collapse URM D—Partial failure of wall (some bricks down or wall out of plumb) Adobe—Severe damage to walls Frame—Collapse or toppling of steeple Damage to foundation; failure of foundation Iron columns (supports) “out” and to be replaced Settling under weight of building contents Settling of floors or entire building</p>

TABLE 1 (CONT'D.)

Intensity	Observations of damage
Intensity 7.5	<p>URM D—Partial collapse of structure</p> <p>URM D—Total failure of wall or fallen wall</p> <p>Frame—Structure reusable after repositioning on foundation (structure shifted on foundation)</p> <p>Failure of supported, non-structural components (e.g., collapse of porch or stairway)</p> <p>Water tank thrown down (possible range 6-8, depending on support of tank)</p>
Intensity 8.0	<p>URM D—Structural failure or total collapse</p> <p>URM D Adobe—Structural failure or total collapse</p> <p>URM C—Partial failure of wall (some bricks down or wall out of plumb)</p> <p>Frame, standard—Structure shifted off foundation, "twisted on foundation," or "thrown off foundation" (failure of cripple walls)</p> <p>Frame, substandard—Total collapse of structure</p> <p>Collapse of roof—Probably secondary to structural failure</p>
Intensity 8.5	<p>URM C—Total failure of wall or partial collapse of structure</p> <p>Frame, standard—Partial collapse of structure; frame racked or out of plumb</p>
Intensity 9.0	<p>URM C—Total collapse of structure</p> <p>Frame, standard—Total collapse of structure</p>
Intensity 10.0	(No observations)

TABLE 1 (CONT'D.)

<p><i>Notes:</i> Modified Mercalli Intensity (MMI) scale as refined for this study from Stover and Coffman (1993) MMI scale. Observations of damage were developed from dense data for damage to structures in and around San José, California, during the 18 April 1906 earthquake. Excellent sensitivity of the data in the intensity range six through nine permits use of partial steps in intensity (notated as half steps). At intensity 6, buildings are not damaged; at intensity 10, buildings are generally totally destroyed. Partial steps in intensity indicated by 6.5, 7.5, and 8.5, are not precisely half steps but represent a range of 0.25 to 0.75 above the next lower full step. URM in San José in 1906 is unreinforced masonry—primarily brick, but a few structures of stone, adobe, or unreinforced concrete. URM C (poorly constructed) and URM D (well constructed) follow Richter's (1958) definitions. Richter's MMI scale dates from 1956 (Richter, 1958).</p>

TABLE 2. COMPARISON OF INTENSITY SCALES FOR KEY EARTHQUAKE EFFECTS

Earthquake effect observed	Lawson (Rossi-Forel) (1908)	Wood and Neumann (1931 MMI)	Richter (1958) (modified 1931 MMI)	Topozada <i>et al.</i> (1982)	Stover and Coffman (1993)	Present study (2009)
Weak plaster cracked	N.D.*	VI	VI	V	VI	6
Fallen plaster: a little/much	VII	VII	VII	VI	VI – VII	6.5
Cracking of or loss of bricks in chimney	VII	VI – VII	VII	VI	VI	6
Fail or complete collapse of chimney	VIII	VIII	VIII	VII	VII	7
Nearly all chimneys fallen	VIII	VIII	VIII	VIII	VII – VIII	N/A
Frame—Structure shifted off foundation, “twisted on foundation,” or “thrown off foundation” (failure of cripple walls)	IX	IX	IX	VIII	VIII – IX	8
Frame—Partial collapse of structure; frame racked or out of plumb	IX	IX	IX	N.D.*	VIII – IX	8.5
URM C—Cracking of masonry	VIII	VIII	VIII	VII – VIII	VI	6

TABLE 2 (CONT'D.)

Earthquake effect observed	Lawson (Rossi-Forel) (1908)	Wood and Neumann (1931 MMI)	Richter (1958) (modified 1931 MMI)	Topozada <i>et al.</i> (1982)	Stover and Coffman (1993)	Present study (2009)
URM C—Total collapse of structure	VIII – IX	X	X	IX	IX	9
URM D—Masonry cracked	VIII	VI	VI	VI	VI	6
URM D—Total collapse of structure	IX	VIII	VIII	IX	VIII	8
Damage to or failure of foundation	N.D.*	IX	IX	N.D.*	VII (cracking)	7 (cracking) 8 (failure)

Notes: Comparisons for typical types of damage to buildings (“earthquake effects”) in the 18 April 1906 earthquake. The Boatwright and Bundoock (2005) scale is not shown because it closely follows that of Stover and Coffman (1993), with two exceptions: (1) “frame—structure shifted off foundation”, to which Boatwright and Bundoock assigned MMI 8, and (2) damaged chimneys, which Boatwright and Bundoock assigned MMI 6 to 8, depending on the quantity of damaged chimneys in an area.
*N.D.—no data available.

following the usage of Boatwright and Bundock (2005, 2008a, 2008b). The sole exception occurs in Table 2, which preserves Roman numerals for intensities from previous work but employs Arabic numerals for intensities from the present study. Although the intensity scale used here is a refinement of the 1931 MMI scale, values of intensity are expressed in units of *intensity* rather than *MMI*. *MMI* is used exclusively for previous work and where intensity values in formulas are expressed in units of *MMI*.

The *MMI* scale of Stover and Coffman (1993) is the starting point for assigning intensity values to buildings in the present study (Appendix B). Inspectors' 1906 damage evaluations employ terminology consistent with that in Stover and Coffman, and buildings are of the same types and construction materials as those in the Stover and Coffman catalog. Intensity values, however, differ from those of Stover and Coffman (1993) in several important respects. In the *MMI* scale as refined in the present study, (1) the range of observed intensities is limited to 6-9, (2) intensity values are assigned to individual structures rather than aggregated damage reports, (3) partial steps in intensity are recognized, (4) assigned intensity is lower than Stover and Coffman *MMI* for damage to tall structures such as chimneys, and (5) two qualities of URM construction are distinguished.

The present study does not consider the full range of intensity (*MMI* 1-12). As noted earlier, all intensity values assigned to damage data points fall within the range 6-9, the intensity range for which degrees of damage to structures can be distinguished. The entire study area is assumed to have experienced ground shaking equivalent to intensity 6, the minimum detectable in the data, and intensity 9 is assigned only for total

destruction of a frame building. By intensity 10, nearly all structures are destroyed, and fine distinctions would not be possible, using the data available.

For the present study, a single intensity value from the refined MMI scale is assigned to each point of observed damage rather than to an entire community, town, or region. The advantage of individual point intensities is the ability to maintain resolution of detail for later analysis at different scales. Variability of the data over very small areas is also readily determined, given the large number of closely spaced data points.

A key difference between the MMI scale as used here and that of Stover and Coffman (1993) centers on the intensity at which nearly all chimneys have fallen. According to Lawson et al. (1908), 95 percent of chimneys in San José fell during the 1906 earthquake. In the present study, aggregate shaking effects, such as fallen chimneys reported over a large area, are not considered; a fallen chimney is assigned intensity 7. In Stover and Coffman (1993), MMI 7 is assigned for a single fallen chimney and MMI 8 for nearly all chimneys fallen (Table 2). The reason for this discrepancy is that the 1931 MMI scale, on which Stover and Coffman intensities are based, tends to overestimate intensity for long-period effects associated with the large displacements of large-magnitude events (Richter, 1958). In the 1906 earthquake, duration of damaging shaking in San José was more than one minute (Lawson et al., 1908), sufficient time for tall structural components (e.g., chimneys, church steeples, and water towers) to develop long-period resonance. An inverted-pendulum effect, induced by long duration of shaking, caused damage to chimneys and church steeples at relatively low intensities throughout the “felt” area of

the 1906 earthquake (Boatwright and Bundock, 2005). The present study follows the practice of Boatwright and Bundock with regard to damaged chimneys.

High density of data, detailed reports of damage, and sensitivity of the buildings in the data set permit distinctions in intensity between full steps of the MMI scale. A partial step (e.g., 6.5, 7.5, or 8.5) is not precisely a half step, but rather represents a range of 0.25-0.75 above a full step in intensity. Boatwright and Bundock (2005) also recognized degrees of damage between full steps of the MMI scale from the damage descriptions in the Lawson report (1908). Figure 6 illustrates damage to a substantial frame dwelling at intensity 8.5; intensity 9 would have been assigned had the house collapsed completely.

Intensity ranges for which partial steps can be distinguished are 6-8 for URM D buildings, 8-9 for URM C buildings, and 7-9 for frame buildings. Two examples of common 1906 damage in downtown San José will illustrate this point. URM D responds to shaking at three distinct levels, intensities 7, 7.5, and 8, as indicated in Table 1. The most common mode of damage to 2- and 3-story URM D buildings in San José in 1906 was out-of-plane damage to exterior brick walls (Tobriner, 2006), in which lateral forces normal to the plane of a wall pushed outward, particularly where a wall lacked a strong connection to the interior framework. This type of damage commonly resulted in partial or complete separation of a brick façade from the inner wood framework (Fig. 7) and in most cases affected only a portion of an upper-story wall. In certain cases, as in Figure 8, the entire upper portion of a URM wall was dislocated while the first-story wall remained relatively undamaged. Stover and Coffman (1993) assigned MMI 7 to slight URM damage and MMI 8 to total failure of URM; in the current study, intensity 7.5 is used to

Figure 6. Dougherty mansion after the 1906 earthquake. The wood-frame Dougherty mansion, located a few blocks north of downtown San José, was considered a “total wreck” by building inspectors and passersby alike. The porch collapsed, and the corner of the house (right, bottom of photograph) was lifted off the unbolted foundation. A prominent San José architect was eventually able to restore Mrs. Dougherty’s dwelling. Intensity 8.5. Photograph courtesy of History San José (accession number 1997-225-200).

Figure 7. San José High School after the 1906 earthquake. This rear view shows out-of-plane damage to free-standing brick walls, a common type of damage to URM buildings in the 1906 earthquake. Note the lack of tie-in between brick and the inner wood framing. Intensity 8.0. Photograph courtesy of History San José (accession number 1997-300-1316).

Figure 8. Failure of upper-story URM wall. This photograph, taken in downtown San José within days after the 1906 earthquake, shows URM (unreinforced masonry) failure typical for the older brick buildings in the center of the city (**DTC**). The front, upper-story, brick wall of the building housing the Pacific Coast Business College and Home Union Bank appears to have been poorly connected to the building and fell into the street with minimal damage to the remainder of the building. Closely-spaced iron tie rods typically ran through URM buildings between the first and second floors; above that level, tie rods commonly were either not used or widely separated. Better wall connections at corners and tie rods of appropriate spacing at the roof joists could have prevented or minimized this failure. The building was at 59 South Market Street, San José, at the northeast corner of South Market and Lightston streets. Intensity 7.5. Photograph courtesy of History San José (accession number 1997-225-208).

recognize an intermediate level of structural damage, as in Figure 8, and intensity 8.0 for the more severe structural damage in Figure 7.

INTENSITY RESULTS AND INTERPRETATION

Full Study Area

Intensities for the 607 data points in the present study are approximately normally distributed over the range 6.0-9.0 (Fig. 9). For the entire study area, median intensity is 7.50 and mean intensity is 7.36, with standard deviation 0.69 (Table 3). The closeness in value of the medians and means for two extremely different construction materials, URM and frame, together with a standard deviation of less than 0.7 in intensity value, indicates that the methodology produces a consistent overall measure of intensity of shaking, regardless of construction material or quality.

Of the 607 data points, 264 represent URM structures and 343 represent wood-frame structures (Appendix A). Buildings constructed from the two types of material responded differently but predictably—in both type and level of damage—to ground shaking in 1906. Intensities for URM structures are focused in the 7.0-8.0 range; intensities for frame structures are more evenly distributed over the wider 6.5-8.5 range. Figure 9 summarizes intensity by construction material; attributes of individual data points are in Appendix A. The maximum observed intensity is 8.5 for partial collapse of URM C and

Figure 9. Distribution of 1906 intensity data points by construction material. The range of intensity is 6.0 through 9.0. Of the 607 data points, 264 represent URM and 343 wood-frame buildings. The distributions for all buildings and URM-only approximate a normal distribution, but the distribution is flatter for frame. Median intensity for all data points is 7.5, and mean intensity is 7.36.

TABLE 3. INTENSITY STATISTICS BY CONSTRUCTION MATERIAL

Statistical measure for intensity	<u>Building construction material</u>		
	URM	Frame	All
Mean	7.24	7.46	7.36
Standard deviation	0.54	0.77	0.69
Median	7.25	7.50	7.50
Minimum	6.00	6.00	6.00
Maximum	8.50	9.00	9.00
<p><i>Notes:</i> Statistics are for the 607 individual damage data points in the study area. Median, rather than mean, is the preferred central measure for intensity of grouped data points. <i>Frame</i> for wood-frame structures; <i>URM</i> for structures of unreinforced masonry (primarily brick, but also adobe, stone, or unreinforced concrete).</p>			

9.0 for collapse of a frame structure. The minimum intensity of 6.0-6.5 indicates apparent lack of structural damage.

Median intensity for all structures is 7.50, for URM is 7.25, and for frame is 7.50. At intensity 7.0-7.5, the response of URM structures to shaking in 1906 was severe damage to or partial falling of masonry walls but not complete structural failure. Most URM structures in the study area in 1906 were of similar construction (URM D, commercial brick buildings of two or three stories), were concentrated in the downtown center of San José, and had similar responses to ground motions.

At intensity 7.5, frame buildings in 1906 were rarely damaged structurally but were typically moved off their foundations and, commonly, subsequently repositioned. Because frame structures have a wider geographic distribution than URM structures, the intensity distribution for frame is wider and flatter than for URM (Fig. 9). Frame structures predominate at the extremes of the intensity range: they constitute 75 percent of structures in the intensity range 6.0-6.5 (slight or no damage) and 99 percent in the range 8.5-9.0 (severe structural damage), but only 37 percent in the range 7.0-7.5, at which most structural damage to URM occurs.

Undamaged Buildings

Undamaged buildings are more difficult to identify, because after the 1906 earthquake, investigations focused on the damaged buildings. A few general conclusions can, however, be drawn from the damage data, building locations, and construction

detail. It is likely that all or nearly all damage to URM buildings was reported and is included in the data. Most of the URM buildings in San José were concentrated in the downtown commercial district; the inspection committee inspected and reported on ca. 100 percent of buildings in 19 city blocks and ca. 50 percent in 17 other blocks in the commercial district. In this central district, nearly 100 percent of URM buildings were damaged to some extent. Essentially all the URM buildings located outside the central district were also damaged (e.g., Fig. 10) and are included in the data. For wood-frame buildings in the city, most of the moderate to severe damage was reported. It is unlikely that more than 10 percent of frame buildings in San José suffered moderate or greater structural damage.

Outside the city limits, the damage reports concentrated on severely damaged buildings, primarily wood-frame dwellings and larger commercial and institutional structures. Estimating the percentage of damaged buildings there is more difficult, although in the town of Campbell (Fig. 2), nearly all of the damage appears to have been reported and has been captured in the present study.

Damage to chimneys is separate from structural damage and is probably underreported in the present study. In the Lawson report (1908), 95 percent of chimneys in the city were reported as being “down” after the 1906 earthquake. Chimney damage of some extent can, therefore, be assumed to be common, although not necessarily reported. The buildings described as “good as ever” by inspectors (Appendix A) likely had minimal or no damage to chimneys.

Figure 10. Buckeye grocery, San José, 1910. This building housed the Kottinger grocery in 1906. Diagonal shear cracks from the 1906 earthquake are visible (at left edge of building) in this 1910 photograph. These cracks are typical of minor structural damage to URM buildings. Intensity 7.0. Until the 17 October 1989 Loma Prieta earthquake, this building was located near the eastern edge of the San José State University campus. Photograph courtesy of History San José (accession number 1997-300-1606).

Census Blocks

Damage data points are grouped into present-day census blocks for spatial interpretation and estimation of variability of intensity over very small areas. Census blocks are the smallest geographic units with 100 percent tabulation of census data; they range in size from a single city block in urban settings to large rural areas bounded by visible features (U.S. Census Bureau, 2007). In the year 2000, the average population of a census block was 100 people (Hayslett, 2008); building density approximately correlates with population density.

In the study area, census blocks (Fig. 11) containing intensity data points range over 0.005 km²-0.481 km² in size, with an average area of 0.035 km²; the typical city block of the downtown core (**DTC**) of San José has an area of 0.021 km² (Fig. 12). Census blocks are an ideal choice for grouping because they are generally sufficiently large to encompass multiple points in dense areas, are small enough to eliminate most data-less space around the points, have objectively determined boundaries, and are widely and publicly available. In a single census block, median intensity of data points is the primary measure of intensity (Fig. 11). For groups of census blocks, the mean of census block median intensities is the central measure. The mean of all census block medians is 7.46, with standard deviation 0.66. Figure 13 shows the range of census-block median intensities in (a) 126 (56 percent) of the 227 census blocks with one point, and (b) the remaining 101 census blocks (44 percent) with between two and 31 points.

Figure 11. Census blocks in the study area. Census blocks from the 2000 U.S. decennial census are outlined in gray. The 227 census blocks containing 1906 intensity data points are shown in color. Within the study area, census blocks with data points range in size from 0.005 km^2 to 0.481 km^2 , with an average area of 0.035 km^2 . In downtown San José (DTC), census blocks are commonly the size of city blocks, which have an average area of 0.021 km^2 (DTC is the densely colored area in middle-right of figure; see Figure 12). Median intensity for blocks with data points is the median of 1906 intensities in the block and is the primary measure of 1906 intensity for the block.

Figure 12. Census blocks in the downtown core of San José (**DTC**). Census blocks are from the 2000 U.S. decennial census. Colors indicate median 1906 intensities for census blocks with data points; white blocks have no data points. For most of **DTC**, census blocks coincide with city blocks; the average area is 0.021 km^2 . The spatial distribution of wood-frame (frame) and unreinforced masonry (URM) construction is shown (circles and crosses). The large, green block at right is the campus of San José State University.

Figure 13. Range of 1906 intensity in census blocks. A. Vertical lines show intensity ranges for the 101 census blocks with two or more data points. B. Count of census blocks by intensity range for the 227 census blocks in the study area.

Range of intensity is the primary measure of variability at the census block level and applies only to the 101 census blocks with two or more data points. It is significant that 71 percent of blocks with two or more data points have an intensity range of one or less (Fig. 13). For these blocks with small variability, intensity probably reflects consistent response of structures to ground shaking. In the remaining 29 percent of blocks with two or more data points, moderate to large variations in intensity may be attributed to factors other than ground shaking, such as differences in construction, prior damage to structures, or anthropogenic factors.

Downtown Core: Area of Greatest Data Density

A group of 72 census blocks in the downtown core of San José (**DTC**) has the greatest point density in the study area (Fig. 12). Although data points are not uniformly distributed, density is extremely high at 228 points/km², or five points per typical city block. Here the mean of census block medians is 7.24 and standard deviation is 0.54. Of the 72 blocks in **DTC**, 51 have two or more points. For these 51 blocks, the mean of median intensities is 7.19, and standard deviation is 0.48. Of the 51 census blocks, 30 blocks (58 percent) have small variability: 16 blocks (31 percent) have intensity of range ≤ 0.5 , and another 14 blocks (27 percent) have intensity of range 0.5-1.0. As a group, the census blocks in **DTC** show remarkable consistency of intensity.

Communities: Microzones of Intensity

Community in the present context does not mean neighborhood, village, or town; it has instead the sense of *microzone*—an area up to several square kilometers in size characterized by a particular intensity. Six separate communities are formed in the study area by grouping geographically distinct associations of contiguous or nearly contiguous census blocks containing intensity data points (Fig. 11). Five data points in four spatially separate census blocks are excluded from communities. Communities have areas ranging from 1.0 km² to 16.8 km², with an average area of 6.6 km². Communities have irregular shapes, and their maximum dimensions (envelopes for the census blocks) range from 1.1 km by 0.9 km to 7.0 km by 2.4 km. Mean intensity for a community is defined as the mean of median intensities for all census blocks in the community.

Mean community intensity varies over the range 6.6-8.2 and reflects the tremendous geographic variation in damage over the study area. Standard deviations of intensity are small (0.16-0.64), indicating low variability within communities (Table 4). The **CMB** (Campbell) community has mean intensity of 6.6 (no significant structural damage). At the other extreme, **ALA** (the Alameda) and **ESJ** (East San José) both have mean intensity of 8.2 (significant structural damage). The larger communities of **SJ** (San José), **STC** (Santa Clara), and **WSJ** (West of San José) have intermediate intensities of 7.4 and 7.5, and 7.0, respectively.

Because variability of intensity is small within a community, intensity variations among communities are significant and probably represent true differences in ground

TABLE 4. BASIC MEASURES FOR COMMUNITIES

Community	Maximum dimensions for community			Number of data points	Number of census blocks	Community-average	
	Length* (km)	Width [†] (km)	Area (km ²)			1906 Intensity	Standard deviation
ALA	1.5	1.0	1.5	20	13	8.231	0.504
CMB	1.9	1.1	2.1	13	10	6.575	0.160
ESJ	0.9	1.1	1.0	38	15	8.167	0.384
SJ	4.8	2.9	13.9	479	152	7.387	0.637
STC	1.9	2.4	4.6	26	14	7.500	0.535
WSJ	2.4	7.0	16.8	26	19	7.011	0.470
OUT[§]	N/A	N/A	N/A	5	4	N/A	N/A

Notes: *Communities*, or microzones, are distinct geographic areas of contiguous or nearly contiguous census blocks that contain 1906 intensity data points. Although median is the preferred central measure for 1906 intensity within a single census block, community-average intensity is used as the primary measure of intensity for a community. Community-average intensity is the mean of intensity medians for all census blocks with data points in a community. Communities—**ALA** (the Alameda); **CMB** (Campbell); **ESJ** (East San José); **SJ** (San José); **STC** (Santa Clara); and **WSJ** (West of San José). See Figures 14 and 15 for maps with locations of communities.

*Length measured as longest dimension north-south $\pm 45^\circ$.

[†]Width measured as longest dimension east-west $\pm 45^\circ$.

[§] **OUT** is a non-geographic grouping of five data points near the edges of the study area; these outlying points do not fit into a community.

motion. These intensity variations are clearly shown in Figure 14 and Plate 1. Why did URM buildings survive at **CMB** with virtually no damage, while nearly all URM buildings at **SJ** were damaged? Why were wood-frame mansions at **ALA**, along the main road between **SJ** and **STC**, so severely damaged that they had to be razed? Why did observers in 1906 note a marked increase in damage at **ESJ** during a center-to-east traverse of San José? These differences in intensity are probably the result of underlying factors still in operation today. Possible causes of the variations will be evaluated in the following sections.

COMPARISONS WITH OTHER STUDIES

Intensity studies for historical earthquakes have traditionally been undertaken on a regional basis, with small-scale mapping of intensity data points widely dispersed over a large region (e.g., Stover and Coffman, 1993). Today, Internet questionnaires permit MMI mapping by ZIP code (and street address, when given) within minutes of modern earthquakes. The precursor of this Community Internet Intensity Map (CIIM) tool was developed following the 17 January 1994 Northridge, California, earthquake (Dewey et al., 1995; Dengler and Dewey, 1998; Wald et al., 1999a). Although ZIP codes are commonly the size of several city blocks in extent, in rural areas they can be quite large. Traditional MMI studies, whether for historical or modern earthquakes, delineate envelopes of maximum intensity for large regions; rarely is an intensity study undertaken on a scale to reflect spatially small variations in intensity. Only if data are sufficiently

Figure 14. 1906 intensity in point and ShakeMap formats. Variations in 1906 intensity are seen at the scale of communities. Both areas of lower intensity and hot spots of amplified ground motion are evident in the study area. ShakeMap colors represent Modified Mercalli intensity. The 1906 intensities from the present study are shown as small colored circles. The Lawson report (1908) intensities of Boatwright and Bundock (2005) constrain intensity outside the study area; these intensities are incorporated with the permission of the authors. Howard Bundock, USGS, created the ShakeMap from the two sets of intensities and has given permission to use the ShakeMap. When this illustration is viewed at high magnification (Plate 1; PDF file, in pocket), the exact locations and colors of data points from the present study are visible. Communities: **ALA** (Alameda), **CMB** (Campbell), **ESJ** (East San José), **SJ** (San José), **STC** (Santa Clara), and **WSJ** (West of San José).

dense, as in the Dewey et al. (1995) study of the 1994 Northridge earthquake, may unusually high or low variations by neighborhood be recognized; these variations may then be averaged into a single MMI value for a larger area.

Intensity Studies

For six locations, intensity values from the present study are compared with results of three other modern intensity studies for the 18 April 1906 earthquake: Topozada et al. (1982), Stover and Coffman (1993), and Boatwright and Bundock (2005). Table 5 shows generally good agreement between maximum intensity in the present study and MMI in the other studies. It is reasonable that intensity averaged over individual data points should be somewhat lower than MMI from methodologies that emphasize maximum damage. The averaged intensity from the present study is consistent with results of other average-damage studies, in which intensity estimates of local engineers are consistently one intensity point below intensity assigned by seismologists (Lomnitz, 1994).

At four locations, 1906 intensity values from the present study are directly compared with intensities for the 17 October 1989 Loma Prieta, California, earthquake, restated in CIIM format (U.S. Geological Survey, 2006b). The 1906 intensities are higher by 0.6-1.4 in intensity value than the 1989 intensities at three of the four locations but lower by 1.1 in intensity value southwest of San José (Table 6). The 2.0-point intensity range for 1906 data is much larger than the 0.5-point range for 1989. The 1906 earthquake produced not only very high intensity but also a larger range of intensity.

TABLE 5. COMPARISON WITH PREVIOUS INTENSITY STUDIES

Location (community)*	1906 Intensity from the present study (2009)		Boatwright and Bundock (2005)	Stover and Coffman (1993)	Toppozada <i>et al.</i> (1982)
	Median	Maximum			
Agnews State Hospital [†]	8.0	8.0	8	N.D.	8
Campbell (CMB)	6.5	7.0	7	8-9	8
Evergreen [§]	8.5	8.5	8	8-9	8
Meridian (WSJ)	7.0	8.5	8	8-9	N.D. [#]
San José (SJ)	7.5	9.0	8-9	8-9	9
Santa Clara (STC)	8.0	8.5	8-9	8-9	8

Notes: Comparison of intensity values from the present study with MMI values from previous intensity studies for the 1906 earthquake in the vicinity of San José, California. MMI from Boatwright and Bundock (2005) and Toppozada and others (1982) are from Boatwright (pers. comm., 2006). MMI from Stover and Coffman (1993) are taken from their isoseismal map for the 1906 earthquake. For ease of comparison, Arabic numerals are used throughout. For the present study, median and maximum 1906 intensity values are for all individual data points in a geographic area. Names of locations are taken from Lawson and others (1908).

*Communities—**CMB** (Campbell); **ESJ** (East San José); **SJ** (San José); **STC** (Santa Clara); and **WSJ** (West of San José). See Figures 14 and 15 for maps with locations of communities.

[†]Agnews State Hospital is the most northwesterly data point in the study area; this point is an outlier, not in a community.

[§]In 1906, the village of Evergreen was located southeast of **ESJ**; intensity for **ESJ** is used for Evergreen.

[#]N.D.—no data available.

TABLE 6. COMPARISON OF 1906 INTENSITY WITH COMMUNITY INTENSITY FOR
THE 1989 LOMA PRIETA EARTHQUAKE

Location number	Latitude (°N)	Longitude (°W)	Intensity		General location relative to San José
			1906 intensity (present study)	1989 intensity (CIIM)	
1	37.377	121.867	8.5	7.1	NE
2	37.297	121.867	8.0	7.1	SE
3	37.377	121.967	8.0	7.4	NW
4	37.297	121.967	6.5	7.6	SW

Notes: Comparison of (1) 1906 intensities from the present study and (2) intensities for the 17 October 1989 Loma Prieta earthquake, restated in CIIM (Community Internet Intensity Map) format. Intensity values from the present study have greater range (2.0 in intensity value) than the 1989 intensities (range of 0.5 in intensity value). 1906 intensity is higher at the first three locations; at location four, the relative intensity is reversed. 1989 data from USGS (2006b).

Ground-Motion Studies

For some modern earthquakes, ground motions measured at seismic stations in the study area can be compared with 1906 intensity from the present study. In Table 7, intensity values at two seismic stations, SJH and AGW, are compared for the 1906 and 1989 Loma Prieta earthquakes (U.S. Geological Survey, 2006a). At both locations, 1906 intensity is higher by 0.5-0.7 in intensity value than 1989 instrumental intensity inverted from ground motions using the regression relationship for peak ground velocity (PGV) of Wald et al. (1999b).

Three seismic arrays have measured ground motions in the northern Santa Clara Valley. Ground motions from the Fletcher et al. (2003) array and the two configurations of the San José dense array (Hartzell et al., 2003; Hartzell et al., 2006) are compared here with 1906 intensities from the present study. The seismic array of strong-motion recorders of Fletcher et al. (2003) captured ground motions from 14 local and seven large teleseismic events recorded during 1998. This 42-element array was deployed across the entire northern Santa Clara Valley; a small portion of the array overlapped the present study area. The array measured variation by a factor of 6.8 in site amplification within the northern Santa Clara Valley. For locations within ca. 1 km of each of the eight array stations within the study area, the 1906 intensity values are within ± 1.0 of the intensities inverted from site amplifications by the PGV regression relationship of Wald et al. (1999b), and the two sets of intensities are positively correlated. Notable similarities in

TABLE 7. COMPARISON OF 1906 AND 1989 INTENSITIES AT THE LOCATIONS
OF TWO 1989 SEISMIC STATIONS

USGS seismic station	Latitude (°N)	Longitude (°W)	1906 intensity from the present study	1989 PGV (cm/s)	1989 I_{MM} (from PGV)
AGW	37.394	121.954	8.5	37.570	7.8
SJH	37.340	121.852	8.0	30.872	7.5

Notes: At the two locations, 1906 intensities from the present study are compared with peak ground velocities (PGV) from the 17 October 1989 Loma Prieta earthquake. Ground motions from 1989 were inverted to 1989 I_{MM} (instrumental Modified Mercalli intensity) using the PGV regression relationship of Wald and others (1999b).

the two intensity data sets are (1) high amplification/intensity values at the western edge of the Evergreen basin and (2) low values in the eastern Cupertino basin.

The San José dense seismic array of the northern Santa Clara Valley was a unique, high-resolution instrument designed to map lateral variations in ground-motion amplification across a major urban center. The array, composed of up to 52 strong-motion recorders located primarily in backyards of single-family homes at 1-km or smaller spacing, continuously recorded ground motions from local and teleseismic events from 1999 to 2004 (Frankel et al., 2001; Hartzell et al., 2003; Hartzell et al., 2006). The locations and number of recorders (42 in 1999; 51 in 2004) varied as the array was incrementally deployed westward across the valley from its initial position over the Evergreen basin, east of San José (Frankel et al., 2001).

The San José dense array, when configured for the Evergreen basin, measured 23 small to moderate local/regional earthquakes and one large event from 1999 through 2001 (Hartzell et al., 2003). The site amplification values duplicate a pattern seen in the 1906 intensity values from the present study. Site amplification from array measurements increases by a factor of over 2.5, the equivalent of slightly more than 1.0 in intensity value, over a distance of 2 km from the center of **DTC** (downtown San José) to **ESJ**, at the western edge of the Evergreen basin. 1906 intensity at the same locations increases by 1.0, from 7.2 at **DTC** to 8.2 at **ESJ**.

In a later deployment of the San José dense array, 51 stations spanned the entire width of the present study area and captured ground motions from the M_w 6.0 Parkfield, California, earthquake of 28 September 2004. Figure 15 shows 1906 intensity data points

Figure 15. 1906 intensity, communities, and 2004 site amplification. Seismic stations of the San José dense array and site amplification from the 2004 Parkfield earthquake are from Hartzell et al. (2006).

and envelopes for the six communities from the present study overlying the Hartzell et al. (2006) site amplifications in the 2-4 Hz range from the 2004 Parkfield earthquake. Table 8 compares relative site amplification at seven locations for the 1906 and 2004 earthquakes. Because the area surrounding present-day, central San José has an intermediate range of ground motion for both events, **SJ** has been selected as the reference location for comparison of 1906 and 2004 site amplification.

The comparison of 1906 intensities and 2004 ground motions reveals geographic areas of significant agreement. These locations of site amplification or deamplification have lasted for at least 98 years and can be expected to persist in the future. Site amplification for 2004 (relative to 2004 site amplification at **SJ**) and 1906 intensity (relative to 1906 intensity at **SJ**) match in direction, but not necessarily in magnitude, at four of the six communities—**ALA**, **ESJ**, **CMB**, and **STC** (Table 8). (**SJ** is omitted because it is used as the standard.) The near-match between 1906 and 2004 values at **ALA** and **ESJ** is striking—the differences in relative intensity of 0.0 at **ALA** and 0.3 at **ESJ** likely indicate strong, enduring, site amplification. For both communities, the 2004 data were well constrained by dense data. At **CMB**, both 1906 and 2004 intensities are lower than at **SJ**. **CMB** can be expected to continue to have weaker ground motions than **SJ**. The 1906 value at **CMB** is lower by 0.6, but the closest seismic array station was located more than 3 km from **CMB**, and 2004 ground motions there were not well constrained. At **STC**, ground motions are higher than at **SJ** for both 1906 and 2004. The relative 2004 intensity is higher by 0.5 at **STC**, but 2004 ground motions, based on array measurements more than 1.8 km from **STC**, were not well constrained. For **WSJ**, the

TABLE 8. COMPARISON OF GROUND MOTIONS FROM
THE 2004 PARKFIELD, CALIFORNIA, EARTHQUAKE WITH 1906 INTENSITY

Community (location)	Hartzell et al. (2006)		Present study		Relative 2004 I_{MM} less relative 1906 intensity [†]
	2004 site amplification ratio	Relative 2004 I_{MM} [†]	1906 intensity [§]	Relative 1906 intensity [†]	
SJ (reference location)	1.00	0.0	7.4	0.0	0.0
ALA	1.63	0.8	8.2	0.8	0.0
ESJ	1.34	0.5	8.2	0.8	-0.3
CMB	0.90	-0.2	6.6	-0.8	0.6
Northeast SJ (Grant School in 1906; 11 th and Empire Streets)	1.38	0.5	8.5	1.1	-0.6
STC	1.50	0.6	7.5	0.1	0.5
WSJ (Intersection of I-280 and I-880)	1.63	0.8	7.0	-0.4	1.2

TABLE 8 (CONT'D.)

Notes:

1. 2004 I_{MM} is instrumental intensity, equivalent to Modified Mercalli intensity, inverted from 2004 site amplifications by PGA relations in Wald and others (1999b). 1906 intensity is intensity from the present study.
 2. Modern ground motions were measured in the M_W 6.0 Parkfield, California, earthquake of 28 September 2004 (Hartzell et al., 2006).
 3. Communities—**ALA** (the Alameda); **CMB** (Campbell); **ESJ** (East San José); **SJ** (San José); **STC** (Santa Clara); and **WSJ** (West of San José). See Figures 14 and 15 for maps with locations of communities.
 4. Site amplification in Hartzell and others (2006) is relative to amplification of hard rock at Alum Rock Park, located 11 km northeast of downtown **SJ**.
 5. **SJ** is used as the reference location because it has intermediate values for both 2004 site amplification and 1906 intensity.
 6. Site amplification ratios are assumed to be equivalent to ratios of PGA (peak ground acceleration). PGA in %g; PGA ratios are dimensionless.
 7. 2004 I_{MM} (instrumental Modified Mercalli intensity, inferred from PGA) is assumed to be equivalent to 1906 intensity in the present study.
 8. Wald and others (1999b) regression equation for converting PGA to I_{MM} : $I_{MM} = 3.66 * \log_{10}(PGA) - 1.66$, for $5.0 < I_{MM} \leq 8.0$. Relative site amplification for hypothetical locations 1 and 2 is PGA_1 / PGA_2 . The corresponding relative intensity = $Intensity_1 - Intensity_2 = 3.66 * \log_{10}(PGA_1/PGA_2)$. Note the logarithmic relationship between PGA and I_{MM} .
 9. Example: Comparison of site amplification and intensity at two hypothetical locations.
 - a. Site amplification (PGA, %g) at location 1 is twice the site amplification (PGA) at location 2: $PGA_1 / PGA_2 = 2.0$.
 - b. $Intensity_1 - Intensity_2 = 3.66 * \log_{10}(2.0) = 1.10$.
 - c. Therefore, instrumental intensity (I_{MM}) at location 1 is approximately one intensity value higher than I_{MM} at location 2.
- *2004 site amplification ratio = 2004 site amplification at a given location / 2004 site amplification at **SJ** (reference location). Site amplifications are interpreted from Hartzell and others (2006).
- †Relative intensity is the intensity at a given location less the intensity at **SJ** (reference location). Used for both 2004 I_{MM} and 1906 intensity.
- §1906 community-average intensity.

2004 value (relative to **SJ**) is higher by 0.8, but the 1906 relative value is lower by 0.4. This discrepancy in direction as well as magnitude may be explained by (1) low density of 1906 intensity data for **WSJ**, (2) 2004 measurements at widely spaced stations within **WSJ**, and (3) different azimuthal effects in 1906 and 2004. **SJ**, as the reference location, has intermediate intensity for both 1906 and 2004.

The significant areas of agreement between the 1906 intensities and the modern ground-motion studies discussed in this section strongly suggest that site amplification patterns in San José and vicinity are enduring and can be expected to recur. The areas of disagreement require further, detailed investigation to uncover the causes of the discrepancies.

1906 Ground-Motion Simulation

A comparison of 1906 intensity values from the present study with MMI inverted from simulated ground motions for the 1906 earthquake (the broad-band, finite-difference rupture model SF1906Song 2c at 1-10 Hz; Aagaard et al., 2008) shows general agreement but also highlights small areas of significant disagreement (Fig. 16; Table 9; Appendix C). Residuals between the intensity values inferred from the ground motion simulation (MMI_{Sim}) and the intensity values from the present study (Int_S) are calculated as $MMI_{Sim} - Int_S$. MMI_{Sim} values have a grid spacing of one arc-minute, and Int_S is compared with the closest MMI_{Sim} grid value at each of the 607 Int_S locations. On average, MMI_{Sim} is 0.6 intensity value higher than Int_S but only 0.4 higher than the

Figure 16. Map of intensity residuals. Simulated 1906 MMI values from Aagaard et al. (2008) are compared with 1906 intensity from the present study. Simulated MMI values are inverted from ground motions with grid spacing of one arc-minute throughout the study area. Residuals are simulated MMI less 1906 intensity. Mean residual is +0.6 and standard deviation is 0.8. Agreement is within ± 0.5 for 40 percent of the 607 intensity data locations.

TABLE 9. INTENSITY RESIDUALS

Statistic	Study area	Community*				
		ALA	CMB	ESJ	SJ	WSJ
Average	0.6	-0.2	2.2	-0.2	0.7	1.1
Standard deviation	0.8	0.6	0.2	0.3	0.7	0.7
Median	0.8	-0.5	2.2	-0.4	0.8	1.3
Maximum	2.3	1.3	2.2	0.6	2.3	2.0
Minimum	-1.2	-0.5	1.7	-0.4	-1.2	-0.5

Notes: Residual value is the modeled intensity (the broad-band, finite-difference rupture model SF1906Song 2c at 1–10 Hz of Aagaard and others (2008) less intensity from the present study. A positive value indicates intensity value from 1906 ground-motion simulation is higher than intensity from the present study. See Appendix D for modeled intensities used in the residual calculations.

* Communities—**ALA** (the Alameda); **CMB** (Campbell); **ESJ** (East San José); **SJ** (San José); **STC** (Santa Clara); and **WSJ** (West of San José). See Figures 14 and 15 for maps with locations of communities.

average of census-block maximum intensities. The distribution of residuals (Fig. 17) has mean of +0.6, standard deviation of 0.8, and range of -1.2 to +2.3. Residuals are within ± 0.5 for 40 percent of the 607 locations and within ± 0.8 for 54 percent. At **ALA**, **ESJ**, and **STC**, the two values are in very close agreement: $-0.2 < MMI_{\text{Sim}} \leq +0.2$. At **SJ**, the residual equals +0.7, slightly above the average for the study area. **CMB** (residual of +2.2) and **WSJ** (residual of +1.1) have the highest residuals.

The intensities from the present study and modeled ground motions from the broadband simulation are in substantial agreement at most locations. The major areas of disagreement are at **WSJ** and **CMB**, both in the Cupertino basin (Fig. 2). It is possible that either the 1906 data from the present study have not accurately captured ground motions in this area or site-specific factors controlling ground motions in 1906 are not included in the broadband model. In particular, at **CMB** the high residual of +2.2 represents a substantial discrepancy between the modeled ground motions and the fairly minor damage to buildings reported in contemporary sources.

An area of 0.27-km radius within **SJ**, at the confluence of the Guadalupe River and Los Gatos Creek (**CONFL**, Fig. 18) has a notably high residual of +1.7: the 1906 damage data indicate an unusually low intensity here that is not reflected in the simulation. A particular set of site conditions, discussed subsequently, may have governed ground motions here in 1906. With the data points of **CONFL** omitted, the residual at **SJ** decreases to +0.6, the average for the study area.

The close correlation of 1906 intensity values from the present study with ground motions measured for modern earthquakes and modeled for the 1906 earthquake suggests

Figure 17. Distribution of intensity residuals. X-axis values mark the bottom of intensity ranges (ranges of 0.50, except 0.25 for the first range). Residual = $MMI_{Sim} - Int_s$, where MMI_{Sim} is MMI intensity from the 1906 ground-motion simulation (the broad-band, finite-difference rupture model SF1906Song 2c at 1-10 Hz) of Aagaard et al. (2008), inverted by the authors, and Int_s is 1906 intensity from the present study. Residuals are calculated at the 607 intensity locations from the present study. Intensity values from the present study are generally slightly lower: the residuals form a rough normal distribution with mean +0.6, standard deviation 0.8, and range -1.21 to +2.25.

Figure 18. Confluence (**CONFL**) of the Guadalupe River and Los Gatos Creek. An area of radius c. 0.27 km surrounding the confluence of the two streams in downtown San José had unusually low intensity in 1906. The area extending from the seasonal Canoas Creek (Arroyo Tulare de las Canoas) to the confluence, shown in approximate extent with diagonal hatching, was originally marsh land and was drained in the late 19th century. The fine-grained, homogeneous sediment here may have contributed to stability of the soil and low 1906 intensity. In the 1950s, Canoas Creek was diverted upstream into the Guadalupe River. The creek no longer flows through downtown San José. The 1905 course of Canoas Creek after San José city engineer's map (Husted, 1905).

that site conditions controlling ground motion (intensity) have not changed appreciably in the past 100 years. The methods of this study can be used to improve on site-specific assumptions for ground motion models for the 1906 and other historical earthquakes.

CONTROLS OVER INTENSITY OF SHAKING

Which factors, individually or in combination, are important controls over intensity of shaking in the 1906 earthquake? Seismologists usually group the complex set of factors controlling ground motion, a measurable quantity directly related to intensity (Wald et al., 1999b), into three categories: the source dynamics of the rupture (source-related); the seismic ray-path between the source and the site of interest (path-related); and the local geology underlying the site (site-related) (e.g., Boore and Atkinson, 2008; Campbell and Bozorgnia, 2008; Chiou and Youngs, 2008).

A comparison of (1) ground motions inverted from 1906 intensities at different locations from the present study (using the intensity-ground motion relations of Wald et al., 1999b) with (2) ground motions from modern ground-motion prediction equations (GMPEs) places the 1906 intensity results in perspective (Fig. 19). Ground motions from the present study do not show the expected attenuation, or decrease, with increasing distance from the fault rupture: factors in addition to and masking attenuation evidently controlled ground motion in the study area in 1906. The range of ground motion inferred from 1906 intensity in the present study completely spans and is generally significantly higher than the peak ground acceleration (PGA) curves from the GMPEs (Fig. 19; Boore

Figure 19. Peak ground acceleration (PGA) from 1906 intensity and two ground-motion prediction equations (GMPEs). 1906 peak ground acceleration (1906 PGA) significantly greater than predicted by the GMPEs indicates site-specific amplification of ground motion in the study area in 1906. Median 1906 PGA (the equivalent of 1906 intensity 7.5) lies above both GMPE curves for the 12- to 24-km distance from the San Andreas Fault. 1906 PGA is inverted from the 1906 intensity data by the MMI-PGA relationship of Wald *et al.* (1999). R_{JB} is the (Joyner-Boore) distance from data point to the vertical projection of the fault plane at the Earth's surface; for the present study area and the 1906 earthquake, R_{JB} is the closest distance to the 1906 surface rupture of the San Andreas Fault. The GMPE curves are calculated using average site conditions for the study area: 230 m/s average shear-wave velocity in the top 30 m (Holzer *et al.*, 2008).

and Atkinson, 2008; Chiou and Youngs, 2008). Over the distance of 12 to 24 km from the fault rupture, the median 1906 PGA (the equivalent of 1906 intensity 7.5) from the present study falls above both of the GMPE curves calculated for a M_w 7.8, ground-rupturing, strike-slip earthquake and the average site conditions for the study area. According to the seismic cone penetrometer (S-CPT) measurements of Holzer et al. (2008), average seismic shear-wave velocity (V_s^{30}) is 230 m/s in the study area.

A note on the correlation of intensity with ground motion is necessary. Shaking intensity has a logarithmic relationship with ground motion, i.e., intensity can be expressed as a linear function of the logarithm of either peak ground acceleration (PGA) or peak ground velocity (PGV). Figure 20 shows the ranges of peak ground acceleration associated with whole values of intensity (Wald et al., 1999b). Ground motion on a logarithmic scale is equivalent to intensity on a linear scale. Hereafter, intensity is treated as a linear quantity in graphs in order to make direct use of the data from this study.

Site-Related Factors I: The Shallow Subsurface

Can physical properties of the shallow subsurface exert strong local influence over shaking in an earthquake? Site-specific characteristics of the shallow ground examined here for possible control over 1906 intensity are the velocity of seismic shear waves, the thickness of unconsolidated sediment, resonant-period matches with buildings, surficial geologic units, and susceptibility to liquefaction. Temporally varying characteristics such as depth to ground water are beyond the scope of this study.

Figure 20. Relationship of peak ground acceleration (PGA) and intensity. When PGA and intensity are graphed on linear axes, PGA is seen to be a geometric function of intensity, with one intensity value corresponding to a range of PGA values. Conversely, intensity is a logarithmic function of PGA. Although intensity is used linearly in the present study, it is recognized that ground motions are not linear but geometrically increase with intensity. PGA/intensity relation from Wald et al. (1999).

Seismic Shear-Wave Velocity

The velocity of seismic shear waves in the top 30 m of the subsurface (V_s^{30}) is recognized as a control over ground motion in computer models (Hartzell et al., 2006; Aagaard et al., 2008). The reciprocal of V_s^{30} ($1/V_s^{30}$) is called *slowness* and is commonly used instead of V_s^{30} because it is positively correlated with ground motion. That is, *slower* sediment generally has stronger ground motion. For comparison with 1906 intensity from the present study, slowness values are calculated from 81 contoured V_s^{30} measurements from seismic cone penetrometer test soundings (S-CPT) in the study area (Holzer et al., 2008; Appendix D).

Average V_s^{30} and the range of V_s^{30} values for communities are shown in Table 10. The very strong, positive correlation (goodness of fit, $R^2 = 0.71$) between community-average 1906 intensity and slowness indicates that V_s^{30} is a strong control for 1906 intensity (Fig. 21). 1906 census-block median intensity generally is positively associated with average census-block slowness, although scatter of the data and site-specific effects prevent a usable correlation. Thus, the 1906 intensity data substantiate the current use of V_s^{30} as an important factor in modeling ground motion (e.g., Boore and Atkinson, 2008; Campbell and Bozorgnia, 2008; Chiou and Youngs, 2008). Furthermore, these results show that the shallow subsurface is an important control over short-period ground motion in the 1906 earthquake.

TABLE 10. COMMUNITY SUMMARY FOR POTENTIAL GEOLOGIC CONTROL OF INTENSITY

Community*	1906 intensity [†]	Shear-wave velocity (V_s^{30}) [§] (m/s)	Thickness of sequence one [#] (m)	Depth to bedrock basement** (km)	Distance from San Andreas Fault (km)	Distance from 1906 epicenter ^{††} (km)
ALA	8.2 (6.5 – 8.5)	219 (212 – 226)	15.9 (14.6 – 18.3)	ca. 0.40	18.0 (17.8 – 18.4)	76.6 (76.2 – 77.3)
CMB	6.6 (6.0 – 7.0)	343 (337 – 351)	5.1 (3.4 – 8.5)	1.25 (1.2 – 1.4)	12.5 (12.0 – 13.5)	77.3 (76.8 – 77.6)
ESJ	8.2 (7.5 – 8.5)	221 (217 – 224)	19.7 (16.5 – 21.9)	1.50 (0.5 – 2.3)	21.8 (21.5 – 22.3)	80.2 (79.8 – 80.6)
SJ	7.4 (6.0 – 9.0)	223 (203 – 257)	18.8 (12.2 – 22.9)	0.25 (< c. 0.5)	19.7 (18.3 – 21.6)	78.8 (76.5 – 81.4)
STC	7.5 (6.5 – 8.5)	216 (179 – 250)	17.0 (14.3 – 18.0)	0.50 (< c. 0.5)	16.9 (15.9 – 17.6)	73.7 (72.8 – 74.4)
WSJ	7.0 (6.0 – 8.5)	297 (244 – 328)	12.9 (4.3 – 19.5)	0.50 (0.4 – 1.3)	15.6 (13.3 – 17.3)	77.5 (73.2 – 80.2)

Notes: Top entry is average value; range of values (minimum to maximum) is given in parentheses

* Communities—**ALA** (the Alameda); **CMB** (Campbell); **ESJ** (East San José); **SJ** (San José); **STC** (Santa Clara); and **WSJ** (West of San José). See Figures 14 and 15 for maps with locations of communities.

[†]1906 community-average intensity and, in parentheses, the range of individual 1906 intensities in a community. Average community intensity is the mean of intensity medians for census blocks with intensity data points in a community.

[§] V_s^{30} data (average horizontal shear-wave velocities in the top 30 m) are from Holzer and others (2008). See Appendix E.

[#]Sequence one is the unconsolidated sediment deposited since the most recent glaciation maximum; values for thickness of sequence one are from Carl Wentworth (pers. commun., 2008; Appendix E).

**Depths to bedrock basement are estimated from Jachens and others (2005) and Figure 2 of Hartzell and others (2006).

^{††}Location of 1906 epicenter is from Lomax (2008).

Figure 21. 1906 intensity and shear-wave velocity of the top 30 m. V_S^{30} is the average horizontal shear-wave velocity of the top 30 m. The reciprocal, $1/V_S^{30}$, is called *slowness* and is positively and strongly correlated with 1906 intensity. A. Community-average intensity and slowness; strong correlation. B. Census-block median intensity and slowness; scatter of the data and site-specific effects prevent a good correlation, but lower intensity is generally associated with faster shear-wave velocity (smaller value of slowness).

Thickness of Unconsolidated Sedimentary Layers

In the Santa Clara Valley, the shallow subsurface consists of Pleistocene to Holocene sediment that was deposited following the most recent glacial maximum ca. 18 ka and unconformably overlies late Pleistocene deposits. The post-glacial sediment is still unconsolidated (relatively loose), uncompacted, and uncemented and is referred to here as (glacio-eustatic) *sequence one* (Wentworth and Tinsley, 2005b). The unconformity at the base of sequence one has been recognized from cone penetrometer (CPT) soundings and from geophysical measurements from downhole logs and core samples of deep boreholes and wells (Newhouse et al., 2004; Wentworth et al., 2005a). This unconformity is also evident in the seismic velocity data of Williams et al. (2005a).

Sequence one has been subdivided by Wentworth and Tinsley (2005b) into an upper interval of predominantly fine-grained, unconsolidated layers (mostly clay and silt) and a lower interval of coarser, unconsolidated layers (mostly sand and gravel). The boundary between the two subintervals of sequence one has been recognized by a change in grain size and engineering properties from the geotechnical analysis of approximately 1700 borehole logs by Clahan et al. (2002) and from lithologic data and standard penetration test (SPT) blow counts in more than 650 drillers' well logs (Knudsen et al., 2004; Rosinski, 2008). These three groups of workers referred to this surface as the top of the Pleistocene, but the 11-ka Pleistocene-Holocene boundary may actually be either shallower or deeper than the depth at which grain size and engineering properties change within sequence one (Carl Wentworth, pers. commun., 2008).

Joyner and Boore (1988) and Borchardt (1994) noted that both short-period and long-period seismic waves tend to increase in amplitude in looser soils; higher-amplitude seismic waves generally produce higher intensity. The following sections investigate whether intensity patterns in the 1906 data could be due to variations in either the thickness of sequence one or the thickness of its upper interval.

Total Thickness of Unconsolidated Sediment. In the study area, the thickness of full sequence one ranges from 3 m (10 ft) near the base of the alluvial fans flanking the study area to 23 m (75 ft) north of downtown San José (Carl Wentworth, unpub. data, 2008; Appendix D).

Community-average intensity is strongly and positively correlated with the thickness of sequence one ($R^2 = 0.62$; Fig. 22). The thickness of sequence one satisfactorily accounts for the intensity values at **CMB**, **SJ**, **STC**, and **WSJ**, but not for the very high intensity at **ALA** and **ESJ**.

For individual intensity data, lower 1906 intensity is associated with thinner sequence one: all locations with sequence-one thickness up to 11.6m (38 ft) have intensity 7.0 or less (Fig. 22). Scatter in the data prevents a successful correlation.

It is not surprising that intensity is strongly correlated with both the thickness of sequence one and slowness ($1/V_S^{30}$). On average, sequence one takes up 59 percent of the 30-m thickness over which V_S^{30} is measured, and the unconsolidated sediment promotes slower V_S^{30} . Figure 23 shows the moderately strong correlation ($R^2 = 0.55$) between the thickness of sequence one and slowness.

Figure 22. 1906 intensity and thickness of sequence one. 1906 intensity is positively correlated with the thickness of sequence one, the layers of unconsolidated sediment deposited after the most recent glacial maximum (Wentworth and Tinsley, 2005b). A. Community-average intensity and thickness of sequence one are strongly and positively correlated. B. Although scatter in the individual data prevents a correlation, lower intensities are clearly associated with thinner sequence one.

Figure 23. Thickness of sequence one and slowness. Sequence one (Wentworth and Tinsley, 2005) consists of the layers of unconsolidated sediment deposited after the most recent glacial maximum. Slowness is the reciprocal of V_s^{30} , the average horizontal shear-wave velocity of the top 30 m. Slowness is strongly and positively correlated with the thickness of sequence one. Locations of individual 1906 intensity data points are used for the comparison.

Thickness of Upper Interval of Sequence One. The upper, comparatively fine-grained, interval of sequence one ranges over the study area from 3 m (10 ft) at the base of the alluvial fans to 18 m (59 ft) north of downtown San José (Rosinski, 2008; Appendix D). As mentioned earlier, the surface between the upper and lower intervals of sequence one has been interpreted by an increase in SPT blow count, a lithologic change from finer to coarser grain size, and a change from softer to denser, stiffer sediment (Clahan et al., 2002; Knudsen et al., 2004; Rosinski, 2008).

Community-average intensity correlates moderately well ($R^2 = 0.53$) with thickness of the upper interval of sequence one (Fig. 24). 1906 intensity values at **CMB**, **SJ**, **STC**, and **WSJ** lie close to the line of least-squares regression. For **ALA** and **ESJ**, intensity is significantly higher than predicted by the regression equation and cannot be explained by the thickness of the upper interval. Individual intensity data are not correlated with the thickness of the upper interval.

A note of caution: although intensity correlates moderately well with the thickness of the upper interval of sequence one at the scale of communities, because of inherent difficulties in interpreting this thickness from well data, intensity at a specific site should not be estimated using data from nearby wells.

Surficial Deposits: Quaternary Geologic Units

To minimize the flooding of buildings, the founders of San José built their commercial center on the higher ground of stream levees (finger-shaped areas with slight topographic relief and coarse sediment of typically sand-sized grains). The streets of the

Figure 24. 1906 intensity and thickness of the upper interval of sequence one. The upper interval of sequence one is distinguished by fine-grained sediment and low density (Clahan et al., 2002; Rosinski, 2008). A. Community-average 1906 intensity is moderately well correlated with thickness of the upper interval. B. Individual 1906 intensity and thickness of the upper interval are not correlated.

new town followed the northwest-trending geologic and geomorphic grain of the region, as did the stream levees on which the first structures were built. Streets today still closely follow the original street grid. The present stream levees generally are no longer closely associated with the streams that deposited them but mark former courses of streams.

The Quaternary geologic units mapped within the study area (Fig. 3) are fluvial sedimentary facies generally less than ca. 3 m in thickness (Carl Wentworth, pers. commun., 2008). On some current seismic hazard maps based on surficial geologic units, the stream levees (geologic unit Qhl) are assigned a higher seismic hazard than adjacent geologic units (e.g., ABAG, 2005). Geologic units from the most recent Quaternary geologic map (Witter et al., 2006) are examined in the following paragraphs for possible correlation with 1906 intensity.

Table 11 gives the distribution of 1906 intensities by Quaternary map unit: 407 points (two-thirds) on Qhl (stream levees as described earlier), and 191 points (nearly one-third) on Qhf (undifferentiated alluvial fan facies, generally finer in texture than levees). The eight intensity points on Qhff (fine fan facies, typically silt and clay) and one point on Qhty (young stream terrace) are hereafter grouped with Qhf as *other units* without loss of resolution.

For both Qhl and the other units, mean intensity (7.36) and median intensity (7.5) are identical. When the geologic units are subdivided by construction material, however, Qhl appears to have slightly higher intensity (Table 12). For frame buildings, mean intensity is 7.52 for Qhl and 7.40 for other units, and for URM, mean intensity is 7.24 for Qhl and 7.20 for other units. The frame distribution is preferred for showing any differences in

TABLE 11. NUMBER OF STRUCTURES BY 1906 INTENSITY
AND QUATERNARY GEOLOGIC MAP UNIT

1906 Intensity	Qhl	Other Units		Total
		Qhf	Qhff	
6.0	19	8	0	27
6.5	46	49	0	95
7.0	120	35	1	156
7.5	105	37	2	144
8.0	78	31	1	111
8.5	38	31	4	73
9.0	1	0	0	1
Total	407	191	8	607

Notes: All geologic map units are Quaternary Holocene (Qh). Qhf—fan facies; Qhff—fine fan facies; Qhl—stream levee; Qhty—young stream terrace. Because of the scarcity of data points in units Qhff and Qhty, these two units are grouped with Qhf as *other units*. Quaternary map units are defined in Witter and others (2006).

TABLE 12. INTENSITY STATISTICS BY GEOLOGIC MAP UNIT AND CONSTRUCTION MATERIAL

<u>Statistical measure</u>	<u>Geologic map unit</u>							
	<u>Qhl</u>		<u>Other units</u>				<u>All map units</u>	
	Frame	URM	Total	Frame	URM	Total	Frame	URM
Median	7.50	7.00	7.50	7.50	7.50	7.50	7.50	7.25
Mean	7.52	7.24	7.36	7.40	7.20	7.36	7.46	7.24
Standard deviation	0.75	0.53	0.65	0.79	0.60	0.76	0.77	0.54
Skewness	-0.11	-0.53	-0.02	0.08	-0.63	0.08	-0.02	0.55
Coefficient of variation (%)	9.97	7.30	8.81	10.67	8.29	10.35	10.33	7.43
<u>Count by intensity value</u>								
Intensity 6.0	2	17	19	4	4	8	6	21
Intensity 6.5	38	8	46	47	2	49	85	10
Intensity 7.0	30	90	120	25	11	36	55	101
Intensity 7.5	29	76	105	27	12	39	56	88
Intensity 8.0	41	37	78	27	6	33	68	43
Intensity 8.5	37	1	38	35	0	35	72	1
Intensity 9.0	1	0	1	0	0	0	1	0
Total	178	229	407	165	35	200	343	264
<i>Note:</i> Frame for wood-frame structures; URM for structures of unreinforced masonry (primarily brick, but also adobe, stone, or unreinforced concrete).								

the geology because frame buildings are more evenly distributed over the study area and better represent spatial differences than do URM buildings, which are concentrated primarily in downtown San José.

Figure 25 shows that Qhl has a higher proportion of higher intensities, and the other units have a higher proportion of lower intensities. The cumulative curves show a somewhat more rapid accumulation of points up through the median intensity and, therefore, lower average intensity, for other units than for Qhl: 7.2 percent higher for frame on other units, but 2.8 percent higher for URM on Qhl. As mentioned earlier, the frame distribution may give the more accurate indication of intensity.

The comparison with the Quaternary geologic units of Witter et al. (2006) shows that the 1906 intensity data do not support the idea that stream levees are areas of higher seismic hazard. From the analysis of the previous paragraphs, Qhl appears to have higher intensity. Qhl cannot, however, be definitively associated with elevated seismic hazard. The large scale of geologic mapping creates some uncertainty in the precise location of Qhl boundaries. In addition, the minor differences in the cumulative curves can be explained by other factors, discussed later, that operate on specific geographic groupings of points, e.g., a small area of very low intensity at the confluence of Los Gatos Creek and the Guadalupe River [**CONFL**], and an area of higher intensity on geologic unit Qhff at easternmost **ESJ** (see Figures 15 and 18).

Figure 25. Normalized distribution of 1906 intensity by construction material and Quaternary geologic unit. Percentages are normalized to total for each construction material/geologic unit pair (e.g., frame on Qhl). A. Distribution for frame (wood-frame) buildings. B. Cumulative distribution for frame buildings. C. Distribution for unreinforced masonry (URM) buildings. D. Cumulative distribution for URM buildings. The group “other units” comprises Qhf (undifferentiated fan facies), Qhff (fine facies), and Qhty (young stream terrace).

Earthquake-Induced Liquefaction

Liquefaction can create substantial damage in large earthquakes. During a major earthquake, long-duration cyclic shaking can cause increased pore pressure, loss of shear strength, temporary transformation to a liquid state, repacking, and subsidence of saturated, coarse-grained, unconsolidated Earth materials within approximately the top 15 m (50 ft). Earthquake-induced ground deformation results in differential settling of and damage to structures or pipelines directly above the liquefied material (Youd, 1973).

The intensity data show minimal evidence for liquefaction in the study area during the 1906 earthquake. Within the 1906 city limits of San José, a single damage report from the downtown commercial center suggests that earthquake-induced liquefaction may have occurred. According to the official Inspection Committee report on 23 April 1906,

Richards Building--The Richards Building since reported on Saturday [21 April 1906], is settling more into the street and should be properly braced before any more work is done on the same (*San Jose Daily Mercury*, 1906a).

No other mention of “settling” appears in the damage reports. In isolated instances, building foundations may have failed as a result of liquefied soils directly underneath, but widespread evidence of liquefaction is not indicated in the data.

For the 1906 earthquake, the Lawson report (1908) documents liquefaction north and northeast of San José but not within the city limits. Outside the city, particularly to the north, ground failures—including sand boils, lateral spreading, changes in water levels in wells, and separation of a bridge abutment from its creek bank—are noted. Although specific locations are not given in the Lawson report, water and mud are reported as

“having spurted from the artesian wells”; these effects probably resulted from liquefaction. In San José, a single gas main was crushed when a brick building fell on it: “The bricks penetrated thru the soft earth to the main and broke it.” Gas delivery after the earthquake would have continued uninterrupted, except that “the breaking off of pipes in the buildings and the crushing of meters under falling houses necessitated shutting off the gas thruout [*sic*] the city for 24 hours” (Lawson, 1908). No damage report for the part of the study area west of the 1906 San José city limits suggests earthquake effects attributable to liquefaction.

In their comprehensive study of historical ground failures in northern California, Youd and Hoose (1978) found that, in the vicinity of San José, “Pleistocene and most Holocene alluvial fan deposits at points well removed from active stream channels” were sufficiently well-consolidated to resist ground deformation caused by cyclic shaking. Youd and Hoose underscored the importance of the intact water and sewer systems in San José as evidence that the city did not experience liquefaction in the 1906 earthquake. Even on stream banks, downtown San José showed no evidence of liquefaction or other ground failure.

The most convincing evidence against widespread liquefaction in 1906 is that city water and sewer systems continued to operate during and after the earthquake. Charles Derleth (1907), professor of engineering at the University of California, Berkeley, wrote,

San José's water works, like that of Santa Rosa, was not injured; its sewers also were left intact, showing that there was no unequal displacement of the ground.

Fire hydrants in downtown San José had water pressure after the earthquake; the San José Fire Department was able to extinguish the numerous fires that erupted throughout the city (Fig. 5). The hydrants were connected directly to the San José Water Company's main facility (the "water works," Fig. 26) at the confluence of the Guadalupe River and Los Gatos Creek by two 16-inch water mains running under Santa Clara Street (Sanborn-Perris Map Co., 1891, revised 1901). Thus, it is clear that the streets and subsurface infrastructure of 1906 San José were not disturbed by earthquake-induced ground displacement.

The absence of liquefaction in 1906 matches the liquefaction hazard map of Holzer et al. (2008) for the 1906 earthquake scenario. This quantitative liquefaction probability map is based on 165 cone penetration test soundings, 55 of which are in the present study area. With the exception of one data point, all intensity data in the present study are in a region of very low to low liquefaction hazard (under 10 percent) on this map. The qualitative liquefaction map of Witter et al. (2006) is more conservative in defining areas of liquefaction susceptibility. On this map, much of modern San José, including all of the present study area, is shown as being susceptible to liquefaction in a major earthquake.

Possible Match in Resonance between Buildings and the Ground

Shallow sedimentary layers may promote site-specific amplification of shear-wave energy. A seismic impedance contrast between layers can cause reflection of seismic ray-paths; if conditions are right, resonance can direct reinforced, amplified energy toward specific locations at the surface (Joyner et al., 1981; Williams et al., 1999;

Figure 26. San José Water Company in 1901. The water company was located on W. Santa Clara Street at the Guadalupe River, San José. The two 16-in water mains running east under Santa Clara Street to the commercial district functioned after the 1906 earthquake. Original scale 1:600; ruler in inches. Access to original volume of Sanborn (1891, revised 1901) and permission to photograph courtesy History San José.

Williams et al., 2000). Studies in the Seattle basin, a sedimentary basin similar to the Santa Clara Valley, have demonstrated (1) significant resonances from very shallow impedance boundaries (7 m or less) (Williams et al., 1999) and (2) a substantial decrease in amplitude from the fundamental to the first and higher overtones (Williams et al., 2000).

In an earthquake, when the natural fundamental period of a building closely matches an energetic mode of vibration of the ground underneath, a resulting double-resonance coupling can significantly amplify shaking and cause severe building damage. Double-resonance coupling for short-period buildings is most likely achieved by a match of the building fundamental period with short-period, very shallow layers. The thicknesses of two shallow layers described earlier, full sequence one and the upper interval of sequence one, will be examined in the following paragraphs for potential resonance with the 1906 buildings. It is unlikely, although possible, that higher modes of vibration from deeper layers with longer-period fundamentals could match the fundamental periods of the short buildings (Williams et al., 2000).

Buildings represented in the 1906 intensity data range in height from one to seven stories; buildings over four stories are rare (Fig. 27). Most URM buildings have two stories, and most frame buildings have one story. In the commercial center of downtown San José (**DTC**), the average building is URM and two stories tall, and in outlying areas, the average building is a one-story dwelling. A story is typically ca. 3 m tall, although some public buildings have taller story heights (e.g., some churches are built as a single

Figure 27. Distribution of buildings by number of stories and construction material. Average story height for the 1906 buildings is 3 m, although large buildings such as churches are reported as having a single story equal in height to two stories. Missing data for number of stories are shown in this figure as “0” stories. Two-story buildings are most common and are approximately evenly divided between wood-frame and unreinforced masonry (URM) construction. Most one-story buildings are wood-frame (dwellings), and most three-story buildings are URM (commercial or mixed commercial and residential).

story that is the equivalent in height of two stories). Attached towers, e.g., steeples or bell towers, are not included in building height.

In the study area, 35 percent of buildings have the potential for double-resonance coupling with the upper interval of sequence one. For **ALA** and **ESJ**, 65 percent and 63 percent of buildings, respectively, likely have double-resonance coupling (Table 13). Double-resonance coupling may help to explain the unusually high intensity (8.2) at **ALA** and **ESJ**. **STC** also has a significant match with the upper interval of sequence one (58 percent of intensity data points likely have double-resonance coupling), although intensity there (7.5) is intermediate. For **SJ** (32-percent match), a good resonance match is much less pronounced—or else escapes detection by the methods employed here. Full sequence one is a potential match for double-resonance coupling only at **WSJ** (Appendix C). **CMB** is not included because of inconsistent layer-thickness data.

The resonance calculations are consistent with the high amplifications of Hartzell et al. (2006) at **ALA**, **ESJ**, and **STC** (Fig. 15). Hartzell et al. (2006) measured significant amplification in the 2004 Parkfield earthquake at the precise location of maximum 1906 intensity at **ALA**, in the frequency range (2-4 Hz) roughly corresponding to the natural resonance of the two-story buildings there in 1906. In 2004, the seismic array had five stations at **ALA**; ground-motion measurements there were well constrained (Hartzell et al., 2006). At **STC**, although Hartzell et al. (2006) showed high site amplification in 2004, ground motions were more poorly constrained; the closest station was 1.8 km away. The earlier array configuration (Hartzell et al., 2003) measured high amplification at **ESJ** from local and teleseismic earthquakes, with stations closely spaced at 1-km

TABLE 13. BUILDINGS WITH POSSIBLE DOUBLE-RESONANCE COUPLING WITH THE UPPER INTERVAL OF SEQUENCE ONE

Community*	Count of all buildings	Count of buildings with possible double-resonance coupling					Total count and percentage
		1	2	3	4	5	
ALA	20	0	13	0	0	0	13 (65%)
CMB[†]	13	6	0	0	0	0	6 (46%) [†]
ESJ	35	14	8	0	0	0	22 (63%)
SJ	482	20	98	35	0	0	153 (32%)
STC	26	5	10	0	0	0	15 (58%)
WSJ[§]	26	1	1	0	0	0	2 (8%)
Total[#]	602	46	130	35	0	0	211 (35%)

Notes: Double-resonance coupling between buildings and the upper interval of sequence one may have produced unusually high 1906 intensity in **ALA** and **ESJ**. **CMB** is shown but should be ignored because of inconsistent data for the two layers. *Sequence one* is the unconsolidated sediment deposited since the most recent glacial maximum. Thickness of the upper interval of sequence one is from Rosinski (2008; Appendix E).

* Communities—**ALA** (the Alameda); **CMB** (Campbell); **ESJ** (East San José); **SJ** (San José); **STC** (Santa Clara); and **WSJ** (West of San José). See Figures 14 and 15 for maps with locations of communities

[†]Should be ignored—Inconsistent thickness data for upper interval of sequence one and full sequence one.

[§]The community average of two stories has been assumed for 17 of the 26 buildings that are missing data for the number of stories. This assumption is reasonable for the area and types of buildings.

[#]Five buildings in outlying areas have been omitted. These buildings are not in a community.

intervals in and around **ESJ**. The double-resonance coupling may add to any other site amplification at **ESJ**.

Together, 1906 and modern ground motions suggest an underlying geologic condition that may well produce damaging ground motion in future earthquakes on the San Andreas fault or Hayward fault. Today **ALA**, in particular, is developed primarily with one- to three-story buildings with natural resonant periods similar to those of their 1906 counterparts. Some dwellings in this area that survived the 1906 earthquake have been preserved as historical treasures but lack appropriate seismic reinforcement; these buildings are more susceptible now than in 1906. **ALA** and **ESJ** could be microzoned to monitor for potentially damaging ground motions.

Site-Related Factors II: Deep Geologic Structures

Underlying geologic structure can significantly influence ground motion (Hartzell et al., 2006). In the study area, the main geologic structures are two buried sedimentary basins, the Evergreen and Cupertino basins, filled and covered by 0.5-5 km of sediment, and a bedrock basement high, under 0.3-0.6 km of sediment, separating the two basins (Fig. 3). The two concealed basins have been mapped in depth and extent from gravity, magnetic, and seismic data (Roberts et al., 2003, Roberts et al., 2004; Williams et al., 2005b). The Silver Creek fault, concealed at the latitude of the study area, forms the southwestern edge of the Evergreen basin (Williams et al., 2002; Jachens et al., 2005a;

Williams et al., 2005b). Both the buried edges of basins and depth to bedrock can be examined for association with higher 1906 intensity.

Buried Basin Edges

Basin edges—particularly deeply buried, concave-upward basement contacts with overlying sedimentary layers—were found to be an important factor in site amplification of ground motion (basin-edge effects) in the 1994 Northridge, California, earthquake (e.g., Gao et al., 1996; Graves et al., 1998). Since 1994, deep sedimentary basins, particularly those with margins within 1-2 km of the surface, have been examined as likely causes of site amplification (Hartzell et al., 1997). Depth from ground surface to the bedrock basement is an important factor controlling ground motion in the models of Chiou and Youngs (2008) and Campbell and Bozorgnia (2008).

At **ESJ**, 1906 intensity values are 8.0 to 8.5 from 0.3 km west of the fault to 0.5 km east of the fault, with no data points farther east. At the same location, Hartzell et al. (2003) found the basin-bounding Silver Creek fault to be an efficient reflector of seismic energy entering the Evergreen basin from the east; the reflected energy was directed toward the surface at **ESJ**. They measured high site amplification from ca. 1.2 km west of the Silver Creek fault to ca. 1.5 km east of the fault, with maximum amplification ca. 0.5 km to 1.5 km east of the fault. Hartzell et al. (2006) also recorded strong site amplification in the 2-4 Hz frequency range in this neighborhood for the 2004 Parkfield, California, earthquake. Focusing and/or reflection of seismic waves at the steeply

dipping, southwestern edge of the Evergreen basin (the Silver Creek fault) may be the cause of very high 1906 intensity (community-average intensity 8.2) in **ESJ** (Fig. 28).

ALA, southwestern **SJ**, and **STC** are at the gently dipping, eastern edge of the Cupertino basin (Fig. 28). Focusing of seismic waves at this basin edge probably contributes to high intensity at **ALA** and the southwestern edge of **SJ**. **ALA** and the six data points in southwestern **SJ** lie on a northwest-southeast trend at the basin edge; these two locations have high average 1906 intensity (8.2). As mentioned earlier, Hartzell et al. (2006) measured high amplification at **ALA** in the 2-4 Hz range for the 2004 Parkfield earthquake (Fig. 15).

The moderate 1906 intensity at **STC** is not, however, associated with basin-edge amplification. Hartzell et al. (2006) interpreted high amplification here for the 2004 Parkfield earthquake, although their closest recording station was 1.8 km away. 1906 intensity at **STC** (intensity 7.5) is slightly higher than at **SJ** (intensity 7.4). In the 1868 earthquake on the southern Hayward fault (Fig. 1), intensity was lower at **STC** than **SJ** (Boatwright and Bundock, 2008b), although **STC** was closer to the fault rupture. It is likely that basin-edge effects at **STC** are dependent on variables such as azimuth or directivity of rupture. The large site amplification of 2004 may not have been present in either 1868 or 1906.

Basin-edge effects are not evident in 1906 intensity at **CMB**, **SJ**, or **WSJ**. **CMB** and **WSJ** are located over the center of the deep Cupertino basin. **SJ**, with the exception of the southwestern edge, lies over the bedrock basement high separating the Cupertino and Evergreen basins. Ground motions at basin edges (at **ALA**, southwestern **SJ**, and **STC**)

Figure 28. Study area with 1906 intensity, communities, and bedrock basement contours.

could be checked by co-locating stations of a seismic array to verify or negate the possibility of basin-edge focusing.

Locally higher 1906 intensity values at the southwestern edge of the Evergreen basin and the eastern edge of the Cupertino basin are associated with buried basin edges. Communities located away from the edges of the basins show little or no evidence of site amplification.

Depth to Bedrock Basement

Depth to bedrock basement is equivalent to the thickness of sediment overlying bedrock. In the ground-motion simulation of Aagaard et al. (2008), the deep basins significantly amplified shaking, but primarily for long-period waves. The short buildings in 1906 were unlikely to have resonated with the long-period motions developed in the basins. The data for the present study cannot test for long-period amplification.

The comparison of 1906 intensity with depth to bedrock requires that the intensities be grouped as communities in order to match the resolution of the modeled bedrock surface (Jachens et al., 2001, 2005b). It would be inappropriate to attempt a correlation with individual data points.

Higher community-average 1906 intensity is not positively correlated with the ca. 0.2-1.5 km depth to bedrock basement under the study area (Table 10). Low intensity at **WSJ** (intensity 7.0) and **CMB** (intensity 6.6) is associated with deep sediment of 0.4-1.3 km and 1.2-1.4 km, respectively (Figure 28). In addition, **WSJ** lacks an expected intensity gradient increasing from shallower to greater basin depth over a width of

7.0 km. At **SJ** and **STC**, higher 1906 intensity (7.4 and 7.5, respectively) is associated with depth to bedrock of ca. 0.5 km or less. At **ALA** (intensity 8.2), sediment depth is also less than 0.5 km. At **ESJ** (intensity 8.2), sediment depth ranges from ca. 0.5 km to 2.3 km, but individual 1906 intensity points there are not correlated with depth.

The 1906 intensity data do not indicate that depth to the bedrock basement surface controlled intensity for the 1906 earthquake in the northern Santa Clara Valley. The buildings in the data base were short, however, and probably did not respond to damaging, long-period motions that may have developed in the deep basins. It is possible that small areas of topographic relief on the bedrock surface may cause local, short-period amplification or deamplification at the surface of the ground. More detailed depth data will be needed to investigate the relationship between 1906 intensity and large-scale basement topography.

Path-Related Factors: Control by Factors between Fault and Data Points

Shortest Distance from the Fault Rupture

As seismic energy passes through energy-absorbing Earth materials, it normally attenuates, or decreases, with increasing distance from a fault rupture. For the 1906 earthquake, intensity has been mapped across the width of California as decreasing away from the San Andreas fault (e.g., Lawson et al., 1908; Boatwright and Bundock, 2005). Distance from the fault rupture as used here is consistent with distance from a ground-rupturing, strike-slip fault for the Next Generation of Ground-Motion Attenuation Models

(NGA) project, in which ground motion is a logarithmic function of shortest distance from the rupture (e.g., Boore and Atkinson, 2008; Campbell and Bozorgnia, 2008; Chiou and Youngs, 2008). A logarithmic scale is not employed here because distance across the study area varies only by a factor of two, not multiples of ten.

When individual 1906 intensity data are compared with distance from the San Andreas fault, the normal intensity-distance relationship inverts. Figure 29 shows that most locations closer to the fault rupture have lower intensities, and sites farther from the rupture generally have higher intensities. The 12-15 km range is associated with intensities 6.0-7.5, the 15-18 km range shows increasing intensity with distance, and the 22-24 km range has only intensities 7.5-8.5. High data density and scatter for **SJ** obscure results in the 18-22 km range.

This inverse relationship also holds for communities (Fig. 29 and Table 10). As discussed earlier, shallow site factors and basin-edge effects overshadow the attenuation expected over the 12.0-23.6 km from the San Andreas fault. **CMB**, with lowest intensity (intensity 6.6), is closest to the fault rupture; communities of intermediate intensity, **SJ**, **STC**, **WSJ** (intensities 7.0-7.5), are also intermediate in distance; **ESJ**, with highest intensity (intensity 8.2), is farthest from the rupture. **ALA** is the single exception, where unusually high intensity (intensity 8.2) is associated with intermediate distance.

Distance from the Epicenter

Intensity is normally expected to attenuate with increasing distance from the focus (point of nucleation) of an earthquake. Several groups of workers have shown evidence

Figure 29. 1906 intensity vs. distance from the San Andreas Fault. Distance in km is the shortest distance from intensity data points to the 1906 rupture of the San Andreas fault. Intensity normally attenuates, or decreases, with increasing distance from a fault rupture. In both graphs, 1906 intensity increases away from the fault; site-specific amplification masks the expected attenuation. A. Distance for all individual intensity data points in the study area. B. Distance range for all intensity data points within each community. Communities: **ALA** (Alameda), **CMB** (Campbell), **ESJ** (East San José), **SJ** (San José), **STC** (Santa Clara), and **WSJ** (West of San José).

that the focus of the 1906 earthquake was located off the Golden Gate, near San Francisco (Bolt, 1968; Boore, 1977; Zoback et al., 1999; Lomax, 2008). Using as the 1906 epicenter the center of the surface projection of Lomax's (2008) volume of most likely foci, the latitude and longitude of the epicenter are taken to be 37.77° N, 122.55°W; this location is consistent with estimates of Zoback et al. (1999). For the purpose of comparing 1906 intensity with distance from the center of the 1906 earthquake, the ca. 10-km depth of focus (Lomax, 2008) is not considered; ignoring depth of focus does not alter the results. Surface distance from the epicenter is compared with intensity for both individual data points and communities.

The 1906 intensity data, individual or grouped by community, do not support distance from the epicenter as a control over intensity in the study area. Figure 30 shows that for individual data, 1906 intensity is nearly 100 percent uncorrelated with distance from the epicenter. For intensity data grouped by community, 1906 intensity is associated negatively, although extremely weakly, with distance (Fig. 30). Although attenuation of seismic energy with distance is a basic tenet of seismology (e.g., Lawson, 1908; Richter, 1958; Stover and Coffman, 1993; Boore and Atkinson, 2008; Campbell and Bozorgnia, 2008; Chiou and Youngs, 2008), attenuation within the study area is masked by other factors with stronger control over ground motion.

Figure 30. 1906 intensity vs. distance from the 1906 epicenter. Neither individual nor community-grouped 1906 intensity data show the expected increase with increasing distance from the 1906 epicenter. A. Individual intensity data points. B. Distance range from epicenter for all points within a community; community-average intensity.

Summary for Controls over Intensity of Shaking

Variations in 1906 intensity within the study area are governed primarily by site-related conditions of the shallow subsurface and the buried sedimentary basins. The major site-specific factors controlling 1906 intensity are the slowness of seismic shear-wave velocity, the thickness of unconsolidated deposits, and a possible double-coupled resonance between buildings and a shallow ground layer. Neither surficial geologic unit nor liquefaction is a controlling factor. The shallow, buried edges of sedimentary basins are associated with higher 1906 intensity. Depth to bedrock—the depth of sedimentary basins—is not correlated with higher 1906 intensity, although areas with moderate 1906 intensity lie above a relatively high bedrock basement surface. Path-related factors are not evident in the 1906 intensity data. Similarly, the source dynamics of the M_W 7.8 1906 earthquake (WGCEP, 2003) cannot be seen in the 1906 intensity data.

Confluence of the Guadalupe River and Los Gatos Creek: Enigmatically Low Intensity

In 1906, buildings had very little reported earthquake damage within a 0.27-km radius of the confluence of the Guadalupe River and Los Gatos Creek (**CONFL**), an area within **SJ** and west of the downtown core (**DTC**) of the city (Fig. 18). Of the 35 data points at **CONFL**, 91 percent have intensity between 6.0 and 6.5; a single point has the maximum intensity 8.0. Mean intensity is 6.5, and standard deviation is 0.33. Because several

independent historical sources are used to document the 1906 damage at **CONFL**, errors in interpreting damage and assigning intensities there are minimized.

A combination of anthropogenic and natural factors helps to explain the unusually low intensity at **CONFL**. The land at **CONFL**, originally a swamp, was probably well drained by 1906 (Figs. 18 and 31). Beginning around 1866, a series of canals was dug in the second half of the nineteenth century to drain this soggy area and create arable land for orchards (Santa Clara Valley Water District, 1999). By the first decade of the twentieth century, the formerly saturated land became increasingly drier, the local water table lower, and the shallow subsurface more stable in earthquakes. Also, pumping of groundwater since the 1860s at the main waterworks of the San José Water Company, located at **CONFL**, may have helped to lower the water table there (Fig. 27). Twelve artesian wells at **CONFL**, if operating in the spring of 1906, could have created a cone of depression above a leaky deeper aquifer to lower the water table further. At least six shallow wells for private residences were also within the 0.27-km radius of **CONFL** and would have contributed directly to a lower water table and drier shallow subsurface.

The weather also helped create favorable conditions at **CONFL** in 1906. On 18 April 1906, cumulative rainfall was average for the 1905-06 precipitation season, and 2½ weeks had passed since the last storm (Appendix E). Only trace amounts of rain (less than 0.01 inch per day) fell in April 1906 (*San Jose Daily Mercury*, 1905-06). The ground surface would have been dry at the time of the 1906 earthquake, and the shallow subsurface would have been drying since the end of March. Although the weather

Figure 31. Segment of 1866 map of pueblo lands surrounding San José, California. The confluence of the Guadalupe River and Los Gatos Creek is marked as **CONFL**. Marsh land near **CONFL**, drained by 1906, is indicated on this map by tufts of grass. The marsh followed the course of the seasonal Arroyo Tulare de las Canoas (later, Canoas Creek) to **CONFL**. After Map of Pueblo Lands (1866) (accession number 1977-2012). Permission to photograph courtesy of History San José.

conditions were not unique to **CONFL**, dry weather was likely a contributing factor to low intensity at **CONFL**.

Low to moderate stream depth at the confluence of Los Gatos Creek and the Guadalupe River on 18 April 1906 was also a likely factor for low intensity at **CONFL**. Hydrologic records for Coyote Creek beginning in 1903 and records for **CONFL** beginning in 1930, when the stream gage was installed, are combined to reconstruct estimates of the Guadalupe River discharge and stage at **CONFL** on 18 April 1906 (Appendix E). The calculations indicate that stream depth was ca. 1.7 m below bank top on the day of the earthquake. At **CONFL**, both streams were most likely effluent, or gaining water, and the surrounding soil losing water after the final winter storm surge at the end of March. Such conditions produce a downward gradient from the higher water table in the subsurface to the lower water surface of the streams. The gradient in the water table would create well-drained soil conditions in the shallow subsurface at **CONFL**. Hydraulic gradient in the low-permeability, clay-rich soil would not have been sufficiently high to desaturate the entire 0.27-km radius at **CONFL**, from ground surface down to the surface of the streams, within the 2½ weeks after the last storm in March. The two streams would, nevertheless, have helped to drain the shallow subsurface.

Favorable soil texture at **CONFL** on 18 April 1906 probably helped to minimize ground motion and increase resistance to failure under cyclic stress during the earthquake: the soil has a high percentage of fine-grained material (clay and silt). The original, fine-grained swamp or marsh sediment is mixed with coarser-grained levee deposits—near-channel overbank deposits of sand and gravel normally found in banks of

energetic streams—to form a cohesive (clay-rich), homogeneous (bioturbated), silty-sandy soil at **CONFL** (Fig. 32). The high percentage of fine-grained sediment (42.8 percent silt and clay in the analyzed sample) is sufficient to reduce susceptibility to liquefaction (Terzaghi et al., 1996). The areas of higher intensity surrounding **CONFL** may be more lenticular and lacking in this cohesive, homogeneous soil.

Low 1906 intensity at **CONFL** is supported by measurements of V_s^{30} (average horizontal velocity of shear waves in the top 30 m of the subsurface) made by seismic cone penetrometer test (S-CPT) sounding. V_s^{30} is ca. 20 percent higher at **CONFL** than at sites on stream banks 1.5 km downstream and 0.8 km upstream on the Guadalupe River (Holzer et al., 2008). This difference is sufficient to raise the National Earthquake Hazard Reduction Program (NEHRP) site classification from D-E to D at **CONFL** and thereby reduce seismic hazard from shaking (Building Seismic Safety Council, 2000).

Each of the anthropogenic and natural factors mentioned above—drainage and pumping, weather, stream depth, water table, soil texture, and shear-wave velocity—is unlikely by itself to be responsible for the low 1906 intensity at **CONFL**. Instead, a combination of several or all of these factors probably helped minimize ground motion there. The homogeneous, fine-grained soil and V_s^{30} significantly higher at **CONFL** than nearby increase the likelihood that this area may continue to experience lower-than-average intensity in major earthquakes.

Figure 32. Grain size distribution of **CONFL** soil sample. The original, fine-grained marsh deposits have combined with coarse-grained levee sediment to form a cohesive, bioturbated, silty-sandy soil at the confluence of the Guadalupe River and Los Gatos Creek (**CONFL**). The high percentage of fine grains (clay) substantially reduces the likelihood of liquefaction at **CONFL**.

A TALE OF NINE SCHOOLS

Nine grammar schools in the study area formed an irregular array of crude seismometers in 1906. A comparison of 1906 intensity at the nine schools is particularly interesting because construction style, materials, and size can be substantially eliminated as causes of different intensities (details in Appendix A). Although these buildings are not identical, in the northern Santa Clara Valley in the late nineteenth-century, grammar school architecture was standardized: large wood-frame building, roughly square in shape and two or three stories in height, with a bell tower of at least one story above the building, either at the front or over the center. All footprints had approximately the same area. Figure 33 reproduces contemporary etchings of the five schools located in **SJ**.

The base structures naturally resonate in response to short-period seismic waves. The bell towers, which are longer-period structures, have differential movement with respect to the bases. With moderate shaking, these wood-frame schools can sustain damage; under conditions of severe and prolonged cyclical shaking, the bell towers assist in pulling the buildings apart. Because all the schools had similar bell towers, differences in degree of damage in 1906 probably reflect real differences in ground motion.

The schools were not equally affected by the earthquake: 1906 intensity ranges from 6.5 to 8.5 over 10 km (Fig. 34). The grammar-school seismometers recorded site intensity, which is not always in agreement with community-average intensity from the present study. For eight of the nine schools, intensities are within ± 1.0 of community-average intensity (Fig. 35).

Figure 33. Five grammar schools in San José in 1906. Drawings are not to scale. Permission to photograph from McKenney (1880) courtesy of History San José.

Figure 34. 1906 intensity map with intensities for nine grammar schools. These very similar grammar schools acted as rough “seismometers” in 1906. Colors for schools also apply to 1906 intensity points (small circles).

Figure 35. Comparison of grammar-school and community-average intensity. All schools except one (Grant) have intensity within ± 1.0 of the intensity for the surrounding community; Grant School (in northeastern **SJ**) has unusually high intensity (8.5). Lincoln, Longfellow, and Lowell schools, also in **SJ**, had relatively minor damage. Hester School (intensity 7.5) is immediately southeast of the “hot spot” of markedly high damage (intensity 8.5) in **ALA** (community-average intensity 8.2). Abbreviations for communities are above the white bars: **ALA** (Alameda), **CMB** (Campbell), **ESJ** (East San José), **SJ** (San José), **STC** (Santa Clara), and **WSJ** (West of San José).

The following discussion, based on the data in Table 14, suggests likely causes for the 1906 intensities measured by the grammar-school seismometers.

1. Campbell Grammar School—The most important factor influencing intensity is its location atop thin (ca. 5 m), unconsolidated alluvium. School intensity of 6.5 is in agreement with community intensity 6.6 at **CMB**.
2. East San José School—Like much of **ESJ**, this school was heavily damaged, probably because of high site amplification from reflection or focusing by the nearby Silver Creek fault. School intensity is 8.5; community intensity at **ESJ** is 8.2.
3. Grant School (Fig. 33)—The location 820 m west of the Silver Creek fault may be a factor for the high intensity; Hartzell et al. (2006) measured very high site amplification here in the 2004 Parkfield earthquake. This school was severely damaged in the 1906 earthquake and was razed within days. Site-specific effects may have intensified already strong ground motions here in 1906. The damage reported at the school, particularly the separation of the central stairway from the wall, suggests that the bell tower at the center-front of the school acted as an inverted pendulum to pull apart the building. School intensity is 8.5; community-average intensity at **SJ** is 7.4.
4. Hester School—Intensity for the school (intensity 7.5) is substantially lower than, but still well within ± 1.0 of, the community-average intensity of 8.2 at **ALA**. The tall bell tower may have lengthened the natural period of the building so that the school escaped the destructive resonance match at **ALA** for two-story buildings.

TABLE 14. SUMMARY OF DATA FOR NINE GRAMMAR SCHOOLS

Entry Number*	Name of school (community [†])	Intensity	Year built [§]	Number of stories	Summary of damage
72800	Campbell Grammar School (CMB)	6.5	Before 1896	2	"After a thorough inspection," school was found to be "staunch and safe." School reopened 24 April 1906.
51000	East San José School (ESJ)	8.5	Before 1886	2	School "badly injured" and "entirely out of a home. It will take \$1200 to put the building in proper shape."
37400	Grant School [#] (Empire Street School) (SJ)	8.5	1877	2	School "a ruin"; entire building off foundation and settled 6-8 feet while shifting same distance to one side; walls "bulged out at all kinds of angles." Entire floors were salvaged for reuse.
50600	Hester School (ALA)	7.5	After 1861	2	School "in a bad condition"; "practically all of the plaster was shaken from the first floor of the Hester school. The upper story lost but little," but classes met 25 April 1906.
36400	Horace Mann School (SJ)	7.5	Before 1870	2½	"Foundation all in good condition...Both stair cases in main hall out of position. Somewhat racked...[Upper floors] to be better supported from the ground up... Outside steps to be made safe, also remainder of tower and entrance to be put in safe condition"; tower "inclined at a perilous angle"; plaster badly damaged; stairs "partly wrenched from the wall."
74100	Lincoln School (SJ)	7.0	1874	2	School "in good shape after earthquake" and "probably usable after a few slight repairs are made." After the earthquake, Lincoln School was used for temporary classrooms and storage of salvaged furnishings.
74900	Longfellow School (SJ)	6.5	1877	3	"The Longfellow has been examined by the inspectors and pronounced perfectly safe."

TABLE 14 (CONT'D.)

Entry Number*	Name of school (community) [†]	Intensity	Year built [§]	Number of stories	Summary of damage
38700	Lowell (Reed Street) School (SJ)	6.5	Before 1874	2	"Outside undamaged and in good condition"; "probably usable after a few slight repairs are made." Later inspection showed some interior damage but no structural damage.
59100	Willow Glen School (WSJ)	7.0	1897	2	Four classrooms damaged and library "wrecked," but school reopened 29 April 1906.

Notes: Grammar schools in 1906 served students in grades one through eight. All nine schools were of similar construction—large, wood-frame buildings with square cross-section, two to three stories tall, with a bell tower. Outcomes for the schools during the 1906 earthquake are generally more alike than not.

*Entry number is the record locator number in the damage database of Appendix A.

[†]Communities—**ALA** (the Alameda); **CMB** (Campbell); **ESJ** (East San José); **SJ** (San José); **STC** (Santa Clara); and **WSJ** (West of San José). Five of six communities are represented; the grammar school in **STC** (Santa Clara) was new in 1906 and of more modern style and construction. See Figures 14 and 15 for maps with locations of communities.

[§]The year of construction for schools in **SJ**, where available, is from McKenney (1880) or earlier city directories for San José and Santa Clara County.

[#]Grant School was the most severely damaged school.

5. Horace Mann School (Fig. 33)—School intensity (7.5) and degree of damage mirror those of the surrounding neighborhood in **SJ**; the school is located in the area of densest data in the downtown core of San José (**DTC**). Community intensity at **SJ** is 7.4.
6. Lincoln School (Fig. 33)—School intensity (7.0) is slightly lower than the average intensity (7.3) for the neighborhood in the southwestern quadrant of **SJ**; the average community intensity at **SJ** is 7.4.
7. Longfellow School (Fig. 33)—Intensity for the school (6.5) is substantially lower than intensity for either the neighborhood in northwestern **SJ** or the community **SJ** (mean intensity 7.4 for both).
8. Lowell School (also known as Reed Street School; Fig. 33)—School intensity (6.5) is substantially lower than intensity for either the neighborhood surrounding the school in southeastern **SJ** or the community **SJ** (intensity 7.4 for both).
9. Willow Glen School—The school intensity (7.0) matches community-average intensity at **WSJ** (7.0). The location on relatively thin, unconsolidated sediment probably accounts for the low intensity.

The nine very similar schools had different fates. Severely damaged Grant school was demolished for salvage soon after the 1906 earthquake; whole floors were reused in makeshift tent schoolrooms. The other schools in **SJ**—Horace Mann, Lincoln, Longfellow, and Lowell—were replaced by new structures by 1910 or 1911. The decision to replace the schools was primarily political; the schools were old, and the San José school board wanted to avoid any possibility of having students in unsafe buildings

(*San Jose Daily Mercury*, 1906b). East San José School, which was substantially damaged, was rebuilt immediately after the earthquake. Hester School was replaced by 1911 despite suffering relatively minor damage. Only Campbell Grammar School and Willow Glen School continued in service for many years after the 1906 earthquake.

CONCLUSION

This study makes two major contributions toward understanding 1906 earthquake damage in the vicinity of San José, California: (1) the database of previously undocumented damage reports with geospatial locations and interpreted intensity and (2) the compilation of likely geologic causes of variation of intensity in this area. Published descriptions of damage within 10 days after the earthquake, mostly from respected, local building-industry professionals and never before evaluated for an intensity study, together with detail from Sanborn-Perris Map Company fire insurance maps, provide damage details, precise location, and nature of construction for 607 damaged structures within the 11.8-km by 11.8-km study area surrounding San José, California.

Intensity ranges from MMI 6 to 9 over the study area. The distribution of intensities approximates a normal distribution with median intensity 7.5, mean intensity 7.36, and standard deviation 0.69. Maximum intensity of 8.5 to 9.0 is identical to contoured MMI from previous intensity studies with much lower density of data.

The methodology of assigning individual intensities to data points permits grouping of the points and analysis at different scales without loss of resolution. When data points are grouped by census blocks, mean intensity for the study area is 7.46 and standard deviation is 0.66. In 71 percent of 101 census blocks with two or more data points, the range of intensity is 1.0 or less. This low variability indicates consistent building response in these blocks to ground shaking. At a second scale, six communities or microzones are recognized, ranging from 1.1 km by 0.9 km to 7.0 km by 2.4 km and having average intensity of 6.6-8.2, with a range in standard deviation of 0.16-0.64. The intensity differences for communities, most of which match variations observed in modern ground-motion studies, are inferred to reflect real variation in damage-causing ground motion in 1906.

Four geologic factors related to the shallow subsurface evidently have significant control over spatial variations in 1906 intensity. V_s^{30} , the average shear-wave velocity in the top 30 m of the subsurface, has the best correlation with 1906 intensity ($R^2 = 70\%$). 1906 intensity is also strongly correlated ($R^2 = 62\%$) with the total thickness of unconsolidated sediment deposited following the most recent glacial maximum. A double-resonance coupling between the fundamental period of the uppermost, fine-grained layer of sediment and the natural periods of buildings is very strongly indicated at **ALA** (65 percent of 1906 buildings) and **ESJ** (63 percent). Finally, the edges of buried sedimentary basins (basin-edge effects) are significant factors in explaining the high intensity at **ALA**, at the eastern edge of the Cupertino basin, and **ESJ**, astride the Silver Creek fault at the southwestern edge of the Evergreen basin.

Four other factors commonly associated with higher seismic hazard do not appear to have a major influence on 1906 intensity. Intensity is not correlated with Quaternary geologic unit. The 1906 intensity data do not support the possibility of liquefaction, either widespread or local, in the study area in the 1906 earthquake. Depth to the bedrock basement evidently does not control variation in 1906 intensity in the study area, but the 1906 buildings may be too short to respond to the long-period ground motions developed in deep sedimentary basins. Over the 12-km width of the study area, intensity does not decrease with distance from either the fault rupture or the 1906 epicenter; other, more strongly expressed, controls mask the expected attenuation.

Comparisons of 1906 intensity with ground motions from recent earthquakes show remarkable consistency for the 2-10 Hz range appropriate for the short buildings of 1906. Small areas where high 1906 intensity and modern site amplification match closely (e.g., **ALA** and **ESJ**) may be candidates for stronger local seismic safety and building regulations. Areas of poor match could be re-examined with densely spaced stations of a seismic array.

An area of 0.27-km radius at the western end of downtown San José, at the confluence of Los Gatos Creek and the Guadalupe River, has unusually low 1906 intensity. Possible reasons include both anthropogenic and natural factors: draining of the old swamp, groundwater pumping, weather, stream stage, and soil texture.

A group of nine grammar schools in 1906, all similar in size, style, and construction, serve as an array of rough seismometers across a 10-km width of the study area. These buildings were particularly sensitive to variations in shaking: their bell towers behaved as

inverted pendulums in 1906 and tended to intensify the shaking. The school-seismometers “recorded” site intensity in the 6.5-8.5 range; all intensities except one were within ± 1.0 of average intensity for the surrounding community. With the variables of building details substantially eliminated, differences in intensity reflect spatial variation in ground motion. The most severely damaged school (intensity 8.5) was located near an area in which high, localized site amplification was recorded for the 2004 Parkfield earthquake.

The methods presented here can be used to constrain ground-motion models, identify persistent seismic hot spots, and improve site-specific assumptions for probabilistic seismic hazard analysis (PSHA). The results of this study can be used to refine loss estimates for the northern Santa Clara Valley for scenario repeats of the 1906 and 1868 (Hayward fault) earthquakes. The methodology can be employed in other areas of significant seismic hazard, and for either modern or historical earthquakes, to identify microzones of unusually high or low site response. If areas that persistently experience stronger shaking are known in advance, scarce emergency resources can be deployed efficiently after a major earthquake, and seismic building codes can be strengthened on a neighborhood basis to minimize property damage in future earthquakes.

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APPENDIX A: Damage Database

This appendix contains the database of 607 damage data points to which intensities for the 1906 earthquake have been assigned. All data and references for sources of data are included in Appendix A.

The sections of Appendix A are as follows:

A1. Key to Database for Intensity Data Points

A2. References for Data Sources

A3. Sanborn Fire Insurance Maps and San José City Directories

Table 15. Damage Descriptions and Data Sources for Intensity Data Points

Table 16. Attributes of Intensity Data Points

A1. Key to Database for Intensity Data Points

Tables 15 and 16 constitute the database for the intensity study in the present paper. These tables are printed at the end of Appendix A and are reproduced as electronic data files in plain ASCII text (in pocket). The following sections explain the field names and contents of the fields in the tables.

Key to Table 15. Damage Descriptions and Sources

Entry Number (Entry No.): Unique record number assigned to each damage data point. Entry numbers from sources 1a through 1e are in the same order as printed in the newspapers for reports of the subcommittees of the Inspection Committee.

Data Sources: Reference number(s) of data source(s) consulted to determine degree of damage for each data point.

Each data-source number corresponds to a reference (see section “Data Sources in Numerical Order”). References are mostly for sources of information on 1906 earthquake damage, typically not for building construction detail or building location. Sanborn fire insurance maps and San José city directories are common references for construction detail and addresses (see notes at bottom of the above file).

Damage Descriptions: Descriptions taken from data sources to make intensity assignments for damage data points.

Key to Table 16. Attributes of Intensity Data Points

Intensity: Intensity value assigned to damage data point. MMI assigned to data point, using partial steps in intensity where appropriate. Intensity is distinguished to ½ points of the MMI scale.

Community: Six communities are defined as groups of contiguous or nearly contiguous census blocks containing damage data points. The six communities are

ALA—The Alameda (along the road from San José to Santa Clara)

CMB—Campbell

ESJ—East San José

SJ—San José

STC—Santa Clara

WSJ—West San José

(OUT)—Outliers, a group of five data points not grouped geographically in a community)

Latitude (° N): Latitude of data point.

Longitude (° W): Longitude of data point.

Latitude and longitude are in decimal degrees, NAD 1983. Note that the goal of mapping in high resolution is to place each damage data point within the footprint of its 1906 building. Six decimal places for coordinates are needed to achieve this precision.

Street Number: Street number for damage data point.

Street number is based on information from 1906 sources plus additional research in city directories and Sanborn insurance map books to resolve inconsistencies. The numbers are either exact or the closest possible, given available data. The street number from 1906 is given wherever possible, but the streets of San José were renumbered between 1901 and 1915. Where necessary, the modern location is given.

Street: Street name for damage data point.

1906 street names are used, for consistency with contemporary data sources and maps; modern equivalents are also indicated where streets have changed names.

Const. Mat.: Construction material—the primary building material used to build the structure.

Construction material codes:

ad – adobe
br – brick
co – concrete
fr – wood frame
st – stone

Bldg. Size: Size of building footprint, relative to building material. Number of stories is not taken into consideration for this field.

Building size codes:

xs – extra small

x – small

m – medium

l – large

xl – extra large

Examples for wood frame: An extra small dwelling is a one- to two-room cottage, typically less than 20 ft wide; small is roughly 25 ft-35 ft wide, either square or longer than wide; medium is roughly 35 ft-40 ft wide, typically with longer depth than width; large is a substantial, typically Victorian, house, around 50 ft wide, either square or longer than wide; extra large is a private mansion, or very large commercial building or lodging house, typically 60 ft-80 ft wide and either square or longer than wide.

Examples for URM (unreinforced masonry – typically brick commercial buildings, less commonly concrete or stone): An extra small building is a one-room store, typically 15 ft-20 ft square; small is roughly only 10 ft-15 ft wide but 50 ft-100 ft deep; medium is typically 30 ft-45 ft wide and 50 ft-100 ft deep; large is typically 60 ft wide and 100 ft-120 ft long; extra large is wider than 60 ft and typically a brick warehouse or public building.

No. of Stories: Number of stories in the main part of building.

Additions to back or sides of building not counted in this field.

A typical story height is 3 m (10 ft), but buildings such as churches may have twice this height in a single story.

Bldg. Use: Use of building in 1906.

Documented building-use codes:

Bldg. Use Code	Building Use
apa	apartment building
chu	church
clu	private club
com	commercial
dep	railway depot
dwl	dwelling
fhs	fire house
hos	hospital
hot	hotel
log	lodging house
mtg	meeting house
mfg	manufacturing facility
off	office building
pub	public building
sch	school
sta	horse stable (non- commercial)
whs	warehouse

A2. References for Data Sources

The number for the data source is given first, followed by the reference for the source. Cross-reference with Appendix A, Table 15 (Damage Descriptions and Data Sources for Intensity Data Points). Sources numbered 1a through 1e contain the reports of the Special Building Inspection Committee of the Board of Police and Fire Commissioners, established 20 April 1906 to investigate and report on the 1906 earthquake damage to structures in San José, California.

Source

1a

San Jose Daily Mercury, Saturday, 21 April 1906, Building inspectors report day's work: San José, California, p. 5. Reports from inspection committees for the first, second, and third wards of San José.

1b

San Jose Daily Mercury, Tuesday, 24 April 1906, Many buildings declared safe--Others to be repaired: San José, California, p. 16. Reports from inspection committees for the second, third, and fourth wards of San José.

1c

San Jose Daily Mercury, Wednesday morning, 25 April 1906, Police and Fire Board ratifies report: San José, California, p. 5. Reports from inspection committees for the first (two reports), second, third, and fourth wards of San José.

1d

San Jose Daily Mercury, Thursday morning, 26 April 1906, The building inspectors perform a strenuous day's work in San Jose: San José, California, p. 5. Reports from inspection committees for the first (three reports), second, third, and fourth (two reports) wards of San José.

1e

San Jose Daily Mercury, Saturday morning, 28 April 1901, Building inspectors spend strenuous day in interests of the garden city: San José, California, p. 4. Reports from inspection committees for the second (two reports), third (two reports) and fourth wards of San José. This article contains the final reports from the inspection subcommittees.

2

Solari, A., and Zaro, M., 1975, San José's St. Joseph's: The church that watched a pueblo grow into a city: San José, California, 74 p.

3

San Jose Mercury News, 31 January 1965, Trinity Episcopal Church is a city landmark: San José, California, p. 14.

4

Houston, J.D., 1988, A centennial history of the Sainte Claire Club, 1888-1988: Cupertino, California, California History Center Foundation, 193 p. Information on the Mabury residence on p. 72-73.

5

St. Claire Club Photograph Collection, 1906, original photograph of St. Claire Club one hour after the 1906 earthquake, showing gentlemen at al fresco breakfast outside the ruined club building: courtesy of St. Claire Club; photographer unknown (not catalogued).

6

Pacific Hardware & Steel Co., 30 May 1906, letter from Pacific Hardware & Steel Co. to Mr. H.L. Garnot, discussing insured losses suffered at Mr. Garnot's bicycle shop during the 1906 earthquake: History San José Research Library, San José, California (not catalogued).

7

Allen, R., Baxter, R.S., Medin, A., Costello, J.G., and Yu, C.Y., 2002, Excavation of the Woolen Mills Chinatown (CA-SCL-807H), Volume I, San José: CA DOT District 4, Oakland, CA, January 2002, under contract with Jamie Cleland, EDAW, Inc.

8

Batchelder, L., no date (but after March 1956), interview with Russell O'Brien, grandson of Maurice O'Brien and son of Charles M. O'Brien, Sr.: San José Historical Museum and Association, San José Research Library, San José, California.

9

Richard Daffner Photograph Collection, 1906, photograph of Dougherty mansion ruined by 1906 earthquake: History San José Research Library, San José, California (accession number L2005-26).

10

History San José Research Library, no date, files on Peralta adobe and Fallon House: History San José Research Library, San José, California(not catalogued).

11

History San José Postcard Collection, various dates, postcards of buildings in San José from before and/or after the 1906 earthquake: History San José Research Library, San José, California.

12

History San José Photograph Collection, various dates, photographs of buildings in San José from before and/or after the 1906 earthquake: History San José Research Library, San José, California (accession numbers 1997-30-xxxx).

13

Kleemeyer, A., 1986, An Oral History: Adelaide Kleemeyer's [Woebecke] Memoir, Willow Glen: Beck, B., interviewer: Willow Glen Community Oral History Society; History San José Research Library, San José, California.

14

San Jose Daily Mercury, 27 April 1906, County hospital in almost total wreck: San José, California, p. 8.

15

San Jose Herald, Friday afternoon, 20 April 1906, Property in second ward that was destroyed: San José, California, p. 8.

16

Douglas, J., 2001, Historic San José: Tales of Naglee Park, 2nd rev. ed.: San José, California, Campus Community Association.

17

Skehan, P., Skehan, B., and Wang, C.N., 2009, San José Main Carnegie Library (photograph): Carnegie Libraries of California (<http://carnegie-libraries.org>; last updated 2009).

18

Hunt, R. D., 1951, History of the College of the Pacific, 1851-1951: Stockton, California, College of the Pacific, 226 p.

19

Terwilliger, S., April 2006, photographs of Sarah Winchester's house (Winchester Mystery House), San José, California. The photographs were taken on a tour of the house in April 2006; use for this study by courtesy of the photographer.

20

Mars, A., 1901, *Reminiscences of the Santa Clara Valley and San José with the souvenir of the Carnival of Roses*: San Francisco, Artistic Publishing Company, 276 p.

21

Nelson, N., 5 January 2006 and 6 March 2006, personal communication regarding her ancestors who lived through the 1906 earthquake and aftermath in San José, California.

22

State of California, 1996, *The River Street project: San José historic inventory*, State of California -- The resources agency: Sacramento, California, California Department of Parks and Recreation.

23

San Jose Herald, Saturday afternoon, 21 April 1906, News from the coast towns: San José, California, p. 3.

24

San Jose Herald, Saturday afternoon, 21 April 1906, House collapses and The schools at Santa Clara to open Monday (two articles): San José, California, p. 4.

25

San Jose Herald, Friday afternoon, 20 April 1906, Gravity of property loss is now being realized: San José, California, p. 7.

26

San Jose Herald, Friday afternoon, 20 April 1906, Santa Clara damage greater than supposed: San José, California, p. 7; identical article in *San Jose Daily Mercury*, Friday morning, 20 April 1906, p. 4.

27

San Jose Herald, Friday afternoon, 20 April 1906, University of the Pacific is at work: San José, California, p. 7.

28

San Jose Herald, Friday afternoon, 20 April 1906, Cities and the losses known: San José, California, p. 5.

29

San Jose Herald, Friday afternoon, 20 April 1906, Losses at Gilroy will reach half a million: San José, California, p. 7.

30

San Jose Herald, Friday afternoon, 20 April 1906, Damage not great at University of Pacific: San José, California, p. 2.

31

San Jose Herald, Friday afternoon, 20 April 1906, Local Chinatown is a scene of chaos: San José, California, p. 3.

32

San Jose Herald, Friday afternoon, 20 April 1906, San Jose free library but slightly damaged: San José, California, p. 3.

33

San Jose Herald, Friday afternoon, 20 April 1906, Relief committee met this morning: San José, California, p. 3.

34

San Jose Mercury and Herald, Thursday afternoon, 19 April 1906, Gardner School house was badly wrecked in interior: San José, California, p. 8.

35

Lawson, A.C., Gilbert, G.K., Reid, H.F., Branner, J.C., Leuschner, A.O., Davidson, G., Burkhalter, C., Campbell, W.W., 1908, *The California earthquake of April 18, 1906: Report of the State Earthquake Investigation Commission*, v.1: Washington, D.C., Carnegie Institution of Washington, 451 p.; reprinted 1969.

36

City of San José, no date(in the 1970s), San José historic landmark nomination form #14, Auzerais House, *in* file "Auzerais House. Downtown San José, Historical Buildings and Sites (1970s) Box 1 of 3": History San José Research Library, San José, California (not catalogued).

37

San José City Council, 29 September 1981, Documentation for City Council resolution designating the Troy Steam Laundry Building as a landmark of special historical, architectural, cultural or aesthetic value or interest, *in* box "Downtown San José, Historical Buildings and Sites (1970s) Box 3 of 3", file "Troy Steam Laundry": History San José Research Library, San José, California (not catalogued).

38

History San José Research Library, no date (in the 1970s), file “Wente Building”, *in* file “Downtown San José, Historical Buildings and Sites (1970s) Box 3 of 3”: History San José Research Library, San José, California (not catalogued). The file “Wente Building” has photographs of architectural details of the building; no historical designation is indicated in the file.

39

Campbell Historical Museum & Ainsley House and Karen Brey, 2004, *Images of America: Campbell, California*, Arcadia Publishing, 128 p.

40

Self-guided walking tour of Campbell, California, August 2006, personal observations and conversations with residents concerning historical buildings in Campbell, California.

41

City of San José, 1905-1906, City clerk's register of claims allowed and warrants drawn on the police fund, *in* City clerk's register of warrants, July 1, 1905 - July 1, 1906, City of San José, tabbed section “Police”: History San José Research Library, San José, California, no page numbers (accession number 1997-329-145).

42

Derleth, C., Jr., 1907, The destructive extent of the California earthquake of 1906: Its effect upon structures and structural materials within the earthquake belt, *in* Jordan, D.S., ed., *The California earthquake of 1906*: San Francisco, A.M. Robertson, 371 p. The description of effects of the 1906 earthquake in San José is on p. 188-191.

43

Hyams, M., 28 October 2006, personal communication regarding Michael Hyams' historic residence in Santa Clara, California.

44

San Jose Daily Mercury, Saturday morning, 21 April 1906, City schools closed for thirty days: San José, California, p. 6.

45

San Jose Daily Mercury, Saturday morning, 21 April 1906, Residences in Willows are badly damaged: San José, California, p. 4.

46

Sanborn-Perris Map Company, Insurance maps of San Jose, including Santa Clara, California, 1891, revised 1901; and 1891, revised 1921: New York, 2 vol., 73 numbered double map sheets, plus sheets 0a-0d. Used for comparison of original 1891 Sanborn (revised August 1901) with original 1891 Sanborn (revised February 1921) map sheets in the History San José Research Library. The version revised to 1921 has (1) a full-page revision from August 1906 printed by the Sanborn-Perris Map Company, and (2) other individual revisions. The other individual revisions consist of thick, irregularly cut rectangles of paper pasted over existing buildings on the 1891 map pages. These roughly-done revisions may have been either quick, official revisions by the representative of the Sanborn-Perris Map Company or (more likely) changes pasted in by the owner of the two-volume set to mark buildings no longer in existence after the earthquake. These volumes were also very neatly updated by hand (dates unknown but well after 1906) to add entire map sheets for newly developed areas outside the boundaries of the 1891 volumes; these updates appear to be careful copies, on tracing paper, of official Sanborn map sheets from an updated version of the same volume. Original map books for San José for 1882 through the 1950s, including the specific revisions used in the present study, are at History San José Research Center, Senter Road, San José, California 95112 (408-287-2290 or research@historysanjose.org). Online commercial resource for Sanborn insurance maps: Environmental Data Resources, Inc, www.edrnet.com/sanborn.htm. Sanborn maps are frequently accessible online through university or public libraries. The San José Public Library has an online subscription to Sanborn maps for cities in California. Contact the California Room of the Dr. Martin Luther King, Jr. Library, 150 E. San Fernando St., San José, CA 95112 (408-808-2167 or cal.sjpl@sjlibrary.org). Also consulted: Sanborn Map Company, Insurance maps of San Jose (1915), 2 vol.

47

San Jose Mercury News, 14 April 1991, Square roots: San José, California, p. 1L. Article on historic buildings surrounding St. James Square, San José, California.

48

Yu, C. Y., 1991, Chinatown San José, USA: San José, California, San José Historical Museum, 127 p.

49

San Jose Mercury News, 4 December 2005, Dobashi | Family store fed generations: San José, California, p. 8A. Article on closing of Dobashi Market, Japantown, San José. Original photograph of the building, reprinted in the article, is in the Japanese-American Museum, Jackson and 5th Streets, San José.

50

History San José Photograph Collection, 1906, photographs of 1906 earthquake damage to buildings at Agnews State Hospital: History San José Research Library, San José, California (uncatalogued).

51

San Jose Mercury and Herald, Sunday morning, 22 April 1906, Garden city will be made greater: San José, California, p. 1.

52

San Jose Mercury and Herald, Sunday morning, 22 April 1906, Here are conditions in first and fourth wards: San José, California, p. 11.

53

Nailen, R. L., 2002, *Guardians of the Garden City*: Smith and McKay Printing Co., Inc.: San José, California, 254 p.

54

Duval, C., 31 January 2006, personal communication with Charlene Duval, historian, Sourisseau Academy, San José State University, San José, California.

55

Scales, E.J., 1906, letter of 25 May 1906 from Elizabeth J. Scales of Long Beach to Thomas D. Scales of San José, *in* file "Mary Saunders and Scales Family": History San José Research Library, San José, California (accession number 1988-30-7).

56

San Jose Daily Mercury, Wednesday morning, 2 May 1906, O'Connor Sanitarium is in a safe condition: San José, California, p. 4.

57

History San José, no date, document with oral history about buildings and 1906 earthquake damage to buildings in the Peralta adobe complex: History San José Research Library, San José, California (uncatalogued).

58

History San José Photograph Collection, 1906, photographs of 1906 earthquake damage to San José High School: History San José Research Library, San José, California (accession numbers 1997-30-1316, 1997-300-1644, and 1977-300-1804).

59

Winchester Mystery House, 2006, guided tour of house and basements, September 2006; see www.winchestermysteryhouse.com, last accessed April 2009.

60

San Jose Daily Mercury, Monday morning, 23 April 1906, County hospital may collapse any moment: San José, California, p. 4.

61

San Jose Daily Mercury, 28 April 1906, Schools of the county preparing to open: San José, California, p. 9.

62

San Jose Mercury and Herald, Sunday morning, 22 April 1906, Inspecting buildings at Santa Clara: San José, California, p. 2.

63

San Jose Daily Mercury, 27 April 1906, Campbell's big water tanks being replaced: San José, California, p. 5.

64

Wilston, D., 8 August 2006, personal communication with Diane Wilston, genealogist and descendant of Theodore L. Lenzen, preeminent architect in San José in 1906.

65

San Jose Mercury-Herald extra edition, 18 April 1906: San José, California, 4 p. Various articles on the 1906 earthquake in San José.

66

San José State College, 1889, Historical sketch of the state Normal School at San José, California, with a catalogue of its graduates and a record of their work for twenty-seven years: Young, J.D., Superintendent State Printing, Sacramento, California, 283 p.

67

History San José, no date, file "Hotel Vendome Ephemera": History San José Research Library, San José, California (uncatalogued).

68

Campbell Interurban Press, 27 April 1906, Earthquake. Campbell escaped any serious damage.--No lives lost: Campbell, California, p.1.

69

Campbell Interurban Press, 27 April 1906, School attendance--Statement as to attendance at the school.--Condition of buildings: Campbell, California, p.5.

70

Campbell Interurban Press, 11 May 1906, Press notes: Campbell, California, p.4.

A3. Sanborn Fire Insurance Maps and San José City Directories

Sanborn fire insurance maps, in conjunction with San José/Santa Clara city directories for all years around the turn of the twentieth century, give a remarkably clear picture of building locations and construction details. These background items are necessary for an accurate and high-resolution study of intensity. The following maps and directories contributed to the database for the intensity data points.

1. Sanborn Fire Insurance Maps for San José, East San José, and Santa Clara, California

Sanborn-Perris Map Company, Limited (1891). Insurance maps of San Jose, including Santa Clara, California, New York, 2 vol., 73 numbered, double map sheets, plus sheets 0 - 0b.

Versions of the 1891 map book consulted:

1891, unrevised (accessed through www.sanborn.com)

1891, rev. August 1901 (original volumes accessed through History San José Research Library)

1891, rev. February 1921 (original volumes accessed through History San José Research Library)

Sanborn Map Company (1915). Insurance maps of San Jose, California, New York, 2 vol., 230 numbered single map sheets, plus sheets 0a - 0d.

Versions of the 1915 map book consulted:

1915, unrevised (accessed through www.sanborn.com)

1915, rev. March 1929 (original volumes accessed through History San José Research Library)

1915, rev. March 1917-June 1930 (original volumes accessed through History San José Research Library)

2. Sanborn Fire Insurance Maps for Campbell, California

Sanborn-Perris Map Company, Ltd., 1899, unrevised, Insurance maps of Campbell, Santa Clara Co., California: New York, 2 map sheets (www.sanborn.com, last accessed 20 October 2007).

Sanborn Map Company, 1905, unrevised, Insurance maps of Campbell, Santa Clara Co., California: New York, 3 map sheets (www.sanborn.com, last accessed 20 October 2007).

Sanborn Map Company (1908, unrevised). Insurance maps of Campbell, Santa Clara Co., California: New York, 3 map sheets (www.sanborn.com, last accessed 20 October 2007).

3. San José City Directories

Husted, F.M., publisher, various years, San Jose city directory including Santa Clara County: F.M. Husted, San José, California.

These city directories, the predecessors of telephone directories, include listings for the cities of San José, East San José, and Santa Clara. The primary resource for names and addresses was the city directory for 1905-06. Other city directories were consulted for the years 1880 through 1914. The Research Library at History San José provided access to its collection of city directories.

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
100	1a	"County Jail--The county jail is in good condition, no repairs being necessary, with the exception of iron tie rods through the brick work under the water tank." [The old County Jail, the one in this damage report, was directly in back of County Court House, in middle of block between Market Street and 1st Street. The new County Jail (called the Hall of Justice) was built in 1905, in back of Hall of Records but facing Market Street. This building had not yet replaced the old County Jail by April 1906. The water tank was positioned over the NE wall of jail yard, opposite the main cell block.]
200	1a	"County Court House--The foundation and first story found to be in safe condition, also all of the second story, with the exception of the court room and District Attorney's offices. In the court room the trusses have have dropped down and damaged the plastering and ceiling, but can be used until repairs are made. In the District Attorney's offices two cross walls will have to be taken down and rods run through and the walls rebuilt. The trusses under the dome are in good condition and the dome is safe. Four trusses back of the dome have dropped off of the wall and are in bad condition. A number of brick walls in the attic are down, but are low walls and are not dangerous. With the exception of the District Attorney's offices and the one court room, the Court House can be used."
300	1a	"Nabury Building or Oakland House--We find that the same is safe for the present, but will need to be rodged and tied together and repaired, but can be used as at present."
400	1a	"Hall of Records --The Hall of Records in the basement and first story are safe, with the exception of the southwest corner, which is unsafe; the second story is not safe and must not be used."
500	1a	"St. James Hotel--We find that the hotel in the main is in fair condition. The brick walls in the front building are standing fine and have but few checks. Posts have been ordered under two of the small arches in the rear hallway, and the walls on the fourth story in the rear to be taken down part way. The annex facing on St. John street has been found to be unsafe and this committee recommends to have it condemned and taken down."
600	1a	St. James Annex. "The annex facing on St. John street has been found to be unsafe and this committee recommends to have it condemned and taken down."
700	1a	"Sweigert Building--The Sweigert Building, at the southwest corner of St. John and First streets, has been found to be unsafe and should be condemned by the Fire Commissioners. It should be braced well first before the work is commenced of taking down this building."
800	1a, 11, 12, 65	Source #1a: "Phelan Building--The Phelan Building should be well braced and made safe and all portions taken down that are necessary to place the building in a safe condition." Source #65: Phelan building: Dr. De Crow was killed. (p. 4) Sources #11, 12: Photographs and postcards show that this building collapsed entirely.

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
900	1a	"Odd Fellows' Building, southwest corner of Third and Santa Clara streets --Stairs and platforms of same not safe; must be supported under same; no heavy weights or crowds must be allowed on the stairs. Temporary shores must be erected along the entire east wall of building and, when possible, to be rebuilt from the sidewalk level up. West fire wall to be torn down immediately, if possible, and all loose or broken glass removed. Will be safe for the stores below and occupancy above when shored." [This building is still in use. From an inspection in March 2006, Masonry D construction is evident: brick walls free-standing, not well anchored. Old tie rods run through building between first and second floors; tie rods are scant between second and third floors. The brick walls have recently been internally braced (2006 observation).]
1100	1a	"Conservative Realty Building--Northwest plaster brick corner must be shored temporarily, but as soon as possible to be torn down and back approximately 10 feet and rebuilt plumb. This building is perfectly safe and around otherwise."
1200	1a	"Lower walls and brick pilasters intact. Northwest corner of the second story street walls, also northeast corner on rear and street sides, to be torn down and set back to plumb lines."
1300	1a	"Unique Theater Building--This building was carefully inspected and condemned unanimously; must be torn down as soon as possible; occupancy above or below not safe."
1900	1a, 1b	Source #1a:"Richards Building. West half should be taken down; east half braced until repaired. Front east part of front wall must be taken down and brick work replaced; needs new steel girder. Repair roof, ceilings and some rear portions of the buildings." Source #1b (inspection on Monday, April 23 1906 and newspaper report on Tuesday, April 24, 1906): "Richards Building--The Richards Building since reported on Saturday [April 21, 1906] is settling more into the street and should be properly braced before any more work is done on the same." [Stewart's Shoe Store below, Ideal Tea Co. 2 stories above. It is evident that the entire structure was compromised by substantial settling. Liquefaction seems likely as the cause of settling.]
2100	1a, 1b, 47	Source #1a: "Knox-Goodrich Building--Rear wall needs repairs near top and wall in general needs some repairs; about 12 feet down from top should be rebuilt. In Eagles' Hall the second story of this building needs tie rods, etc., to tie said east wall in place. This building can be placed in good condition with some repairing in general if placed in the hands of an architect." Source #1b: "Eagle Hall should have some necessary repairs for safety made at once on the east wall; this building should not be occupied until these repairs are made." Source #47: Eagles Hall was built in 1900 on 3rd St., corner St. John St., as a Masonic hall; in 2006 the façade had been saved and was being used in the St. James Park office tower.
2200	1a	"Have inspected Dr. Bangs' Sanitarium, situated on North Third street, and find some broken plastering and cracked walls, but nothing dangerous."
2300	1a	"Martin Estate, Jarman's Store--Upper front second story to be torn down to girder; we recommend that the same be braced up until so done; must not be used on second story; can be used below [on first floor] after shoring."

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
2400	1a, 65	Source #1a: "Methodist Episcopal Church, South--Second story walls badly shattered and dangerous; assemblages and others must keep out of second story; better shoring must be placed along the San Fernando street side and stronger than at present. Loose brick and portions of the fallen firewalls must be cleared off the roof. Source #65: Central Methodist Episcopal Church: slightly injured (p. 3).
2500	1a	"Tococo [sic: Toccoa] Building, San Fernando street--In very good condition; a few repairs and safe for stores below and occupancy above. Shore up brick pilasters at end of the building in front."
2700	1a	"Belloli Building--Shore and jack up brick pilasters; needs same badly. Upper portions over the rear entrances to the second stories to be supported and made safe; at present very dangerous. Remove loose terra cotta and brick work; this work must be done immediately, as the same is dangerous. Rear wall of hall above to be torn down and rebuilt and the north wall repaired; must not be used until put in safe condition; building otherwise all right and can be repaired."
2800	1a	"William H. Krause or Bethell Block, South First and and Carlos--Fire walls to be rebuilt; otherwise sound and safe."
2900	1a	"Holy Jumpers' Building--Shore up south brick columns; in fair condition and can be repaired, not safe in same until repaired."
3000	1a	"Kuchenheuser Foundry--Will move; unanimously condemned." [1905-06 City Directory: F. Kuchenbeiser Co, Inc., foundry and machine works. Inspectors gave no address; 1891 (rev. 1901) Sanborn gives address as #71 S. 3rd Street.]
3100	1a, 11, 12, 65	Source #1a: "Gardiol and Kappa, or N.S.G.W. Building--We recommend that the entire second story be torn off, shore up main entrance immediately, cover sidewalk openings; first story can be saved." Source #65: Upper story demolished; lower floor (Santa Clara Valley Wine Co.) "suffered but little damage" (p. 3). Source#65: "rear wall fell out," crushing the wall of adjoining residence and killing baby Higuera (p. 3). Sources #11, 12: Postcards and photographs show extent of damage to front and side of this building. [This building housed the second-floor meeting rooms of the Native Sons of the Golden West. The rear wall of this building fell out into the small dwelling to the rear on 3rd Street, killing baby Higuera.]
3200	1a	"Jose Theater [sic: Theater Jose]. Safe and sound. Can be used with safety."
3300	1b	"C.P. Bailey Glove Co., 404 North Fourth street--Brace south wall with heavy timber and it will be in safe condition until the proper repairs are made."
3400	1b, 15	Source #1b: Ward residence, Southeast corner Third and Empire streets--House condemned and should be taken down as soon as possible, it being dangerous for the public." Source #15: "Wrenched out of shape; torn from its base; temporarily shored up to prevent from falling into Empire Street; will have to be torn down."
3500	1b	J.C. Black residence, 322 North Third street--Condemned and should be taken down.

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
3700	1b, 65	Source #1b: "First M.E. Church, North Second street--South brick wall taken down from top as far as out of plumb and replaced with new brickwork and well anchored with bond irons. Should have additional tie rods in rear of Auditorium, two rods will do and one in front of Auditorium. The rear wall and return part of north wall as far as damaged and cracked, to be taken down and replaced with new brick work. During the taking down of these walls and rebuilding of the same, the north and south walls to be properly shored and braced. The church should remain closed until all work to the adjoining buildings and repairs of same are made safe in every respect." Source #65: First Methodist Church: "cracked from end to end" but "still standing." (p. 3).
3800	1b	"Bank of San Jose Building, Northeast corner of Santa Clara and First streets--The northeast corner of the banking room brick wall is in bad condition, crushed and unsafe. Basement and all foundations under the bank and under the entire building are in good condition. Front on Santa Clara street and First street first story, the iron work and supports of same are racked and out of its [sic] original position. Brick wall on north side of the stairway is broken on east and west ends. North party wall with Knox-Goodrich Building in good condition. The building is not safe for occupancy in its present condition and should be heavily shored up at each column on both streets, which, if properly done, would render the building temporarily safe and until the entire building is remodeled and repaired, as the upper stories are somewhat out of plumb. The east wall of said building is condemned and should not be used." [1905-06 City Directory gives N. 1st St, NE crnr Santa Clara Street. This location is the same as for index #9200, which has a substantial damage report and is also in the list.]
4000	1b	"Baptist Tabernacle. Southeast corner Second and San Antonio streets. Church is safe for occupancy with the exception of the rear room and the gallery. These latter must not be used until repaired, strengthened and made safe." [1905-06 City Directory gives address as 2nd Street, NE corner San Antonio Street. City Directory is presumed correct.]
4100	1b	"172 South Second street, Mastretti Owner. Repairs needed on roof, clearing of bricks, etc. Otherwise building is safe for occupancy above and below."
4200	1b	"One-story frame building south of [172 South Second street]--Repairs needed, but otherwise safe." Assume that repairs are of the same type and magnitude as for index #4100 (cleaning of bricks from roof, etc.) These two houses are adjacent and were noted in the same inspection report.
4300	1b	"Second Presbyterian Church. Was carefully inspected and found safe as it ever was, fallen plaster, etc.; otherwise not damaged." [No address given by inspectors; 1905-06 City Directory gives address as 2nd Street, near William Street; 1891 (rev. 1901) Sanborn shows the structure between #469 and #497 S. 2nd Street, second lot N of E. William St., W side of S. 2nd St.]

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
4400	1b, 1e	Source #1b: "Centella Church. Examined exterior only. Tower on northeast corner of same must come down, especially the brick veneer. Otherwise the inspection was uncompleted, not being able to get inside. Will inspect interior later." Source #1e [for damage inspected 4/27/1906 and reported 4/28/1906]: "Centella Church, Second and Reed--Inside in good condition and safe; must close sidewalk at corner more effectively." [No address given by inspectors; 1905-06 City Directory gives address as 2nd Street, SW corner Reed Street; 1891 (rev. 1901) Sanborn shows Centella M.E. Church at that location.]
4500	1b, 65	Source #1b: "Franklin Fire House. Walls and woodwork badly shattered. Unanimously condemned." Source #65: Franklin Engine house: "demolished." (p. 3).
4600	1b	"Library Hall; Owner, C. W. Quilty. Dancing hall must not be used until the fire wall of the Odd Fellows' building [adjacent] is repaired and the building repaired throughout, especially the roof, which must be strengthened inside or supported. Shore west end and front of building for temporary safety until the same can be properly strengthened." [Failure of neighboring Odd Fellows' building compromised this building. This building also suffered damage independent of Odd Fellows' damage to it: the roof lost its structural support.]
4800	1b	"W.E. Allen's Emporium, South Second Street. With a few much-needed repairs, the same is safe for business." [From 1905-06 City Directory: Wallace E. (W.E.) Allen, pianos, sewing machines, and clocks, #14-16 S. 2nd Street; inspectors gave address only as S. 2nd Street.]
4900	1b	"No. 20 South Second Street, Mrs. Farley, owner. Safe above and below. Walls in good condition."
5000	1b	"Bristol Hotel, J.H. Miller Proprietor. Weak corner of shatter [sic] brick work in northeast corner of office very dangerous and posts must be placed under it immediately. Rear one-story portion of the dining room cracked, but no immediate danger. All loose brick should be removed. Safe below and above for occupancy after the above conditions have been complied with."
5100	1b	"Wenger, Knapp & Clark Apartment House and Stores. Safe above and below and in fine condition." [No address given; 1891 (rev. 2/1921) Sanborn shows this building at 40-44 S. 2nd Street; this location agrees with position in inspectors' trajectory down S. 2nd Street.]
5300	1b	"Wells Fargo Building, corner Post and Market Streets. Northeast corner, north side, center to be removed from top to top of windows, and have tie rods put through at top of windows and another tie rod in wall at height of roof joist. Front should have both corners removed and rebuilt down to window sills and more tie rods. Supports of second story front to be put in proper position." [1905-06 City Directory gives Market, corner of Post, as address of Wells Fargo & Co. Express, and 1891 (rev. 1921) Sanborn shows Wells Fargo Express at #40-44 S. Market St., NE corner of Post St.]
5400	1b	"Stores Nos. 30, 32 and 38 South Market street should have the front fire wall drawn back to position by iron anchors well secured and four to each store."
5500	1b	"Stores Nos. 30, 32 and 38 South Market street should have the front fire wall drawn back to position by iron anchors well secured and four to each store."

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
5600	1b	"Stores Nos. 30, 32 and 38 South Market street should have the front fire wall drawn back to position by iron anchors well secured and four to each store."
5700	1b	"Nos. 24 and 28 South Market street should have fire wall in front removed and rebuilt, anchored, four to each store at top of fire-wall as well as at ceiling."
5800	1b	"Nos. 24 and 28 South Market street should have fire wall in front removed and rebuilt, anchored, four to each store at top of fire-wall as well as at ceiling."
5900	1b	"Saloon Nos. 12 to 20 South Market street should be rebuilt in front wall."
6000	1b	"Southeast corner of Market and Santa Clara streets--The southwest corner to be rebuilt and well anchored back. Main corner to be well anchored."
6100	1b	"Press Saloon building--Column at corner needs resetting. Tie rods put in rear second-story wall and wall pointed up".
6200	1b	"Scandinavian Exchange on Post street--Front fire-wall to be taken down to the break between roof and the ceiling. Brick wall at stairway first floor to be removed, and wood replacement. Wood posts in front to be replaced."
6300	1b	"Pacific Hotel, Market street--Rear wall of hotel part to be removed and replaced from second floor to bottom of foundation."
6400	1b	"[Pacific Hotel] Lodging House Annex at rear, including toilets, condemned." Second report from same source: "Branch of Pacific Hotel, on Market Street. Building condemned."
6500	1b	"Cambers' Store--Front dangerous. Top to bottom should be torn down. Wall at center of Cambers' should be removed to rear of the opening, cut through the wall. Fire-wall in front of hotel proper dangerous; should be taken down to below cornice."
6600	1b	"Kitchen of Pacific Hotel is dangerous on account of hanging portion of St. Joseph's Church. Column at front of south wall anchored back into the wall." [St. Joseph's Church is next door, immediately adjacent to the kitchen.]
6700	1b, 65	Source #1b: "Russ House [including annex]--Front wall leaning out above second floor. Front wall of annex removed at once; dangerous. Front wall of main building on First Street tied in at once and loose brick removed. Rear fire wall--First Street building remove to ceiling joist. Ladies' toilet in annex dangerous; remove at once. Steel girder across kitchen should be resupported and temporary column put under now. Remove awning on San Antonio Street." Source #65: Conkling Grocery Co. -- destroyed (p. 3). Russ House Annex substantially collapsed (photograph).
6800	1b	"Telephone Building. Rear corner badly cracked at top and should be taken down; rear fire wall at top removed and replaced. Building at present is perfectly safe, if loose portions are removed." [1905-06 City Directory gives #130 S. Market Street as address of Sunset Telephone and Telegraph Co. Telephone building is a fairly new building, most likely URM C.]
7000	1b	"Western Hotel, Market street. Store room at rear to be repaired. Portion of rear fire wall to be removed. In excellent condition."

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
7100	1b	"Hotel Metropole. One place needs repairs on Post Street entrance. Pier at north side, Market Street, needs steel or cast column. Fire wall in front to be put in good condition and to be thoroughly anchored back to building. In excellent condition."
7200	1b	"No 36 South San Pedro Street. Corner Post and San Pedro streets. Fire walls down, plaster cracked, flues and rear fire wall in bad shape. Arch over Post Street entrance should be replaced."
7400	1b	"Washington House Building. Santa Clara street, between San Pedro and Market streets. Rear brick wall, remove to top of windows; west wall, remove to second floor, remove rear corner. Front fire wall should be examined between ceiling and roof. One-story brick part on San Pedro Street to be condemned."
7500	1b	"Jefferson House, Santa Clara and San Pedro Streets. First-story rear wall next to Lamb's to be repaired. Fire wall at west side, second story at the rear, portion should be removed and rebuilt. Front and side wall should be inspected where cracked. Pier at west side of Santa Clara Street front supporting girder should have a proper support. Column on the corner, reset."
7600	1b	"Normandin - Campen Company. Front wall, removed; rear brick wall to be removed where pushed out; north fire wall, removed above the ceiling joist; front part of north wall, removed and rebuilt; front part of south wall, removed and rebuilt."
7700	1c	"The Theater Building or Phelan Block. Found to be in very good shape, also all the stores under are in good condition. A few walls on the third story are cracked, but in the main the building is safe for occupancy."
7800	1c	"The Mansion House. Found to be in fair shape. Rear walls to be repaired. The building can be used, as we find it in good shape. The stores under this building are all safe and can be used."
7900	1c	"The Rucker Building. Found to be unsafe and cannot be used at all. The two top stories have to be taken down, also part of the first story."
8000	1c	"The Knox Block Building, Northwest Corner of First and Santa Clara. The rear wall is in fair shape; the joists on the second story next to the Auzerals Building have dropped down and should have posts under at once. The larger part of the second story in front should come down, but the building seems safe at present."
8100	1c, 51	Source #1c: "The Auzerals Building. In the front the stores seem to be in fair condition; few iron columns have moved out but can be replaced; the second story of this part can be repaired and is in fair shape; the third story we find quite bad and part of it will have to be taken down; side walls in this story found to be in good shape. The rear or all back of the main building found to be in quite bad shape and the larger part of the ell should be taken down, especially in the rear under the water tank." Source #51, damage reported as of 4/22/1906: "The debris caused by the cave-in of the roof of the Auzerals Building was almost entirely removed and the breaks in several walls will soon be repaired."

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
8201	1c	"Farmers Union Building. Found to be in safe condition. The east wall has sprung out next to the vault and should be braced up at once." [Inspectors gave no address; 1905-06 City Directory gives Santa Clara St., NW corer San Pedro. Main building fronts on W. Santa Clara Street and stretches along N. San Pedro Street.]
8202	1c	Farmers Union Building [annex]. "The annex front should be taken down and post should be put under girder in the mill".
8300	1c	"Lamolle House. Has been inspected and the front columns should be braced up at once. The side wall on San Pedro street, first story, shattered and should be repaired at once. The second story found to be in fair shape, except the rear corner next to the Rea Building, which has fallen. This wall should be repaired at once; the third story cracked, but is not dangerous."
8400	1c	"G.J. Ryan, Owner. Anchors being placed in present wall should be five cement blocks and should be at least five-eighths inch thick and five inches wide. Rear wall should be taken down and rebuilt, which would allow side walls to be drawn into place. Second floor joists should be shoved up before side walls are drawn."
8500	1c	"Mrs. L.D. Letcher--flats; 295 thr. 321 North Market Street. In good condition. Base of [?] being taken out and chimneys shored up."
8600	1c	"Eureka Hotel, Bassett and Market Streets, Eugene Pozzoio [sic: Pozzio], Prop. In good condition; safe to use."
8700	1c	"Newlands Hotel, Northeast corner Bassett and Market Streets, Morrison Sisters, owners. In good condition; safe for occupancy."
8800	1c	"Telescope Hotel, corner Little Market and Bassett Streets, Mrs. Snook, Owner. In safe condition, except chimneys. Front somewhat out of plumb."
8900	1c	"Washburn School, Devine and San Pedro Streets, George Washburn, Owner. In fine condition except chimneys."
9001	1c	Hotel Vendome [Main building, front, south end]. "Considerable part of foundation on ends of front must be rebuilt."
9002	1c	Hotel Vendome [Main building, front, north end]. "Considerable part of foundation on ends of front must be rebuilt."
9003	1c	Hotel Vendome [West wing, main building]. "Foundation of west wing in good condition."
9004	1c	Hotel Vendome [Dining room]. "Rear annex over dining-room has gone away about two inches on third floor." [The dining room formed the stem of a "T" on S side of main building (to the rear of the hotel, overlooking extensive gardens). The dining room addition to hotel had 3 stories plus basement.]
9005	1c	Hotel Vendome [Bath Hall]. "Music hall and bath hall in fairly good condition." [Swimming and bowling complex northwest of main building]

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
9006	4, 11, 67	Hotel Vendome Annex [north of main building]. Source #4: Annex "badly damaged" (p. 72). Sources #11 and 67: The collapsed annex was a rectangular building at the right front of main building (facing front of hotel from N. First Street) with long axis slightly angled towards front of hotel; length of annex was somewhat shorter than that of main hotel; annex had 3-1/2 stories and brick basement. The inspectors did not comment on the collapsed annex. The "annex over dining ell" (to the rear of and attached to main hotel) is NOT the structure photographed (Source #11) as having sheared to side, telescoping all floors above first.
9008	1c, 4	Hotel Vendome [Main building, north side]. Source #1c: "Considerable part of foundation on ends of front must be rebuilt, also on north side of main building." Source #4: Paul Masson lost 62,000 "neatly stacked" bottles of champagne in the hotel cellars (p. 72).
9200	1c	"San Jose Abstract Building. Front upper story badly shaken up and dangerous and should be shored up to protect the public; the rear wall has fallen out and leaves the return wall in dangerous condition. Finding the north wall one inch in seven feet out of plumb, by actual plumb line. Building condemned, to ground floor. Basement and ground floor in good condition."
9300	1c	"Letcher Automobile Garage, Northeast Corner First and St. James Streets. North wall in good condition (except rear fire wall). Front shattered and condemned. All of south wall as far as damaged to be taken down and rebuilt. Southeast corner is in dangerous condition. To be taken down and rebuilt. On the north wall in front one truss is not safe, as wall is broken. Trusses are not over any of the piers." [In 1906 the building was brick (URM D). This description of damage is typical of severe damage to URM D (brick) -- fire wall damaged, wall "shattered" or "broken", walls to be "taken down and rebuilt", roof trusses sheared off piers and no longer supported from below.]
9400	1c	"Two-story residence, northwest corner St. James and Second streets condemned."
9500	1c, 47	Source #1c: "First Church of Christ Scientist. In first class condition and safe in every respect." Source #47: Built 1904 in shape of Greek cross; 2 tall stories with central dome.
9600	1c	"Central Christian Church, South Second Street. Plaster cracked, loose bricks on chimney to be reset; safe and can be used." [Inspectors mistakenly gave location as South Second Street, rather than North Second Street, between St. James and Julian streets.]
9700	1c	"Japanese M.E. Mission, [255? 256?] North Second Street. Should have shores put on south side at ends to protect adjoining property. This building is in very bad condition and needs attention." [Rightmost digit of street number in newspaper not legible; 1905-06 City Directory gives 255 North Second St.]

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
9800	1c, 4, 5, 47	Source #1c: "St. Claire Club House, Corner second and St. James Streets. West side wall very bad condition, unsafe and must come down. The front and side wall the same. About twenty feet at the rear might be put in good condition. This building unsafe and condemned." Source #4: Building was condemned but later rebuilt by architect and club member W.H. Weeks. Source #5: Third floor destroyed in rear, from photograph; no photo of front of building. Members are shown enjoying an <i>al fresco</i> breakfast in rear of damaged building, with elegant table linens and silver service. Photograph was taken one hour after the earthquake. Source #47: St. Claire Club, originally Santa Clara Club, was built in 1893 by architect A. Page Brown.
9900	1c, 65	Source #1c: "St. Mary's School. Building good and sound, with the exception of rear wall, which can be reconstructed part way down; must not use stage as it now is. Girders below stage must be replaced with new. Entire building can be used with safety except stage portion of building. Props must be placed under roof in rear." Source #65: St. Mary's Church. School building wrecked. (p. 3)
10000	1c, 65	Source #1c: "St. Mary's Church. South wall must be repaired, rear rebuilt part way and properly bonded. Must be temporarily shored for safety, also the front over entrance braced and made safe. Rod tower at gallery line where cracked with rods set through corner posts horizontally. Front taken down to stone work and rebuilt. Main entrance must not be used until made safe. Building from front back, and trussed roof in good condition." Source #65: St. Mary's Church: wrecked. (p. 3) [Note that the St. Mary's church steeples did not fall, but one cracked. Most church steeples in San José fell during the earthquake.]
10100	1c	"Safe Deposit Building. We recommend that all loose portions of brick and roof be removed at once, especially a brick return in rear of same. Roof over Fountain Alley dangerous. Building to be jacked up and all columns plumbed. Shore up Santa Clara Street side immediately. Building upstairs in good condition, and safe for occupancy after shoring."
10200	1c, 1a, 65	Source #1c: "Archer Building, Corner Fountain Alley and Second Street. Rear of top story rebuild. Front south party wall to be strongly anchored to front wall. Pilasters on front leaning out should be tied back. West wall of third story not safe; should be strongly anchored." Source #1a, damage inspected and reported April 21, 1906: "Archer Building. In very good condition. Few repairs needed for stores below and occupancy above. Shore up brick pilasters at ends of building in front." Also from Source #1d, damage reported April 24, 1906: "Roof should be relieved of weight at once. Portions of rear wall repaired. Front fire wall removed. Rear first story part repaired. Otherwise in good shape. Should have tie rods in rear second story wall. Rear porch should be reconstructed." Source #65: Nevada building "suffered by the throwing down of a portion of the front wall." (p. 3)
10300	1c	Chargin's Restaurant and Store, West of Same [Archer Building, corner Fountain Alley and Second Street]. "Should be shored up in center and east side. Under roof place trusses immediately."

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
10400	1c	"Phelan (Alice Building). Rear of party wall down to second story joist should be shored up and then taken down and forced back to plumb line. Rear wall is already down, and roof hangs over same in a dangerous condition and should be supported temporarily until rebuilt. Rear portion of store must not be used until placed in a safe condition. Steel tie rods must be run from north to south in building at foot of all the trusses over the large hall for permanent repair. Otherwise building is in good condition and can be repaired, [?] be rodded through and well anchored."
10500	1c	"Paul Block - David Jacks, owner. To remove bricks on fire wall. Photo gallery not safe until same is done. Otherwise in good condition."
10700	1c	"Kirk Building, Southwest Corner of Second and Santa Clara. Shore up east street wall, especially at front. Shore window. Rear fire wall: remove loose bricks."
10800	1c	"Kirk Building, West of Above [Southwest Corner of Second and Santa Clara]. This as well as additional Kirk building, all three in good condition and safe when shored up and repairs made."
10900	1c	"No. 29 Fountain Alley. All safe and sound."
11000	1c	"No. 31 [Fountain Alley]. Safe and in good condition".
11100	1c	"Northwest Corner Fountain and Second Street (Formerly McKagney's). Safe and in good condition."
11200	1c	"Nos. 35 and 37 Fountain Alley. Frame one-story safe and in good condition."
11300	1c	"Roberts' Block. Repairs in rear fire wall and portions of third story wall also. Fire walls of rear annex to be rebuilt and cleared immediately. Otherwise, Roberts building is safe and sound. First class. Tank on roof must have water drawn out immediately. Very dangerous. Must be attended to at once."
11400	1c	Source #1c: "Nos. 46 and 48 [South First Street]. Good and sound. One-story frame front."
11500	1c	"Tiny Block. Roberts & Gross below; lodgings on two stories above. Repair north fire wall."
11600	1c	"Druids' Hall--Adam Reel, Owner. Dangerous corner in rear above roof; should be attended to at once. Floor below roof must be cleared of bricks immediately."
11700	1c	"Letitia Building. Rear wall will have to be taken down and rebuilt. Should be taken down immediately. Third story rear wall especially dangerous. Photograph gallery not safe. All upper stone gables must come down." [This building exists at same location in 2006.]
11800	1c	Source #1c: "First National Bank. Front wall next to Archer's should be tied back with iron rods, also tied to the Archer Building. Front wall at the division between the bank and the Western Union Telegraph office should be anchored back. Wall between bank and the Western Union office at the rear should be rebuilt. Plaster in front reset. Roof needs to be relieved of weight of brick immediately and repaired at once. Also fire wall on First street should be partially taken down. South and west fire wall removed and repaired and anchored."

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
11900	1c	"Home Mutual Building, West Santa Clara Street. Rear wall to be tied to division wall at east side; loose brick removed and repaired."
12000	1c	"Mercury printing establishment. Brick wall between two-story [at front] and one-story part (first story) [at rear] should be rebuilt and tie rods run full width. Rebuild portions of brick wall back of wrapping table. Arches in front should be removed and steel beams put across with metal columns well anchored back into wall and tied from side to side. Building should have tie rods running clear through north and south and building drawn together. North wall first-story part where joining second-story portion should be rebuilt. Front wall north side is leaning out -- should be repaired. The building is at present shored up in good shape and is safe."
12100	1c	"National Laundry. Fire walls to be rebuilt, otherwise the building is in good shape"
12300	1c	"Park Hotel Building. Front entrance should be rebuilt. Rear outside stairs repaired and strengthened. Rear balconies put in good condition. Flue thimbles all to have tin thimble covers. Tie rod at south corner of the rear to run east at third floor and ceiling, and portion of south wall should be rebuilt. Rear fire wall should be removed down to top of window frames and rebuilt and reanchored. Steel lintels over all third story rear windows secured by tie rods. Flues should be examined before they are used. Building is in very good condition and perfectly safe."
12400	1c	"McKagney's Building, Santa Clara Street. Front wall dangerous. Front should be roped off and braced. West wall in bad shape. Girder entering at rear wall, first story, part needs supporting. Danger of fire at rear is very great on account of excelsior and other rubbish. Second story rear wall and the support of second story rear wall condemned. Rear fire wall, first story part, needs rebuilding where pushed out."
12800	1c	"Brassy Building, Market Street. Plaster in front of second story should be removed; front fire wall drawn in with iron anchors and plaster rebuilt. Otherwise in fine condition".
12900	1c	"Taylor Block. Chimneys down and roof broken in. Roof needs repairing to keep water out. Otherwise in excellent condition and perfectly safe."
13000	1c, 64	Source #1c: "City Hall. Police office, two small cracks. Ante-room, one small crack. City Physician's room, crack on inside wall next to Park Avenue. Large arch in room at north of corridor badly cracked, also walls have small cracks. Shore up the corner of inside wall next to stairs facing the San Antonio Street entrance. South wall of the main corridor from the main floor up to the second floor should be rebuilt, also portions of the same wall above second floor. North walls of main corridor should be replaced in shattered portions above the doors. We suggest that bond irons be used freely throughout the building. Necessary repairs in walls should be made at once, especially the elevator, and pending repairs to elevator walls it should be braced. Rooms that can be safely used after loose plaster, etc. have been removed are: Mayor's office, Board of Health room, Justice Davison's room, Treasurer and Collector's rooms and vault, Chief of Police's office, Superintendent of School's room, Engineer's rooms, to Park Avenue. Large arch in room Council chamber, City Clerk's room, Superintendent of Street's [sic] office, all of basement portion. In fact all rooms may be used except Justice Davison's court room and Board of Education room." Source #64: The old City Hall was razed in 1958.

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
13200	1d	"Brown building, 143, 145, 147 and 149 North Market street--Rear walls and fire walls to be repaired; part of rear walls to be taken down to tops of windows; one-story part in rear found to be in bad shape."
13300	1d	"Capitol House, Nos. 82-86 North San Pedro street--Building badly damaged and is not safe and should be partly taken down."
13400	1d	"85 and 87 North San Pedro street--Found to be in good shape and is safe."
13500	1d	"73 and 75 North San Pedro street--Rear wall to be repaired; side walls found in good shape; building can be used."
13600	1d	"Lord & Westlake, 59, 65 and 69 North San Pedro street--Front columns badly damaged and to be taken down; back in good condition, also sides; this building can be used with safety."
13700	1d	"Waterhouse & Lester, 49, 51, 53 and 55 North San Pedro street--Front and side walls to be taken down; front part of this building found to be in very bad shape; rear part can be used."
13800	1d	"No. 45 North San Pedro street--Wood building; has to be furnished with underpinning."
13901	1d	No. 41 North San Pedro street. "One-story frame to be raised and can be repaired."
13902	1d	No. 43 North San Pedro street. "One-story frame to be raised and can be repaired."
14000	1d	"39 North San Pedro street--Wooden cottage in good shape."
14100	1d, 53	Source #1d: "Hook and Ladder Company, No. 30 North San Pedro street--Can be repaired." Source #53: "Hook & Ladder 1's quarters on San Pedro Street collapsed in a shower of bricks, putting the company out of service and killing Foreman Paul Furrier as he fled the building (p. 44)."
14200	1d	"Nos. 16 and 18 North San Pedro street--Front to be taken down; side and rear walls in good shape." This building is likely a very old structure; 1891 (rev. 1901) Sanborn gives construction as "frame special" -- most likely frame surrounding URM or adobe interior walls.
14301	1d	No. 24 North San Pedro street -- "Wooden cottage, as good as ever."
14302	1d	No. 26 North San Pedro street -- "Wooden cottage, as good as ever."
14303	1d	No. 28 North San Pedro street -- "Wooden cottage, as good as ever."
14400	1d	"No. 44 North San Pedro street--Frame cottage in good shape."
14500	1d	"No. 52 North San Pedro street--Frame building not injured."
14600	1d	"No. 58 North San Pedro street--Frame building not injured."
14700	1d	"No. 74 North San Pedro street--Frame building not injured."

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
14800	1d	"La Franc Building, No. 163, 165 and 167 West Santa Clara street--All the front arches to be taken down and steel beams should be put in; corners in front and rear and side walls found to be in good shape; also front wall on the second and third story; basement found to be in good shape. The building in the main found to be safe and can be used. West wall on third story has gone out a little, and will have to be rebuilt; also tops of fire walls."
14900	1d	"Lyndon Building, 171 West Santa Clara street--Fire walls to be repaired; also east side of roof to be repaired. Back wall to be taken down to the ceiling line [?] of the second story. Front seems to be in good shape except iron pilaster on front west corner has broken; otherwise the front is in good shape. All rear walls and side walls of first story found to be in good shape, and safe for occupancy."
15000	1d	Notre Dame Convent. "High School Building--Front room down stairs not safe; also upstairs not safe. The north rooms down stairs in the rear can be used."
15100	1d	Notre Dame Convent. "Grammar School--East front badly cracked and unsafe and should be braced and rodded before using."
15200	1d	"Notre Dame Convent. Primary School found to be in excellent condition."
15300	1d	Notre Dame Convent. "Dormitory building should not be occupied until the proper repairs are made. Assembly Hall, fair condition, to be properly repaired."
15400	1d	Notre Dame Convent. "North end of art building must come down."
15500	1d	Notre Dame Convent. "Art and chemistry building fair with repairs."
15600	1d	Notre Dame Convent. "Infirmary and dining room wing undamaged."
15700	1d	Notre Dame Convent. "Novitiate, the west wall needs proper repairs."
15800	1d	Notre Dame Convent. "Dormitory of Sisters, south end needs repairing."
15900	1d	"No. 259 West Santa Clara street--Frame dwelling house; the house was closed up; the exterior appearance seems to be good."
16000	1d	"No. 261 West Santa Clara street--Frame building, good condition."
16100	1d	"No. 265 West Santa Clara street--Frame building, good."
16200	1d	"No. 269 West Santa Clara street--Brick cottage; in good condition."
16300	1d	"No. 271 [West Santa Clara street]--The same [brick cottage; in good condition]."
16400	1d	"Nos. 287, 289 and 293 West Santa Clara street--In good condition."
16500	1d	"No. 299 West Santa Clara street--One-story brick store; good condition."

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
16600	1d	"Nos. 301, 303, 305 an 307 [West Santa Clara Street]--Brick building; northwest corner in rear to be taken down to top of first floor joist; brace rear porch as soon as possible; otherwise the building is safe."
16701	1d	"No. 319 [West Santa Clara street]--Building found to be in good shape."
16702	1d	"No. 323 [West Santa Clara street]--Building found to be in good shape."
16703	1d	"No. 325 [West Santa Clara street]--Building found to be in good shape."
16801	1d	"No. 327 [West Santa Clara street]--Wooden buildings, in good shape."
16802	1d	"No. 337 [West Santa Clara street]--Wooden buildings, in good shape."
16803	1d	"No. 347 [West Santa Clara street]--Wooden buildings, in good shape."
16804	1d	"No. 357 [West Santa Clara street]--Wooden buildings, in good shape."
16805	1d	"No. 359 [West Santa Clara street]--Wooden buildings, in good shape."
16806	1d	"No. 361 [West Santa Clara street]--Wooden buildings, in good shape."
16807	1d	"No. 371 [West Santa Clara street]--Wooden buildings, in good shape."
16900	1d	"Nos. 373 and 375 [West Santa Clara street]--Brick side walls good; front and rear to be repaired."
17001	1d	No. 387 West Santa Clara street. "All in good condition."
17002	1d	No. 389 West Santa Clara street. "All in good condition."
17003	1d	No. 391 West Santa Clara street. "All in good condition."
17004	1d	Nos. 417, 419 and 423 West Santa Clara street--"All in good condition."
17100	1d	"No. 429 [West Santa Clara street]--"Wooden building; in good condition."
17200	1d	"Rea Building. At the corner of Santa Clara and Market Streets two posts should be put under corner at once and the Market street side be repaired as soon as possible. On the fifth story, west wall to be taken down to top of fifth story windows. West wall of north wing to be partly taken down and rebuilt. The building as a whole found to be in good shape and safe."
17300	1d	"Spring Building. At the northeast corner of Market and Santa Clara streets the arch and columns to be taken down to the ground. The east wall of the north wing must come down and be rebuilt at once and fire-walls repaired; also light well walls. Walls running back of Oberon to be repaired. Otherwise the building found to be safe and can be used."
17400	1d	"Fisher Building. Back wall in pool room is cracked, but otherwise the building is safe and can be used with safety."
17500	1d	"Smout Building. Found to be in good shape; brick walls in the stairway to be repaired and back wall to be taken down a short distance. Fire wall to be repaired; otherwise the building is quite safe."

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
17600	1d	Source #1e: "Auzerais Building, 43 North Market. Rear wall to be repaired; also fire walls; otherwise the building found to be safe." Also from Source #1e: "South side damaged; building is not dangerous."
17700	1d	"Promis Building, 36-38 North Market. Found to be in good condition except rear walls to be taken down to the window heads. Also the light wells to have posts under ceiling of second story at once; otherwise building is safe at present."
17800	1d	"Yick Waker. Old wooden building should be condemned."
17900	1d	"National Guard Building. Front arch to be taken down and rebuilt. Rear wall to be taken down to the top of first story, as it bulges out. The front pediment to be repaired; fire-place in the northwest corner to be taken down and rebuilt; side walls seem to be in good shape; the building can be used with safety."
18000	1d	Source #1d: "The New York Exchange Hotel, or Vatuone [sic: Vatuone] Building, North Market. Front found to be in good shape; rear wall to be repaired on third story; fire walls to be repaired. This building is found to be in good condition and can be used; the top story annex to this building should not be used until proper repairs are made; rear and side walls being defective, we would advise the owners of this building to have it inspected as soon as the top story is removed." Also from Source #1d but from a different inspector: "Front side and rear walls found to be in good condition; one-story brick kitchen in rear should be condemned and taken down."
18100	1d	"Mrs. Pene [sic] Building, 80-82 North Market street. Is found to be in bad condition and would recommend it all to be taken down except the north wall."
18200	1d	"Raley Building, 84, 86, 88 and 90 North Market. Front found to be in good shape, except one pilaster on north side to be rebuilt. Rear brick wall on first story in good condition; light well should be braced up. Front and rear fire wall also chimneys to be repaired. In looking over the building, we find it safe for occupancy."
18300	1d	"Costello Building, 92, 94, 96 North Market. Found to be in good shape except fire walls to be repaired."
18400	1d, 38	Source #1d: "Wendt Building, Corner Market and St. John Street. Back wall on first story badly cracked and checked; should be repaired at once. Back wall on second story to be repaired; otherwise the building is safe." Source #38: photographs of the building.
18600	1d	"Olsen [sic: Osen] & Hunter Auto. Building. Part of side wall in front to be taken down; other damaged walls have been removed and ground floor safe for occupancy." [Inspectors gave no address; the #13-33 St. John St. address is from 1905-06 City Directory.]
18800	1d	"Building on the northwest corner of First and St John Streets. Front and side and rear walls found to be in good condition."
18900	1d	"Moir Building. Arches in front to be repaired as soon as possible; north side walls checked, but not dangerous; rear fire wall to be repaired; also east fire wall; we would recommend the water tank on the southwest corner to be removed as soon as possible."

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
19000	1d	"Tony Tognazi [sic], 261 and 263 North First Street. Found to be safe, but front second story to be rodged and repaired. Side walls and rear walls are in good shape; building found to be safe."
19100	1d	"Beatrice Building. Found to be in good condition; repairs on this building are few."
19200	1d	"Pellemo Building, 97 and 99, Corner Market and St. Augustine Streets. Rear wall to be repaired; also fire wall; otherwise building safe."
19300	1d	"85 North Market Street. Front and rear wall should be taken down to the top of first story; also side wall to be braced."
19400	1d	"Swiss Hotel. This is found to be an old wooden building, but it is as good at present as before the earthquake."
19500	1d	"Peirano Building, 73 and 75 North Market. First story, rear walls to be repaired and top story in rear to be partly taken down and rebuilt; side walls in good condition; otherwise the building is safe."
19600	1d	"Lyndon, 65 1-2 to 69 North Market--Front and back wall to be repaired; otherwise the building is in good condition."
19700	1d	"63 to 65 North Market--Front in good condition; rear to be partly taken down; fire walls to be repaired, otherwise the building is safe."
19900	1d	"53 North Market street--A wooden building, as good as before the shake."
20000	1d	"49 North Market street--Repairs on front and rear; otherwise the building is safe."
20300	1d	"Old City Hall engine house--Found to be in an unsafe condition and should be condemned." Source #53: The engine house "lost most of its upper works"; Engine #2 temporarily moved to a barn (p. 44).
20400	1d	"Lowe building, 21-25 North Market street--Rear wall badly damaged and should be braced. Front of building in good shape."
20500	1d	"19 North Market street--Fire wall to be taken down where cracked; also part of rear wall; otherwise safe."
20600	1d	"No. 15 North Market street--Wooden building, found safe."
20700	1d	"No. 9 North Market street--Second story should be partly taken off and rebuilt." [#11-13 North Market street is likely the correct address.]
20800	1d	"No. 101, Frank building, northwest corner of Market and St. Augustine streets--This building should be condemned and should be braced up at once for safety and taken down as soon as possible."
20900	1d	"Costa Hotel, 111 to 121 North market street--Building in bad shape; larger part of building to be taken down; no part of this building is safe."
21000	1d	"Columbia [sic: Columbian] Hall--Second story rear wall in bad condition. Side walls seem to be in fair condition; building should not be used until proper repairs are made."
21100	1d	"Yocco Building, 128-130 North Market street--Area in front stairway, also northeast corner, slight repairs; damage slight."

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
21200	1d	"Boarding house, Northwest Corner First and Julian Streets. In good condition and safe."
21300	1d	"Porter Packing House. Being used for the Emergency Hospital. In fine condition and perfectly safe."
21400	1d	"Ryland House, North First Street. In good condition and safe."
21500	1d	"Home Sanitarium on Fox Avenue. Foundation gone. Sills on the ground; vacated."
21700	1d	"R. C. Woods, 37 Fox Avenue. In bad condition; not occupied. Must be raised and strengthened."
21800	1d	"No. 56 Fox Avenue. Unsafe; should be braced on west side."
21900	1d	"No. 66 Fox Avenue. Off foundation; in bad condition; being repaired."
22000	1d	"No. 767 Miller Street. Unsafe; chimneys wedged at joist and bases gone. Should be shored up; house needs bracing." [Description of house from 1915 Sanborn (rev. 3/1917-6/1930). Address from inspection report.]
22100	1d	"No. 112 George Street. Off foundation; safe to use."
22200	1d	"No. 184 George Street. Off foundation; safe to use."
22300	1d, 7, 65	Source #1d: "California Compounding Company. Brick walls unsafe; must be torn down." Source #65: The works were "destroyed," although business resumed before noon (p. 4). Source #7: Company began at #481 S. 1st Street in 1905; moved to old Garden City Cannery building at #209 W. Taylor St. in 1906. (p. 33)
22400	1d	"Kelly [sic: Kelley] Laundry. Being repaired; safe."
22500	1d	"Woolen Mills, Chinatown. Total wreck."
22600	1d	"No. 707 North First Street. Unsafe; has been braced; not occupied."
22700	1d	"Garden City Brewery--Bassett Street. In fine condition; rear fire wall to be partly rebuilt."
22800	1d	"Pine Box Warehouse, Bassett Street. Settled under weight of large stock. Stock being removed."
22900	1d	"Stock Sons' Warehouse. And warehouse adjoining to have all walls removed to second floor joist. Roof in dangerous condition and should be removed at once."
22901	1d	"[Warehouse adjoining Stock Sons' Warehouse] to have all walls removed to second floor joist. Roof in dangerous condition and should be removed at once."
23000	1d	"No. 146 Santa Teresa Street. Off foundation. Safe to use."
23100	1d	"Nos. 136 and 138 Santa Teresa Street. Leaning. Should have new foundation."
23200	1d	"No. 88 Fox Avenue. In bad condition; unsafe. Needs bracing."
23300	1d	"No. 75 Fox Avenue. Unsafe; needs considerable repairs."

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
23400	1d	"No. 86 Fox Avenue. Safe if braced from rear."
23500	1d	"No. 68 Fox Avenue. Unsafe. Should be taken down. [Address is likely #76 Fox Avenue.]
23600	1d	"No. 95 Fox Avenue. Unsafe; needs bracing."
23700	1d	"No. 456 San Pedro Street. Needs bracing."
23800	1d	"No. 559 North San Pedro Street. Needs bracing."
23900	1d	"No. 579 North San Pedro Street. Off foundation; safe to use."
24001	1d, 7	San Jose Woolen Mills [main building]. Source #1d: "Main building in good condition. Outer brick buildings should have some brick walls taken down and rebuilt." Source #7: Woolen Mills Chinatown: Fire destroyed most buildings in 1902; Woolen Mills factory closed in 1910; Garden City Cannery (corner of San Pedro and Taylor Sts.) ceased operating in or around 1897 (owner Chin Shin closed the cannery and returned temporarily to China in 1897); Kelley Laundry (around 1899) and other businesses took over use of the cannery buildings (p. 32).
24002	1d	"San Jose Woolen Mills [picker house]. Outer brick buildings should have some brick walls taken down and rebuilt."
24003	1d	"San Jose Woolen Mills [warehouse]. Outer brick buildings should have some brick walls taken down and rebuilt."
24100	1d	"No. 647 North San Pedro Street. Off foundation. Rear part should be torn down; otherwise safe to use."
24200	1d	"No. 145 George Street. Off foundation; unsafe."
24300	1d	"No. 10 Miller Street--Vacant. Should be braced; unsafe."
24400	1d	"No. 99 Miller Street. Unsafe; should be braced."
24500	1d	"No. 65 Miller Street. Unsafe; foundation gone; has been braced." [Location and construction details not certain, but this house is probably on lot adjacent to #99 (A,B,C,D) complex. See 1891 (rev. 1901) Sanborn. Used 1915 Sanborn (rev. 3/1917-6/1930) for location. Two more partial entries without addresses (typographical errors in the newspaper) are below the entry for No. 65 Miller Street: "Should be braced at [sic] once; present", and "Unsafe; foundation gone; rear parts should be torn down." These two additional, heavily damaged, frame dwellings give further weight to the hypothesis of consistently and unusually high damage in this neighborhood.]
24600	1d	"No. 341 St. James Street. Should be braced at [sic] once; present braces insufficient." [Street number 341 not on any of the Sanborns; location is likely #320 on 1891 (rev. 8/1901) Sanborn (between #313 and #365).]
24700	1d	"No. 226 Terraine Street. Unsafe; being torn down."
24800	1d	"San Jose Transfer Company--Brick Warehouse. North wall out; balance of building safe."
24900	1d	"Special Internal Revenue Bonded Warehouse. North and south walls badly damaged".
25000	1d	"Southern Pacific Warehouse. East wall badly damaged; balance of building safe."

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
25100	1d	"Roseburg Warehouse--Ryland Street. East wall to be partly rebuilt."
25200	1d	"First House West of No. 262 San Augustine St. Very dangerous to adjoining house; must be taken down."
25300	1d	"No. 207 St. James Street. Off foundation; safe to use."
25400	1d	"Dr. Dogge, 152 North Second Street. Very good condition, except rear chimney footing to be shored up and replaced with new work before any fire is used in said flue."
25501	1d	"Howard Building, 27-29-31 East Santa Clara Street [No. 27]. Front to be shored up and iron supports to be put in position, and those damaged to be replaced with new ones. West rear portion of rear wall side return to be tied with rods, the east side of stair wall broken and needs repair. Basement and foundation is [sic] in fine condition. Two upper stories some repairing. Repair fire walls and flues. Roof needs attention. Upper safe for occupancy when entrance is repaired, etc."
25502	1d	"Howard Building, 27-29-31 East Santa Clara Street [No. 29]. Front to be shored up and iron supports to be put in position, and those damaged to be replaced with new ones. West rear portion of rear wall side return to be tied with rods, the east side of stair wall broken and needs repair. Basement and foundation is [sic] in fine condition. Two upper stories some repairing. Repair fire walls and flues. Roof needs attention. Upper safe for occupancy when entrance is repaired, etc."
25503	1d	"Howard Building, 27-29-31 East Santa Clara Street [No. 31]. Front to be shored up and iron supports to be put in position, and those damaged to be replaced with new ones. West rear portion of rear wall side return to be tied with rods, the east side of stair wall broken and needs repair. Basement and foundation is [sic] in fine condition. Two upper stories some repairing. Repair fire walls and flues. Roof needs attention. Upper safe for occupancy when entrance is repaired, etc."
25601	1d	"New Alta Building, 35-37-39 East Santa Clara Street. Front supports, first story, slightly racked, but not damaged. Lower stores in fine condition. Second story rear walls need some repairs and anchoring. Rear wall of third story to be taken down and rebuilt. Must be strapped [sic] and anchored. All flues and firewalls to be rebuilt and made safe, and no fires to be allowed in flues of rear wall."
25602	1d	"New Alta Building, 35-37-39 East Santa Clara Street. Front supports, first story, slightly racked, but not damaged. Lower stores in fine condition. Second story rear walls need some repairs and anchoring. Rear wall of third story to be taken down and rebuilt. Must be strapped [sic] and anchored. All flues and firewalls to be rebuilt and made safe, and no fires to be allowed in flues of rear wall." [Second entry for this building.]
25700	1d	"Beach Building, Northwest Corner Second and Santa Clara Streets. Basement in fine condition. Both fronts very little racked and in good condition. Upper stories in good condition, except plaster cracks. Rear brick wall down to ceiling of first story must be strongly anchored in; also the return on rear to be further taken down to plumb line. We recommend that the owners of the Howard, New Alta and Beach Building unite in a general plan of bonding the rear of all three buildings together as one building."
25800	1d	"Two-Story Residence, No. 90 East St. James Street. Condemned." [Street number as given is incorrect. This house is on the northwest corner of East St. James St. and North 3rd St.]

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
25900	1d	<p>"Porter Building. The entire basement and foundation is [sic] in excellent condition and also the stores in first story. Brickwork on Southeast[sic] pier broken and needs repair. Brick division wall cracked in rear. The brick tank tower in rear of this building should be taken down and rebuilt. Condemned [the brick tank tower]. The committee has recommended braces at once and they are now working at the same. Rear of north wing (brick wall) to have one tie rod on each floor. The north wall is in good condition. South wall of north wing needs anchoring, etc. West wall, second, third and fourth stories, some crushed walls need attention. Santa Clara street front [south or southwest side of building] also needs some repairs above first story. South side of drive on Second street on girder line brick work crushed pier. Rear of Second street fire walls to be taken down as far as damaged. All fire walls and flues, wherever broken and crushed, to be rebuilt. The entire building may be safely occupied."</p> <p>"San Carlos Lodging House, northeast corner San Carlos and Second street--Perfectly safe."</p> <p>"First Congregational Church, southeast corner San Antonio and Third streets--Safe and sound. Remove top of brick chimney on south immediately."</p> <p>"Ryland Building, northeast corner First and San Fernando streets-- Repair stone cornice in one portion. Rear wall of main entrance must be torn out and rebuilt, badly shattered but not dangerous. Otherwise in fine condition and safe."</p> <p>"Lick Stables--Brick corner up in stable portion to be repaired: not dangerous. Repairs to be made on fire wall. Rear brick wall to be taken down to floor line and rebuilt. Loose bricks on east side of roof to be removed immediately. Stairway dangerous for use until bricks on roof are removed."</p> <p>"Charles Navlet's, corner First and San Fernando streets--San Fernando street wall must be shored up immediately; badly shattered and in bad condition. Fire walls on street sides of building in good condition, but would recommend that iron braces be anchored to same from roof for future safety. After shoring side street wall, building will be safe for occupancy."</p> <p>"Central Block, 118 South First street, Auzeais Estate--Safe and in good condition."</p> <p>"Roschken Buildings--Good and sound and safe: first-class condition."</p> <p>"Mozart Building, L. Sonniksen owner--North and south fire walls, also rear wall, down to where same are broken, are to be rebuilt; would suggest strong anchors or rods. Back wall and fire wall taken down and loose brick removed from roof. Corner chimney can be anchored. Lower stores safe. Upper flats not to be used until the above repairs are made."</p>
26000	1d	
26100	1d	
26200	1d	
26300	1d	
26400	1d	
26500	1d	
26600	1d	
26700	1d	

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
26800	1d, 65	Source #1d: "O.A. Hale's buildings--Front of First Street store dangerous until south wall of adjoining building is properly repaired. South wall of Second Street building should be taken down to first story; dangerous for adjoining property until this is done. Northwest corner to be taken down at once. Fire walls generally to be repaired. North end second story cornice on Second street front should be removed at once; dangerous for pedestrians until cap of pilaster is removed." Source #65: Hale's store, First-street annex: "a total wreck. The roof in its entirety fell through and buried the goods on the shelves and counters." (p. 3) [O.A. Hale & Co., dry goods & general merchandise; the Hale buildin. runs between 1st and 2nd Sts., with an additional wing fronting San Fernando St. From 1891 (rev. 1901) Sanborn, store fronts are at #140-144 S. 1st St. (front of 1st St. store), #28-32 E. San Fernando St., and #127-145 S. 2nd St.]
26900	1d, 65	Source #1d: "First Christian Church--More tie rods needed at front of trusses. Unsafe for occupancy until repairs are made." Source #65: Central Christian Church: "suffered considerable damage," "the rear end collapsed," and "portions of the side walls fell out and the roof settled." (p. 3)
27000	1d	"Rutherford Block - Masonic Hall--Loose brick in north room of building ought to be removed at once. Southwest corner should be torn down partly and anchored. Building otherwise in good condition and safe after repairs."
27100	1d, 65	Source #1d: "George B. McKee Building--Lower story all right; upper street walls in bad condition; upper portion can be saved by rodding; not safe until so done; safe below." Source #65: Upper story collapsed; little damage to the first floor (p. 3).
27200	1d	"Richmond Block--Back porch dangerous; otherwise in first-class condition and safe. Brick roof pediment should be cleared off roof immediately and before rooms under same are occupied."
27300	1d	"The Elite Millinery Store. One-story frame; roof all down."
27500	1d	"Home of Benevolence--Dangerous for occupancy until new foundations are put in place and the underpinning set perpendicular. Facing should have stakes put back of same. All corners to be thoroughly braced in new construction. Chimneys should be newly constructed. Hospital Building--Should be straightened up for permanent occupancy. Safe for temporary occupancy. Chimneys should be taken down and rebuilt."
27700	1d	"Faber Building or A. O. U. W. Hall--All good and safe and in excellent condition. Safe above and below."
27800	1d	"Northeast corner, Post and Lightston streets--Front columns to be put in proper position. Secure front by anchors run back on second floor and ceiling joist. East wall should be rebuilt from top to bottom. Front fire wall on Post street should be anchored back at once."
27900	1d	"No. 59 Post street--Should be condemned, as a whole."
28000	1d	"Nos. 45 to 55 Post street--Front columns reset. Front fire wall should be rebuilt. Rear brick wall rebuilt in portions."
28100	1d	"C.J. Kune's building, No. 37 South first street--Fire walls should be rebuilt where they are broken down. South wall second story should be taken down from the front back to where it is broken and then rebuilt and tied back with anchors."

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
28200	1d, 65	Source #1d: "Kenoche's Building, Eldorado street [Post street in 1906], east of Schilling's--Front fire wall should be removed and rebuilt and well anchored. Balance of fire walls repaired. Connecting wall at the north, where connecting with Kune's First Street building, should be tied together. West wall of second story is badly shattered and should be rebuilt." Also from same source: "Second story is down. The brick walls from second floor to roof on First Street and Post Street sides should be rebuilt." Third report (from this building or nearby) from same source: "Lyndon property, Post street--Frame building in front, roof is off; parties were stopped from putting on new shingle roof. Rear portion of brick should be rebuilt in parts. The owner or tenants should be compelled to clean up the trash, rags, etc., from upstairs. (We should recommend that the building be condemned)." Source #65: Two upper stories fell in, killing Mrs. Helen Brandon. A man in adjoining room was not injured. (p. 3)
28300	1d	"Schilling's Building, Post street--Fire walls need rebuilding where broken. Front wall should be anchored back at roof and repaired. Small portion of rear wall at top must be rebuilt."
28500	1d	"T.C. Barnett's place, South First Street--Fire walls should be rebuilt."
28600	1d	"National Saloon--Fire walls where broken and north wall of front rebuilt where broken out."
28700	1d	"California Block, West Santa Clara Street--Two stone pilasters in front rebuilt. Take them down at once. West corner of front second story where cracked to be rebuilt and tied back. Fireplace in northwest room to be reconstructed. Rear balcony is partially down and must be rebuilt. Part of the rear wall should come down to the top of first story windows and rebuilt and well anchored. Rear portion of west wall should be taken down and rebuilt. There is a wooden girder inside of furniture store which supports a brick wall. Fire walls should be repaired."
28800	1d	"No. 234 West Santa Clara Street--Occupied by F. Chiapsee--The west wall should be partially rebuilt. Fire walls should be rebuilt. Can be put back into position if properly anchored and braced."
28900	1d	"Small frame building, No. 246 West Santa Clara Street--Should be condemned."
29000	1d	"Mrs. May's Building, Post street--Rear wooden balcony in very poor shape; should be torn down; fire walls, sides and back should be rebuilt. The wooden buildings in the rear should be condemned. Brick pier at east side of front should be rebuilt." [This building was at #73-75 Orchard St.]
29200	1d	"Nos. 38 to 44 Post street--First story rear wall should be rebuilt in portions, especially in rear of No. 38. Fire wall in rear to be rebuilt. Front fire wall to be rebuilt and well anchored."
29300	1d	"Columbus Building, Post street--East wall at rear to be rebuilt. Fire wall to be rebuilt where destroyed and broken. Front fire wall should be rebuilt and anchored. Second story joist at west wall to be supported until repaired. Front and rear portion of west wall should be removed and rebuilt, and rod run from front to rear."
29400	1d	"Fisher [sic: Fischer] & Pellerano, 35 South First street--Rear and front fire walls should be rebuilt."
29600	1d	"515 Prevost street--Underpinning needs more underpinning and bracing."

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
29700	1d	"486 Prevost street--House needs new underpinning and to be well braced."
29800	1d	"325 Grant street--House in very bad shape, but are repairing at present; but recommend that the same be inspected before people live in it."
29900	1d	"320 Grant street--Underpinning to be moved back into place; house is to be shored up while so doing. More new bracing put into basement."
30000	1d	"281 Grant street--House down; can be raised and shored up; new underpinning throughout and well braced." [Location from 1915 Sanborn (rev. 3/1929 and 3/1917-6/1930), v. 2.]
30100	1d	"1234 Locust street--House in bad shape; owner says will tear down and rebuild."
30200	1d	"1299 Lick avenue--House down, but in fairly good shape; can be shored up and new underpinning with good bracing. Porch dangerous, must be taken down immediately."
30300	1d	"1218 Lick avenue--Main building down; very bad shape, must be torn down. Kitchen in rear can be repaired; not safe at present."
30400	1d	"1106 Lick avenue--House in bad shape; new underpinning throughout and well braced."
30500	1d	"103 Grant street--House down; bad shape, not safe at present; can be repaired."
30600	1d	"369 Delmas avenue--Underpinning should be straightened and braced; kitchen foundation needs immediate attention."
30700	1d	"344 Delmas avenue--Foundation needs straightening and bracing; props needed at once."
30800	1d	"338 Delmas avenue--Foundation badly racked; needs permanent repairs; dangerous at present."
30900	1d	"396 West San Carlos street--Underpinning out of plumb; need immediate attention."
31000	1d	"412 West San Carlos street--Badly wrecked; unsafe at present."
31100	1d	"441 West San Fernando street--Brick foundation shattered and needs attention."
31200	1d	"441 Vine--Chimney should be taken out at once; otherwise safe for the present."
31300	1d	"332 Vine--Basement to be shoved into place and well braced."
31400	1d	"Building at southeast corner of Vine and San Fernando should be braced at west side."
31500	1d	"278 West San Fernando--Front porch should be taken off at once. The rest safe for the present."
31600	1d	"The Seventh Day Adventist Church, corner Colfax and Spencer avenues--Foundation in front is three inches out of place and should be shoved back and well braced."
31700	1d	"385 Delmas--Should be well shored on south side until new foundation is in place. Wind mill [sic] frame is unsafe."
31800	1d	"376 Delmas--North side of kitchen foundation should be renewed."

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
31900	1d	"169 Orchard--Front wall should be braced in basement."
32000	1d	"575 Orchard--Basement to be shored up and braced."
32100	1d	"597 Orchard--Basement to be straightened and braced."
32200	1d	"811 Orchard--Should be raised up, straightened and new foundation put in."
32300	1d	"977 Vine--Must be torn down."
32400	1d	"903 Vine--Must be straightened and braced."
32500	1d	"828 Vine--Must be shored up and foundation renewed."
32600	1d	"811 Vine--Is now braced outside. Must be well-braced inside."
32700	1d	"580 Vine--Should be shoved south at first floor line and rebraced."
32800	1d	"About 473 Vine--No [street] number could be found. Must be torn down."
32900	1e	"Baker Building, northwest corner Third and Santa Clara streets--Basement in perfect condition. Stores in good condition (except plaster cracks). West wall in front, pier cracked. Iron support, O.K. All of wall in good condition except fire-wall. Rear or north wall in good condition, except fire-wall. Front section between bay windows should be taken down to girders. East front section should be taken down as far as shattered, and girder and tie anchors put in to properly tie and support building."
33000	1e	"Otter Building, Santa Clara street--Safe and can be occupied."
33100	1e	"Jacob Lenzen Building, Santa Clara street--Cracked plastering and broken fire-walls."
33200	1e	"Alliance Land Company's building, corner Third and Santa Clara streets (in course of construction). East wall has shifted on bottom; cracked on ell. Condemned to floor joist."
33301	1e	"Sperry Flour Company, North Third street--West end of mill: brick wall shattered. Needs tying and patching. Fire-walls broken." [The large complex spanned the block between Third and Fourth Streets.]
33302	1e	Sperry Flour Company, North Third street [old warehouse]--"North side wall of old warehouse broken and should be rebuilt. All of this second-story wall condemned."
33303	1e	Sperry Flour Company, North Third street--"Front of Fourth Street as far as cracked to be taken down and rebuilt."
33304	1e	Sperry Flour Company, North Third street--"Front on Third Street condemned down as far as window heads."
33400	1e	"Fire House No. 1. Safe; some small repairs." [Empire Engine Company]
33501	1e	"Two two-story residences, No. 80 and 84 North Second street--Very bad condition; need attention." [No. 80]
33502	1e	"Two two-story residences, No. 80 and 84 North Second street--Very bad condition; need attention." [No. 84]

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
33600	1e	"Y. M. C. A. Building, No. 72 to 78 North Second street--Front entrance damaged some; is being repaired. Chimneys on north and south walls to be taken down. Floor in locker room to be supported. Thimbles in printing room, third floor, to be bricked around and made safe. All chimneys to be carefully inspected before being used. Plastering throughout the entire building much damaged. Safe to be occupied."
33701	1e	"First Presbyterian Church--Auditorium condemned to floor. Class rooms in fair condition; not to be used until auditorium is taken down. Should be taken down at once on account of danger to adjoining property." [The most important aspect of this inspection report is that the steeple was NOT reported as having fallen. This is a significant report, as nearly all the tall, unreinforced, tower-like structures in the city did topple or crumble.]
33702	1e	First Presbyterian Church auditorium: "Auditorium condemned to floor. Class rooms in fair condition; not to be used until auditorium is taken down. Should be taken down at once on account of danger to adjoining property." [2nd-story auditorium, above classrooms, is in addition at rear of church; is frame with brick veneer.]
33703	1e	First Presbyterian Church classrooms: "Class rooms in fair condition; not to be used until auditorium is taken down. Should be taken down at once on account of danger to adjoining property." [Classrooms are in 1st story of addition at rear or church; this section is frame with brick veneer.]
33800	1e	"Occidental Stables, North Second street--Safe for business. Breaks on roof on account of falling bricks of adjoining building."
33900	1e	"Two-story frame residence, 63 North second street--Chimney to be taken down; in dangerous condition."
34000	1e, 3	Source #1e: "Trinity Episcopal Church--Safe; some small repairs". Source #3: Church suffered minor damage. Refugees slept in St. James Park and worked at Trinity Church during the day. After the earthquake, the Salvation Army ran a commissary in the Guild Hall.
34100	1e, 15	Source #1e: Trinity Episcopal Church. "Parish House--North and south stone gables broken; should be rebuilt and proper care given before this is done. Annex to Parish House broken on gables and fire-walls on south." Source #15: Stone parish house of Trinity Episcopal Church: Front gable down; out of plumb. [Inspectors gave no address for parish house; 1905-06 City Directory gives 2nd St., SW corner of St. John St.; 1891 Sanborn (rev. 1901) shows parish house located at rear of church, between church and residence at #22 E. St. John St.; parish house is frame with stone end-gables; the annex is a brick addition to side of and connected to parish house.]
34300	1e	"Sarah B. Cooper Kindergarten--Safe to be occupied."
34400	1e	"King [sic: King's] Conservatory of Music--Good condition; only a little broken plaster."
34500	1e	"Grace Lutheran Church, Julian street--Broken plaster; some small repairs; not dangerous. Chimney broken. No fire to be used until repaired. Safe in every respect."

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
34600	1e, 33, 47	Source #1e: "Unitarian Church--In very good condition; absolutely safe." Source #33: Unitarian Church to be hospital headquarters after earthquake. Source #47: Built in 1891; Unitarian Church is one building north of Eagles Hall, on St. James Square.
34700	1e	"Woodsen Building, Santa Clara street, near Fourth--Would recommend that southwest corner of one story part have corner of firewall taken down and rebuilt. Northeast corner to be shored up, and for permanent repairs taken down to the second story window sill and rebuilt. Front arches need repairing, for permanent repairs also a tie rod directly back of front wall at level of second floor joist. Top front fire wall on west to be repaired."
34800	1e, 1b	Source #1e: "Doerr Building, South First Street--Rear wall should be well anchored in. All fire walls damaged to be rebuilt. Front walls on south half to be thoroughly anchored back with tie rods or entirely removed. Front is now well braced and is safe. Building safe for occupancy. Second-floor joist at south wall should be wedged in to support same. Rear one story south wall to be taken down and rebuilt." Source #1b: "Condemned for further use until put in proper repair and principal portions reconstructed. Should be braced on west side and east side and shore up the front and rear wall at once." [Note the discrepancy in the two inspectors' opinions of the building's immediate safety. Assume failed brick walls but not structural collapse.]
34900	1e	"Henry French Building, South First street--Safe condition for occupancy." Source #1e: "Maurice O'Brien's building, San Antonio and First streets--Take out south first story wall for permanent repairs. Corner of brick walls under tank on fire walls cracked. Could be anchored and made permanently safe. Would recommend that tank be taken down. Northwest corner front wall loosened away and leans out slightly; could be safely anchored back to party wall and joist, to repair permanently. Rear fire wall to be rebuilt. Entire building safe for occupancy." Same source, from a second damage report: "Front brick wall to be removed. Dangerous for occupancy until building on the south is repaired." Source #8: O'Brien's Candy: The rear wall of the building next door on south side "crashed down, and the sweet shop was pushed into the basement." [The owner, Charles O'Brien, Sr., also owned a store at #120 South First Street, so operations were consolidated there until #30 South First Street (this entry) was rebuilt and reopened in the fall of 1906.]
35100	1e	"Two story building, Southeast corner First and San Antonio streets (Mrs. Sullivan, owner). Safe for occupancy. Good condition." [Sanborn (1891, rev. 1901) shows lodging house on SE corner spanning #202-#210 S. 1st Street.]
35200	1e	"Hunt's Bakery (plant)--East wall near front to be taken down and rebuilt. East front pier to be taken down and rebuilt. Should be attended to immediately. Safe for occupancy when above repairs are made. Not dangerous at present."
35400	1e	"Dashaway Stables, South Second street--Trusses broken by fire wall should be shored up at once to be safe. Third Street end of above building, fire wall to be rebuilt." [Inspectors gave no street number; 1891 Sanborn (rev. 1901) shows Dashaway Livery Stables at #130 S. 2nd St.]
35500	1e	"Walsh-Col Building, South Third street--Rear portion of roof to be shored up at once. Fire walls rebuilt. Otherwise building safe for occupancy."

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
35600	1e	"Louis Henning's Meat Market Building, East Santa Clara street--Anchors in rafters of west party wall to have extensions put on. Rear wall to be entirely rebuilt."
35700	1e	"Harris and Levy Building, East Santa Clara street--West party wall rear top at front bulged out. Should be taken down and rebuilt. Terra cotta sills and cornice broken; should be taken out to prevent falling on sidewalk. Rear wall to be partially taken down and rebuilt. Safe for occupancy."
35800	1e, 66	Source #1e: "State Normal School. Window sills and lintels where damaged to be taken down and rebuilt. Northeast wing badly shattered; should be taken down to first story and rebuilt. All angles where cracked should be properly belted with liberal use of tie rods. East projecting wing, northeast corner to be taken down and rebuilt. Southeast corner wing to be taken down to first story and rebuilt. Certain truss braces under tower in attic sprung out of place. Bell in tower out of place; not dangerous. Foundation in good condition. Annex in safe condition. Plastering needs repairing throughout the Normal and Annex. Main building, when outside walls are properly shored up and temporary bracing is done, will be safe for occupancy. Bracing as now found done, insufficient." Source #66: The Normal school building had continuous iron straps, built into the brickwork, encircling the building. [Normal School Annex is the Training School, listed separately.]
35900	1e, 54	Source #1e: "Turner Hall--Some plaster cracked. Otherwise in excellent condition." Source #54: "Turner Hall" was Turn Verein Hall. The members of this German social, athletic and cultural club were called "Turners." Inspection Committee's regular meetings took place in Turn Verein Hall.
36000	1e	"Turner Hall Annex--West wall fair. South and east walls condemned to second floor. East wall to be shored and attended to at once. Unsafe until repaired."
36100	1e	"United Presbyterian Church, Fifth and Santa Clara streets--In good condition. Safe for use. Chimney to be inspected before any fire is built."
36201	1e	No. 203 East Santa Clara street--[Four houses] "should be shored up to protect the public on the sidewalk."
36202	1e	No. 213 East Santa Clara street--[Four houses] "should be shored up to protect the public on the sidewalk. [This dwelling was one-half of a duplex with No. 215.]
36203	1e	No. 215 East Santa Clara street--[Four houses] "should be shored up to protect the public on the sidewalk." [This dwelling was one-half of a duplex with No. 213.]
36204	1e	No. 223 East Santa Clara street--[Four houses] "should be shored up to protect the public on the sidewalk."
36300	1e	"Observatory Block--West fire wall to be rebuilt. Safe for business."

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
36400	1e, 15	Source #1e: "Horace Mann School--Foundation all in good condition. Furnace needs attention. Both stair cases in main hall out of position. Somewhat racked. Stairs to be raised into position and all carriages and stringers to have strap irons hung on second story joist. North stairs, primary grade, to be repaired before using. Lower Seventh grade room floor to be better supported from the ground up. High Eighth grade floor to have support in center from ground up. Also low Eighth grade. Said supports to be carried up to Assembly Hall floor. High Fourth room, northwest corner, to be repaired. Outside steps to be made safe, also remainder of tower and entrance to be put in safe condition." Source #15: Horace Mann School. Tower inclined "at a perilous angle"; plaster badly damaged; stairs "partly wrenched from the wall." this damage report continues to describe the remainder of buildings at Horace Mann School (separate entries #36501, 36502, and 36503): "Annex buildings on same [Horace Mann School]--First grade building, some plaster off; safe to use. Second grade building safe as above. Foundation needs attention. Old Night School building, good as ever. All chimneys to be inspected and certified for before being used."
36501	1e	Horace Mann School, primary grades building: "Annex buildings on same [Horace Mann School]. First grade building, some plaster off; safe to use."
36502	1e	Horace Mann School. "Annex buildings on same [Horace Mann School]. Old Night School building, good as ever. All chimneys to be inspected and certified for before being used."
36503	1e	Horace Mann School. "Quincy Shaw building. Annex buildings on same [Horace Mann School]. Second grade building safe as above. Foundation needs attention." [The mapped point for this entry is the most likely location in the Horace Mann complex for the second grade building.]
36600	1e, 15, 65	Source #1e: "St. Patrick's Church--Complete wreck. Front southeast and southwest corners condemned to be taken down at once for safety of public." Source #65: St. Patrick's Church: "wrecked completely." (p. 3) Source #15: Tower and front wall fell across Santa Clara Street; rear wall fell inward; east wall fell outward; most of west wall still standing.
36700	1e	"St. Patrick's School Hall--Walls badly cracked on corners and between windows and through buttresses. Should be well anchored at many different places. Fire walls to be rebuilt. Anchoring done before using."
36801	1e	Golden Gate Cannery. "Front wall, south section condemned to floor."
36802	1e	Golden Gate Cannery. "Center section good up to top of arches. To be anchored back."
36803	1e	Golden Gate Cannery. "North section condemned to floor. Dangerous."
36804	1e	Golden Gate Cannery. "Rear of buildings, gables and returns taken down and rebuilt where cracked, and should be carried up 12 inch walls."
36805	1e	Golden Gate Cannery. "The entire upper story of storehouse condemned. Anchors needed at several places to make building safe."
36806	1e	Golden Gate Cannery. "South wall good except fire wall."

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
36900	1e, 15	Source #1e: "Fifth Street Cannery, corner Fifth and Julian--Condemned as unsafe. Should be taken care of at once, as it is dangerous to the public in its present condition. United steps should be taken at once to safeguard the public." Source #15: Old Fifth Street Cannery "in ruin; walls and roof utterly collapsed."
37000	1e, 53	Source #1e: "Chemical Engine No. 2, North Eighth street--Chimney top needs repairs, otherwise in good condition. Safe to use." Source #53: This small, 2-story, frame structure with light bell tower was built in 1876 and stood until replaced in 1913 (photos and captions, pp. 61, 66).
37100	1e, 7	Source #1e: "Kelley Laundry, Tenth street--Brick walls condemned." Source #7 gives the address before 1899 as 10th Street, between St. James Street and Julian Street.
37200	1e	"Free Methodist Church, Ninth street--Safe for use."
37300	1e	"74 North Twelfth street--Two-story house in bad shape; should be braced."
37400	1e, 9, 11, 12, 15	Source #1e: "Grant School--Needs some repairs". Source #15 (4/20/1906): Grant School was "a ruin"; entire building was off foundation and settled 6-8 feet while shifting same distance to one side; walls were "bulged out at all kinds of angles." From photographs (Sources #9, 11, and 12), the building appears to have "pancaked" within a few days after April 20; the floors were saved whole and reused in temporary tent schoolrooms. On April 20, the building was severely damaged from shaking, but by the time of the photographs (Sources #9, 11, and 12), it had entirely collapsed. Either it was deliberately and carefully demolished to save the floors for reuse and to protect the public, or an aftershock helped take it down. The damage report (Source #1e) for this entry was recorded on April 27, 1906 (date of inspection unknown).
37600	1e, 9, 11, 15	Source #1e: "Mrs. Dougherty's residence, 460 North First street--Total wreck". Source #9: Large, well-built frame house. Photograph shows porch cantilevered up on one end, with columns having lost contact with porch floor and subsequent twisting of balcony above. Sources #11 and #15: Residence of Mrs. W.P. Dougherty: "An irremediable ruin. Twisted five feet off its base, dropped into the cellar, canted over at a sharp angle to the east and south, and entirely beyond repair." [Note: This house WAS repaired.]
37700	1e	"27, 29 and 31 South Third street--Southeast corner to be repaired; northeast corner anchored and repaired; northwest corner to be taken down and rebuilt back to anchor; back wall shattered but shored at present; can be torn down partly and rebuilt; southwest corner to be taken down six feet and rebuilt; front and back fire walls to be well anchored; otherwise building in good condition and safe for occupancy below."
37800	1e	"State Normal School engine and tank house--Would recommend rods at top of tank frame on all sides, also at all floor joist line [sic]; use plenty of rods in this frame."
37900	1e, 16	Source #1e: "Northeast corner Ninth and San Antonio--Corners of brick walls to be repaired; also east fire wall; southwest fire wall corner bad; should be remedied at once". Source #16: Kottinger grocery store at corner of 9th and San Antonio Streets (photographs, p. 103, show the structure c. 1890 and c. 1910).
38000	1e	"306 South Ninth street, residence; Taber, owner--All safe."

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
38100	1e	"455 South tenth street--Can be repaired; should have braces put up on north side until foundation is repaired."
38200	1e	"Home School House, Tenth and Keyes--Good condition and safe; clean."
38300	1e	"64 South Ninth street, residence--In bad condition; can be repaired."
38400	1e	"752 South Ninth street--In bad condition; can be repaired."
38500	1e	"690 South Ninth street--Can be raised and made good; off foundation."
38600	1e	"386 East Margaret street--Chimney on roof should come down. Source #1e: "Lowell School, corner Seventh and Margaret--Outside undamaged and in good condition; was unable to inspect inside; would recommend that the building be not used until careful inspection inside." Source #61: "probably usable after a few slight repairs are made."
38900	1e	"398 South First street--Good and sound and safe."
39000	1e	"Southwest corner Santa Clara and Orchard streets--Santa Clara Street front over girder should have tie rod from side to side at second and third floor and ceiling. East wall should be taken down to top of third story windows and rebuilt. Cast column at west side at Santa Clara Street should be reset."
39100	1e	"Pfau's building, West Santa Clara street--Rear wall should be taken down to second floor. West wall at the rear should be taken down where broken back". [Inspectors gave address as W. Santa Clara St.; 1905-06 City Directory gives #210 W. Santa Clara St.]
39200	1e	"St. Joseph's Church--North and south gable should be rebuilt above the spring of the main arches, east gable should be rebuilt; loose brickwork of the supports of the dome should be rebuilt; building should not be used until repairs are made."
39300	1e	"St. Joseph's Academy--Whole building should be braced up, and kept closed, and the work put in the hands of a competent architect."
39400	1e	"Minor Building, Building occupied by Carmichael-Ballar's Co.--Is racked considerably, but after being properly braced, it is fit for occupancy on the first floor."
39500	1e	"Felix Building, Saratoga Market--Rear second story wall is leaning out; should be drawn in with rods. Firewalls should be rebuilt. Plaster at front above second floor between Felix Building and Straus building should be anchored back."
39600	1e	"Straus Building, Occupied by Curtis & Henkle--Front should be braced up temporarily, until it is anchored back in proper shape. The Minor Building, Felix Building and Straus Building should be tied together with iron rods run full distance." [No address given by inspectors; 1905-06 City Directory gives Curtis & Henkle (F.D. Curtis & R.E. Henkle), druggists and chemists, at # 69 S. 1st St.]
39700	1e	"Stock Sons, No. 71 South First street--Front will be rebuilt as it is already down."

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
39800	1e	"Building south of Stock Sons--Front wall should be taken down; portion of second story wall at front, north side, removed and rebuilt; fire walls taken down and rebuilt; rear first story part has the roof off."
39900	1e	"87 South First street, occupied by Arcade--Fire walls need repair. Front brick wall must be attended to at once; should be temporarily anchored back and then the whole drawn back to place by several iron rods."
40000	1e	"93 South First street, Callisch Drug Store--All fire walls in good condition; first story part at rear has fire walls down; brick needs attention where overhanging. In fine condition."
40100	1e	"Wilcox Building, northwest corner of First and San Fernando streets--Fire walls in good shape; in fine condition; room occupied by Hoff & Kayser should have steel beams at rear supported by metal columns where piers are broken; in fine condition". Second report from same source: "Wilcox Building on San Fernando St.--Roof is broken in; fire walls in good condition; building in fine shape."
40300	1e	"St. Louis Building, South First street--Awning should be removed; in fine condition." [Inspectors gave address as S. 1st St.; 1905-06 City Directory gives 115 S. 1st St. for St. Louis Block. This building spans addresses #115 - #121 in 1891 Sanborn (rev. 1901).]
40400	1e	"Arguello Block, South First street--Ornament on front pediment should be removed and fire walls rebuilt where broken; awning should be removed; all in fine condition."
40500	1e	"Brunswick Building, South First street--Rafters in first story part should be anchored in brick wall; all in fine condition."
40600	1e	"Tanta Block [sic: Tantau Block], South First street--Rear wall cracked; should be rebuilt where flues pass through; ceiling joist in rear room at north side where it shows a slight drop should be examined; everything in fine shape."
50100	2	Originally the fathers' residence for St. Joseph's cathedral, directly across Market Street from the cathedral. Three-story, freestanding brick building. Third floor was "badly damaged" and "wrecked" in the earthquake. "Damage done to the entire St. Joseph's complex at Market and San Fernando Streets in the earthquake of 1906 cost ninety thousand dollars to repair." [The 1905-06 City Directory lists W.B. Ward & Son (undertakers and embalmers) as occupant. Ward & Son moved to this building from next door (#97-99 S. Market Street) in 1902; the move was traced in successive San Jose City Directories. This fathers' residence was replaced before 1906 by the newer building, to the rear of the cathedral, that housed both a fathers' residence and school. This newer building was completely destroyed by the earthquake and soon razed.]
50300	11, 12	Sources #11 and 12: San José Post Office. Top two stories of the six-story tower collapsed onto roof of post office, damaging roof. The two-story building was not damaged structurally. The two-story structure was built of reinforced stone (sandstone from Graystone Quarry, in present-day south San José); tower built of <u>non-reinforced</u> sandstone (1891, rev. 1901, Sanborn).

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
50501	46, 65	Source "65: "At least 12 large residences on the Alameda between Lenzen Avenue and Santa Clara have been totally destroyed (no deaths)." Source #46: This dwelling appeared in 1891 (rev. 1901) Sanborn but was pasted over with blank paper (tan paper applied in an individual insurance office, not an official correction from Sanborn) in 1891 (rev. 1921) Sanborn or appeared as a blank space in the 1915 Sanborn. All evidence indicates that this dwelling was damaged beyond repair -- either substantially or totally destroyed -- in the earthquake.
50502	46, 65	Source "65: "At least 12 large residences on the Alameda between Lenzen Avenue and Santa Clara have been totally destroyed (no deaths)." Source #46: This dwelling appeared in 1891 (rev. 1901) Sanborn but was pasted over with blank paper (tan paper applied in an individual insurance office, not an official correction from Sanborn) in 1891 (rev. 1921) Sanborn or appeared as a blank space in the 1915 Sanborn. All evidence indicates that this dwelling was damaged beyond repair -- either substantially or totally destroyed -- in the earthquake.
50503	46, 65	Source "65: "At least 12 large residences on the Alameda between Lenzen Avenue and Santa Clara have been totally destroyed (no deaths)." Source #46: This dwelling appeared in 1891 (rev. 1901) Sanborn but was pasted over with blank paper (tan paper applied in an individual insurance office, not an official correction from Sanborn) in 1891 (rev. 1921) Sanborn or appeared as a blank space in the 1915 Sanborn. All evidence indicates that this dwelling was damaged beyond repair -- either substantially or totally destroyed -- in the earthquake.
50504	46, 65	Source "65: "At least 12 large residences on the Alameda between Lenzen Avenue and Santa Clara have been totally destroyed (no deaths)." Source #46: This dwelling appeared in 1891 (rev. 1901) Sanborn but was pasted over with blank paper (tan paper applied in an individual insurance office, not an official correction from Sanborn) in 1891 (rev. 1921) Sanborn or appeared as a blank space in the 1915 Sanborn. All evidence indicates that this dwelling was damaged beyond repair -- either substantially or totally destroyed -- in the earthquake.
50505	46, 65	Source "65: "At least 12 large residences on the Alameda between Lenzen Avenue and Santa Clara have been totally destroyed (no deaths)." Source #46: This dwelling appeared in 1891 (rev. 1901) Sanborn but was pasted over with blank paper (tan paper applied in an individual insurance office, not an official correction from Sanborn) in 1891 (rev. 1921) Sanborn or appeared as a blank space in the 1915 Sanborn. All evidence indicates that this dwelling was damaged beyond repair -- either substantially or totally destroyed -- in the earthquake.
50506	46, 65	Source "65: "At least 12 large residences on the Alameda between Lenzen Avenue and Santa Clara have been totally destroyed (no deaths)." Source #46: This dwelling appeared in 1891 (rev. 1901) Sanborn but was pasted over with blank paper (tan paper applied in an individual insurance office, not an official correction from Sanborn) in 1891 (rev. 1921) Sanborn or appeared as a blank space in the 1915 Sanborn. All evidence indicates that this dwelling was damaged beyond repair -- either substantially or totally destroyed -- in the earthquake.

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
50507	46, 65	Source "65: "At least 12 large residences on the Alameda between Lenzen Avenue and Santa Clara have been totally destroyed (no deaths)." Source #46: This dwelling appeared in 1891 (rev. 1901) Sanborn but was pasted over with blank paper (tan paper applied in an individual insurance office, not an official correction from Sanborn) in 1891 (rev. 1921) Sanborn or appeared as a blank space in the 1915 Sanborn. All evidence indicates that this dwelling was damaged beyond repair -- either substantially or totally destroyed -- in the earthquake.
50508	46, 65	Source "65: "At least 12 large residences on the Alameda between Lenzen Avenue and Santa Clara have been totally destroyed (no deaths)." Source #46: This dwelling appeared in 1891 (rev. 1901) Sanborn but was pasted over with blank paper (tan paper applied in an individual insurance office, not an official correction from Sanborn) in 1891 (rev. 1921) Sanborn or appeared as a blank space in the 1915 Sanborn. All evidence indicates that this dwelling was damaged beyond repair -- either substantially or totally destroyed -- in the earthquake.
50509	46, 65	Source "65: "At least 12 large residences on the Alameda between Lenzen Avenue and Santa Clara have been totally destroyed (no deaths)." Source #46: This dwelling appeared in 1891 (rev. 1901) Sanborn but was pasted over with blank paper (tan paper applied in an individual insurance office, not an official correction from Sanborn) in 1891 (rev. 1921) Sanborn or appeared as a blank space in the 1915 Sanborn. All evidence indicates that this dwelling was damaged beyond repair -- either substantially or totally destroyed -- in the earthquake.
50510	46, 65	Source "65: "At least 12 large residences on the Alameda between Lenzen Avenue and Santa Clara have been totally destroyed (no deaths)." Source #46: This dwelling appeared in 1891 (rev. 1901) Sanborn but was pasted over with blank paper (tan paper applied in an individual insurance office, not an official correction from Sanborn) in 1891 (rev. 1921) Sanborn or appeared as a blank space in the 1915 Sanborn. All evidence indicates that this dwelling was damaged beyond repair -- either substantially or totally destroyed -- in the earthquake.
50600	61, 65	Source #61: "Practically all of the plaster was shaken from the first floor of the Hester school. The upper story lost but little. All the classes met on Wednesday [April 25]." Source #65: "The Hester School is in a bad condition."
50700	46, 65	Source #65: "All store fronts and many dwellings were wrecked in East San Jose." Source #46: This building appeared in 1891 (rev. 1901) Sanborn but was pasted over with blank paper (tan paper applied in an individual insurance office, not an official correction from Sanborn) in 1891 (rev. 1921) Sanborn or appeared as a blank space in the 1915 Sanborn. All evidence indicates that this dwelling was damaged beyond repair -- either substantially or totally destroyed -- in the earthquake.
50701	46, 65	Source #65: "All store fronts and many dwellings were wrecked in East San Jose." Source #46: This building appeared in 1891 (rev. 1901) Sanborn but was pasted over with blank paper (tan paper applied in an individual insurance office, not an official correction from Sanborn) in 1891 (rev. 1921) Sanborn or appeared as a blank space in the 1915 Sanborn. All evidence indicates that this dwelling was damaged beyond repair -- either substantially or totally destroyed -- in the earthquake.

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
50702	46, 65	Source #65: "All store fronts and many dwellings were wrecked in East San Jose." Source #46: This building appeared in 1891 (rev. 1901) Sanborn but was pasted over with blank paper (tan paper applied in an individual insurance office, not an official correction from Sanborn) in 1891 (rev. 1921) Sanborn or appeared as a blank space in the 1915 Sanborn. All evidence indicates that this dwelling was damaged beyond repair -- either substantially or totally destroyed -- in the earthquake.
50703	46, 65	Source #65: "All store fronts and many dwellings were wrecked in East San Jose." Source #46: This building appeared in 1891 (rev. 1901) Sanborn but was pasted over with blank paper (tan paper applied in an individual insurance office, not an official correction from Sanborn) in 1891 (rev. 1921) Sanborn or appeared as a blank space in the 1915 Sanborn. All evidence indicates that this dwelling was damaged beyond repair -- either substantially or totally destroyed -- in the earthquake. The small blacksmith/machine shop from 1901 was replaced by auto repair shop by 1921 (Sanborn, rev. 8/1901 and 2/1921).]
50704	46, 65	Source #65: "All store fronts and many dwellings were wrecked in East San Jose." Source #46: This building appeared in 1891 (rev. 1901) Sanborn but was pasted over with blank paper (tan paper applied in an individual insurance office, not an official correction from Sanborn) in 1891 (rev. 1921) Sanborn or appeared as a blank space in the 1915 Sanborn. All evidence indicates that this dwelling was damaged beyond repair -- either substantially or totally destroyed -- in the earthquake.
50705	46, 65	Source #65: "All store fronts and many dwellings were wrecked in East San Jose." Source #46: This building appeared in 1891 (rev. 1901) Sanborn but was pasted over with blank paper (tan paper applied in an individual insurance office, not an official correction from Sanborn) in 1891 (rev. 1921) Sanborn or appeared as a blank space in the 1915 Sanborn. All evidence indicates that this dwelling was damaged beyond repair -- either substantially or totally destroyed -- in the earthquake.
50706	46, 65	Source #65: "All store fronts and many dwellings were wrecked in East San Jose." Source #46: This building appeared in 1891 (rev. 1901) Sanborn but was pasted over with blank paper (tan paper applied in an individual insurance office, not an official correction from Sanborn) in 1891 (rev. 1921) Sanborn or appeared as a blank space in the 1915 Sanborn. All evidence indicates that this dwelling was damaged beyond repair -- either substantially or totally destroyed -- in the earthquake.
50707	46, 65	Source #65: "All store fronts and many dwellings were wrecked in East San Jose." Source #46: This building appeared in 1891 (rev. 1901) Sanborn but was pasted over with blank paper (tan paper applied in an individual insurance office, not an official correction from Sanborn) in 1891 (rev. 1921) Sanborn or appeared as a blank space in the 1915 Sanborn. All evidence indicates that this dwelling was damaged beyond repair -- either substantially or totally destroyed -- in the earthquake.

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
50708	46, 65	Source #65: "All store fronts and many dwellings were wrecked in East San Jose." Source #46: This building appeared in 1891 (rev. 1901) Sanborn but was pasted over with blank paper (tan paper applied in an individual insurance office, not an official correction from Sanborn) in 1891 (rev. 1921) Sanborn or appeared as a blank space in the 1915 Sanborn. All evidence indicates that this dwelling was damaged beyond repair -- either substantially or totally destroyed -- in the earthquake.
50709	46, 65	Source #65: "All store fronts and many dwellings were wrecked in East San Jose." Source #46: This building appeared in 1891 (rev. 1901) Sanborn but was pasted over with blank paper (tan paper applied in an individual insurance office, not an official correction from Sanborn) in 1891 (rev. 1921) Sanborn or appeared as a blank space in the 1915 Sanborn. All evidence indicates that this dwelling was damaged beyond repair -- either substantially or totally destroyed -- in the earthquake.
50710	46, 65	Source #65: "All store fronts and many dwellings were wrecked in East San Jose." Source #46: This building appeared in 1891 (rev. 1901) Sanborn but was pasted over with blank paper (tan paper applied in an individual insurance office, not an official correction from Sanborn) in 1891 (rev. 1921) Sanborn or appeared as a blank space in the 1915 Sanborn. All evidence indicates that this dwelling was damaged beyond repair -- either substantially or totally destroyed -- in the earthquake.
50711	46, 65	Source #65: "All store fronts and many dwellings were wrecked in East San Jose." Source #46: This building appeared in 1891 (rev. 1901) Sanborn but was pasted over with blank paper (tan paper applied in an individual insurance office, not an official correction from Sanborn) in 1891 (rev. 1921) Sanborn or appeared as a blank space in the 1915 Sanborn. All evidence indicates that this dwelling was damaged beyond repair -- either substantially or totally destroyed -- in the earthquake.
50712	46, 65	Source #65: "All store fronts and many dwellings were wrecked in East San Jose." Source #46: This building appeared in 1891 (rev. 1901) Sanborn but was pasted over with blank paper (tan paper applied in an individual insurance office, not an official correction from Sanborn) in 1891 (rev. 1921) Sanborn or appeared as a blank space in the 1915 Sanborn. All evidence indicates that this dwelling was damaged beyond repair -- either substantially or totally destroyed -- in the earthquake.
50713	46, 65	Source #65: "All store fronts and many dwellings were wrecked in East San Jose." Source #46: This house is shown as having been rebuilt as a completely different structure in 1891 (rev. 1921) Sanborn.
50714	46, 65	Source #65: "All store fronts and many dwellings were wrecked in East San Jose." Source #46: This blacksmith shop is shown as having been rebuilt between 1901 and 1921 as a completely different structure (1891 Sanborn, rev. 2/1921.)
50715	46, 65	Source #65: "All store fronts and many dwellings were wrecked in East San Jose." Source #46: This mixed-use building is shown as having been rebuilt as a completely different structure in 1891 (rev. 1921) Sanborn.

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
50716	46, 65	Source #65: "All store fronts and many dwellings were wrecked in East San Jose. Source #46: "This substantial frame dwelling was pasted over with opaque, tan, "post-1906" paper between Source #65: "1901 and 1921 revisions of 1891 Sanborn and is, therefore, presumed to have been substantially destroyed in the earthquake.
50717	46, 65	Source #65: ""All store fronts and many dwellings were wrecked in East San Jose." Source #46: This building appears in 1891 (rev. 1921) Sanborn.
50718	46, 65	Source #65: ""All store fronts and many dwellings were wrecked in East San Jose." Source #46: All evidence indicates that this large dwelling was substantially damaged in the earthquake and would have figured importantly in the damage report. It appears in 1891 (rev. 1921) Sanborn.
50719	46, 65	Source #65: ""All store fronts and many dwellings were wrecked in East San Jose." Source #46: This building appeared in 1891 (rev. 1901) Sanborn but was pasted over with blank paper (tan paper applied in an individual insurance office, not an official correction from Sanborn) in 1891 (rev. 1921) Sanborn or appeared as a blank space in the 1915 Sanborn. All evidence indicates that this dwelling was damaged beyond repair -- either substantially or totally destroyed -- in the earthquake.
50720	46, 65	Source #65: ""All store fronts and many dwellings were wrecked in East San Jose." Source #46: This building appeared in 1891 (rev. 1901) Sanborn but was pasted over with blank paper (tan paper applied in an individual insurance office, not an official correction from Sanborn) in 1891 (rev. 1921) Sanborn or appeared as a blank space in the 1915 Sanborn. All evidence indicates that this dwelling was damaged beyond repair -- either substantially or totally destroyed -- in the earthquake.
50721	46, 65	Source #65: ""All store fronts and many dwellings were wrecked in East San Jose." Source #46: This building appeared in 1891 (rev. 1901) Sanborn but was pasted over with blank paper (tan paper applied in an individual insurance office, not an official correction from Sanborn) in 1891 (rev. 1921) Sanborn or appeared as a blank space in the 1915 Sanborn. All evidence indicates that this dwelling was damaged beyond repair -- either substantially or totally destroyed -- in the earthquake.
50722	46, 65	Source #65: ""All store fronts and many dwellings were wrecked in East San Jose." Source #46: Substantial Victorian house, set back from street on large lot. This house would have figured importantly in damage report.
50723	65	Harburg's Steam Carpet Cleaning. The business continued in operation in the same location after 1906 (San Jose City Directories). The stream terrace deposits on the banks of Coyote Creek were famous for clay. Construction is likely substandard, from the depiction in 1891 (rev. 1901) Sanborn.
50725	46	Bowman Methodist Episcopal Church was completely rebuilt (new structure) as Webster St. M.E. Church by 1921.
50726	46	Concrete storage shed on grounds of Garden City Sanitarium was gone by 1921. Shed was located within the "banks" of Coyote Creek as indicated on 1891 (rev. 1901) Sanborn.
50727	46	House was rebuilt before 1921 as a completely different structure.

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
50728	46	House was rebuilt before 1921 as a completely different structure.
50729	46	The repair shop of Alum Rock Railway Company. This building was in the 1891 (rev. 1901) Sanborn but not in 1891 (rev. 1921) Sanborn. Destruction of building from earthquake inferred. Substandard construction: wood frame studs with corrugated iron; earthen floor (1891, rev. 1901, Sanborn).
50730	46	This house disappeared between 1901 and 1921.
50731	46	This house disappeared between 1901 and 1921.
50732	46	This house was covered with opaque, tan, "post-1906" paper in 1891 (rev.1 921) Sanborn. It likely disappeared from Sanborn in 8/1906 revision.
50733	46	This house was covered with opaque, tan, "post-1906" paper in 1891 (rev.1 921) Sanborn. It likely disappeared from Sanborn in 8/1906 revision.
50800	65	"The brick building near the bridge on Alum Rock avenue [in East San Jose] was practically demolished". (p. 4)
50900	46, 65	Source #65: East San Jose hall "badly injured". Source #46: This was a meeting hall, not a city hall. This building appears in 1891 (rev. 1901) Sanborn and is shown as having been rebuilt as a completely different structure in 1891 (rev. 1921) Sanborn.
51000	12, 44, 46, 65	Source #65: East San Jose school house "badly injured". Source #44: "East San Jose school is entirely out of a home. It will take \$1200 to put the building in proper shape." Source #46: The rebuilt school was named Hawthorne School in 1891 (rev. 1921) Sanborn. Source #12: Photographs of East San Jose School (1) before 1906 and (2) c. 1911 (completely new building).
52900	65	Dwelling was wrecked; Mrs. Warden was "fatally injured." (p. 3)
53200	65	"R.S. Hunkins machine shop completely wrecked." (p. 3)
53400	65	Residence of Dr. McNary "is a wreck." (p. 3)
53500	65, 11, 12	Source #65: "San Jose High School building: "a complete wreck" -- "Upper roof fell in. Roof over almost entire building either caving in or sliding off. The brick walls all around, down to the second floor and in places almost to the ground. The front wall fell out and lies in a tangle of debris in front of the structure. Great seams and cracks were opened in the portions of the wall that did not fall. The building will be an entire loss." (p. 3) Sources #11 and 12: Postcards and photographs show failure of upper-story walls on most sides of the building, along with lack of connection of free-standing brick walls to inner wooden framework.
53600	65	Fredericksburg Brewery on the Alameda. "Probably at least \$15,000 in damage." (p. 3)
53700	65	Golden West Hotel. Hotel was badly damaged, "almost the entire front being out." (p. 3)
53900	65	Smith auto garage "demolished." (p. 3)

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
54000	65	National Bakery 'demolished.' (p. 3)
54200	65	Residence of Mrs. Schwiier [sic]: "shaken to pieces." (p. 3)
54800	65	San Jose Basket Company: "buried under its walls and roof." (p. 3)
55500	14, 20, 60, 65	County Hospital. Source #65: Part of the hospital "collapsed at the first shock, burying a score in the ruins." Two people killed (Springer and Hencelot) and seven injured (p. 3); but article on p. 4 adds Miss Springer, Meridian District, to the list of persons killed. Source #14, April 27, 1906: County Hospital was "almost a total wreck", but "the cottages remained intact." Source #20: Photograph of County Hospital before 1906 earthquake. Damage ("collapse") was primarily to the brick addition at rear of the main hospital building, plus interiors. The main building appears structurally intact in a post-earthquake photograph in the hospital archives: windows are broken, but the central tower is upright. Source #60, April 23, 1906, p. 4, however, describes much more serious damage to the main structure: "The main building of the County Hospital lays [sic] in ruins. The recent brick addition where the kitchen was situated fell at the time of the quake--it was here that three of the patients were killed and seven badly injured. The main part of the building--the front--is very badly wrecked inside, the whole lower story is nearly two feet out of plumb and is liable to collapse any minute."
55502	20, 65	Small cottages on grounds of County Hospital. Source #65: "The cottages remained intact." Source #20: 1901 photograph clearly shows small size and standard frame construction of the cottages.
55900	65	Larman residence on King Road "a total loss." (p. 4) [John H. Larmon, blacksmith]
56401	65	University of the Pacific: Residence of H.E. Dorr "completely wrecked."
56402	65	University of the Pacific: Residence of Dr. Eli McClish "completely wrecked."
56403	65	University of the Pacific: Residence of Mr. Simpson "completely wrecked."
56404	65	University of the Pacific: Residence of Dr. R.D. Hunt "completely wrecked."
56600	6	Hilaire L. Garnot & J.W. Dermody, props, Garnot & Dermody, bicycles, #69 South Second Street. The business was destroyed by earthquake and fire. Letter of May 30, 1906, concerning fire insurance, says that this bicycle business was "entirely destroyed."
57100	8	O'Brien's Candy: Building must not have been damaged appreciably, as business continued without disruption, and the damaged store at #30 South First Street (entry #35000) immediately moved its operations here. This candy store was in the Central Block.
57300	10	Peralta Adobe [built 1797] survived the earthquake with minor damage and still stands in its original location in 2007. Source #57: This building had minor damage, but all the other adobes in the same complex were essentially destroyed. An aggregate intensity is assigned to reflect higher, rather than lower, degree of damage. The difference in response to shaking is likely due to differences in quality of construction (Peralta adobe was stronger).
57400	10	Fallon House [built 1855]. Renovated c. 1910 but did not suffer major damage in the earthquake.

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
57500	11, 12	Pacific Coast Business College. Sources #11 and 12: Postcard and photographs show front second story wall completely fallen out; roof unsupported in front over second story; first story exterior in good condition.
57700	11, 12	Elks Hall, 358 West Santa Clara Street. Sources #11 and 12: Postcard and photographs show total collapse of structure.
57900	13	Kleemeyer residence at Minnesota Avenue, opposite Hicks Avenue, suffered the following damage: one chimney fell down; second chimney twisted but remained upright and was taken down later the same day; inside the house, walls cracked and plaster fell.
58000	13	deSmet house (neighbors of Kleemeyers -- see entry #57900), Lincoln Avenue, corner Minnesota Avenue: No more damage than at Kleemeyers' (chimneys, plaster).
58100	13	Buck house (neighbors of Kleemeyers -- see entry #57900), Minnesota Avenue near Cherry Avenue. No more damage than at Kleemeyers' (chimneys, plaster).
59000	14, 39	Meridian District: Hamilton School. Source #14: School NOT damaged. Source #39: Photograph of schoolhouse on p. 85 shows that school was brick with romanesque style windows & arched doorway; two stories and brick bell tower.
59100	14	Meridian District: Willow Glen School. Source #14: Four schoolrooms damaged and library "wrecked", but school was to open in two days (i.e., on April 29th, 1906). [Primary damage was evidently in interior and not structural.]
59200	14	Residence of Miss Edith Burges [sic]: This house was rented out to County Hospital nurses after the earthquake; there would have been little or no damage to the structure.
59300	14	Residence of Mrs. Downing, Infirmary Road, "fine residence". Foundation unsafe; living in tents.
59400	14	Residence of Moses Hemphill, Fruitvale Ave.: nearly all plaster fell down stairs; chimney fell; damage to interior.
59500	14	Residence of Mrs. Kelley, Fruitvale Ave.: "Badly shaken up inside."
59600	14	Residence of Mr. E.C. Kay: Chimney fell and damaged house. From same source: Fallen windmill and/or tank house: Louis Jones (Mr. McKay's place).
59700	14	Residence of Mr. Graff, Meridian Road: "Considerable" plaster fell ("plaster knocked off considerable"); three chimneys fell.
59800	14	Residence of C.E. Wright, "Roselawn", Meridian Rd.: Chimney fell through roof.
59900	14	Residence of L.B. Davison, Meridian Road: "Badly shaken up."
60000	14	Residence of C.F. Bopp [Ropp?], no address: Out of plumb. [Address not given; probably Meridian Road near Willow, from path of reporter].
60100	14	Source #14: Residence of E.C. Conant, Meridian Road. House and porch were damaged.
60200	14	Residence of A.B. Cash, W. Moorpark Ave.: Badly damaged; living in tent; house unsafe. [Albert B. Cash, orchardist, residence Moorpark Ave. near San Jose-Los Gatos Road (Rt. 17 today) (1905-06 City Directory)].

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
60300	14	Residence of Mrs. Laura Hendrix, no address: Dishes ("fine china"), bric-a-brac broken.
60400	14	Residence of Louis Dossee, no address: Dishes broken ("nearly all her dishes").
60500	14	Residence of Mrs. Lazzarine, Carlos St.: Dishes broken ("most of her dishes, etc.").
61000	15	Residence of W.S. Boyle: building was shoved 5-6 feet off its base, dropped 4 feet to the ground, and twisted. Mr. Boyle, a builder, built his home to be substantial. It was a 9-room, 1-1/2-story, heavy-framed structure "with a good brick foundation."
61200	15	"Fine residence" of the Misses Morrison: "Sound as to walls and basement," although chimneys crashed down through the roof.
61400	15	Residence of Henry Lion: "A total wreck; off its foundation and hopelessly twisted out of shape."
61600	15	Residence: "a wreck beyond redemption."
61700	15	Residence: Thrown off foundation; porch torn down.
61800	15	Residence: "Badly wrecked."
61900	15	Residence: Off its base; dropped to ground; "beyond repair."
62000	15	Residence: Thrown five feet from its foundation; twisted to south; no dishes broken inside.
62100	15	"Handsome residence" of J.H. Campbell. Some of the verandah posts are twisted off; foundation is cracked in places; damage to contents of house.
62300	15	Mrs. D'Oyly's residence: Chimney fell through roof and ceiling of bedroom, nearly hitting the occupant.
62400	15	"Small cottage" of John Manger: Shoved "a foot or more" off base; no further visible damage.
63000	17, 32, 65	Carnegie Library building. Source #65: "suffered slight damage"; exterior was not damaged (p. 3). Source #17: Photograph of building. Source #32: One large chimney fell on the roof; walls are intact, uncracked; no window glass broken; shelving and books down inside.
63100	18, 27, 30, 65	University of the Pacific -- East Hall: Source #65: East Hall "suffered much damage"; "All the gables at the north and south ends of the building fell in and seams were opened in almost every part of the structure." Two students were injured in this building. No structural damage was observed to other buildings on the campus. (p. 4) Source #18: "The four-story building known as East Hall was badly shattered. So great was the damage that the final restoration of the structure left East Hall a three-story building." (p. 106) Source #27: The only buildings damaged were East Hall and the art room in the conservatory. Source #30: East Hall was "badly wrenched and many portions of the wall were thrown down"; injury to the university was considered "superficial"; school resumed on April 19, 1906, with dormitories and classes moved from East Hall to other buildings.

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
63200	12, 27	University of the Pacific -- Music conservatory. Source #12: Interior damage is shown in photograph -- room contents fallen off shelves and fallen plaster. Source #27 also indicates interior damage: "The only buildings damaged were East Hall and the art room in the conservatory."
63301	19, 59	Winchester House. Sources #19 and #59: Free-standing, two-story, stone-and-mortar chimney on south tower, front of house, detached from wall and fell. Examination of damage from 1906 post-earthquake photograph and still evident in 2007 shows: (1) likely failure to anchor chimney properly to wall; (2) poor mortaring of brick foundation of chimney (mortar unevenly applied; failure to adhere to some bricks).
63302	19, 59	Winchester House: Source #59: When the tower fell south on roof, it damaged the front rooms of house, including the "Daisy bedroom" in which Sarah Winchester was sleeping. The interior wall of the room, the door, and the door frame shifted enough to trap her in the room for about two hours. Source #19: Photograph shows plaster in "Daisy bedroom" as extensively cracked and fallen. If the seven-story tower had not fallen in the direction of this room, the "Daisy bedroom" would probably have suffered only cracked plaster. Front of house had four stories; most of remainder of house had three stories.
63303	19, 59	Winchester House: Source #59: Rear portions of house, mainly three stories tall, suffered primarily cracked and fallen plaster.
63304	19, 59	Winchester House. Sources #19 and #59: Top-heavy, seven-story, wood-frame tower fell south on roof, damaging front rooms of house. Tower was removed and never replaced.
63500	21	#51 S. River Street. Built around 1899 on the bank of the Guadalupe River; #51 S. River St. was not flooded by the river, but the cottage in back (#55, close to the river) did flood; no record or other indication of 1906 earthquake damage; #51 S. River St. was purchased by the great-grandparents of Nadine Nelson in 1909 or 1910; according to Ms. Nelson, the house was "extremely well built".
63600	21	#61 S. River Street. Built around 1899 on the bank of the Guadalupe River; not flooded by the river; no record or other indication of 1906 earthquake damage; #61 S. River St. was purchased by the great uncle of Nadine Nelson after 1906; according to Ms. Nelson, the house was "extremely well built".
63700	21	#71 S. River Street. Built around 1899 on the bank of the Guadalupe River; not flooded by the river; no record or other indication of 1906 earthquake damage; #71 S. River St. was purchased by the Cicalelli [spelling?] family, relatives of Nadine Nelson in late 1906; according to Ms. Nelson, the house was "extremely well built".
63800	22	#65 N. River St. San Jose Historic Inventory (CA); standing in original location in 1996.
63900	22	#70 N. River St. San Jose Historic Inventory (CA); standing in original location in 1996.
64000	22	#71 N. River St. San Jose Historic Inventory (CA); standing in original location in 1996.
64100	22	#78 N. River St. San Jose Historic Inventory (CA); standing in original location in 1996.

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
64200	22	#83 N. River St. San Jose Historic Inventory (CA); standing in original location in 1996.
64300	22	#85 N. River St. San Jose Historic Inventory (CA); standing in original location in 1996.
64400	16	Residence of Dr. Howard B. Gates, two blocks from his private sanitarium. No report of earthquake damage; house was built in 1904 (designed by architect Bernard Maybeck) and still exists in 2007. Frame covered with stucco. (p.41)
64500	1e, 16, 44	Training School building on grounds of the Normal School. Source #1e: "Annex in safe condition. Plastering needs repairing throughout the Normal and Annex." Source #16: Training school (an annex to the Normal school) was in a 2-story Queen Anne-style house directly behind the main Normal School building. Source #44: Training school was used as temporary classroom space for Normal School students displaced from the main building. This building remained behind Tower Hall (on campus of San José State University in 2007) until the 1930s. (p. 42)
64600	16	Withstood the earthquake; no report of damage. House probably built in 1890s, from style. Horace and Louise Knapp lived in this house from 1904 until the mid-1950s, when Louise died.
64700	16	Withstood the earthquake. Concrete-block construction. Residence of F. Louis King, director of King Conservatory of Music (Germania Hall in 2007). (p. 46) Conservatory advertised that it was in business immediately after the earthquake.
64800	16	Survived earthquake. Originally LeFranc Residence, was later residence of Paul Masson for about 30 years. (Photograph, p. 6)
65000	16	Belden property as "large acreage." Judge Belden's substantial house withstood the earthquake.
65100	16	Large Queen Anne-style house survived from (probably) 1890s to 1950s.
65200	16	House survived earthquake. Clarence Letcher moved out of this house in 1912 to rooms at the Vendome Hotel.
65300	23	One-story brick warehouse behind Lawrence Southern Pacific railway station "is in ruins."
65400	23	The two-story frame structure at Lawrence Southern Pacific railway station (shown as post office and store in 1891, rev. 1901, Sanborn) "is intact."
65500	24	One-story cottage (in the estate of Captain Welch) collapsed, having been "badly damaged by the earthquake." ("House Collapses", p. 4)
65700	25, 53	Princess Rink. Source #25: The roller-skating rink was "thrown open" to house refugees. 150 people took advantage of the offer. Source #53: This building, "claimed to be San Jose's largest building," was new in April 1906; the rink burned to the ground later in 1906 (p. 50).
65800	26	Pacific Manufacturing Mill was "thrown down and a big loss sustained"; workers "clearing away the wreck".
65900	26	Methodist Church "a total wreck"; "fell with a crash"; "only a small portion of a side wall remains."
66100	26	S.A. Elliott's plumbing establishment a "total wreck"; roof and walls caved in.

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
66200	26	Robinson Drug Store a "total wreck"; roof and walls caved in.
66300	26	Relief Saloon a "total wreck"; roof caved in.
66400	26	Santa Clara Odd Fellows' building. Building is a "wreck and will be torn down."
66500	26, 62	Santa Clara Hotel. Source #26: The hotel was "badly damaged." Source #62: "The Santa Clara Hotel building was found to be in a poor condition and should be reconstructed."
66600	26	H.J. Alderman's building: "Badly damaged."
66700	26	Widney building: "badly damaged."
66800	26	Raney stables: "badly demolished"; roof splintered. [Josiah N. Raney, Livery]
67000	26	Vargas building: "badly damaged." [M J & F Vargas, Groceries]
67100	26	Santa Clara College. Memorial chapel damaged. [Students' chapel]
67101	26	Santa Clara College. Convent: "a great deal of damage was done."
67103	26	Santa Clara College. Damage in Catholic church. [This was the old Mission church; crumbling 1826 adobe church refaced with wooden Italianate façade in the 1860s]
67104	26	Santa Clara College. "A great deal of damage was done"; old adobe building badly damaged. [Two-story Debating Halls/Gymnasium building]
67200	26	Santa Clara High School: "interior . . . is not very bad, the plaster being cracked in many places"; school theater: "one of the walls. . . is cracked." [This high school had just been built at the time of the 1906 earthquake.]
67300	26	Residence of Dr. J.W. Paul: "badly damaged." [Judson W. Paul, physician].
67400	26	Residence of Rev. A.L. Kellogg: "badly damaged."
67500	26	One of Dr. Osborne's houses: "badly damaged."
67600	26	Residence of Mrs. Mumfords: "badly damaged."
67700	26	Residence of O.S. Ralph: "badly damaged."
67800	26	Residence of Mrs. Reed: "badly damaged." [Mrs. Martha Reed]
67900	26	One of the Bacigalupi's houses: "badly damaged."
68100	26	Fleury undertaking parlors: an inquest into the death of Dr. Braden of Agnews asylum was held here 4/19/1906. This building would have been safe for occupancy and relatively undamaged.
68200	26	An old adobe wall in rear of residence of P.J. O'Riley: "the oldest in the county" [possibly over 100 years old in 1906] "became badly cracked in many places." [Peter J. Riley, baker; address in 1905-06 City Directory].

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
70300	30	University of the Pacific. Equipment not damaged in laboratories; large telescope in the observatory was "wrenched almost off its base" but not badly damaged. [1891 (rev. 1901) Sanborn shows Observatory on Emory Street at the corner of Elm Street.]
70400	15, 31	Residence of W.B. Minor: Source #31: Wrecked ("falling brick and timbers") and later destroyed by fire. Source #15: Miner [sic] residence: Building collapsed; occupants "had a narrow escape for their lives."
70600	31	Residence of W.H. Christman is "down." ["Down" means "off foundation", not "collapsed."]
70700	31	Residence of R.D. Fox: "wrecked."
70800	31	Residence of Carl Schilling wrecked.
71000	33	Jewish synagogue selected to be trade headquarters immediately after the earthquake. Minimal damage likely.
71200	34	Gardner School "a wreck", "badly damaged", and "wrecked in interior".
71400	34	Residence of Anton Martini: "wrecked completely", thrown 4' off foundation.
71500	34	Residence of Fred Hauss: "complete wreck".
71800	35	San Jose Light and Power Company's Gas Works, E.C. Jones' report on the retort house: "At the gas station, the brick retort house was very badly damaged. The north and south gable ends fell out. The brick work at all 4 corners loosened for about 10 feet down to where the roof trusses are anchored in the walls. The superheater of one of the gas-making machines settled on the south side so that it was 2 inches out of plumb. The weight of this machine is about 78 tons. Some of the cast-iron connections in the building were broken." (p. 285)
71900	35	San Jose Light and Power Company's Gas Works, E.C. Jones' report on the purifying house: "The purifying house, also of brick, was totally destroyed; all the walls and the roof collapsed, carrying the machinery to the ground and destroying it...[T]he breaking off of pipes in the building and the crushing of meters under falling houses necessitated shutting off the gas thruout the city for 24 hours." (p. 285)
72200	36	Auzerais residence. Built 1890; on original site in 1980. Queen Anne Victorian, wood-shingle; 2-1/2 stories. Well-built, imposing residence.
72300	4	M.A. Mabury residence. Used by St. Claire Club as temporary headquarters from June 1906 to August 1908, while their building was being repaired.
72400	37	Troy Steam Laundry Building. Unlikely to have sustained structural damage in 1906. Built in 1895; operated in same location 1895-1979.
72700	39	Meridian School (Meridian School District). Schoolhouse built 1904. Frame, 2 stories; front, wood frame, front bell tower. Photograph c. 1926 on p. 87.

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
72800	39, 63, 69	Source #39: Campbell Grammar School (Campbell School District): schoolhouse was built in 1896. Frame building, 2-1/2 stories plus front frame bell tower. Photos from 1896 and c. 1910 on p. 88 show identical building (source #39). Source #63: This building was importantly NOT mentioned in San Jose newspaper article on damage in Campbell. Source #69: "School opened Tuesday...After a thorough inspection of the buildings by the faculty and some of the trustees we are satisfied that they are staunch and safe." [24 April 1906]
72900	39, 63, 69	Source #39: Campbell Union High School (Campbell Union High School District): high school building was built in 1904. Frame, 2 stories with low attic; no bell tower; two chimneys on roof; size: large. Photograph c. 1910 on p. 90 (source #39). Source #63: This building was importantly NOT mentioned in newspaper article on damage in Campbell. Source #69: "School opened Tuesday...After a thorough inspection of the buildings by the faculty and some of the trustees we are satisfied that they are staunch and safe." [24 April 1906]
73000	39, 63, 68, 70	Source #39: Odd Fellows' Hall, Campbell Avenue (W end, N side of street), Campbell. Frame, 2 stories plus tall attic; soft first story; survived earthquake in good shape. Photo p. 98 (source #39). Source #63: "The windows in the I. O. O. F. Hall building were partly broken out", but no further damage was noted. Source #68: "Aside from the broken glass and plaster it is thought no serious damage has been sustained." Source #70: "The I.O.O.F. building was examined and found to be in a safe condition."
73100	39, 68	Source #39: Congressional Church, Campbell (later used as Campbell's second City Hall). Frame, 1 story plus tall attic; size: medium. Photo on p. 114 shows no steeple. Did the steeple fall in 1906? Built in 1893. Source #68: Catalog of earthquake damage in Campbell omits any mention of damage to this church. It is likely that the steeple <u>did not</u> fall in 1906. [Located on grounds of current Campbell City Hall complex, #70 N. 1st St., Campbell.]
73200	39, 70	Source #39: Bank of Campbell building, E. Campbell Avenue and N. Central Avenue, NE corner. Brick, 1 story; size: small. Built 1895; now Farley Building. Source #39: Photographs p. 26 and 124 (source #39). Source #70: "Several rods have been placed through the Bank of Campbell brick building as a precaution against further damage. The building is very little damaged by the quake." Exterior inspection in 2007 showed no obvious repairs to brickwork.
73300	39, 63, 68	Source #39: Sutter Hotel, opened in 1894 on SE corner of Campbell Avenue and Central Avenue. Frame, 2 stories; 1/2 is soft-story; size: large. Photograph on p. 37. Source #68: "The front show window of Mrs. Sutter's restaurant went out." Source #63: This building was not mentioned in the San Jose newspaper article on damage in Campbell.
73400	39, 63, 68	Source #39: Methodist Church, Campbell Avenue (W. of Central Avenue, N side of street). Built in 1895; frame, tall 1-story with front frame bell tower; size: large. 1895 photograph on p. 16. 1909 photograph (p. 26) shows <u>tower intact</u> . Source #63: This building was not mentioned in the San Jose newspaper article on damage in Campbell.
73500	39	South Pacific Coast Railroad depot. Built in 1886. [Depot still stands in 2007, though substantially remodeled and moved from original site.] Source #39: Photograph. (p. 16) Source #63: This building, which was important for rail traffic in Campbell in 1906, was importantly not mentioned in the newspaper article detailing damage in Campbell.

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
73510	39	Campbell Fruit Growers Union Warehouse #1: Photographs of post-1908 building (pp. 68-70). George Hyde bought and renamed this fruit-packing business in 1909. A close visual inspection of brickwork in 2007 failed to reveal repairs of "earthquake cracks" or replacement of large patches of brickwork but did show newer brickwork in scallops along top few feet of building, under roofline.
73600	40	J.C. Ainsley house c. 1870. Evidently in good condition. Intensity allows for some chimney damage. J.C. Ainsley lived in several houses in Campbell.
73700	40	J.C. Ainsley house c. 1890. Evidently in good condition. House was moved from this location around 1912. Intensity allows for some chimney damage. J.C. Ainsley lived in several houses in Campbell.
73800	40, 63	Source #40: Campbell House c. 1895. Source #63: Chimney fell; otherwise in good condition: "Henry Campbell's house received the severest damage, his chimney falling through entirely, but no one was hurt."
73900	41	Residence of Chief of Police Thomas W. Carroll. Police Department Clerk's register shows warrant #410 issued June 7, 1906 in amount of \$37.50 for "Rent of House for Chief." His pre-earthquake Residence must have been damaged sufficiently to be uninhabitable.
74000	12	Residence of Dr. C.E. Hablutzel. Photograph shows small amount of fallen masonry (most likely a chimney) in foreground with apparently undamaged frame house in background.
74100	12, 61	Lincoln School (formerly Fourth Ward School). In good shape after earthquake. Source #12: Photograph c. 1895. Source #61: Lincoln School was used for storage of furnishings salvaged from Grant School and for temporary classrooms for other schools; "probably usable after a few slight repairs are made."
74200	9	Hannay Nursery. Photograph shows multiple wooden sheds flattened. The sheds of very poor construction quality.
74300	42	San Jose Water Company. Charles Derleth described the "water works": "San José's water works, like that of Santa Rosa, was not injured; its sewers also were left intact, showing that there was no unequal displacement of the ground." (p. 56)
74400	56	San Jose Sanitarium and Home (O'Connor Sanitarium, operated by the Daughters of Charity). The chapel wing was substantially damaged, but hospital operations continued on site. Source #56: From the inspection team of architects and builders -- "We suggest that the operating department be not used until such time as it is put in safe condition. The north corner rooms of center projecting part is [sic] not to be occupied until put in more safe condition. At the round corner of the connecting part between the residence and the main building, to be well bonded. Chapel not to be used until put in perfect condition. The balance of the building we consider to be in a condition to be occupied with safety." From the same source: "The management of the sanitarium also wish to state that the operating room is equipped and ready for use."

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
74500	43	Residence of Michael Hyams [2007], Santa Clara. Frame dwelling, with house that was unharmed and chimney that DID NOT fall in 1906. The small brick cottages in back of house were probably at least cracked. Their occupants disappeared from S.J. City Directories soon after 1906; a 1904 penny was found on the site of the cottages. The cottages were razed between 1906 and 2006.
74601	49	Barn/stable at back of property at #596 N. 5th Street; [In 1912 became Kinokuiya Shoten market and later Dobashi Market. Dobashi Market closed in December 2005.] Photograph from 1912 shows an already old building with access door for hay at front, top of second story. This building survived the 1906 earthquake in excellent condition; at most, minor repairs would have been needed.
74602	48	Ng Shing Gung building ["Joss house"]. Building was damaged in 1906 but repaired and in use until 1947. Photograph on p. 41.
74603	12, 48	Heinlenville Chinatown. Source #48: Photographs and description of damage from earthquake. Buildings were primarily one- and two-story brick structures lining both sides of Cleveland Street between Sixth and Seventh Streets. No detailed damage reports are available (inspectors did not enter the gates of Heinlenville Chinatown), so photographs of damage are the primary source of damage data. Photograph on p. 60 shows nearly all buildings on these blocks as having partially damaged or partially fallen brick walls. The buildings on this street did not suffer total collapse. The contemporary accounts blame this degree of damage on substandard ("shoddy") construction. One damage data point here represents several dozen buildings. Many families and businesses were displaced; buildings typically had stores on the ground floor and living quarters on the upper floor. From same source: "Heinlenville patched up the damage to its buildings and stayed put. Merchants took the opportunity while rebuilding to remodel and expand their buildings." (p. 61) From same source: Photograph of Chinese refugees from the earthquake in St. James Park (p. 60). Source #12: Two photographs, one taken on October 17, 1897, looking north on North Jackson Street and another taken "near Jackson Street" c. 1895, clearly show URM D construction throughout Heinlenville Chinatown.
74700	50, 42	Agnew State Hospital ("insane asylum"). Source #50: Photographs show loss of structural integrity in all, or nearly all, of the 3- and 4-story brick buildings housing inmates and administrative facilities. 112 inmates and staff members were killed. According to source #42 (Derleth, 1907), the poor performance of these structures could be blamed on low-cement, high-lime mortar.
74800	55	Residence of Thomas D. Scales, who moved to this location from #325 North Third Street immediately after the earthquake. From the letter of May 25, 1906 from (sister) Elizabeth J. Scales of Long Beach to (brother) Thomas D. Scales of San José: "You certainly made good time during the last earthquake. 'Practice makes perfect,' you know, and after a while you will probably be able to move the entire house into another county before the shock is being experienced by your neighbors. You are all right." This dwelling (at #132 North Fourteenth -- now Seventeenth -- Street, near the west bank of Coyote Creek), to which Thomas Scales moved immediately after the earthquake, was safe for occupancy after the earthquake and immediately available for rent.

TABLE 15. DAMAGE DESCRIPTIONS AND DATA SOURCES FOR INTENSITY DATA POINTS

Entry Number	Data Sources	Damage Descriptions
74900	1c, 61	Longfellow School (formerly First Ward School). Source #1c: "In safe condition and could be used if walls were cleaned down and brick taken from roof." Source #61: "The Longfellow has been examined by the inspectors and pronounced perfectly safe."

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (°N)	Longitude (°W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
100	6.5	SJ	37.338191	121.893059		N. Market St., opp. 160-174 N. Market & mid-block bet. N. Market & N. 1st Sts.	br	xl	1	pub
200	8.0	SJ	37.338351	121.892700		N. 1st St. bet. St. John St. & St. James St.	br	xl	2	pub
300	7.0	SJ	37.340261	121.893900	291	N. 1st St.	br	m	3	com
400	8.0	SJ	37.338705	121.893094		N. 1st St., SW cmr. St. James St.	st	xl	2	pub
500	7.5	SJ	37.338070	121.892283		N. 1st St. opp. St. James Park	br	xl	4	hot
600	8.0	SJ	37.337452	121.892488		W. St. John St. [facing St. James Hotel]	br	xl	4	hot
700	8.0	SJ	37.337361	121.891883	89-97	N. 1st St.	br	m	3	com
800	8.0	SJ	37.335057	121.890124	53	S. 1st St.	br	m	3	com
900	7.5	SJ	37.336891	121.888528	86-98	E. Santa Clara St., SW cmr 3rd St.	br	l	3	com
1100	7.0	SJ	37.336216	121.890925	7	W. Santa Clara St.	br	xs	2	com
1200	7.5	SJ	37.331415	121.886796	310	S. 1st St.	br	m	2	com
1300	7.5	SJ	37.336238	121.890036	24-26	E. Santa Clara St.	br	m	2	com
1900	8.0	SJ	37.336550	121.890259	17-19	E. Santa Clara St.	br	s	3	com
2100	7.5	SJ	37.336636	121.890696	20-40	N. 1st St.	br	l	2	com
2200	6.5	SJ	37.338550	121.889196	86	N. 3rd St.	fr	l	2	hos
2300	7.5	SJ	37.335207	121.888190	88-90	S. 2nd St.	br	s	2	com
2400	7.5	SJ	37.335102	121.888090		S. 2nd St., NE cmr San Fernando St.	br	m	2	com
2500	6.5	SJ	37.335246	121.887720	69-79	E. San Fernando St.	br	l	2	com
2700	7.5	SJ	37.335387	121.887432	89-97	E. San Fernando St., at NW cmr 3rd St.	br	xl	2	com
2800	7.0	SJ	37.331739	121.887019	294	S. 1st St., NE cmr San Carlos St.	br	m	2	com
2900	7.5	SJ	37.335754	121.887815	81	S. 3rd St.	br	m	2	com
3000	8.0	SJ	37.335927	121.887955	71	S. 3rd St.	fr	l	1	com
3100	7.5	SJ	37.335048	121.887281	90	E. San Fernando St.	br	l	2	com

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (°N)	Longitude (°W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
3200	7.0	SJ	37.335554	121.888437	62	S. 2nd St.	br	m	2	com
3300	7.5	SJ	37.344518	121.892221	404	N. 4th St.	fr	s	2	com
3400	8.5	SJ	37.345748	121.894541	478	N. 3rd St.	fr	l	2	dwl
3500	8.5	SJ	37.342148	121.891914	322	N. 3rd St.	fr	m	2	dwl
3700	7.5	SJ	37.336846	121.890178	25	N. 2nd Street	br	l	2	chu
3800	7.5	SJ	37.336427	121.890517	2-12	N. 1st St.	br	l	3	com
4000	8.0	SJ	37.333844	121.887145		S. 2nd St., NE cmr San Antonio St.	fr	xl	1	chu
4100	7.0	SJ	37.333984	121.887262	172	S. 2nd St.	br	s	2	com
4200	7.0	SJ	37.333638	121.887013	172 (S. of #4100)	S. 2nd St.	fr	s	1	com
4300	6.5	SJ	37.329275	121.884481		S. 2nd St., near William St.	fr	xl	1	chu
4400	7.0	SJ	37.327262	121.883102		S. 2nd St., SW cmr Reed St.	br	m	1	chu
4500	7.5	SJ	37.326625	121.883219	624	S. 1st St. near Reed St.	br	xs	2	fls
4600	7.5	SJ	37.336815	121.888709	80	E. Santa Clara St.	br	m	2	com
4800	7.0	SJ	37.336420	121.889117	14-16	S. 2nd St.	fr	m	1	com
4900	6.5	SJ	37.336345	121.889056	20	S. 2nd St.	fr	xs	2	com
5000	7.5	SJ	37.336231	121.888971	26-38	S. 2nd St.	br	l	2	com
5100	6.0	SJ	37.335833	121.888678	40-44	S. 2nd St.	br	s	3	com
5300	7.0	SJ	37.334786	121.891284	40-44	S. Market St.	br	m	2	com
5400	7.0	SJ	37.335026	121.891470	30	S. Market St.	br	s	1	com
5500	7.0	SJ	37.334991	121.891444	32	S. Market St.	br	s	1	com
5600	7.0	SJ	37.334923	121.891393	38	S. Market St.	br	s	1	com
5700	7.0	SJ	37.335153	121.891555	24	S. Market St.	br	s	1	com
5800	7.0	SJ	37.335061	121.891494	28	S. Market St.	br	s	1	com

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (°N)	Longitude (°W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
5900	7.5	SJ	37.335312	121.891688	12-16	S. Market St.	br	m	2	com
6000	7.0	SJ	37.335400	121.891736	2-8	S. Market St., SE cnr Santa Clara St.	br	m	2	com
6100	7.0	SJ	37.335474	121.891574	80	W. Santa Clara St.	br	s	2	com
6200	7.0	SJ	37.335118	121.890577	29	Post St.	br	m	3	com
6300	7.5	SJ	37.334379	121.890917	72-80	S. Market St., cnr Post St.	br	l	2	com
6400	8.0	SJ	37.334899	121.892051	19-31	S. Market Street	br	l	3	com
6500	8.0	SJ	37.334460	121.891004	66-74	S. Market St.	br	m	2	com
6600	7.0	SJ	37.334303	121.890622	72-80	S. Market St., cnr Post St.	fr	s	1	com
6700	8.0	SJ	37.332939	121.888558	185-199	S. 1st St.	br	xl	2	hot
6800	7.5	SJ	37.333408	121.889771	130	S. Market Street bet. #138 and Post Office	br	s	2	com
7000	7.0	SJ	37.334284	121.891466	73-75	S. Market St.	br	s	2	hot
7100	7.0	SJ	37.334567	121.891897	33	S. Market St.	br	l	2	com
7200	7.0	SJ	37.334418	121.892162	36	S. San Pedro St. (cnr. Post St.)	br	m	2	com
7400	7.5	SJ	37.334983	121.892586	144	W. Santa Clara St.	br	l	2	com
7500	7.5	SJ	37.334797	121.892970	154	W. Santa Clara St.	br	xl	2	com
7600	7.5	SJ	37.334560	121.893519	190	W. Santa Clara St.	br	xs	2	com
7700	6.5	SJ	37.336750	121.891358	29 - 57	N. 1st St.	br	xl	3	com
7800	7.0	SJ	37.336969	121.891563	61-67	N. 1st St.	br	m	3	com
7900	8.0	SJ	37.337070	121.891643	65	N. 1st St.	br	m	3	com
8000	7.5	SJ	37.336149	121.891077	7-29	W. Santa Clara St. (NW cnr 1st St.)	br	xl	2	com
8100	8.0	SJ	37.335989	121.891461	47	W. Santa Clara St.	br	xl	3	com
8201	7.0	SJ	37.335257	121.893337	151-159	W. Santa Clara St., NW cnr San Pedro St.	br	xl	3	com
8202	7.0	SJ	37.335514	121.893564		N. San Pedro Street (around corner)	br	xl	3	com

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (°N)	Longitude (°W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
8300	7.5	SJ	37.335358	121.892824	131-149	W. Santa Clara St., NE cmr San Pedro St.	br	l	2	com
8400	8.5	SJ	37.341308	121.894722	359	N. 1st St.	fr	m	1	dwl
8500	6.5	SJ	37.340032	121.895896	295-321	N. Market St.	fr	l	3	apa
8600	6.5	SJ	37.340659	121.896279		N. Market St., SW cmr Bassett St.	fr	l	3	hot
8700	6.5	SJ	37.340883	121.895775	1	Bassett St., NE cmr N. Market St.	fr	m	2	hot
8800	7.5	SJ	37.340993	121.895557		Bassett St.	fr	m	2	hot
8900	7.0	SJ	37.338859	121.895984		N. San Pedro St., NW cmr Devine St.	fr	xl	2	sch
9001	8.0	SJ	37.344757	121.898470		N. 1st St. and Empire Alley, bet.N. San Pedro St. & Hobson St.	fr	xl	4	hot
9002	8.0	SJ	37.345233	121.898835		N. 1st St. and Empire Alley, bet.N. San Pedro St. & Hobson St.	fr	xl	4	hot
9003	7.0	SJ	37.345150	121.898881		N. 1st St. and Empire Alley, bet.N. San Pedro St. & Hobson St.	fr	l	4	hot
9004	7.5	SJ	37.344813	121.899062		N. 1st St. and Empire Alley, bet.N. San Pedro St. & Hobson St.	fr	l	3	hot
9005	7.0	SJ	37.345306	121.899596		N. 1st St. and Empire Alley, bet.N. San Pedro St. & Hobson St.	fr	l	1	hot
9006	9.0	SJ	37.345553	121.899885		N. 1st St. and Empire Alley, bet.N. San Pedro St. & Hobson St.	fr	l	3	hot
9008	8.0	SJ	37.345098	121.898992		N. 1st St. and Empire Alley, bet.N. San Pedro St. & Hobson St.	fr	xl	4	hot
9200	8.0	SJ	37.336570	121.890481	2-12	N. 1st St., NE cmr Santa Clara St.	br	l	3	com
9300	8.0	SJ	37.339375	121.892650		N. 1st St., NE cmr St. James St.	br	xl	1	com
9400	8.5	SJ	37.339167	121.893153		N. 2nd St., NW cmr St. James St.	fr	s	2	dwl
9500	6.5	SJ	37.339596	121.892389		W. St James St., bet. 1st St. and 2nd St.	fr	l	1	chu

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (°N)	Longitude (°W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
9600	6.0	SJ	37.340093	121.892535		N. 2nd St., bet St. James St. and Julian St.	fr	l	1	chu
9700	8.5	SJ	37.340229	121.892626	255	N. 2nd St.	fr	s	2	chu
9800	7.5	SJ	37.339878	121.891580		N. 2nd St., NE cmr St. James St.	br	l	3	clu
9900	7.5	SJ	37.328235	121.882104	581	S. 3rd St., NW cmr Reed St.	fr	m	2	sch
10000	7.5	SJ	37.328373	121.882209	571	S. 3rd St., NW cmr Reed St.	br	l	1	chu
10100	7.5	SJ	37.335996	121.890228		S. 1st St., SE cmr Santa Clara St.	br	m	3	com
10200	7.5	SJ	37.335970	121.889243	29-39	S. 2nd St., SW cmr Fountain St.	br	l	2	com
10300	7.5	SJ	37.335868	121.889703	28	Fountain Alley	br	m	1	com
10400	7.5	SJ	37.335757	121.889045	45	S. 2nd St.	br	m	3	com
10500	7.0	SJ	37.335712	121.890004	24-28	S. 1st St., SE cmr Fountain Alley	br	m	3	com
10700	7.0	SJ	37.336407	121.889662	34-50	E. Santa Clara St., SW cmr 2nd St.	br	xl	2	com
10800	7.0	SJ	37.336340	121.889801	34-50	E. Santa Clara St. (SW cmr 2nd St.)	br	xl	2	com
10900	6.0	SJ	37.336070	121.889741	29	Fountain Alley	br	l	3	com
11000	6.0	SJ	37.336097	121.889677	31	Fountain Alley	br	s	3	chu
11100	6.0	SJ	37.336168	121.889504		Fountain Alley and Second Street, NW cmr	br	m	2	com
11200	6.5	SJ	37.336125	121.889605	35-37	Fountain Alley	fr	s	2	com
11300	7.0	SJ	37.335433	121.889799	40-50	S. 1st St.	br	m	3	com
11400	6.5	SJ	37.335347	121.889737	46-48	S. 1st St.	fr	xs	1	com
11500	7.0	SJ	37.335277	121.889685	52-54	S. 1st St.	br	s	3	com
11600	7.0	SJ	37.335186	121.889615	56-62	S. 1st St.	br	s	2	com
11700	7.5	SJ	37.335040	121.889497	64-72	S. 1st St.	br	m	3	com
11800	7.5	SJ	37.335879	121.890668	1-9	S. 1st St.	br	s	2	com
11900	7.0	SJ	37.335793	121.890847	24	W. Santa Clara St.	br	l	2	off

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (°N)	Longitude (°W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
12000	7.0	SJ	37.335823	121.890793	20	W. Santa Clara St.	br	l	2	off
12100	7.0	SJ	37.331016	121.889464	275	S. Market St.	br	m	3	com
12300	7.0	SJ	37.331075	121.889518	265	S. Market St.	br	m	3	com
12400	7.5	SJ	37.336210	121.889428	19	S. 2nd St.	br	s	2	com
12800	7.0	SJ	37.333312	121.889620	140-144	S. Market St.	br	l	2	com
12900	7.0	SJ	37.328729	121.885311	481-499	S. 1st St.	br	l	2	com
13000	8.0	SJ	37.332266	121.889671		S. Market St., bet San Antonio St. & Park Ave.	br	xl	2	pub
13200	7.5	SJ	37.337817	121.894194	143-149	N. Market St.	br	m	1	com
13300	8.0	SJ	37.336656	121.893833	82-86	N. San Pedro St.	br	m	2	apa
13400	6.0	SJ	37.336539	121.894244	85-87	N. San Pedro St.	br	m	2	com
13500	7.5	SJ	37.336388	121.894140	73-75	N. San Pedro St.	br	s	1	com
13600	7.0	SJ	37.336131	121.894181	59, 65, 69	N. San Pedro St.	br	xl	1	com
13700	7.5	SJ	37.335912	121.894022	49-55	N. San Pedro St.	br	xl	2	com
13800	8.0	SJ	37.335761	121.893832	45	N. San Pedro St.	fr	s	2	dwl
13901	7.5	SJ	37.335755	121.893728	43	N. San Pedro St.	fr	xs	1	dwl
13902	7.5	SJ	37.335724	121.893701	41	N. San Pedro St.	fr	xs	1	dwl
14000	6.5	SJ	37.335669	121.893649	39	N. San Pedro St.	fr	xs	1	dwl
14100	7.5	SJ	37.335748	121.893171	30	N. San Pedro St.	br	xs	1	fls
14200	7.5	SJ	37.335487	121.892959	16, 18	N. San Pedro St.	fr	xs	2	com
14301	6.5	SJ	37.335566	121.893029	24	N. San Pedro St.	fr	xs	1	dwl
14302	6.5	SJ	37.335609	121.893063	26	N. San Pedro St.	fr	xs	1	dwl
14303	6.5	SJ	37.335659	121.893101	28	N. San Pedro St.	fr	xs	1	dwl
14400	6.5	SJ	37.335929	121.893301	44	N. San Pedro St.	fr	s	1	dwl

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (°N)	Longitude (°W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
14500	6.5	SJ	37.336109	121.893431	52	N. San Pedro St.	fr	s	1	dwl
14600	6.5	SJ	37.336321	121.893592	58	N. San Pedro St.	fr	s	1	dwl
14700	6.5	SJ	37.336498	121.893714	74	N. San Pedro St.	fr	s	1	dwl
14800	7.5	SJ	37.335042	121.893486	163-167	W. Santa Clara St.	br	l	3	com
14900	7.5	SJ	37.334938	121.893698	171	W. Santa Clara St.	br	l	2	com
15000	8.0	SJ	37.334390	121.894956	199	W. Santa Clara St.	br	xl	2	sch
15100	7.0	SJ	37.334915	121.893941	199	W. Santa Clara St.	br	s	2	sch
15200	6.5	SJ	37.334160	121.895428	199	W. Santa Clara St.	br	s	2	sch
15300	7.5	SJ	37.334741	121.894508	199	W. Santa Clara St.	br	l	3	sch
15400	7.5	SJ	37.335286	121.894686	199	W. Santa Clara St.	br	l	2	sch
15500	7.0	SJ	37.335454	121.894716	199	W. Santa Clara St.	br	l	2	sch
15600	6.0	SJ	37.335013	121.894862	199	W. Santa Clara St.	br	l	2	sch
15700	7.0	SJ	37.334396	121.895319	199	W. Santa Clara St.	br	l	3	sch
15800	7.0	SJ	37.334798	121.895012	199	W. Santa Clara St.	br	l	3	sch
15900	6.5	SJ	37.333941	121.895825	259	W. Santa Clara St.	fr	m	2	dwl
16000	6.5	SJ	37.333877	121.895957	261	W. Santa Clara St.	fr	xs	1	dwl
16100	6.5	SJ	37.333812	121.896089	265	W. Santa Clara St.	fr	s	1	dwl
16200	6.0	SJ	37.333747	121.896264	269	W. Santa Clara St.	br	xs	1	dwl
16300	6.0	SJ	37.333709	121.896348	271	W. Santa Clara St.	br	xs	1	dwl
16400	6.5	SJ	37.333669	121.896423	291	W. Santa Clara St.	fr	s	1	dwl
16500	6.0	SJ	37.333640	121.896489	299	W. Santa Clara St.	br	xs	1	com
16600	7.0	SJ	37.333463	121.896859	301-307	W. Santa Clara St.	br	m	2	com
16701	6.5	SJ	37.333401	121.896982	319	W. Santa Clara St.	fr	xs	2	dwl
16702	6.5	SJ	37.333349	121.897078	323	W. Santa Clara St.	fr	xs	1	com

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (°N)	Longitude (°W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
16703	6.5	SJ	37.333314	121.897135	325	W. Santa Clara St.	fr	s	1	com
16801	6.5	SJ	37.333215	121.897328	337	W. Santa Clara St.	fr	l	2	com
16802	6.5	SJ	37.333179	121.897401	347	W. Santa Clara St.	fr	l	2	com
16803	6.5	SJ	37.333150	121.897476	349	W. Santa Clara St.	fr	l	1	com
16804	6.5	SJ	37.332987	121.897794	359	W. Santa Clara St.	fr	xs	1	off
16805	6.5	SJ	37.332945	121.897872	361	W. Santa Clara St.	fr	xs	1	dwl
16806	6.5	SJ	37.332709	121.898389	371	W. Santa Clara St.	fr	xs	1	com
16807	6.5	SJ	37.333267	121.897247	327	W. Santa Clara St.	fr	m	2	com
16900	7.0	SJ	37.332634	121.898543	373, 375	W. Santa Clara St.	br	s	1	com
17001	6.5	SJ	37.332567	121.898711	387	W. Santa Clara St.	fr	xs	1	com
17002	6.5	SJ	37.332530	121.898789	389	W. Santa Clara St.	fr	xs	1	dwl
17003	6.5	SJ	37.332502	121.898862	391	W. Santa Clara St.	fr	xs	1	com
17004	6.5	SJ	37.332266	121.899555	413-425	W. Santa Clara St.	fr	xl	2	hot
17100	6.5	SJ	37.332257	121.899746	427-429	W. Santa Clara St.	fr	l	2	com
17200	7.5	SJ	37.335506	121.892524	105-125	W. Santa Clara St., NW cmr Market St.	br	xl	5	com
17300	7.5	SJ	37.335752	121.891988	87-97	W. Santa Clara St., NE cmr Market St.	br	m	2	com
17400	6.5	SJ	37.335842	121.891777	73-83	W. Santa Clara St.	br	m	2	com
17500	7.0	SJ	37.335902	121.891645	65-69	W. Santa Clara St.	br	m	2	com
17600	7.5	SJ	37.336051	121.892983	37-45	N. Market St.	fr	xl	2	hot
17700	7.0	SJ	37.336095	121.892278	36, 38	N. Market St.	br	m	3	hot
17800	8.0	SJ	37.336164	121.892341	40	N. Market St.	fr	xs	2	com
17900	7.0	SJ	37.336241	121.892391	50	N. Market St.	br	m	2	com
18000	7.0	SJ	37.336433	121.893119	57	N. Market St.	br	l	3	hot
18100	8.0	SJ	37.336754	121.892769	80,82	N. Market St.	fr	xs	1	com

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (°N)	Longitude (°W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
18200	7.0	SJ	37.336825	121.892823	84, 86, 88, 90	N. Market St.	br	s	2	com
18300	7.0	SJ	37.336879	121.892864	92, 94, 96	N. Market St.	br	s	1	com
18400	7.0	SJ	37.336928	121.892907	98	N. Market St. SE cmr St. John St.	br	s	2	com
18600	7.5	SJ	37.337626	121.892157	13-33	W. St. John St.	br	xl	1	com
18800	6.0	SJ	37.337707	121.891958	101-103	N. 1st St., cmr St John St.	br	xs	1	com
18900	7.0	SJ	37.339577	121.893424	227-243	N. 1st St.	br	m	3	com
19000	7.0	SJ	37.339932	121.893703	261-263	N. 1st St.	br	s	2	com
19100	6.0	SJ	37.339835	121.893632	255-259	N. 1st St.	br	m	2	com
19200	7.0	SJ	37.337117	121.893599	97, 99	N. Market St., SW cmr St. Augustine St.	br	s	1	com
19300	7.0	SJ	37.336991	121.893514	85	N. Market St.	br	xs	2	hot
19400	6.5	SJ	37.336894	121.893449	79-83	N. Market St.	fr	m	2	hot
19500	7.0	SJ	37.336794	121.893384	73,75	N. Market St.	br	m	2	com
19600	7.0	SJ	37.336704	121.893319	67-71	N. Market St.	br	m	2	com
19700	7.0	SJ	37.336597	121.893235	63,65	N. Market St.	br	m	2	lod
19900	6.5	SJ	37.336317	121.893039	53	N. Market St.	fr	l	1	com
20000	7.0	SJ	37.336228	121.892974	49	N. Market St.	fr	m	2	hot
20300	7.5	SJ	37.335935	121.892755	27-35	N. Market St.	br	m	2	fls
20400	7.5	SJ	37.335834	121.892684	21 & 23	N. Market St.	br	m	1	com
20500	7.0	SJ	37.335769	121.892622	19	N. Market St.	br	xs	1	com
20600	6.5	SJ	37.335766	121.892501	15	N. Market St.	fr	s	1	com
20700	7.0	SJ	37.335643	121.892521	11-13	N. Market St.	br	s	2	com
20800	8.0	SJ	37.337393	121.893845	107	N. Market St.	br	m	3	hot

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (°N)	Longitude (°W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
20900	8.0	SJ	37.337479	121.893910	111, 113, 115, 117, 119 & 121	N. Market St.	br	s	2	hot
21000	7.5	SJ	37.337655	121.894059	123-131	N. Market St.	br	l	2	com
21100	7.0	SJ	37.337609	121.893337	128, 130	N. Market St	fr	m	1	com
21200	6.5	SJ	37.340606	121.894325	13	W. Julian St., NW cmr 1st	fr	m	2	lod
21300	6.5	SJ	37.342175	121.895377	N. of 381	N. 1st St.	fr	xl	3	whs
21400	6.5	SJ	37.342455	121.896362	431	N. 1st St.	fr	xl	2	dwl
21500	8.0	SJ	37.343135	121.896785	45	Fox Avenue.	fr	m	1	dwl
21700	8.0	SJ	37.343169	121.896645	37	Fox Avenue.	fr	s	1	dwl
21800	8.0	SJ	37.342862	121.896772	56	Fox Avenue.	fr	s	1	dwl
21900	8.0	SJ	37.342818	121.896935	66	Fox Avenue.	fr	s	2	dwl
22000	8.5	SJ	37.350108	121.902942	767	Miller St.	fr	s	2	dwl
22100	7.0	SJ	37.346867	121.900901	112	George St.	fr	s	1	dwl
22200	7.0	SJ	37.346244	121.902212	184	George St.	fr	s	1	dwl
22300	8.0	SJ	37.347219	121.904061	A	W. Taylor St.	br	l	1	com
22400	7.0	SJ	37.347303	121.903894	207-211	N. San Pedro St., N side, bet. Taylor St. & Guadalupe River	br	l	1	com
22500	8.0	SJ	37.347019	121.904391		Taylor St. to Wheeler St.; incl. Dupont St., Kearney St.	fr	m	1	
22600	8.0	SJ	37.349376	121.900838	707	N. 1st St.	fr	s	2	dwl
22700	7.0	SJ	37.340279	121.897041		N. San Pedro St., SW cmr Bassett St.	fr	l	2	whs
22800	7.0	SJ	37.342069	121.896504		Bassett St., mid-block & W of 38 N. 1st St.	fr	l	1	whs
22900	7.5	SJ	37.339401	121.900890	275	Bassett St.	br	l	2	whs
22901	7.5	SJ	37.339636	121.900378	273	Bassett St.	br	l	2	whs

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (°N)	Longitude (°W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
23000	7.5	SJ	37.336248	121.897054	146	Santa Teresa St.	fr	s	1	dwl
23100	8.0	SJ	37.336139	121.896988	136, 138	Santa Teresa St.	fr	s,m	1	dwl
23200	8.0	SJ	37.342477	121.897754	88	Fox Avenue	fr	s	1	dwl
23300	8.0	SJ	37.343127	121.897279	75	Fox Avenue	fr	s	1	dwl
23400	7.5	SJ	37.342588	121.897385	86	Fox Avenue	fr	s	1	dwl
23500	8.5	SJ	37.342764	121.897099	76	Fox Avenue	fr	s	2	dwl
23600	8.0	SJ	37.342926	121.897589	95	Fox Avenue	fr	s	1	dwl
23700	8.0	SJ	37.342753	121.898435	456	N. San Pedro St.	fr	s	1	dwl
23800	8.0	SJ	37.344877	121.900620	559	N. San Pedro St.	fr	m	2	dwl
23900	7.5	SJ	37.345159	121.900780	579	N. San Pedro St.	fr	s	2	dwl
24001	7.0	SJ	37.344198	121.900198	579	Hobson St., cmr N. San Pedro St.	fr	l	3	whs
24002	7.5	SJ	37.344239	121.900444	579	Hobson St., cmr N. San Pedro St.	br	l	1	whs
24003	7.5	SJ	37.344046	121.900732	579	Hobson St., cmr N. San Pedro St.	br	l	1	whs
24100	8.0	SJ	37.346547	121.901728	647	N. San Pedro St.	fr	s	1	dwl
24200	8.5	SJ	37.346948	121.901613	145	George St.	fr	m	2	dwl
24300	8.5	SJ	37.347388	121.901007	10	Miller St.	fr	s	2	dwl
24400	8.5	SJ	37.347575	121.901147	99	Miller St.	fr	s	1	dwl
24500	8.5	SJ	37.347752	121.901278	65	Miller St.	fr	s	1	dwl
24600	8.5	SJ	37.342695	121.885686	341	W. St. James St.	fr	s	1	dwl
24700	8.5	SJ	37.337042	121.895587	226	Terraine St.	fr	m	2	dwl
24800	7.5	SJ	37.336680	121.889021	62	E. Santa Clara St.	br	s	2	com
24900	8.5	SJ	37.339716	121.898160		Bassett St., cmr Terraine St.	fr	l	1	whs
25000	7.5	SJ	37.340886	121.897562		RR tracks along Bassett Street, bet N Market & Old M Sts.	br	l	1	whs

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (°N)	Longitude (°W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
25100	7.0	SJ	37.341907	121.898214		Ryland St. near San Pedro St.	br	l	1	whs
25200	8.5	SJ	37.335453	121.897166	276	San Augustine St. [1st house to W of 262]	fr	l	1	dwl
25300	7.5	SJ	37.337522	121.896459	207	W. St. James St.	fr	m	2	dwl
25400	7.0	SJ	37.339813	121.890070	174	N. 3rd St.	fr	s	2	dwl
25501	7.5	SJ	37.336602	121.890151	27	E. Santa Clara St.	br	s	3	com
25502	7.5	SJ	37.336623	121.890112	29	E. Santa Clara St.	br	s	3	com
25503	7.5	SJ	37.336641	121.890075	31	E. Santa Clara St.	br	s	3	com
25601	7.5	SJ	37.336666	121.890009	35	E. Santa Clara St.	br	s	3	com
25602	7.5	SJ	37.336688	121.889959	39	E. Santa Clara St.	br	s	3	com
25700	7.5	SJ	37.336736	121.889837	41-49	E. Santa Clara St.	br	s	3	com
25800	8.5	SJ	37.340158	121.891035	20	E. St. James St.	fr	l	2	dwl
25900	7.5	SJ	37.336931	121.889459	51-73	E. Santa Clara St., NE cmr 2nd St.	br	xl	4	com
26000	6.5	SJ	37.332278	121.885919	296	S. 2nd St. [NE cmr San Carlos & 2nd Sts.]	fr	l	2	lod
26100	6.5	SJ	37.333864	121.885683	204	S. 3rd St. [SE cmr San Antonio & 3rd Sts.]	fr	l	1	chu
26200	7.0	SJ	37.334579	121.889128	74-98	S. 1st St. & San Fernando St., NE cmr	br	xl	3	com
26300	7.0	SJ	37.334290	121.888714	18-24	E. San Fernando St.	br	xl	2	sta
26400	7.5	SJ	37.334260	121.888909	104	S. 1st St., cmr San Fernando St.	br	m	2	com
26500	6.0	SJ	37.334080	121.888772	114-126	S. 1st St.	br	m	2	com
26600	6.0	SJ	37.333923	121.888664	126-132	S. 1st St.	br	s	2	com
26700	7.0	SJ	37.333652	121.888468	150	S. 1st St.	br	m	1	com
26800	8.0	SJ	37.333772	121.888541	140-144	S. 1st St.	br	xl	1	com
26900	8.0	SJ	37.333785	121.887664	161	S. 2nd St., near San Antonio St.	br	m	1	chu
27000	7.5	SJ	37.334603	121.888223	101-121	S. 2nd St., SW cmr. San Fernando St.	br	l	2	mtg
27100	7.0	SJ	37.334766	121.887884	102	S. 2nd St.	br	m	2	com

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (°N)	Longitude (°W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
27200	7.0	SJ	37.335536	121.888885	59	S. 2nd St.	br	m	3	com
27300	8.0	SJ	37.333564	121.888395	152-156	S. 1st St.	br	s	1	com
27500	8.0	SJ	37.327521	121.869228	516	Martha St., SE crnr 11th St.	fr	xl	2	hos
27700	6.0	SJ	37.333453	121.888316	160-166	S. 1st St.	br	m	2	com
27800	7.5	SJ	37.334932	121.890942	65	Post St., NE crnr Lightston St.	br	s	2	com
27900	8.0	SJ	37.334969	121.890879	59	Post St.	br	xs	2	com
28000	7.0	SJ	37.335006	121.890803	45-55	Post St.	br	m	1	com
28100	7.0	SJ	37.335363	121.890317	37	S. 1st St.	br	xs	2	com
28200	7.5	SJ	37.335219	121.890338	21	Post St. [Eldorado St., E. of Schilling's]	br	xs	2	com
28300	7.0	SJ	37.335159	121.890501	27	Post St.	br	s	2	com
28500	7.0	SJ	37.335541	121.890485	27	S. 1st St.	br	xs	1	com
28600	7.0	SJ	37.335580	121.890518	23	S. 1st St.	br	xs	1	com
28700	7.0	SJ	37.334160	121.894349	220-232	W. Santa Clara St.	br	m	2	com
28800	7.5	SJ	37.334083	121.894518	234-238	W. Santa Clara St.	fr	m	1	com
28900	8.0	SJ	37.334011	121.894697	246	W. Santa Clara St.	fr	xs	1	dwl
29000	8.0	SJ	37.333162	121.893045	73-77	Orchard St.	fr	l	1	whs
29200	7.0	SJ	37.334831	121.890524	38-44	Post St.	br	m	2	com
29300	7.5	SJ	37.334771	121.890637	50	Post St.	br	xl	2	com
29400	7.0	SJ	37.335419	121.890360	35	S. 1st St.	br	xs	1	com
29600	8.0	SJ	37.325201	121.891577	515	Prevost St.	fr	s	1	dwl
29700	8.0	SJ	37.325452	121.891295	486	Prevost St.	fr	s	1	dwl
29800	8.5	SJ	37.323551	121.889013	325	Grant St.	fr	s	1	dwl
29900	7.5	SJ	37.323365	121.888667	320	Grant St.	fr	s	1	dwl
30000	8.0	SJ	37.323879	121.888315	281	Grant St.	fr	s	1	dwl

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (°N)	Longitude (°W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
30100	8.5	SJ	37.314461	121.881329	1234	Locust St.	fr	s	1	dwl
30200	8.0	SJ	37.312500	121.883142	1299	Lick Avenue	fr	s	1	dwl
30300	8.5	SJ	37.313643	121.883234	1218	Lick Avenue	fr	s	2	dwl
30400	8.0	SJ	37.315251	121.884378	1106	Lick Avenue	fr	s	1	dwl
30500	8.0	SJ	37.325616	121.885183	103	Grant St.	fr	s	2	dwl
30600	8.0	SJ	37.326301	121.895064	369	Delmas Avenue	fr	m	1	dwl
30700	8.0	SJ	37.326769	121.894951	344	Delmas Avenue	fr	s	1	dwl
30800	8.0	SJ	37.326908	121.895058	338	Delmas Avenue	fr	s	1	dwl
30900	8.0	SJ	37.327360	121.895345	396	W. San Carlos St.	fr	s	2	dwl
31000	8.5	SJ	37.327121	121.895858	412	W. San Carlos St.	fr	m	2	dwl
31100	8.0	SJ	37.330137	121.898477	441	W. San Fernando St.	fr	m	2	dwl
31200	7.0	SJ	37.327262	121.890099	441	Vine St.	fr	xs	2	dwl
31300	7.5	SJ	37.328624	121.890361	332	Vine St.	fr	s	1	dwl
31400	8.5	SJ	37.331613	121.894400	244-248	Vine St. & San Fernando St., SE crnr	fr	m	2	com
31500	7.5	SJ	37.331410	121.894933	278	W. San Fernando St.	fr	m	1	dwl
31600	7.5	SJ	37.323125	121.891739		Spencer Ave., crnr Colfax Ave.	fr	m	1	chu
31700	7.5	SJ	37.326020	121.894830	385	Delmas Avenue	fr	m	1	dwl
31800	7.5	SJ	37.326374	121.894656	376	Delmas Avenue	fr	m	2	dwl
31900	7.5	SJ	37.331794	121.892024	169	Orchard St.	fr	m	2	dwl
32000	7.5	SJ	37.325662	121.887611	575	Orchard St.	fr	s	1	dwl
32100	7.5	SJ	37.325360	121.887356	597	Orchard St.	fr	s	1	dwl
32200	7.5	SJ	37.321873	121.884642	811	Orchard St.	fr	s	2	dwl
32300	8.5	SJ	37.319245	121.884114	977	Vine St.	fr	s	1	dwl
32400	8.0	SJ	37.319960	121.884641	903	Vine St.	fr	s	1	dwl

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (°N)	Longitude (°W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
32500	8.0	SJ	37.321202	121.885087	828	Vine St.	fr	s	1	dwl
32600	8.5	SJ	37.321165	121.885584	811	Vine St.	fr	s	2	dwl
32700	7.5	SJ	37.325286	121.888204	580	Vine St.	fr	m	1	dwl
32800	8.5	SJ	37.326976	121.889834	473	Vine St.	fr	s	2	dwl
32900	7.0	SJ	37.337173	121.888901	93-97	N. 3rd St. & Santa Clara St., NW cmr	br	l	3	com
33000	6.0	SJ	37.337131	121.888999	81-85	E. Santa Clara St.	br	m	1	com
33100	7.0	SJ	37.337035	121.889223	75	E. Santa Clara St.	br	l	1	com
33200	7.5	SJ	37.337434	121.888407	105	E. Santa Clara St., NE cmr 3rd St.	br	m	2	com
33301	7.5	SJ	37.337790	121.888207	22	N. 3rd St.	br	l	5	whs
33302	7.5	SJ	37.337950	121.888025	22	N. 3rd St.	br	l	2	whs
33303	6.5	SJ	37.337969	121.887823	22	N. 3rd St.	br	l	2	whs
33304	8.0	SJ	37.337733	121.888661	22	N. 3rd St.	fr	xl	1	whs
33400	7.0	SJ	37.338215	121.889441	61	N. 3rd St.	fr	m	2	fhs
33501	8.5	SJ	37.337916	121.890228	80	N. 2nd St.	fr	m	2	dwl
33502	8.5	SJ	37.337977	121.890269	84	N. 2nd St.	fr	m	2	dwl
33600	7.5	SJ	37.337821	121.890069	72-78	N. 2nd St.	fr	l	3	com
33701	7.0	SJ	37.337399	121.889918	56	N. 2nd St.	br	l	1	chu
33702	7.0	SJ	37.337479	121.889812	56	N. 2nd St.	br	l	2	chu
33703	7.0	SJ	37.337440	121.889775	56	N. 2nd St.	br	l	2	chu
33800	6.5	SJ	37.337131	121.889641	28-34	N. 2nd St.	fr	l	2	com
33900	7.0	SJ	37.337564	121.890459	63	N. 2nd St.	fr	m	2	dwl
34000	7.0	SJ	37.337914	121.890743	91	N. 2nd St.	fr	l	1	chu
34100	7.0	SJ	37.337829	121.890956		N. 2nd St., SW cmr of St. John St.	fr	m	1	pub

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (°N)	Longitude (°W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
34300	6.5	SJ	37.340341	121.892013	34 (S of #25601)	N. 2nd St.	fr	m	1	sch
34400	6.5	SJ	37.340420	121.892910	269	N. 2nd St	fr	l	2	com
34500	7.0	SJ	37.341295	121.892735		E. Julian St. bet #55 & #73	fr	m	1	chu
34600	6.5	SJ	37.339690	121.889970	bet. 152 & 174	N. 3rd St., bet St. James and St. John Sts.	fr	xl	1	chu
34700	7.0	SJ	37.337945	121.887343	151-165	E. Santa Clara St. near 4th St.	fr	l	2	com
34800	7.5	SJ	37.333298	121.888201	168-182	S. 1st St.	br	xl	2	com
34900	6.0	SJ	37.333239	121.888148	184-188	S. 1st St.	br	xs	2	com
35000	7.5	SJ	37.335596	121.889915	30	S. 1st St.	br	s	1	com
35100	6.0	SJ	37.332832	121.887844	202-210	S. 1st St. & San Antonio St., SE cmr.	br	s	2	com
35200	7.5	SJ	37.333144	121.888076	190-200	S. 1st St.	br	l	3	com
35400	7.0	SJ	37.334499	121.887674	130	S. 2nd St.	fr	l	1	com
35500	7.0	SJ	37.335178	121.886749	120	S. 3rd St.	br	l	1	com
35600	7.5	SJ	37.337179	121.887841	136	E. Santa Clara St.	br	s	2	com
35700	7.0	SJ	37.337065	121.888097	114	E. Santa Clara St.	fr	s	1	com
35800	7.5	SJ	37.335248	121.883299	1	Washington Square	br	xl	2	sch
35900	6.0	SJ	37.338034	121.889443	53	N. 3rd St.	fr	xl	2	mtg
36000	7.0	SJ	37.337929	121.889458	53	N. 3rd St.	br	l	2	mtg
36100	6.5	SJ	37.338270	121.886830	195	E. Santa Clara St., NW cmr 5th St.	fr	l	2	chu
36201	8.0	SJ	37.338443	121.886288	203	E. Santa Clara St.	fr	m	1	dwl
36202	8.0	SJ	37.338489	121.886187	213	E. Santa Clara St.	fr	m	2	dwl
36203	8.0	SJ	37.338520	121.886113	215	E. Santa Clara St.	fr	m	2	dwl
36204	8.0	SJ	37.338565	121.886008	223	E. Santa Clara St.	fr	s	2	dwl
36300	7.0	SJ	37.338658	121.885805	231-247	E. Santa Clara St.	fr	xl	1	com

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (°N)	Longitude (°W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
36400	7.5	SJ	37.339372	121.885023	275	E. Santa Clara St. bet. 6th & 7th Sts.	fr	xl	4	sch
36501	6.5	SJ	37.339851	121.885099	275	E. Santa Clara St. bet. 6th & 7th Sts.	fr	m	1	sch
36502	6.5	SJ	37.339894	121.885417	275	E. Santa Clara St. bet. 6th & 7th Sts.	fr	m	1	sch
36503	7.5	SJ	37.339657	121.885570	275	E. Santa Clara St. bet. 6th & 7th Sts.	fr	m	1	sch
36600	8.0	SJ	37.340298	121.882562	199	E. Santa Clara St., NW cmr. 9th St.	br	l	2	chu
36700	7.0	SJ	37.340564	121.882749	199	E. Santa Clara St., NW cmr. 9th St.	br	m	1	mtg
36801	7.5	SJ	37.343356	121.891995	361	N. 4th St.	br	xl	1	whs
36802	7.0	SJ	37.343437	121.892192	361	N. 4th St.	br	xl	1	whs
36803	7.5	SJ	37.343599	121.892336	361	N. 4th St.	br	xl	1	whs
36804	7.0	SJ	37.343370	121.892336	361	N. 4th St.	br	xl	1	whs
36805	8.0	SJ	37.343502	121.892248	361	N. 4th St.	br	xl	1	whs
36806	7.0	SJ	37.343214	121.892028	361	N. 4th St.	br	xl	1	whs
36900	8.0	SJ	37.342530	121.889292		N. 5th St. SE cmr Julian St.	br	xl	2	mfg
37000	6.0	SJ	37.343327	121.886141		N. 8th St. between St. James and Julian Sts.	fr	s	2	fhs
37100	7.5	SJ	37.343935	121.883845		N. 10th St., bet. St. James & Julian Sts.	br	xl	1	com
37200	6.5	SJ	37.341920	121.883157		N. 9th St. NE cmr. St. John St.	fr	m	1	chu
37300	8.5	SJ	37.343135	121.879275	74	N. 12th St.	fr	m	1	dwl
37400	8.5	SJ	37.349965	121.887365		Empire St. [bet. 10th St. & 11th St.]	fr	l	2	sch
37600	8.5	SJ	37.344028	121.896026	460	N. 1st St.	fr	xl	2	dwl
37700	7.5	SJ	37.336531	121.888236	27, 29 & 31	S. 3rd St.	br	m	1	com
37800	7.0	SJ	37.336129	121.882600		Washington Square	fr	m	2	mfg
37900	7.0	SJ	37.337182	121.879579		S. 9th St. & San Antonio St., NE cmr	br	xs	1	com
38000	6.5	SJ	37.335631	121.877710	306	S. 9th St.	fr			dwl

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (°N)	Longitude (°W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
38100	7.5	SJ	37.333684	121.876156	455	S. 10th St.	fr	s	2	dwl
38200	6.5	SJ	37.324647	121.868729		S. 10th St. & Keyes St.	fr	s	1	dwl
38300	7.5	SJ	37.339868	121.881574	64	S. 9th St.	fr			dwl
38400	7.5	SJ	37.328928	121.873407	752	S. 9th St.	fr			dwl
38500	8.0	SJ	37.329859	121.874105	690	S. 9th St.	fr			dwl
38600	7.0	SJ	37.329329	121.874400	386	E. Margaret St.	fr	m	1	dwl
38700	6.5	SJ	37.329324	121.877549		E. Margaret St., NE cmr S. 6th St.	fr	xl	2	sch
38900	6.0	SJ	37.330255	121.885967	398	S. 1st St.	br	s	2	com
39000	7.0	SJ	37.334373	121.893895	202-204	W. Santa Clara St., SW cmr Orchard St.	br	s	3	com
39100	7.0	SJ	37.334322	121.893997	206-212	W. Santa Clara St.	br	s	2	com
39200	8.0	SJ	37.333987	121.890507		S. Market St., NE cmr San Fernando St.	br	xl	2	chu
39300	8.0	SJ	37.334297	121.889990		E. of St. Joseph's (in rear)	br	l	3	chu
39400	7.0	SJ	37.334923	121.890047	59	S. 1st St.	br	xs	2	com
39500	7.0	SJ	37.334845	121.889983	65	S. 1st St.	br	xs	2	com
39600	7.0	SJ	37.334799	121.889939	69	S. 1st St.	br	xs	2	com
39700	7.5	SJ	37.334723	121.889887	71-77	S. 1st St.	br	s	2	com
39800	7.5	SJ	37.334640	121.889826	79	S. 1st St.	br	xs	2	com
39900	7.0	SJ	37.334539	121.889738	83-91	S. 1st St.	br	xs	2	com
40000	7.0	SJ	37.334439	121.889655	93	S. 1st St.	br	xs	2	com
40100	7.0	SJ	37.334405	121.889715	95	S. 1st St.	br	s	2	com
40300	6.0	SJ	37.333927	121.889249	115-121	S. 1st St.	br	s	2	com
40400	7.0	SJ	37.333845	121.889182	123	S. 1st St.	br	m	2	com
40500	7.0	SJ	37.333533	121.888981	141	S. 1st St.	br	m	2	com
40600	7.0	SJ	37.333419	121.888887	157	S. 1st St.	br	s	2	com

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (°N)	Longitude (°W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
50100	7.5	SJ	37.333648	121.891064	95	S. Market St.	br	m	3	com
50300	7.0	SJ	37.333408	121.890230		S. Market St., E cmr W. San Fernando St.	st	m	2	pub
50501	8.5	ALA	37.336693	121.918901	1345	The Alameda, San Jose	fr	l	1	dwl
50502	8.5	ALA	37.336835	121.919188	1355	The Alameda, San Jose	fr	xl	2	dwl
50503	8.5	ALA	37.336295	121.917108	1290	The Alameda, San Jose	fr	l	2	dwl
50504	8.5	ALA	37.337798	121.918821	1380	The Alameda, San Jose	fr	m	2	dwl
50505	8.5	ALA	37.336142	121.916872	1280	The Alameda, San Jose	fr	s	1	dwl
50506	8.5	ALA	37.337605	121.918554	1370	The Alameda, San Jose	fr	l	2	dwl
50507	8.5	ALA	37.338560	121.919044	775	Asbury, San Jose	fr	m	2	dwl
50508	8.5	ALA	37.337573	121.920065	1383	The Alameda (SW cmr Naglee), San Jose	fr	xl	2	dwl
50509	8.5	ALA	37.333329	121.914529	1101	The Alameda (NW cmr Henry Place), San Jose	fr	s	2	com
50510	8.5	ALA	37.332911	121.914004	1135	The Alameda (SW cmr Phelan [later Hester]), San Jose	fr	s	2	com
50600	7.5	ALA	37.334536	121.913462		The Alameda bet Brown Ave. & Lenzen Ave., San Jose	fr	l	2	sch
50700	8.5	ESJ	37.345293	121.870931		Alum Rock Ave., S. side, midway bet. Webster & Jones Sts.	fr	xs	1	dwl
50701	8.5	ESJ	37.344695	121.872244		Alum Rock Ave., S. side, 1st lot E. of Clay (19th) St., W. half	fr	m	2	com
50702	8.5	ESJ	37.344777	121.872049		Alum Rock Ave., S. side, 2nd lot E. of Clay (19th) St., E. edge of lot	fr	xs	1	com
50703	8.0	ESJ	37.344844	121.871916		Alum Rock Ave., S. side, 2nd lot E. of Clay (19th) St.	co	s	1	com
50704	8.5	ESJ	37.344972	121.871631		Alum Rock Ave., S. side, SW cmr Webster (20th) St.	fr	m	1	com

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (° N)	Longitude (° W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
50705	8.5	ESJ	37.345124	121.871301		Alum Rock Ave., S. side, SE cmr Webster (20th) St.	fr	s	2	com
50706	8.5	ESJ	37.345435	121.870677		Alum Rock Ave., S. side, SW cmr Jones (21st) St.	fr	xs	1	com
50707	8.5	ESJ	37.345277	121.870454		Alum Rock Ave., S. side, on back of lot on SW cmr Jones (21st) St., facing Jones St.	co	s	1	com
50708	8.0	ESJ	37.345577	121.870344	F	Alum Rock Ave., S. side, SE cmr Jones (21st) St.	fr	s	2	com
50709	8.0	ESJ	37.345669	121.870157	G, H, I	Alum Rock Ave., S. side, E. side of lot on SE cmr Jones (21st) St.	fr	s	1	com
50710	8.0	ESJ	37.345773	121.869873	J	Alum Rock Ave., S. side, 2nd lot E. of cmr Monroe (22nd) St.	fr	xs	1	dwl
50711	8.0	ESJ	37.345879	121.869718	N, O	Alum Rock Ave., S. side, SE cmr Monroe (22nd) St.	fr	xs	1	com
50712	8.0	ESJ	37.346033	121.869378	P	Alum Rock Ave., S. side, SE cmr Monroe (22nd) St., adjoining #O	fr	xs	1	dwl
50713	8.5	ESJ	37.346156	121.869021	Q	Alum Rock Av., S. side, bet Monroe (now 22nd) and Adams (now 23rd) Aves.	fr	m	1	dwl
50714	8.0	ESJ	37.346215	121.868987	R	Alum Rock Av., S. side, bet Monroe (now 22nd) and Adams (now 23rd) Aves.	co	s	1	com
50715	8.5	ESJ	37.346375	121.868676	T	Alum Rock Av., S. side, bet Monroe (now 22nd) and Adams (now 23rd) Aves.	fr	s	1	com
50716	8.5	ESJ	37.346724	121.867853		Alum Rock Av., S. side, 2nd lot W. of cmr McLaughlin (now 24th) St.	fr	m	1	dwl
50717	7.5	ESJ	37.347057	121.868095	A	Alum Rock Ave., N. side, cmr McLaughlin (24th) St.	fr	s	1	com
50718	8.0	ESJ	37.346793	121.869422	B	Alum Rock Ave., N. side, midway bet Sullivan (21st) and McLaughlin (24th) Aves.	fr	l	2	dwl

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (°N)	Longitude (°W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
50719	8.0	ESJ	37.346354	121.869682	C	Alum Rock Ave., N. side, midway bet Sullivan (21st) and McLaughlin (24th) Aves.	fr	m	1	dwl
50720	8.0	ESJ	37.346193	121.870050	D	Alum Rock Ave., N. side, midway bet Sullivan (21st) and McLaughlin (24th) Aves.	fr	m	1	dwl
50721	8.0	ESJ	37.346140	121.870343	E	Alum Rock Ave., NE cmr. Sullivan Av. (21st St.)	fr	l	2	dwl
50722	8.0	ESJ	37.345758	121.871012		Alum Rock Av., NW cmr Sullivan Av. (now N. 21st St.)	fr	l	1	dwl
50723	7.5	ESJ	37.344232	121.874392		Alum Rock Ave., NE cmr N. 14th St. (E. bank of Coyote Creek)	fr	m	1	com
50725	8.5	ESJ	37.343336	121.870046		S. 20th St., NW cmr Jefferson (now San Fernando) St.	fr	m	2	chu
50726	8.0	ESJ	37.345957	121.873492		Wichita Av., on bank of Coyote Creek	co	xs	1	whs
50727	8.5	ESJ	37.346544	121.867533	5	McLaughlin (now 24th) Ave.	fr	s	1	dwl
50728	8.5	ESJ	37.346193	121.867168	7	McLaughlin (now 24th) Ave.	fr	s	1	dwl
50729	7.5	ESJ	37.348796	121.865558	E	Fairbrother (now 27th) Av., W. side, second lot N. of Alum Rock Av.	fr	s	1	com
50730	8.5	ESJ	37.348751	121.865181	A	Fairbrother (now 27th) Av., E. side, second divided lot N. of Alum Rock Av.	fr	m	1	dwl
50731	8.5	ESJ	37.346762	121.863365	550	Wright (now San Fernando) Av., S. side, fourth (1901 lot fr cmr 28th Av.	fr	xs	1	dwl
50732	8.5	ESJ	37.346621	121.864237	G	Wright (now San Fernando) Av., third (1901) lot fr cmr 27th Av.	fr	s	1	dwl
50733	8.5	ESJ	37.347683	121.863686		Shortridge, two houses W. of cmr Shortridge & Wooster Aves. (now S. 28th St.)	fr	s	1	dwl

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (°N)	Longitude (°W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
50800	8.0	ESJ	37.344513	121.872585		Alum Rock Ave., S. side, 2nd lot from Coyote Creek	br	s	2	com
50900	8.5	ESJ	37.346278	121.868867	S	Alum Rock Av., S. side, bet Monroe (now 22nd) and Adams (now 23rd) Aves.	fr	m	1	mee
51000	8.5	ESJ	37.345666	121.867291		McLaughlin Ave. (S 24th St.), bet Alum Rock Ave. and Jefferson (1 blk S of Alum Rock Ave.)	fr	xl	2	sch
52900	8.0	SJ	37.330354	121.879298	525	S. 6th St.	fr	m	2	dwl
53200	8.0	SJ	37.334998	121.887380	88	E. San Fernando St.	br	s	1	com
53400	8.0	SJ	37.338125	121.886020	204	E. Santa Clara St. (SE cnr 5th St.)	fr	m	2	dwl
53500	8.0	SJ	37.336349	121.883440		San Fernando St., opp. S. 6th St. (S side) (Washington Square)	br	xl	4	sch
53600	8.0	ALA	37.332934	121.911946		The Alameda, NE cnr Cinnabar	br	xl	2	sch
53700	7.5	ALA	37.332083	121.912365		The Alameda	fr	l	3	hot
53900	8.0	SJ	37.330959	121.886916	323	S. 1st St., S of San Carlos St.	fr	l	1	com
54000	8.0	SJ	37.331553	121.886491		S. 1st St., S side of San Carlos St. (S side, middle of block bet. 1st & 2nd Sts.)	fr	s	1	com
54200	8.5	SJ	37.326510	121.886432	132	Pierce Ave.	fr	s	1	dwl
54800	8.0	SJ	37.332939	121.887717	10	E. San Antonio St.	fr	xs	1	com
55500	8.5	WSJ	37.313059	121.933321		Bascom & Moorpark (modern street names)	fr	xl	3	hos
55502	6.5	WSJ	37.313307	121.934140		Bascom & Moorpark (modern street names)	fr	xs	1	hos
55900	8.5	OUT	37.373149	121.873758		King Rd. near Berryessa Rd.	fr			dwl
56401	8.5	ALA	37.340768	121.918297	629	Elm St., near Emory Street	fr			dwl
56402	8.5	ALA	37.340137	121.919226	695	Elm St.	fr			dwl
56403	8.5	ALA	37.341066	121.920289	579	University Ave., cnr. Myrtle St.	fr			dwl

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (°N)	Longitude (°W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
56404	8.5	ALA	37.340819	121.920030	624	Myrtle St.	fr			dwl
56600	7.5	SJ	37.335443	121.888818	69	S. 2nd St.	br	s	3	com
57100	6.5	SJ	37.334007	121.888724	120	S. 1st St.	br	xs	2	com
57300	8.0	SJ	37.336955	121.895205	175	W. St. John St.	ad	xs	1	dwl
57400	7.0	SJ	37.336840	121.895094	175	W. St. John St.	fr	m	2	dwl
57500	7.5	SJ	37.334348	121.891515	59	S. Market St.	br	l	2	com
57700	8.0	SJ	37.336545	121.889214	358	W. Santa Clara St., cnr. Lightston St.	br	l	2	com
57900	7.0	WSJ	37.301341	121.905715		Minnesota Ave. opposite Hicks Ave.	fr	m	2	dwl
58000	7.0	WSJ	37.303041	121.897402		Lincoln Ave. cnr Minnesota Ave.	fr			dwl
58100	7.0	WSJ	37.301434	121.903178		Minnesota Ave. near Cherry Ave.	fr			dwl
59000	6.0	CMB	37.294817	121.937352		Los Gatos Rd. near Hamilton Ave.	br	l	2	sch
59100	7.0	WSJ	37.303665	121.897860		Lincoln Ave., cnr Minnesota Ave.	fr	m		sch
59200	6.5	WSJ	37.315058	121.931271		Infirmary Rd. near Moorpark Ave.	fr	m		dwl
59300	8.0	WSJ	37.309818	121.932196		Infirmary Rd. near Fruitvale Av.	fr	m		dwl
59400	7.0	WSJ	37.310877	121.931056		Fruitvale Ave. near Infirmary Rd.	fr	m		dwl
59500	6.5	WSJ	37.311008	121.918518		Fruitvale Ave. near Meridian Rd.	fr	m		dwl
59600	7.0	WSJ	37.311019	121.915201		Fruitvale Ave. near Meridian Road	fr	m		dwl
59700	7.0	WSJ	37.308962	121.914012		Meridian Road	fr	m		dwl
59800	7.0	WSJ	37.308046	121.914025		Meridian Road, corner Lincoln Ave.	fr	m		dwl
59900	6.5	WSJ	37.307870	121.913133		Meridian Rd. near Willow	fr	m		dwl
60000	8.5	WSJ	37.307524	121.914095		[probably Meridian Road near Willow]	fr	m		dwl
60100	7.5	WSJ	37.303603	121.914005		Meridian Rd. near Willow	fr	m		dwl
60200	8.5	WSJ	37.316011	121.926392		Moorpark Ave. near SJ-LG Rd.	fr	m		dwl
60300	6.0	WSJ	37.315921	121.923099	337	Moorpark Ave	fr	m		dwl

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (°N)	Longitude (°W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
60400	6.0	WSJ	37.311248	121.914070		Fruitvale Ave.	fr	m		dwl
60500	6.0	WSJ	37.310582	121.912766		Carlos St.	fr	m		dwl
61000	8.0	SJ	37.341843	121.881653	70	N. 9th St.	fr	l		dwl
61200	7.0	SJ	37.342991	121.889316		N. 5th St., crnr Julian St.	fr	l		dwl
61400	8.5	SJ	37.341930	121.891397	121	E. Julian St.	fr	s	2	dwl
61600	8.5	SJ	37.342048	121.891105		E. Julian St., 2nd house E of Henry Lion's	fr	s	2	dwl
61700	8.0	SJ	37.343876	121.886611	338	E. Julian St. near crnr N. 8th St.	fr	m	2	dwl
61800	8.5	SJ	37.343786	121.886834	326	E. Julian St.	fr			dwl
61900	8.0	SJ	37.341985	121.891233	139	E. Julian St.	fr			dwl
62000	8.0	SJ	37.340879	121.892886		N. 2nd St., SW crnr Julian St.	fr			dwl
62100	7.5	SJ	37.344686	121.896524		N. 1st St.	fr	l		dwl
62300	7.0	SJ	37.345315	121.896334		N. 2nd St., crnr Empire St.	fr			dwl
62400	8.0	SJ	37.341913	121.881730	N of #70	N. 9th St.	fr	s		dwl
63000	7.0	SJ	37.335773	121.885227		San Fernando St crnr 4th St (Washington Square)	st	m	1	pub
63100	7.0	ALA	37.342540	121.916538		College Park, blk. enclosed by Elm, Hedding, Emory & Stockton Sts., off The Alameda	br	xl	4	sch
63200	6.5	ALA	37.342168	121.918376		College Park, blk. enclosed by Elm, Hedding, Emory & Stockton Sts., off The Alameda	fr	xl	2	sch
63301	7.0	WSJ	37.318110	121.950873	525	S. Winchester Blvd. (modern address)	fr	xl	2	dwl
63302	6.5	WSJ	37.318233	121.950855	525	S. Winchester Blvd. (modern address)	fr	xl	4	dwl
63303	6.5	WSJ	37.318231	121.951001	525	S. Winchester Blvd. (modern address)	fr	xl	3	dwl
63304	7.0	WSJ	37.318350	121.950831	525	S. Winchester Blvd. (modern address)	fr	xl	7	dwl
63500	6.5	SJ	37.332535	121.897376	51	S. River St.	fr	m	1	dwl

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (°N)	Longitude (°W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
63600	6.5	SJ	37.332335	121.897218	61	S. River St.	fr	m	1	dwl
63700	6.5	SJ	37.332144	121.897070	71	S. River St.	fr	m	1	dwl
63800	6.5	SJ	37.333425	121.898192	65	N. River St.	fr	s	2	dwl
63900	6.5	SJ	37.333763	121.897903	70	N. River St.	fr	m	1	dwl
64000	6.5	SJ	37.333674	121.898349	71	N. River St.	fr	xs	1	dwl
64100	6.5	SJ	37.334230	121.898274	78	N. River St.	fr	s	1	dwl
64200	6.5	SJ	37.334345	121.898866	83	N. River St.	fr	s	1	dwl
64300	6.5	SJ	37.334548	121.899032	85	N. River St.	fr	s	1	dwl
64400	7.0	SJ	37.341174	121.877139	62	S. 13th St.	fr	m	2	dwl
64500	6.5	SJ	37.335571	121.882611		Washington Square	fr	l	2	sch
64600	7.0	SJ	37.336296	121.876666	205	S. 11th St. (SW crnr 11th and San Carlos Sts.)	fr	l	2	dwl
64700	7.0	SJ	37.340020	121.875644	141	S. 14th St.	co	s	1	dwl
64800	7.0	SJ	37.334577	121.891682	45	S. Market St.	fr	s		dwl
65000	7.0	SJ	37.337569	121.877819		11th St. & San Antonio St.	fr	l	2	dwl
65100	7.0	SJ	37.342485	121.878063		13th St. & Santa Clara St., NE crnr	fr	l	2	dwl
65200	7.0	SJ	37.341252	121.874021	101	S. 16th St.	fr	l		dwl
65300	7.0	OUT	37.371024	121.995574		Lawrence SP Station	br	l	1	whs
65400	6.5	OUT	37.370742	121.995831		Lawrence SP Station	fr	m	2	com
65500	8.0	SJ	37.341588	121.887098	198	N. 6th St.	fr	xs	1	dwl
65700	7.0	SJ	37.338681	121.884587		Santa Clara St., bet. S. 6th & S. 7th Sts.	fr	xl	1	com
65800	8.0	STC	37.346200	121.938577		Belomy St., crnr Alviso St.	fr	xl	2	whs
65900	8.0	STC	37.348187	121.945407	5-8	Liberty St.	br	l	1	chu
66100	8.0	STC	37.346081	121.944262	660	Main St.	fr	s	1	com

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (°N)	Longitude (°W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
66200	8.0	STC	37.349388	121.945391	1072	Franklin St.	br	s	1	com
66300	8.0	STC	37.349584	121.944857	1026	Franklin St.	br	xs	2	com
66400	7.5	STC	37.349655	121.944681	1006	Franklin St.	br	m	2	com
66500	7.5	STC	37.349606	121.944799	1024	Franklin St.	br	s	2	hot
66600	8.0	STC	37.346216	121.954937	1900	Franklin St.	fr	m	1	com
66700	8.0	STC	37.349484	121.946150	1161	Franklin St.	fr	m	2	com
66800	8.5	STC	37.349677	121.945581	1065	Franklin St.	fr	l	2	com
67000	8.0	STC	37.350151	121.944211	945	Franklin St.	fr	m	2	com
67100	7.5	STC	37.350427	121.942130		Alviso St., bet Santa Clara and Franklin Sts.	fr	s	2	chu
67101	7.5	STC	37.347739	121.943057		Lexington St., bet. Washington and Lafayette Sts.	br	l	2	sch
67103	7.5	STC	37.349237	121.941540		Alviso St., bet Santa Clara and Franklin Sts.	fr	xl	1	chu
67104	7.5	STC	37.349474	121.941521		Alviso St., bet Santa Clara and Franklin Sts.	ad	l	2	sch
67200	6.5	STC	37.350639	121.950050		Monroe St. bet Harrison and Fremont Sts.	fr	xl	2	sch
67300	8.0	STC	37.350827	121.945456	1116	Washington St.	fr	l	1	dwl
67400	8.0	STC	37.346676	121.950815	1565	Liberty St.	fr	l	2	dwl
67500	8.0	STC	37.347135	121.951357	1590	Franklin St.	fr	m	2	dwl
67600	8.0	STC	37.347908	121.938475	641	Grant St.	fr	m	1	dwl
67700	8.0	STC	37.352748	121.938805	505	Benton St.	fr	m	1	dwl
67800	8.0	STC	37.345956	121.946457	715	Monroe St.	fr	s	1	dwl
67900	8.0	STC	37.350488	121.939945		Grant St., near cmr of Liberty St. or Franklin St.	fr			dwl
68100	6.5	STC	37.349674	121.944390	975	Washington St.	br	s	1	com

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (°N)	Longitude (°W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
68200	7.0	STC	37.351620	121.940354	1037	Grant St. College Park, blk. enclosed by Elm, Hedding, Emory & Stockton Sts., off The Alameda	ad			wal
70300	7.0	ALA	37.340988	121.917868			fr	xs	2	sch
70400	8.0	ESJ	37.347044	121.875640	199	Latewana (SW cmr. E. St. James St.)	br	m	1	dwl
70600	8.0	SJ	37.345062	121.880638		St. James St., cmr. 13th St.	fr			dwl
70700	8.0	OUT	37.371742	121.893272		Milpitas Rd. nr Gish Rd. [use E. Gish Rd. & Old Oakland Rd.]	fr	m	1	dwl
70800	8.0	SJ	37.343203	121.896536	35	Fox Ave.	fr	s	1	dwl
71000	7.0	SJ	37.334275	121.886085	196	S. 3rd St., NE cmr San Antonio St.	fr	l	1	chu
71200	8.0	SJ	37.321884	121.896113		Martin Ave., 2nd lot SE of corner with W. William St.	fr	xl	2	sch
71400	8.5	SJ	37.321635	121.897213	618	W. William St., W of Martin Ave.	fr	s	1	dwl
71500	8.5	SJ	37.326858	121.896412	416	W. San Carlos St., SE cmr San Carlos St. & Walnut St. (now Sonoma St.)	fr	m	1	dwl
71800	7.5	SJ	37.333156	121.903141		San Augustine St., 70' from cmr Senter St.	br	m	1	mfg
71900	8.0	SJ	37.333167	121.902777		San Augustine St., 150' from cmr Senter St.	br	m	1	mfg
72200	7.0	SJ	37.346631	121.893795	155	E. Empire St.	fr	l	2	dwl
72300	7.0	SJ	37.340854	121.893743		N. 1st & Julian Sts.	fr	xl	2	dwl
72400	7.0	SJ	37.323380	121.885224	724, 726	Almaden Avenue (Orchard in 1906)	fr	l	2	com
72700	7.0	WSJ	37.323175	121.969866			fr	l	2	sch
72800	6.5	CMB	37.289935	121.950467			fr	xl	2	sch
72900	6.5	CMB	37.287482	121.951292			fr	xl	2	sch
73000	6.5	CMB	37.287134	121.942589			fr	l	2	mtg
73100	7.0	CMB	37.287927	121.944589			fr	m	1	chu

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (°N)	Longitude (°W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
73200	6.5	CMB	37.287161	121.943482			br	xs	1	com
73300	6.5	CMB	37.287181	121.943818		Central Ave., SE cnr. Campbell Ave.	fr	l	2	hot
73400	6.5	CMB	37.287206	121.944302			fr	l	1	chu
73500	6.5	CMB	37.287268	121.941782			fr	s	1	dep
73510	6.5	CMB	37.285066	121.944002		Railroad Ave., W side, 2 bldgs. S. of Campbell Ave.	br	xl	1	whs
73600	6.5	CMB	37.287979	121.947125		N. 3rd St., NE cnr Civic center Dr.	fr	m	2	dwl
73700	6.5	CMB	37.288934	121.942628		Grant St., SW cnr Harrison Ave.	fr	m	2	dwl
73800	7.0	CMB	37.285765	121.946270		S. 2nd St., midway bet Everett Ave. & Orchard City Dr.	fr	m	1	dwl
73900	8.0	SJ	37.334057	121.897306	35	Pleasant St.	fr	s	1	dwl
74000	7.0	SJ	37.339160	121.878782	105	S. 11th St.	fr	m	2	dwl
74100	7.0	SJ	37.328658	121.889023		Auzerais Ave., cnr. Orchard St. (now Almaden)	fr	xl	2	sch
74200	8.0	SJ	37.332912	121.889380	182	S. Market Street	fr	s	1	com
74300	6.0	SJ	37.331638	121.897502		W. bank of Guadalupe, bet. W. Santa Clara & W. San Fernando Sts.	br	l	1	mfg
74400	7.5	WSJ	37.322609	121.911939		Race St., SW cnr. W. San Carlos	br	xl	2	hos
74500	6.5	STC	37.356720	121.949665	1795	Main St., cnr. Main & Wistar (renamed Warburton) Sts.	fr	s	1	dwl
74601	7.0	SJ	37.349044	121.893745	596	N. 5th St.	fr	s	2	sta
74602	7.0	SJ	37.351662	121.894334		Cleveland St., NW cnr. E. Taylor St.	br	s	2	chu
74603	7.5	SJ	37.350790	121.893570		Cleveland St., bet. Jackson St. and E. Taylor St.	br	s	2	com
74700	8.0	OUT	37.391208	121.954592		Lafayette St., bet. Agnew Rd. & Montague Expy. (modern)	br	xl	4	hos

TABLE 16. ATTRIBUTES OF INTENSITY DATA POINTS

Entry No.	Intensity	Community	Latitude (° N)	Longitude (° W)	Street Number	Street	Constr. Mat.	Bldg. Size	No. of Stories	Bldg. Use
74800	6.5	ESJ	37.346049	121.875355	132	N. 14th St.(now 17th St.)	fr	xs	1	dwl
74900	6.5	SJ	37.338471	121.897066	40	W. Julian St.	fr	xl	1	sch

APPENDIX B: Supplement for Development of Intensity Scale

The following discussion on the refinement of the Modified Mercalli Intensity (MMI) scale for the present paper is accompanied by Table 17, MMI assignments to earthquakes from the Stover and Coffman earthquake catalog (on CD in pocket, but not printed).

Observations on Seismic Intensity Scales and Notes on Development of Intensity Scale

1. Begin with 1931 MMI and maintain consistency with this scale whenever possible.

Per Jack Boatwright (pers. commun.): the Stover and Coffman (1993) scale is the “modern” scale used by workers after the compilation of their catalog of earthquakes in the United States. Boatwright & Bundock (2005) used a slight variation of this scale for their ShakeMap of relocated points from Lawson (1908). The Stover and Coffman 1993 MMI scale should actually be the starting scale. It should be modified slightly as required. The problem is that Stover and Coffman did not explicitly state their MMI scale, whereas Lawson (1908), Wood and Neumann (1931), and Richter (1958) did. A careful reading of Stover and Coffman’s damage descriptions for large earthquakes in California and a correlation of damage with their maximum MMI assignment is necessary to infer their scale (see Table 17, on CD in pocket).

2. As 95 percent of chimneys in San José were thrown down in 1906 (Lawson, 1908), I agree with Boatwright and Bundock (2005) that chimney damage was probably MMI

VI-VII rather than VII-VIII (1931 MMI). Reason: long duration of shaking (approximately one minute) in thick sediment enhanced the effect of long-period effects. Thus, the pendulum effect of chimneys and church steeples caused damage at lower intensity levels in San José in 1906 than it would have done under “normal” conditions. Richter (1958) mentions that the 1931 MMI scale tends to place long-period effects where they occur in events of moderate magnitude, that the proportion of long-period to short-period effects increases with increasing magnitude, and that long-period effects are generally associated with large displacement rather than acceleration. These statements support downgrading the intensity ratings of long-period effects in 1906. By the same reasoning, pendulum clocks also stopped at lower intensity levels in 1906. (N.B.: The present study has no stopped clocks except for those reported by Lawson (1908).)

3. Almost universally, URM in San José in 1906 fell into Richter’s (1958) categories of Masonry C (“ordinary workmanship and mortar; no extreme weaknesses like failing to tie in at corners, but neither reinforced nor designed against horizontal forces”) and Masonry D (“weak materials, such as adobe; poor mortar; low standards of workmanship; weak horizontally”). A few reinforced brick buildings in downtown San José are recorded in the 1891 (rev. 1901) Sanborn and Perris fire insurance map book. In 1906 San José had not yet found need to build structures over five stories in height; even five-story buildings were very scarce. The tallest structure built up to 1906 in San José was a steel-framed, seven-story office building downtown. Only the

frame underwent shaking, as the building was still under construction on 18 April 1906. The George Lawrence aerial photo from June 1906 (in the Research Library at History San José and online collection of the Library of Congress) shows the framework of this building standing after the earthquake. This steel frame is also mentioned in the *San.Jose Mercury* and shown in the background of photograph in Figure 4. Buildings of this sort may have fallen into Richter's (1958) category of Masonry B ("good workmanship and mortar; reinforced; but not designed in detail to resist lateral forces") but probably not Masonry A ("good workmanship, mortar, and design; reinforced, especially laterally, and bound together by using steel, concrete, etc.; designed to resist lateral forces"). It must be kept in mind that building codes improved tremendously over the period 1906 to 1959 and that Richter's categories were appropriate for the 1950s, not for years before 1940, when building codes were rewritten for unreinforced masonry.

4. When it is apparent from descriptions of structural damage that facades or walls simply fell away from the framing (whether steel, iron columns, or wood frame), the assumption is that such buildings were not properly tied together and therefore fall into Richter's category of Masonry D, regardless of any reinforcement they may have had. (One may think of these walls as "tilt-downs.") In this case a photograph may be misleading because the focus is on a huge pile of bricks on the street and a building completely open on one side from street to roof. The viewer is aghast at the apparently severe damage without thinking about why the bricks fell—about

structural flaws that allowed an entire wall to fall away without damaging adjoining walls.

5. A number of brick buildings in downtown San José are shown in Sanborn (1891, revised 1901) as having iron columns for support. In some cases, the descriptions in Sanborn mention “cast iron” specifically. Lawson (1908) discusses the failure of cast iron and the survival of wrought iron in the San José Gas Works in 1906. Iron columns did not in all cases withstand the extreme lateral forces to which they were exposed in 1906.
6. As only effects on exteriors and interiors of structures are under consideration, intensities of I through IV are not considered in this study. Similarly, intensities over X are considered only in the context of total destruction of frame structures or ground failure. By intensity X nearly all structures are destroyed, and it is difficult to make fine distinctions.
7. Standard practice for frame residential construction was (1) not to bolt a structure to the foundation (if any), and (2) to employ cripple walls between the foundation and the elevated first floor. Many Victorian houses had eight or more steps leading up to the front porch from ground level, with that height supported by an unbolted half-wall of framing. The most common failure modes for frame houses in 1906 were twisting off the foundation and collapse of the cripple walls. Per Jack Boatwright (pers.

commun.), the phrase “thrown off foundation” in Lawson (1908) is code for failure of the cripple walls; assign MMI 8 in this situation.

8. The inspectors distinguished between “underpinning” and “foundation.” The following quotation from the April 1906 inspections refers to failure of cripple walls: “Underpinning to be moved back into place; house is to be shored up while so doing. More new bracing put into basement” (see Appendix A).
9. Richter (1958) does not distinguish classes of frame construction, but in San José in 1906 it is likely that at least two classes of frame construction existed. Both, however, shared the characteristics of unbolted foundations and cripple walls. Some frame houses rested on unmortared stone foundations or even directly on the ground.
10. Notes on deciphering Stover and Coffman’s (1993) MMI scale from their descriptions of damage. It is not necessary to analyze all events in the catalog—just California earthquakes involving buildings similar to those in San José in 1906. I have included all California earthquakes that they described through 1925 Santa Barbara. Ground effects are only rarely relevant; they may, however, matter when no structural damage is reported. Stover and Coffman assign a maximum intensity to each earthquake in their catalog. The most important descriptions for inferring the maximum MMI are those for locations nearest the epicenter. Only if near-field descriptions seem at odds with Stover and Coffman’s MMI rating for the event

should one look farther afield. If no reports or usable descriptions were recorded for the areas nearest the epicenter but damage to structures was reported in a city at some distance, one can assume that the structural damage applied to an attenuated intensity and that the maximum MMI (nearer the epicenter) was higher. Near-field (N) is taken as $< \text{ca. } 10 \text{ km}$ from the epicenter; mid-field (M) as used here is $\text{ca. } 10\text{--}25 \text{ km}$; and far-field (F) is $> \text{ca. } 25 \text{ km}$.

APPENDIX C: Intensity Residuals for 1906 Simulation

Modified Mercalli intensities (MMI), inverted by the authors from the 1906 ground motion simulation of Aagaard et al. (2008) and originally on a one arc-minute grid, have been matched with the 607 1906 intensity data locations from the present study. The simulation MMI values (MMI_{Sim}) are from the broad-band, finite-difference rupture model SF1906Song 2c at 1-10 Hz. Each 1906 intensity data point is associated with the nearest gridded MMI_{Sim} value.

Table 18 (on CD in pocket, but not printed) gives the entry number, the 1906 intensity, the associated MMI_{Sim} value, and the residual intensity ($\text{MMI}_{\text{Sim}} - 1906$ intensity). The latitude and longitude of 1906 intensity data points may be found by the entry number in Table 18 and the database in Appendix A.

APPENDIX D: Resonance Calculations

Introduction

The possibility of double resonance coupling in 1906 between buildings and shallow ground layers is investigated by determining for each community whether ground motions in a layer could resonate at an average period that matches, within a reasonable range, the average natural fundamental resonance of buildings in the community. Although calculations are made for individual data points, the assumptions are not sufficiently accurate to identify resonances at individual data locations. Results are aggregated by community. The following sections contain assumptions, methods, and notes on the resonance calculations. Table 19 has details of the calculations (on CD in pocket, but not printed). The interpretation of the results is discussed in the main body of the paper.

Assumptions

1. A building is “tuned” to, and resonates with, the ground when the fundamental natural period of the building is close to a resonant period of the ground underneath (G_p , as defined in Methods #3, following). The fundamental period of the ground layer is assumed to be the dominant mode of vibration and the mode most likely to cause damage to buildings.

2. The natural resonant period of a building is assumed to be approximately 0.1 times the number of stories (Parolai et al., 2001). Buildings in the 1906 data set are short (one to five stories in height) and have short-period fundamental resonances.

Individual story height of c. 3 m is assumed. Typical 1906 buildings of one to five stories are assigned resonant periods in the range 0.1–0.5 sec (2–10 Hz frequencies).

Damping factors are not considered in the calculations.

3. A potential double-resonance coupling or “match” is declared if

$$0.1 * (\# Stories - 0.6) \leq Ground Period \leq 0.1 * (\# Stories + 0.6).$$

4. Thickness of the upper interval of sequence one is taken as depth to the change in engineering properties as interpreted in borehole and well data by Rosinski (2008).

Thickness of full sequence one is interpolated at 1-ft intervals from unpublished data of Carl Wentworth (pers. commun., 2008). Both interpolated data sets are given below, in the results by community. Thicknesses are originally in units of feet (ft) and are converted to meters (m) as follows: $ft = m * 0.3048$.

Methods

1. Determine the fundamental resonant period and range for period match for each building in the damage data set.
2. Two shallow surfaces to be investigated as seismic impedance boundaries are:
 - a. the boundary between the upper and lower intervals of sequence one (the potentially resonant layer lies between this boundary and the ground surface and is the upper interval of sequence one)
 - b. the base of sequence one (the potentially resonant layer is the full thickness of sequence one).
3. Apply the method of Williams et al. (2000) for the natural fundamental resonant period of the ground, G_p :

$$G_p = (4 * H) / V_s,$$

where H , in meters, is the depth of a layer, and V_s , in m/sec, is the velocity of a shear wave propagating vertically through the layer.

- a. V_s^{30} , shear-wave velocity of the upper 30 m, is taken from S-CPT data of Holzer et al. (2008). V_s^{30} data are contoured as a surface with 1-ft contour intervals. V_s^{30} values used in the calculations are the closest contoured values to the locations of the 607 intensity data points.
4. For each intensity data point, the shear-wave velocity, V_s , is estimated for the two layers (upper interval of and full sequence one) as follows:

- a. $V_S = 0.8867 \times V_S^{30}$ is used for the upper interval of sequence one and $V_S = 0.9591 \times V_S^{30}$ for the full thickness of sequence one.
- b. The multiplicative factors 0.8867 and 0.9591 are derived from the combined seismic reflection (Williams et al., 2005a) and lithologic/geophysical (Wentworth and Tinsley, 2005a) studies performed at and near the deep Coyote Creek Outdoor Classroom borehole (CCOC) in San Jose. This method is employed because, to the present time, no other detailed lithologic/geophysical study and seismic reflection/refraction measurements have been performed in matching locations.
- c. Thickness of full sequence one and the upper, fine-grained interval of sequence one have been interpreted by Wentworth and Tinsley (2005a) from detailed lithologic core analyses and geophysical logs from the CCOC borehole, 1.94 km east-southeast of the intersection of First Street and Santa Clara Street in central San Jose. Wentworth and Tinsley found the base of the upper interval of sequence one at 18 m and the base of full sequence one at 22.8 m.
- b. From shallow seismic-reflection and -refraction measurements at William Street Park, c. 200 m southeast of CCOC, Williams et al. (2005a) found an increase in V_S at 18 m and another increase in V_S at 27.2 m. As calculated from data in that paper, seismic reflection measurements at CCOC produce a time-weighted average V_S^{30} of 220 m/sec in accordance with the NEHRP guidelines of FEMA 368 (Building Seismic Safety Council, 2000;

Williams et al., 2005a). The thickness of the upper interval of sequence one is taken as 18 m and the thickness of full sequence one as 27.2 m.

- c. Seismic reflection data from Williams et al. (2005a) at William Street Park yield V_S^{18} of 195 m/sec and $V_S^{27.2}$ of 211 m/sec, calculated according to NEHRP guidelines.
- d. V_S^{18} is taken as the shear-wave velocity of the upper interval of sequence one at CCOC and William Street Park. $V_S^{18} / V_S^{30} = 195/220 = 0.8867$.
- e. $V_S^{27.2}$ is taken as the shear-wave velocity of full sequence one at William Street Park. $V_S^{27.2} / V_S^{30} = 211/220 = 0.9591$.

Notes on Calculations in Table 19

- 1. The results are organized by community. Refer to entry numbers in Appendix A for the latitude and longitude of individual intensity data points.
- 2. Field names in Table 19
 - a. Intensity = 1906 intensity as assigned in the present study.
 - b. Community = Geographical grouping of intensity data points, as described in the body of the present paper.
 - c. Thick_Up = Thickness of upper interval of sequence one (ft), interpolated as a surface with 1-ft contour intervals from data in Rosinski (2008).
 - d. Thick_Full = Full thickness of sequence one (ft), interpolated at 1-ft intervals from unpublished data of Wentworth (2008).
 - e. No. of stories = Number of stories of the buildings in the intensity data.
 - f. V_S^{30} = Average horizontal shear-wave velocity in the top 30 m (m/sec).

- g. Period_Up = Fundamental resonant period of the upper interval of sequence one (sec), estimated as described earlier.
- h. Period_Full = Fundamental resonant period of full sequence one (sec), estimated as described earlier.

APPENDIX E: Conditions at the Confluence of the Guadalupe River and Los Gatos Creek on 18 April 1906

The discussion of and evidence for conditions at the confluence of the Guadalupe River and Los Gatos Creek (**CONFL**), San José, California, on 18 April 1906 are in two parts: (I) 1905-06 precipitation and (II) estimate of Guadalupe River streamflow (discharge) on 18 April 1906. A table and four figures, at the back of this appendix, support the discussion of this section.

I. 1905-06 Precipitation

Table 20 gives 1905-06 daily precipitation measured in downtown San José. Figure 36 compares monthly cumulative rainfall (precipitation) totals for the 1905-06 season and the average for the 1948-49 through 2005-06 seasons. By the end of February, 1905-06 rainfall was 82 percent of the 1948-2005 average, but storms during the last week of March raised the percentage to 106. Rain fell only in trace amounts in April 1906 through the day of the earthquake, by which time cumulative precipitation had declined to 102 percent of the 1948-2005 average. The ground in San José was not, therefore, unusually saturated on 18 April 1906 and, in fact, was drying out from the most recent rain storm 2½ weeks before the earthquake.

II. Estimate of Guadalupe River Streamflow (Discharge) on 18 April 1906

A. Correlate the peak discharge for Guadalupe River (Guad) and Coyote Creek (Coyote), using peak streamflow for matching dates in the period 1930–1950:

1. Use the best data for Coyote Creek (the closest Santa Clara Valley stream to the Guadalupe River with 1906 daily data available)
2. Guadalupe River data begin in 1930, when the Guad gage was installed approximately ½ block north of the confluence of the Guadalupe River and Los Gatos Creek (**CONFL**). The Coyote Creek data series begin in January 1903.
3. Omit flood stages, peak dates too far apart for the two streams, and dates after 1950 (reservoirs interfere with streamflow data).
4. The linear regression equation (Fig. 37) for Guadalupe River peak streamflow (*Guad*) against Coyote Creek peak streamflow (*Coyote*) is:

$$Guad = 0.8276 \times Coyote + 680.17 \quad (\text{Eq. E1})$$

B. Using equation E1 and Coyote daily streamflow for 18 April 1906, estimate the 18 April 1906 Guadalupe streamflow from (Fig. 37):

1. 18 April 1906 Coyote streamflow = 115 cfs (from daily discharge data)
2. 18 April 1906 Guad streamflow (est.) = 775 cfs

C. Use the Guadalupe River rating curve for 1930-1950 (Fig. 38) and 18 April 1906 estimated Guadalupe River streamflow (775 cfs; Fig. 37) to estimate the Guad gage height on 18 April 1906:

1. Guad gage height = $0.1653 \times \text{Streamflow}^{0.4686}$ (from power-law trendline)
2. Estimated Guad stage (gage height) 18 April 1906 = 3.73 ft

D. Check for reasonableness with the Guad rating curve for 1930-1984 (Fig. 39):

1. Guad gage height = $0.3345 \times \text{Streamflow}^{0.3791}$ (from power-law trendline)
2. Estimated Guad stage (gage height) 18 April 1906 = 4.17 ft

E. For an upper bound on the Guad gage height on 18 April 1906:

Match the two highest, actual Guad peak streamflows with Coyote peak streamflows < 1000 cfs for closely matching dates:

<u>Streamflow (cfs)</u>		Guadalupe Gage (ft)	Date
Coyote	Guad		
365	2080	5.93	29 January 1933
910	1020	4.25	21 February 1936 (Coyote) 22 February 1936 (Guad)

F. The 18 April 1906 streamflow is at the opposite (low) end of the curve from the two 1906 Coyote Creek peak streamflows:

Date	<u>Coyote Creek</u>	<u>Guadalupe River</u>	
	Actual Peak Streamflow (cfs)	Est. Peak Streamflow (cfs)	Est. Gage Height (ft)
19 Jan 1906	8350	7591	11.21
11 Dec 1906	8210	7475	11.13

G. Conclusion

The Guadalupe River gage heights estimated from the 1906 Coyote Creek peak streamflows are approximately at flood stage, according to the Guadalupe River rating curve for 1930-1950 (Fig. 38). No floods for the 1905-06 precipitation season are in the historical record, so it is reasonable to conclude that on 18 April 1906, the Guadalupe River was far from flood stage. On the day of the 1906 earthquake, the river had less than 4 ft of water within banks at least 11 ft tall.

H. Notes:

1. The Alamaden, Calera, Guadalupe, Stevens Creek, and Vasona dams were finished by 1935; Coyote dam by December 1936, Anderson dam by fall 1950 (before rain began); and Lexington dam by fall 1952 (California History Center, 1981).
2. All water data are from the National Water Information System web site:

- a. Guadalupe River peak streamflow data are from “Peak streamflow for the nation: Surface water: Peak streamflow, USGS 11169000 Guadalupe R A San José, CA” (National Water Information System, 2008a).
 - b. Coyote Creek peak streamflow data are from “Peak streamflow for California: Surface water: Peak streamflow, USGS 11170000 Coyote C nr Madrone, CA” (National Water Information System, 2008b).
 - c. Coyote Creek daily discharge data are from “Time series daily data: Mean discharge for 1906, USGS 11170000 Coyote C nr Madrone, CA” (National Water Information System, 2008c).
3. From the National Weather Service, the Guadalupe gage datum is 72.00 feet above sea level (NGVD29).

TABLE 20. NATIONAL WEATHER SERVICE SAN JOSE DAILY PRECIPITATION
(INCHES)
SEASON-TO-DATE REPORTED AS OF 5 P.M. PREVIOUS DAY
BY MAURICE CONNELL, NATIONAL WEATHER SERVICE OBSERVER,
SAN JOSE, CALIFORNIA

Day of Month	Inches of Precipitation						
	Oct 1905	Nov 1905	Dec 1905	Jan 1906	Feb 1906	Mar 1906	Apr 1906
1	0.00	0.00	2.18	3.41	6.29	8.65	13.55
2	0.00	0.00	2.18	3.41	6.29	8.68	13.55
3	0.00	0.00	2.18	3.41	6.29	8.68	13.56
4	0.00	0.00	2.18	3.41	6.29	9.66	13.56
5	0.00	0.00	2.18	3.41	6.29	9.67	13.56
6	0.00	0.00	2.18	3.41	6.29	9.67	13.56
7	0.00	0.00	2.18	3.41	6.30	9.67	13.56
8	0.00	0.00	2.18	3.41	6.30	9.67	13.56
9	0.00	0.00	2.18	3.41	6.30	9.67	13.56
10	0.00	0.00	2.18	3.44	6.30	9.67	13.56
11	0.00	0.00	2.18	3.45	6.36	9.67	13.72
12	0.00	0.00	2.18	3.45	6.36	9.69	13.72
13	0.00	0.00	2.18	4.34	6.41	10.64	13.72
14	0.00	0.00	2.18	4.79	6.42	10.66	13.72
15	0.00	0.00	2.18	4.79	6.57	10.70	13.72
16	0.00	0.00	2.29	4.98	6.62	10.70	13.72
17	0.00	0.00	2.29	4.98	6.63	10.70	13.72
18	0.00	0.00	2.29	4.98	6.77	11.38	-----
19	0.00	0.00	2.57	5.62	7.09	11.41	-----
20	0.00	0.09	2.63	6.28	7.33	11.41	-----
21	0.00	0.10	3.14	6.28	7.33	11.41	-----
22	0.00	0.10	3.14	6.28	7.85	11.44	-----
23	0.00	0.10	3.14	6.28	8.05	11.55	-----
24	0.00	0.24	3.14	6.29	8.17	12.16	-----
25	0.00	0.40	3.14	6.29	8.46	12.20	-----
26	0.00	0.40	3.14	6.29	8.48	12.31	-----
27	0.00	0.41	3.21	6.29	8.48	12.98	-----
28	0.00	1.37	3.21	6.29	8.65	12.95	-----
29	0.00	1.48	3.24	6.29	N/A	12.95	-----

TABLE 20. NATIONAL WEATHER SERVICE SAN JOSE DAILY PRECIPITATION
(INCHES)

SEASON-TO-DATE REPORTED AS OF 5 P.M. PREVIOUS DAY
BY MAURICE CONNELL, NATIONAL WEATHER SERVICE OBSERVER,
SAN JOSE, CALIFORNIA

Day of Month	Inches of Precipitation						
	Oct 1905	Nov 1905	Dec 1905	Jan 1906	Feb 1906	Mar 1906	Apr 1906
30	0.00	2.05	3.24	6.29	N/A	12.95	-----
31	0.00	N/A	3.39	6.29	N/A	13.21	N/A
Monthly Total (in)	0.00	2.18	1.23	2.88	2.36	4.90	0.17

Notes: Dashes indicate that rainfall was not reported. Weather station at Second and San Fernando Streets in San José was destroyed in earthquake and fire on 18 April 1906. 1905-06 precipitation data from *The Weather* daily column of the *San José Daily Mercury* (Monday through Saturday) and *San José Mercury and Herald* (Sunday), reported by Maurice Connell, National Weather Service observer, San José, California.

Figure 36. Cumulative 1905-06 monthly precipitation and 1948-2005 mean monthly precipitation. Although March 1906 rainfall was significantly heavier than average, by 18 April 1906, the cumulative rainfall for the 1905-06 season was still average. Both sets of monthly precipitation (rainfall) data were measured at Second and San Fernando Streets, San José, California. 1905-06 monthly totals are compiled from daily cumulative precipitation reported in *The Weather* column of the *San José Daily Mercury* (Monday through Saturday) and San José *Mercury and Herald* (Sunday) by Maurice Connell, National Weather Service observer, San José, California. The 1948-2005 monthly precipitation data are from the National Weather Service (2006).

Figure 37. Peak streamflow for Guadalupe River and Coyote Creek, 1930-1950. This graph is based on USGS Annual Peak Streamflow Data 1930-1950 (National Water Information System, 2008a, 2008b) and uses only closely matching measurement dates for Guadalupe River and Coyote Creek peak streamflow. The 18 April 1906 streamflow (775 cfs) is estimated from the daily discharge data for Coyote creek (115 cfs on 18 April 1906) and the linear regression of Guadalupe River peak streamflow against Coyote Creek peak streamflow (this figure). Coyote Creek daily discharge data from (National Water Information System 2008c).

Figure 38. Guadalupe River rating curve, 1930-1950. Based on USGS Annual Peak Streamflow Data for the Guadalupe River, 1930-1950 (National Water Information System, 2008a); dates before installation of the Lexington Dam and dates of flood stages are omitted. The Guadalupe River stage of 3.73 ft above datum of on 18 April 1906 is estimated from the rating curve in this figure and Guadalupe River streamflow of 775 cfs from Figure 37.

Figure 39. Guadalupe River rating curve, 1930-1984. Based on USGS Annual Peak Streamflow Data for the Guadalupe River, 1930-1984 (National Water Information System, 2008a); flood stages are omitted. The Guadalupe River 1906 peak streamflow is estimated from Coyote Creek peak streamflow in Figure 38. The 18 April 1906 stage (gage height above datum) of 4.17 ft on 18 April 1906 is estimated from the regression curve in this figure and Guadalupe River estimated streamflow of 775 cfs from Figure 37.