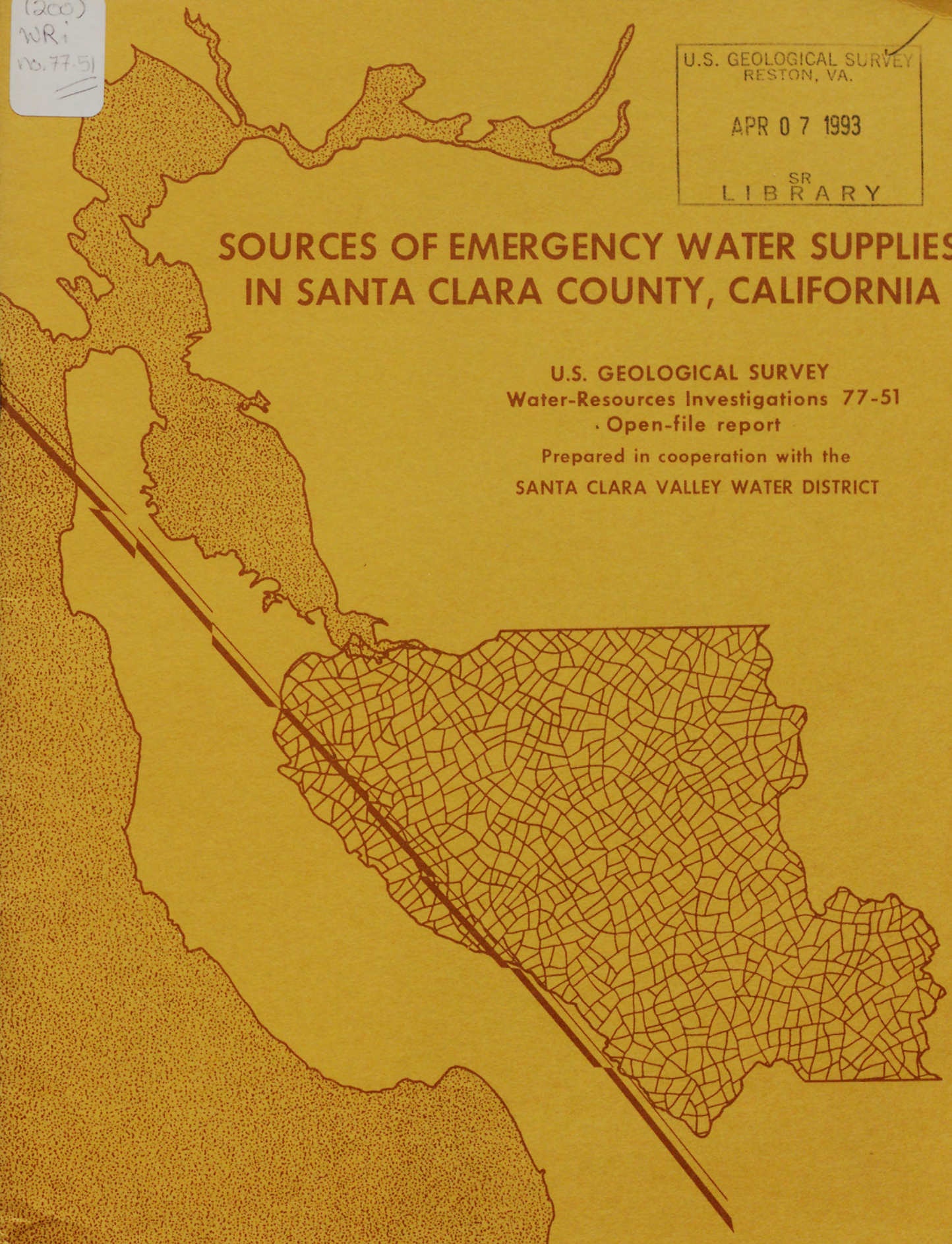
SOURCES OF EMERGENCY WATER SUPPLIES IN SANTA CLARA COUNTY, CALIFORNIA

U.S. GEOLOGICAL SURVEY
Water-Resources Investigations 77-51
· Open-file report
Prepared in cooperation with the
SANTA CLARA VALLEY WATER DISTRICT



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By J. P. Akers

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Santa Clara Valley Water District

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UNITED STATES DEPARTMENT OF THE INTERIOR

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GEOLOGICAL SURVEY

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CONVERSION FACTORS

Factors for converting metric units to English units are shown to four significant figures. In the text, the English equivalents are shown only to the number of significant figures consistent with the values for the metric units.

Metric	*Multiply by*	*English*
square hectometers (hm^2)	2.471	acres
cubic hectometers (hm^3)	8.110×10^{2}	acre-feet (acre-ft)
horsepower	9.862×10^{-1}	horsepower
liters (L)	2.642×10^{-1}	gallons (gal)
liters per second (L/s)	1.585×10^{1}	gallons per minute (gal/min)
meters (m)	3.281	feet (ft)
millimeters (mm)	3.937×10^{-2}	inches (in)

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ABSTRACT

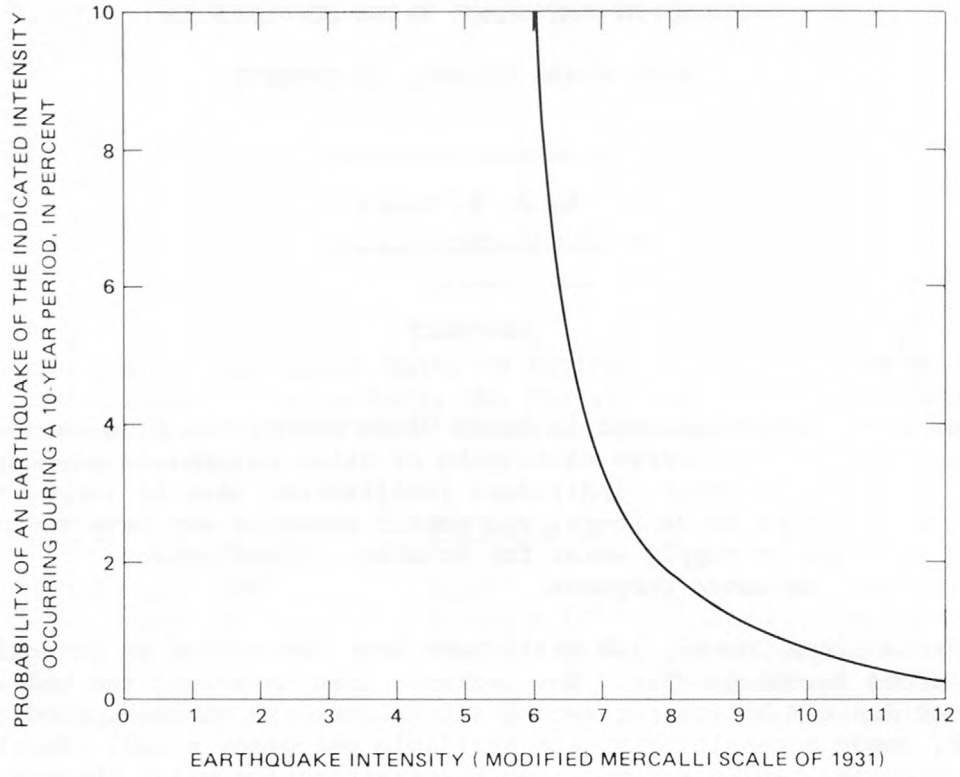
Water distribution systems in Santa Clara County may be damaged and rendered inoperable by a large earthquake or other natural or man-caused disaster. In such an event, individual families may have to supply their own drinking water for 24 to 36 hours, and public agencies may have to implement emergency measures to supply water for drinking, firefighting, decontamination, or other purposes.

In Santa Clara County, 128 wells have been identified as potential water-supply sources in emergencies. The criteria used to select the wells are: yield of at least 3 liters per second (50 gallons per minute), good quality of the water, ready accessibility, and available emergency power. Purification of small supplies can be accomplished by straining the water through a fine-mesh cloth and then boiling the water or disinfecting it by adding either chlorine or iodine in some form.

INTRODUCTION

Water-supply systems in urban areas of the United States, on the whole, maintain uninterrupted municipal water supplies of high quality. Disruptions do occur from a variety of natural causes, including hurricanes, tornados, floods, fires, and earthquakes. Other disruptions might include civil disorders, wars, employee strikes, accidents, and vandalism.

One of the more likely causes of widespread disruptions of water supplies in Santa Clara County is earthquakes. Figure 1 shows the probability of an earthquake of a given intensity occurring within a 10-year period in the San Francisco-San Jose area. Damage to water-supply systems that might result from a major earthquake includes breakage of pipelines, destruction of water-treatment and pumping facilities, disruption of electrical-power supplies, collapse or breakage of well casings, destruction of dams, collapse of elevated water tanks, and rupture of concrete water tanks. In the San Fernando earthquake of February 1971 in southern California, two reservoirs were severely damaged, a partially completed water-treatment plant was virtually destroyed, a local power-converter station was heavily damaged, numerous water mains and valves were broken, and water-pumping plants were damaged. It took the city of San Fernando 11 days to establish a temporary above-ground water system.



INTENSITY	EFFECT
6	Felt by all, but damage slight.
7	Considerable damage in poorly built or badly designed structures; negligible in buildings of good design and construction.
8	Considerable damage in ordinary substantial buildings. Walls, chimneys, stacks fall. Sand, mud ejection from wells. Changes in well water levels.
9	Considerable damage and partial collapse of even specially designed buildings. Displacement of foundations. Ground cracks, underground pipes broken.
10	Ground badly cracked, rails bent, landslides common. Shifted sand and mud. Water splashed over river banks.
11	Few, if any, masonry structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service.
12	Complete destruction and damage total.

FIGURE 1.--Probability of an earthquake of given intensity occurring during any 10-year period in the San Jose-San Francisco area. (Based on 126 years of records, Agardy and Ray, 1972)

Regardless of the cause of disruption of water supplies, advanced planning to lessen the impact of the disruption should be a part of any emergency-preparedness program. At the city and county level, planners can (1) identify potential emergency sources of water for drinking, firefighting, sanitary, and other purposes, (2) have available alternative power sources for pumps in case of electrical failures, (3) have available emergency water-treatment facilities such as portable chlorinators and filter units, (4) have available tank trucks, pumps, portable pipelines, and hoses to facilitate distribution of drinking water, and (5) have available trained personnel to carry out emergency water-supply plans.

This report, intended to satisfy the requirements of step 1, above, describes existing and potential water sources that might be used in an emergency in Santa Clara County and outlines measures that can be used by individual families or other small groups to supply temporarily their own emergency domestic water needs.

Detailed information on planning for emergency water supplies has been published by the U.S. Department of the Army (1967), the U.S. Office of Civil Defense (1966 and 1968), the American Water Works Association (Agardy and Ray, 1972), and the Santa Clara County Planning Department (1976).

SOURCES OF EXISTING WATER SUPPLIES

Water for municipal use in Santa Clara County is supplied by local streams, by water imported in the South Bay and Hetch Hetchy Aqueducts, and by several hundred local wells. From July 1973 through June 1974, 462 hm^3 (375,000 acre-ft) of water was available to Santa Clara County from existing sources (Santa Clara Valley Water District, 1975, p. I-32); 199 hm^3 (162,000 acre-ft) was from wells, 93 hm^3 (75,000 acre-ft) was from streams, and 170 hm^3 (138,000 acre-ft) was from imported water sources.

The existing water distribution systems and the areas served by the various water-distribution agencies are outlined in the Santa Clara Valley Water District's "Master Plan" (1975) and are not reproduced here.

POTENTIAL SOURCES OF EMERGENCY WATER SUPPLIES

The "Seismic Safety Plan" of the Santa Clara County Planning Department (1976, p. 15) states that most families will have to cope with their own situation during the first 24 to 36 hours after a large-scale disaster. The plan suggests that each household set aside enough food, water, and other emergency supplies to last for 2 to 3 days. Sterilized water in sealed containers should remain potable for several years. Stored food should be replaced occasionally, perhaps annually, to keep it fresh.

Small, immediately available emergency supplies of potable water can be found in most homes and apartment complexes. These include the water stored in heater tanks; flush-toilet storage tanks; ice cubes in refrigerators and freezers; bottled-water dispensers; distilled-water jugs for steam irons; canned fruits, vegetables, and beverages; and building piping systems. To keep the water in the building piping systems in case of breaks in the water mains, the master valve, between the water meter and the building, should be turned off immediately after a large earthquake. To use the water thus stored, turn on a faucet at the highest point in the building to let air into the system, and withdraw the water from a faucet at the lowest point. To conserve freshwater, toilets can be flushed by quickly pouring about 11 L (about 3 gal) of clear water from any source, such as a swimming pool, into the bowl. Of course, flush toilets should be used only if the sewage system is operable.

The most practical sources of large supplies of potable water in Santa Clara Valley during disruption of normal distribution systems probably would be from intact municipal, industrial, and private storage tanks and from numerous wells throughout the valley.

Water for firefighting, sanitary purposes, and decontamination in case of nuclear disaster might be found in reservoirs, lakes, ponds, streams, drainage ditches, swimming pools, decorative fountains, cooling towers, and large-diameter shallow wells. The water stored in water beds could be used for washing, fighting small fires, and some other purposes. Saltwater from San Francisco Bay and nearby sloughs could be used for firefighting and decontamination. Water might also be brought into some areas by releasing the water stored in reservoirs into normally dry streams and irrigation ditches. It may be feasible in some areas, such as along alluviated stream courses and other areas where there is a shallow water table, to dig pits with backhoes or bulldozers to reach the water table.

Potable water may have to be brought into local areas for a time in a disaster. Portable pipelines and hoses can be used if distances are not too great. Where long distances are involved, vehicles that may be pressed into service include tank trucks used for dust control during road construction; tank trucks used for transporting milk, molasses, and other nontoxic liquids; trucks used for transporting bottled water; and railroad tank cars. Road Operations of the County Transportation Agency has about 10 tank trucks ranging in capacity from 7,600 to 11,400 L (2,000 to 3,000 gal) that could be used. Other tank trucks might be available from the National Guard, the California Division of Highways in San Jose, and from the numerous private paving contractors in the county.

WATER REQUIREMENTS UNDER EMERGENCY CONDITIONS

Water requirements under emergency conditions depend on the nature and magnitude of an anticipated disaster. For example, a tornado may move across an urban area and cause severe damage to structures in a local area, but leave water-distribution systems relatively unharmed. This would create little need for emergency water supplies. A large earthquake could disrupt water-distribution systems and cause fires throughout the county. This would create immediate large demands for emergency water in a broad area. In a major flood, there would be little need for emergency water for fire control, but there would probably be a considerable demand for potable water. In some civil disorders and after nuclear catastrophes or earthquakes, the need for emergency water supplies for fire control, sanitary use, and drinking may be great.

The Santa Clara County Planning Department (1976, p. 24) stated that a great earthquake similar to the San Francisco earthquake of 1906 can be anticipated anytime in the next several decades. In view of this, the emergency planning agencies should base estimates for emergency water-supply requirements on the maximum needs for all categories of emergency water use.

The minimum per capita requirements for postdisaster potable and sanitary water estimated for nuclear disasters by the U.S. Office of Civil Defense (1966, table XV, p. 52) are shown in table 1. These data are probably applicable for other types of disasters. For sustenance of human life, the average per capita requirement in a fall-out shelter is 1.9 L (about one-half gal) of water per day (U.S. Office of Civil Defense, 1966). Although a later report by the same agency (1968) indicated that half that amount would be an absolute minimum, 1.9 L (one-half gal) will be considered the desired minimum for this report.

TABLE 1.--*Minimum potable and sanitary water requirements during emergencies*

[Modified from U.S. Office of Civil Defense, 1966, table XV, p. 52]

Facility and installation	Water requirement (range, in liters per person per day)
Hospitals and other medical care facilities	19 to 95
Mass-care centers and other welfare installations	
Mass-feeding station--cooking and sanitary uses only	11 to 38
Lodging center--drinking and face and hand washing only	7.5
Lodging and emergency feeding station	19 to 57
Lodging center with operative flush-toilet facilities--drinking, feeding, and sanitary uses only	95
Households	
Drinking, cooking, and cleansing only	19 to 57
With operative flush-toilet facilities	95

CRITERIA FOR SELECTING EMERGENCY WATER-SUPPLY WELLS

Wells in Santa Clara County will probably provide the most dependable source of emergency water. Surface-water supplies may be contaminated by wastes or radioactive particles. Ground water is relatively free from potential contamination during a disaster, and it is not as subject to sudden loss or turbidity increases as surface-water sources. It is recognized that some wells will be rendered unserviceable because of misalinement of turbine shafts, collapse of casing, and other physical damage. Most wells, especially those equipped with submersible pumps, will survive. Widespread distribution and large yield make wells prime potential sources of emergency water. Further, the water from a well having an intact sanitary seal generally is potable without treatment. If practicable, any water used for potable supplies should be approved by county health authorities.

Table 2 lists wells in Santa Clara County that would be suitable for emergency water supply. The factors considered in selecting the wells include accessibility, source of power, yield, water quality, and geographical distribution.

Accessibility

Most of the wells listed in table 2 are accessible by roads that are traversable by tank trucks under normal conditions. Many can be fitted with irrigation-type portable pipe or can be quickly fitted to pipe or hose to facilitate loading of trucks or delivery of water to nearby sources. In some places, mains near fire hydrants can be valved off and the hydrants used to load tank trucks. Some wells were selected, even though they may not be easily accessible, to give a better geographical distribution of water sources. Some of the wells are reached by dirt roads that may not be easily traversable in the rainy season or under flood conditions. The Santa Clara County Planning Department (1976, fig. 2) indicated that almost half the valley flat area in northern Santa Clara Valley and three-fourths of the valley flats in southern Santa Clara Valley could be innundated if dams failed when the reservoirs were full. Such an occurrence would limit the accessibility and even the utility of many of the selected wells.

Source of Power

Electrical power failures are common in large-scale disasters. Considerable effort was made to locate wells equipped with internal combustion engines for either direct operation of pumps or for electrical power generation. Most of the large water purveyors that operate wells and many of the large hospitals have generators for standby power supplies. Other agencies that may have generators capable of running pumps include the County Transportation Agency, the local National Guard and other military units, and the many private construction firms in the county. Some of the electrically driven pumps can be adapted readily to belt drive using the power takeoff of tractors.

Yield

Most of the wells selected are of moderate to large yield (more than 3 L/s or 50 gal/min) so that a minimum number would have to be used in any emergency. Even a small well, however, will supply the drinking water needs of a substantial number of people. A well pumped at a rate of 0.3 L/s (5 gal/min) for 12 hours would supply 13,000 L (3,600 gal), the minimum daily survival requirements of about 7,000 people. Thus, operable small domestic wells that are not included in table 2 should not be overlooked where emergency drinking water is needed. Most small domestic wells have submersible or jet pumps that are less prone to damage by earthquakes than shaft-driven turbines.

Water Quality

Nearly all the deep wells in Santa Clara County that have a sanitary seal yield water that is suitable both chemically and bacteriologically for potable water supplies. Most of the deep irrigation and industrial wells that have no sanitary seal also yield water that is suitable for potable supplies, but such wells should be inspected at the time of use to make sure no contaminants are accessible to the wells. Also, as a precaution against possible bacterial contamination, the water from unsealed wells could be chlorinated as suggested below or by portable chlorinators.

TABLE 2.--*Data for emergency water-supply*

Map number: Location number shown in figure 2.
Well number or name: Numbered wells are identified according to location in the rectangular system for the subdivision of public land. For example, in the number 5S/1E-30Q10, the part of the number preceding the slash indicates the township (T. 5 S); the number between the slash and hyphen indicates the range (R. 1 E.); the number between the hyphen and letter indicates the section (sec. 30); the letter (Q) represents the 16-hm^2 (40-acre) subdivision as shown in the accompanying diagram; the final number (10) is a serial number differentiating wells in the subdivision. For wells not assigned a number, the name is given.

D	C	B	A
E	F	G	H
M	L	K	J
N	P	Q	R

Location: Street, avenue, road, or court nearest well; or facility at well site.
Use: Principal use of water. 1, Active commercial; 2, active agricultural; 3, active commercial and agricultural; 4, active domestic; 5, active domestic and commercial; 6, active domestic and agricultural; 7, inactive.
Well depth: In meters below land surface (1 m equals 3.3 ft).
Static depth to water: Approximate depth below land surface datum to water level in early 1976, in meters (1 m equals 3.3 ft). Information can be updated annually from Santa Clara Valley Water District reports.

Map number	Well number or name	Well owner	Location
1	5S/1E-30Q10	Wells Fargo Bank/Fewster	220 m south of Scott Creek, 8.5 m east of Fwy 680
2	5S/3W-35G10	City of Palo Alto	Palo Alto Ave. at Hale St.
3	6S/1E-6N1	Milpitas City Water District	Southeast corner Penitencia Creek and Marylinn Dr.
4	6S/1E-16K4	San Jose Water Works	Northeast corner Croply Ave. and Morril Rd.
5	6S/1E-21M10	Fujimoto, Kiyoshi	Route 2, box 164, Hostetter Rd.
6	6S/1E-27M4	East Side Union High School Dist.	
7	6S/1E-34L2	Alexian Brothers Hospital	225 N. Jackson Ave.
8	6S/1W-1K1	Milpitas City Sanitation Dist.	
9	6S/1W-11C2	San Jose Property Department	934 Zanker Rd.
10	6S/1W-13D3	Agnews State Hospital	Southwest intersection Levee and Boats Rd.
11	6S/1W-22A1	Santa Clara City/Sports	Santa Clara City Golf Course
12	6S/1W-22B1	Santa Clara City Water Department	Nelson and Burke Dr.
13	6S/1W-25E4	Boise Cascade Home and Land	305 m south of San Jose-Alviso Rd., 610 m south of Trimble Rd.
14	6S/1W-27E1	Siliconix Inc./Weston W B	305 m east of San Thomas Creek, 30 m north of Bayshore Fwy.
15	6S/1W-31B3	Sunnyvale City Water Department	Northeast of corner Wolfe Rd. and Southern Pacific Railroad tracks
16	6S/1W-32H1	Santa Clara City Water Department	Northeast corner Agate and Marchese
17	6S/1W-33N1	Santa Clara City Water Department	Northeast corner Calabazas and San Juan
18	6S/1W-35F1	Container Corp. America	488 m north of Martin Ave., 610 m east of railroad tracks
19	6S/1W-36F1	San Jose Airport	Northeast intersection Airport Blvd. and Brokaw Rd.
20	6S/2W-17D10	City of Palo Alto	3896 Duncan Place, 33 m south
21	6S/2W-17R1	City of Mountain View Water Department	20 m north of Central Expwy, 122 m west of Rengstorff Ave.
22	6S/2W-18Q10	North Los Altos Water Company	226 m south of Kelly, 15 m east of Suzanne
23	6S/2W-19D12	Alta Mesa Improvement Company	87 m west of Alta Mesa, 9 m north of Arastradero
24	6S/2W-19H2	North Los Altos Water Company	Intersection Portola Ave. and Pleasant Way

wells in Santa Clara County

Pump type: O, air lift; 1, plunger; 2, deep-well turbine; 3, submersible; 4, centrifugal; 5, jet; 8, none.
Pump manufacturer: 4, Bean; 5, Byron Jackson; 6, Berkeley; 9, Aurora; 14, Campbell and Budlong; 28, Fairbanks-Morse; 46, Jacuzzi; 47, Johnson; 52, Layne-Bowler; 69, Peerless; 70, Pomona-Hendy; 92, Western.
Pump horsepower: Rated pump horsepower if available.
Pump power: Type required to operate pump: 0, electric, 110 volts; 1, electric, 220 volts; 2, electric, 440 volts; 3, gasoline; 4, diesel.
Pump output: Quantity of water pump is capable of lifting to surface, in liters per second (1 L/s equals 16 gal/min).
Discharge pipe, outside diameter: Nominal outside diameter of discharge pipe, in millimeters (1 mm equals 0.04 in).
Remarks: a, well in shed; b, well installation inside locked fence; c, site easily accessible by tank truck in case of need to haul water; d, discharge pipe adaptable to fitting with means to deliver water to tank truck; e, emergency power or engine available to operate pump; f, storage tank at well site; g, well site at golf course or park; h, other wells at site.

Use	Well depth (m)	Static depth to water (m)	Pump type	Pump manufacturer	Pump horsepower	Pump power	Pump output (L/s)	Discharge pipe, outside diameter (mm)	Remarks
6	152.6	-	3	-	15	2	-	89	b
1	256.0	-	2	92	100	2	94.6	273	c,d "Hale well." Water slightly high in chloride. Standby well for city of Palo Alto
1	88.5	27.5	3	5	-	2	25.9	219	c,d,e
1	248.5	73.0	3	52	-	2	74.4	273	b,c,d,f,h
6	91.5	36.5	3	6	-	1	-	60	c,d,f
2	167.5	64.5	2	69	-	1	44.2	169	c,d,f
1	122.0	-	2	14	-	1	-	114	c,d,e,f
1	-	-	4	-	-	1	-	42	b,c,d,e,f
3	122.0	13.5	2	5	-	1	18.9	114	c,f
2	102.0	-	2	46	-	1	37.9	219	a,f
1	122.0	18.5	2	69	-	2	-	219	c,d,g
1	201.5	45.0	3	5	-	2	75.7	219	b,c,d
6	117.5	50.5	2	92	-	4	56.8	219	a,b,c,d,e,f
2	166.0	50.5	2	5	-	2	42.9	168	c,d
1	192.0	56.0	3	5	-	2	37.9	325	b,f
1	199.5	52.5	3	52	-	2	104.1	273	b,c,d
1	161.0	50.5	3	5	-	2	78.9	273	b,c,d
1	219.0	45.5	2	52	-	2	50.5	273	b,c,d,f
6	82.5	-	2	5	-	2	-	219	c
1	278.0	-	3	46	50	2	-	220	c,d "Meadows well"
1	37.0	-	0	6	-	0	38.5	273	d "Well No. 10" in large covered pit
1	-	-	3	52	100	2	20.8	219	b,c,d "Suzanne well." Chlorinator at site
3	152.5	-	3	5	-	4	11.0	152	
1	81.5	48.5	2	-	-	2	6.6	114	b,c,d,f "Ramona No. 2" Chlorinator at site

TABLE 2.--*Data for emergency water-supply*

Map number	Well number or name	Well owner	Location
25	6S/2W-19M11	Alta Mesa Improvement Company	15 m north of Adobe Creek, 125 m east of Miranda Ave.
26	6S/2W-20N1	California Water Service Company	15 m west of intersection of Valencia and Jardin Dr.
27	6S/2W-21D8	City of Mountain View Water Department	76 m south of Crisante Ave., 290 m east of Rengstorff Ave.
28	6S/2W-22G1	City of Mountain View Water Department	53 m west of Easy Ave., 46 m north of Gladys Ave.
29	6S/2W-23J10	City of Sunnyvale/Parks	Northeast corner Maude Ave. and Hwy 237
30	6S/2W-25H1	Sunnyvale City Water Department	Northwest corner Schroeder and Arques Ave.
31	6S/2W-27A1	Ferry Morse Seed Company	North side Hwy 237, 180 m south Southern Pacific Railroad
32	6S/2W-28D1	City of Mountain View Water Department	18 m north of Lloyd Way, 21 m east of El Monte Blvd.
33	6S/2W-29J2	California Water Service Company	53 m east of Clark Ave., 61 m north of Hawthorne Ave.
34	6S/2W-31Q10	California State Department of Transportation	Foothill College maintenance yard
35	6S/2W-32D1	California Water Service Company	61 m southeast of corner of Griffin Rd. and Fremont Ave.
36	6S/2W-34K2	California Water Service Company	61 m south of Wasutch Dr. near Permanente Creek
37	6S/2W-34N1	California Water Service Company	Northeast corner Bryant Ave. and Churn Dr.
38	6S/2W-34P1	Nishimoto Y, trustee	East corner Bryant Ave. and Shady Spring Ln.
39	6S/2W-36A1	Sunnyvale City Water Department	Southeast corner Central and McKinley
40	6S/2W-36C4	Sunnyvale City Water Department	91 m north of Iowa St., 23 m east of S. Taaffee St.
41	6S/3W-1C12	City of Palo Alto	1440 Hopkins, 28 m west of Pine St.
42	6S/3W-1D10	City of Palo Alto	40 m south of Middlefield Rd., 46 m west of Kingsley Ave.
43	6S/3W-1M10	City of Palo Alto	46 m north of Bryant, 58 m west of Lowell Ave.
44	6S/3W-2D10	City of Palo Alto	17 m north of Alma St., 15 m east of Hawthorne
45	6S/3W-3L10	Stanford University	152 m northwest of Willow Rd., 366 m southwest of Arboretum
46	6S/3W-3M10	Stanford University	East bank San Francisquito Creek, 260 m northwest of Willow Rd.
47	6S/3W-11B10	Stanford University	Northeast corner plant services
48	6S/3W-12C10	City of Palo Alto	52 m north of Park Blvd., 6 m west of Cambridge extension
49	6S/3W-12D10	City of Palo Alto	65 m north of Park Blvd., 15 m west of Stanford Ave. extension
50	6S/3W-13A10	City of Palo Alto	Bank of Matadero Creek, 34 m east of Matadero Rd. bridge
51	7S/1E-2J3	San Jose Water Works	South bank west Silver Creek, southwest of corner of McGinness Ave. and Story Rd.
52	7S/1E-3A1	San Jose Water Works	Across street from Post Office at 70 Jackson Ave.
53	7S/1E-5M2	Santa Clara Packing Company	30 m east of 8th St., 61 m north of Jackson St.
54	7S/1E-7R7	San Jose Water Works	Northwest corner San Fernando and Delmas

wells in Santa Clara County--Continued

Use	Well depth (m)	Static depth to water (m)	Pump type	Pump manu-fac-turer	Pump horse-power	Pump power	Pump output (L/s)	Discharge pipe, outside diameter (mm)	Remarks
1	-	-	2	-	-	1	-	89	a,b,c,d,f "Van Buren" well. Chlorinator at site
1	143.0	66.5	2	5	-	2	9.5	169	b,c,d,f
1	172.0	55.5	3	5	-	2	25.2	219	b,c,d,f,g "Mtn. View Well 17"
1	248.0	58.0	3	52	-	2	48.9	219	c,d,f "Mtn. View Well 18"
1	183.0	53.5	3	-	-	2	47.3	219	b,c,d,g
1	202.0	61.5	3	5	-	2	38.3	219	b,c,d,f
1	153.0	61.0	2	52	-	2	18.4	141	c,d,f
1	125.0	73.5	2	52	-	1	21.2	219	a,c,d
1	183.0	-	3	5	-	2	18.9	168	b,c,d
1	-	-	3	4	-	1	-	90	c Behind bleachers at baseball diamond. College has emergency power supply, but not connected to well
1	157.0	87.0	3	5	-	2	22.1	168	b,c,d,f,h
1	227.5	91.5	3	52	-	2	43.5	219	b,c,d,f
1	129.0	89.5	3	5	-	2	18.9	273	c,d
2	244.0	91.0	2	92	-	3	44.2	219	f
1	189.0	66.5	3	5	-	2	33.1	219	c,d,f
1	199.0	72.5	3	5	-	2	28.5	273	a,b,c,d,f
1	158.0	-	2	92	100	2	-	219	c,d,g "Rinconada" well
1	183.0	-	2	70	40	2	2	170	c,d "Middlefield" well
1	131.0	-	2	92	30	2	18.9	168	c,d "Seale" well
1	112.0	-	2	92	30	2	11.3	168	"Tower" well
1	175.5	-	2	92	30	2	18.9	168	a,b,c,d,f
1	93.0	-	2	69	50	2	31.5	168	a,c,d,f
1	190.0	-	2	4	50	2	25.2	220	a,c,d
1	160.0	-	2	92	40	2	14.6	220	c,d "Park" well
1	259.0	-	3	92	125	2	51.1	273	c,d "Peers Park" well
1	325.5	-	3	52	100	2	19.7	220	c,d "Matadero" well
1	212.0	60.5	2	52	-	2	92.7	219	b,c,d
1	183.0	63.5	2	52	-	2	44.2	273	b,c,d
1	78.5	36.5	2	92	-	1	50.5	219	b,c,d
1	248.0	66.0	3	47	-	2	110.4	273	b,c,d

TABLE 2.--*Data for emergency water-supply*

Map number	Well number or name	Well owner	Location
55	7S/1E-9D8	San Jose Water Works	North of intersection of Santa Clara and 19th St.
56	7S/1E-10H4	San Jose Parks and Recreation	90 m east of King Rd., 183 m north of Story Rd.
57	7S/1E-12C1	Soares and Sons, Incorporated	Northwest of airport, southeast corner Capitol Expwy. and Cunningham Ave.
58	7S/1E-16C5	San Jose Water Works	North corner of Martha and 12th St.
59	7S/1E-17F1	San Jose Water Works	Northwest corner Grant and Vine
60	7S/1E-20Q2	San Jose Water Works	South corner Northern Rd. and Willow Glen Way
61	7S/1E-21E2	San Jose Water Works	Southeast corner Cottage Grove and Pomona Ave.
62	7S/1E-22H5	San Jose Water Works	East of bridge on Coyote Creek at Tully Rd.
63	7S/1E-22M1	Chaboya Ranch	Mayfair Packing Co., on S. 7th St.
64	7S/1E-24E1	George F. Fontaine	South end of Fontaine Rd. on private property
65	7S/1E-27K2	Pierson/Hillsdale Dairy	300 m east of Monterey Rd. on north side of Tully Rd.
66	7S/1E-32J3	San Jose Water Works	Northwest corner Foxworthy and Old Almaden Rd.
67	7S/1E-35P1	Arcadia Development Company	Northeast junction of Southern Pacific Railroad and Baroni Ave.
68	7S/2E-7C3	H. I. Duino	North end of Pleasant Hills Golf Course
69	7S/2E-20C4	Mirassou Vineyards	Mirassou Vineyards on Aborn Rd.
70	7S/1W-6B1	City of Sunnyvale	Sunken Gardens Golf Course
71	7S/1W-7F1	Sunnyvale City Water Department	30 m west of Wolfe Rd., 91 m north of Homestead Rd.
72	7S/1W-8B2	Santa Clara City Water Department	Northeast corner Brookdale and Bing
73	7S/1W-9J1	Santa Clara City Water Department	105 m east of Bucher Ave., 90 m south of Toledo Ave.
74	7S/1W-11D2	Santa Clara City Water Department	27 m west of Market St., 56 m north of Jefferson
75	7S/1W-13E3	San Jose Water Works	Northeast corner San Carlos Blvd. and Bascom Ave.
76	7S/1W-15H1	University of California	Holderman Sanitarium, Santa Clara-Los Gatos Rd.
77	7S/1W-17A1	Santa Clara City Water Department	North end of Rodohanan Dr.
78	7S/1W-17P2	San Jose Water Works	Northeast corner Barnham Ave. and Sterling Blvd.
79	7S/1W-18G1	Vallco Park, Limited	N. Stevens Creek Blvd. near entrance to Vallco Park
80	7S/1W-18K1	California Water Service Company	18 m east of Miller Rd. near Calabazas Creek
81	7S/1W-18N2	City of Cupertino	Wilson School
82	7S/1W-20L1	San Jose Water Works	Northeast corner Doyle Rd. and Forest Creek Dr.
83	7S/1W-22E7	San Jose Water Works	San Thomas Expwy, on Williams Rd.
84	7S/1W-23R1	San Jose Water Works	Southwest corner Eisenhower Dr. and Bascom Ave.
85	7S/1W-27P1	Campbell Water Company	97 m west of North Lewellyen Ave., 38 m north of Campbell Ave.
86	7S/1W-31E2	San Jose Water Works	5 Cox Ave. near Fire Station
87	7S/1W-33M1	San Jose Water Works	McCoy Ave. of Graney Dr.
88	7S/1W-35C1	Campbell Water Company	Southeast of intersection Rincon and First St.
89	7S/2W-1B1	California Water Service Company	Sunnyvale-Saratoga Rd., northeast of Fremont High School

wells in Santa Clara County--Continued

Use	Well depth (m)	Static depth to water (m)	Pump type	Pump manu-facturer	Pump horse-power	Pump power	Pump output (L/s)	Discharge pipe, outside diameter (mm)	Remarks
1	259.0	-	3	5	-	2	94.6	273	b,c,d,h
2	146.5	60.0	2	92	-	2	-	220	c,f
3	137.0	-	2	5	-	1	18.9	220	b,c
1	221.0	70.0	2	52	-	2	97.2	274	b,c,d,h
1	218.0	58.5	2	52	-	2	98.9	219	b,c,d
1	169.0	62.0	2	5	-	2	87.1	219	b,c,d,f,h
1	229.0	65.5	2	52	-	2	74.1	273	b,c,d,f,h
1	244.0	59.0	3	5	-	2	82.3	325	b,c,d,f,h
1	155.0	58.0	2	52	-	1	34.7	168	c,d,f
4	94.5	82.0	2	92	-	1	15.8	168	b,c,f
1	-	-	2	67	-	1	-	114	f
1	96.0	47.0	3	5	-	2	37.9	114	b,c,d
2	152.5	30.5	2	47	-	2	44.2	219	d
1	163.5	70.0	3	28	-	2	10.7	168	a,b,c,d,g
6	198.0	76.0	2	69	-	2	12.6	168	c,d
1	87.0	19.0	3	5	-	1	20.5	168	b,c,d,f
1	181.0	79.0	3	5	-	2	-	219	b,c,d,f
1	244.0	-	3	5	-	2	134.0	219	b,c,d
1	152.5	64.0	2	5	-	2	113.6	273	c,d City of Santa Clara station. Public swimming pool could be used for fighting fire
1	175.5	65.6	3	52	-	2	109.8	273	b,c,d City of Santa Clara station 2.
1	242.5	70.5	2	5	-	2	107.3	273	b,c,d,h
1	109.5	69.5	2	14	-	2	17.7	168	a,b,c,d Signs labeled "Danger poison" on nearby storage area
1	203.0	78.5	2	52	-	2	39.3	219	b,c,d City of Santa Clara station 9
1	218.0	115.0	3	5	-	2	44.2	219	b,c,d,f,h
2	122.0	-	2	52	-	1	25.2	168	b,c,d
1	253.0	86.5	3	52	-	2	31.5	219	b,c,d,f
1	183.0	91.5	2	52	-	1	25.2	114	a,c,d,g Cupertino City well
1	241.0	88.0	3	47	-	2	27.8	168	b,c,d,f,h
1	152.5	80.0	2	52	-	2	82.0	273	b,c,d,f,h
1	253.0	82.5	3	5	-	2	102.6	273	b,c,d
1	236.0	81.5	3	92	-	2	56.2	219	b,c,d,f,h
1	244.0	-	2	47	-	2	-	168	b,c,d
1	143.5	-	3	-	-	2	19.6	168	b,c,d,h
1	288.5	75.0	2	5	-	2	60.6	219	b,c,d,f
1	189.0	84.0	2	5	-	2	12.6	254	b,c,d,f,h

TABLE 2.--*Data for emergency water-supply*

Map number	Well number or name	Well owner	Location
90	7S/2W-1E3	California Water Service Company	32 m north of Fremont Ave., 3 m west of Cordileras Ave.
91	7S/2W-2E2	Sunnyvale City Water Department	Southwest corner Syracuse and Cranberry
92	7S/2W-3P1	California Water Service Company	23 m southeast of Newcastle Dr., 91 m southwest of Landell Ct.
93	7S/2W-11G2	Sunnyvale City Water Department	Just west of 829 Homestead Rd.
94	7S/2W-12E1	City of Cupertino	30 m west of Ontario Dr., 122 m south of Kirkland Dr.
95	7S/2W-22A1	City of Cupertino	East bank of Stevens Creek behind Baptist Church
96	7S/2W-23H1	John Perusina	244 m west of Stelling Rd., 244 m north of Regnart Ct.
97	7S/2W-36J2	Mijo Miljevich	61 m south of Argonaut School, east side of Shadow Mountain Rd.
98	8S/1E-5H6	San Jose Water Works	Northwest corner Thousand Oaks Dr. and Buckhampton Ct.
99	8S/1E-7E1	California State Department of Transportation	Southwest corner Branham Ln. and Carter Ave.
100	8S/1E-10K4	San Jose Water Works	Northwest corner Blossom Hill Rd. and Callahan Ave.
101	8S/1E-11K1	Joseph H. Bloom	5695 Snell Rd.
102	8S/1E-19C1	Athenour Sons	Camden Ave. at Guadalupe Creek
103	8S/1E-20J4	T. L. Pierce	Southwest corner McAbee Rd. and Wayland Park Dr.
104	8S/2E-7F1	IBM Corporation	IBM plant near railroad tracks and shipping building
105	8S/2E-8F4	Santa Clara County Parks Department	Near percolation pond on Coyote Creek
106	8S/2E-17J2	E. L. Frost	Southwest intersection Bernal and Monterey Rds.
107	8S/2E-17N10	Great Oaks Water Company	61 m northwest of Martinvale Rd., 15 m east of road end
108	8S/1W-4L1	San Jose Water Works	68 m east of Calle Marguerita, 27 m south of railroad tracks
109	8S/1W-7A1	Odd Fellows Home of California	14500 Fruitvale Ave.
110	8S/1W-10C2	California State Department of Transportation	11.6 m west of Oka Rd., 59.1 m north of Lark Ave.
111	8S/1W-16K3	Town of Los Gatos	Oak Meadow Park near Los Gatos Creek
112	Diana	Town of Morgan Hill	Junction Southern Pacific Railroad and Diana Ave.
113	Dunne Ave.	Town of Morgan Hill	E. Dunne Ave., 90 m east of fwy
114	Jackson	Town of Morgan Hill	Junction Hill Rd. and E. Dunne Ave.
115	Main Ave.	Town of Morgan Hill	465 E. Main, behind building
116	Burnett	Town of Morgan Hill	S. Burnett Ave., 60 m east of Monterey Hwy
117	Mast	Town of Morgan Hill	East end and south side Mast St.
118	East San Martin	Earl Powell	Southwest corner Llagas Ave. and Spring St.
119	West San Martin No. 1	Roy Monsche	Near junction Chester and Sewell Ave.
120	West San Martin No. 2	--	East of Colony Ave., 274 m south of San Martin Ave.
121	San Martin Rocca	Norma Barberi	Northwest of 35 Burbank St.
122	San Martin Gwinn School	--	North side of Gwinn School

wells in Santa Clara County--Continued

Use	Well depth (m)	Static depth to water (m)	Pump type	Pump manu-facturer	Pump horse-power	Pump power	Pump output (L/s)	Discharge pipe, outside diameter (mm)	Remarks
1	237.5	92.0	3	52	-	2	75.7	273	b,c,d,f
1	170.5	96.5	3	5	-	2	35.9	168	b,c,d,f
1	213.5	103.5	2	5	-	3	110.4	168	b,c,d,e,f
1	154.5	120.0	3	47	-	2	25.2	219	c,d
1	317.0	108.0	2	92	-	2	36.3	219	b,c,d Cupertino "Homestead No. 1"
1	9.0	3.0	2	92	-	1	28.4	169	c,d
2	-	-	3	56	-	1	-	50	c,f Private well; storage tank at next door property
2	122.0	61.0	3	47	-	2	-	114	c,d
1	138.0	21.5	3	5	-	2	50.5	273	b,c,d,f,h
6	-	-	2	47	-	1	-	92	c,f
1	69.0	25.0	3	52	-	2	31.5	325	b,c,d
6	30.5	-	2	14	-	3	-	179	c,e
2	5.0	2.0	2	14	-	1	25.2	179	c
1	-	-	2	6	-	1	1.9	62	a,b,c,d
3	-	-	2	4	-	1	25.2	168	c,d
2	52.0	9.0	2	92	-	1	12.6	114	b,c,d
6	61.0	-	2	69	-	1	-	219	c,d,f
2	-	-	2	9	-	4	-	260	c,d,e,h
1	173.0	-	2	92	-	2	18.3	168	
1	230.0	94.5	3	5	-	1	-	89	c,d,e
1	-	-	2	52	-	1	-	38	c
7	15.0	11.0	5	47	-	1	6.3	114	c,d Well inactive, may not be operable because of long disuse
1	-	-	2	89	25	1	-	152	a,b,c,d Chlorinator in shed
1	-	-	2	89	125	2	-	152	a,b,c,d Chlorinator in shed
1	-	-	2	89	50	2	-	152	a,b,c,d Chlorinator in shed
1	-	-	2	89	25	2	-	152	a,b,c,d Chlorinator in shed
1	-	-	2	89	30	2	-	152	a,b,c,d Chlorinator in shed
1	-	-	2	89	25	2	-	152	a,b,c,d Chlorinator in shed
1	74.0	-	5	-	20	2	-	102	c,f
1	108.0	-	2	46	15	2	-	-	b,e,f
1	106.5	-	3	6	15	2	11.0	-	b,c,d
1	45.5	-	4	-	10	-	-	102	c,d,f
3	76.0	-	3	-	-	1	-	127	b,c,d,f

TABLE 2.--*Data for emergency water-supply*

Map number	Well number or name	Well owner	Location
123	San Martin School	--	Southwest corner of school in shed
124	10S/4E-31G4	Town of Gilroy	700 S. Leavesley Rd., north end of trailer court
125	11S/4E-6B1	Town of Gilroy	15 m south of I.O.O.F. Ave., 30 m east of Monterey Ave.
126	11S/4E-6D1	Town of Gilroy	Southeast corner First and Princevalle St.
127	11S/4E-6H1	Town of Gilroy	Northwest corner Forest and Old Gilroy St.
128	11S/4E-6P2	Town of Gilroy	Northeast corner Ninth and Princevalle St.

wells in Santa Clara County--Continued

Use	Well depth (m)	Static depth to water (m)	Pump type	Pump manu-facturer	Pump horse-power	Pump power	Pump output (L/s)	Discharge pipe, outside diameter (mm)	Remarks
3	72.5	-	2	-	7.5	-	-	76	a,c,d,f
1	-	-	2	92	100	2	-	254	a,c.d
1	-	-	2	92	100	2	-	254	a,b,c,d
1	-	-	2	92	100	2	-	254	a,b,c,d,f
1	-	-	2	92	100	2	-	254	a,b,c,d,f
1	-	-	2	92	100	2	-	254	a,c,d

EMERGENCY WATER PURIFICATION

Small quantities of water can be purified in the home by methods outlined by the U.S. Public Health Service (1962, p. 111).

1. Turbid or colored water should be filtered through clean, fine-mesh cloths or allowed to settle, and the clean water drawn off before disinfection. Water prepared for disinfection should be stored only in clean, tightly covered, noncorrodible containers.

2. After the filtering or settling procedure, the water can be disinfected either by boiling or chemical treatment. Vigorous boiling for at least 1 minute will adequately disinfect water. When boiling is not practical, either of the following methods of chemical disinfection should be used: (a) Add chlorine. Household bleach contains hypochlorite which is an effective disinfectant. The procedure to be followed is often given on the label. If not, find the percentage of available chlorine on the label, and then use the following as a guide.

Available chlorine[1] (in percent)	Drops per liter of clear water[2]
1	10
4-6	2
7-10	1

[1]If strength unknown add 10 drops per liter.

[2]Double amount for turbid or colored water.

Mix the treated water thoroughly and allow it to stand for 30 minutes before use. (b) Add iodine. Common household iodine (2 percent tincture of iodine) may be used to disinfect water by adding five drops to each liter of water and letting the solution stand for 30 minutes. Double the dosage for turbid water.

Water to be used for drinking, cooking, making any prepared drink, or brushing teeth should be disinfected.

EMERGENCY WATER SUPPLIES IN SANTA CLARA COUNTY

Municipal Water-Storage Facilities

The locations of most of the municipal storage facilities including steel tanks, concrete reservoirs, and redwood-stave tanks, are shown in figure 2. No attempt was made to determine the capacity of these facilities because it was assumed that all would contain significant quantities of water. The water outlet valves of storage tanks should be closed immediately after a disastrous event to minimize loss of water that might occur because of broken water mains.

Wells

There are more than 3,000 wells in Santa Clara County. These wells serve as water supplies for municipal, private domestic, industrial, and agricultural use. Some are standby wells to be used in time of emergency, and they already have emergency power sources.

The location of many wells is indicated on standard U.S. Geological Survey 7½-minute topographic maps. Most of these maps are several years old and many of the wells thus indicated are not operable; some have been abandoned; and some have been destroyed to make way for new housing developments, highways, and shopping centers.

The wells shown in figure 2 were operable in spring 1976. Pertinent data for these wells are given in table 2. Most of the wells are owned by cities or quasi-public institutions; however, some are privately owned, and their use is subject to owners' approval unless emergency powers are assigned to disaster agencies.

Perennial Streams and Springs

The perennial reaches of streams and the springs as shown in standard 7½-minute U.S. Geological Survey topographic maps are shown in figure 2. The streams and springs were not visited, and their suitability as water supplies for any use was not determined.

The quantity of water available from these sources varies with seasons and weather conditions. Water can be obtained quickly by erecting low dams across the channel of most of the perennial streams shown. Depending on local conditions, there may be other perennial streams that could be dammed. Pits dug to the water table in the alluvium along perennial streams should also produce water. Water taken from streams should be treated before being used for drinking.

More springs occur in Santa Clara County than are shown on the map (fig. 2); the ones shown were mapped from 1953 through 1968 by the Geological Survey. The discharge of many springs commonly decreases, and may disappear, during prolonged dry spells. The water from some undeveloped springs and most properly developed springs is generally free of bacteria and can be used for drinking. More commonly, the water from springs is contaminated by surface runoff and by animals, and before being used for drinking the water should be treated as described in the section "Emergency Water Purification."

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