DRILLING, CONSTRUCTION, AND AQUIFER-TEST DATA FROM WELLS 3-3307-20 AND -21, THOMPSON CORNER EXPLORATORY WELLS I AND II, OAHU, HAWAII

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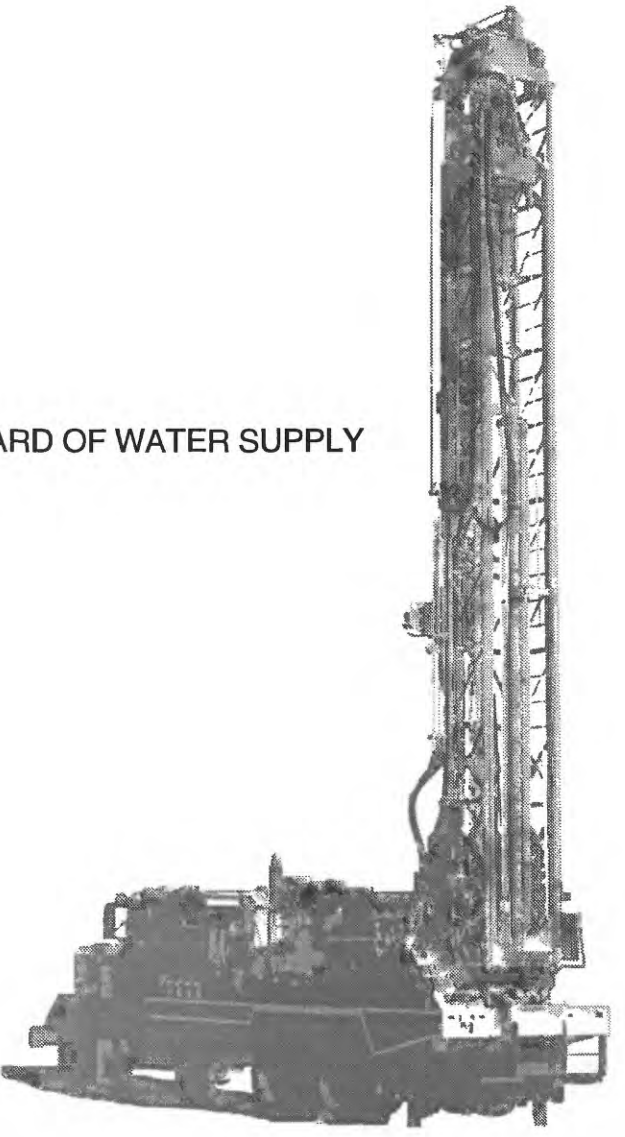

Prepared in cooperation with the
CITY AND COUNTY OF HONOLULU BOARD OF WATER SUPPLY

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Conversion Factors

Multiply	By	To obtain
foot (ft)	0.3048	meter
mile (mi)	1.609	kilometer
inch (in.)	25.4	millimeter
gallon per minute (gal/min)	0.06308	liter per minute

Elevations in this report are referenced relative to mean sea level.

Drilling, Construction, and Aquifer-Test Data for Wells 3-3307-20 and -21, Thompson Corner Exploratory Wells I and II, Oahu, Hawaii

By Todd K. Presley and Delwyn S. Oki

Abstract

The Thompson Corner exploratory wells I and II (State well numbers 3-3307-20 and -21) were drilled near Thompson Corner, about 2.2 miles south-southwest of the town of Haleiwa. The wells are located on agricultural land in the Waialua ground-water area. The wells are about 50 feet apart and penetrate about 90 feet into the ground water. Aquifer tests were conducted using well 3-3307-20 as a pumping well and well 3-3307-21 as an observation well. Well-construction data, logs of drilling notes, geologic descriptions for the samples, and aquifer-test data are presented for the wells. The wells are two of twelve exploratory wells drilled in the north-central Oahu area between July 1993 and May 1994 in cooperation with the Honolulu Board of Water Supply.

INTRODUCTION

Because of water-supply concerns associated with population increase on the island of Oahu, the Honolulu Board of Water Supply, in cooperation with the U.S. Geological Survey (USGS), conducted a study to assess the availability of ground water in north-central Oahu. This study included drilling 12 exploratory and monitoring wells between July 1993 and May 1994.

This report presents drilling, construction, well-log, and aquifer-test data for Thompson Corner exploratory wells I and II (State well numbers 3-3307-20 and -21). The wells are located along a sugar plantation road about 2.2 mi south-southwest of the town of Haleiwa (figs. 1 and 2). The wells were constructed about 50 ft apart. The purposes of the Thompson Corner wells were (1) to conduct local-scale aquifer tests, and (2) to serve as observation wells for monitoring water levels near four major irrigation pumping stations. The wells were drilled in the Waialua ground-water area (Rosenau and others, 1971; Dale, 1978; Hunt, in press).

Regional Setting

The study area is located in north-central Oahu between the crests of the Koolau Range and the Waianae Range (fig. 1). Summarized here are previous studies that describe the physical and geological aspects of the study area (Rosenau and others, 1971; Dale, 1978; Hunt, in press). The mountain ranges are the eroded remnants of two shield volcanoes, the Waianae Volcano and the Koolau Volcano. The Mokuleia ground-water area lies in the basalt aquifer of the Waianae Volcano, and the Waialua and Kawailoa ground-water area lie in the basalt aquifer of the Koolau Volcano. The Mokuleia and Waialua ground-water areas are separated by low-permeability paleosols and saprolite of the Waianae Volcano that lie below the geologic contact between the Waianae and Koolau Volcanoes. The Waialua and Kawailoa ground-water areas are separated by alluvium and weathered basalt in and beneath Anahulu Gulch. Seaward flow of ground water in the Mokuleia and Waialua ground-water areas is impeded by a coastal confining unit that is composed of marine and terrestrial sediment known locally as "caprock." The caprock creates a confined artesian condition at low elevations near the shore. Further inland however, the aquifer is unconfined.

Water levels in the Waialua and Kawailoa ground-water areas are about 12 ft and 4 ft above mean sea level, respectively. Water levels in the Mokuleia ground-water area are about 20 ft. Withdrawal from the Waialua, Kawailoa and Mokuleia ground-water areas is

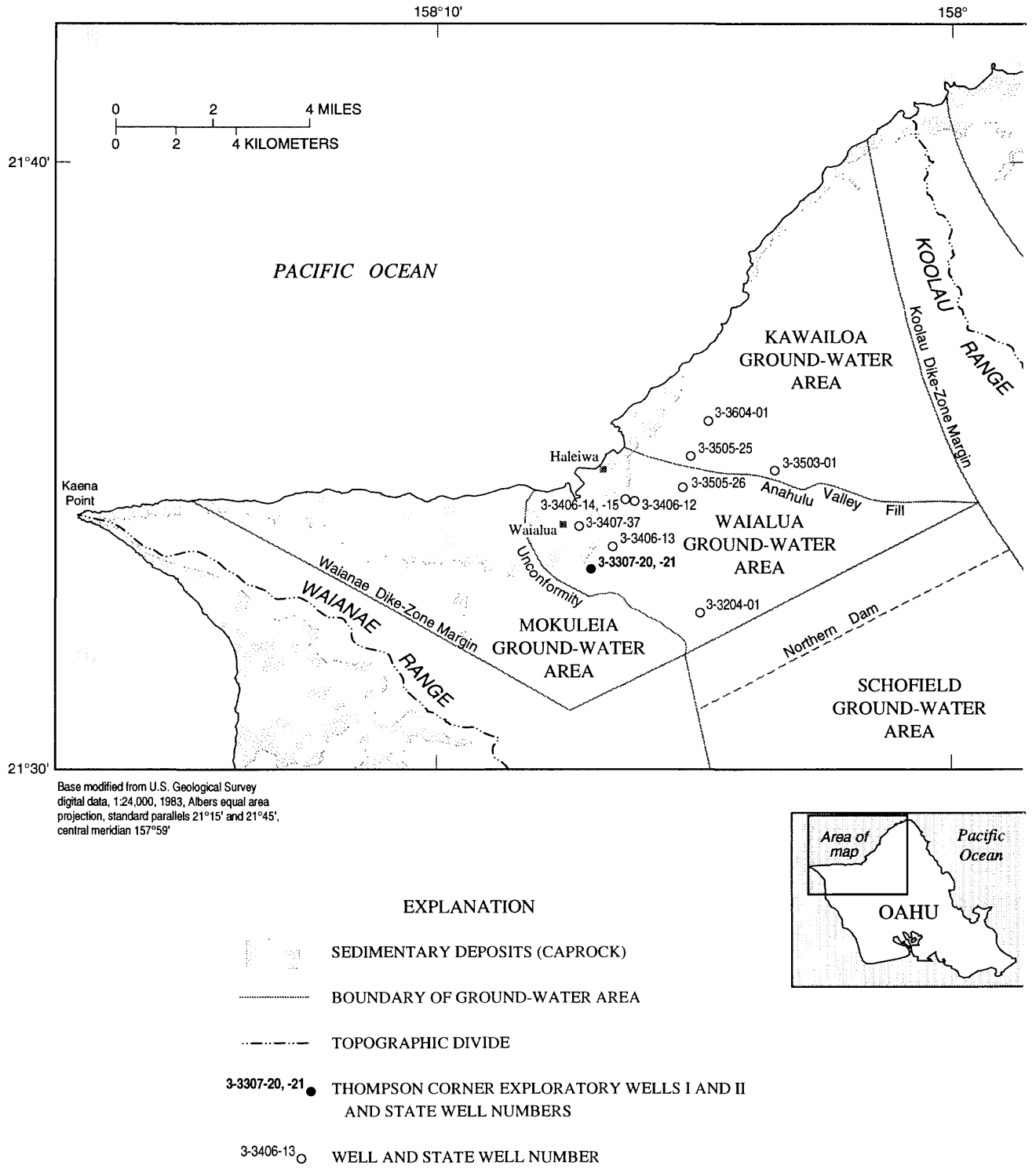

Figure 1. Ground-water areas of north-central Oahu (modified from Hunt, in press) and wells drilled during the study, Hawaii.

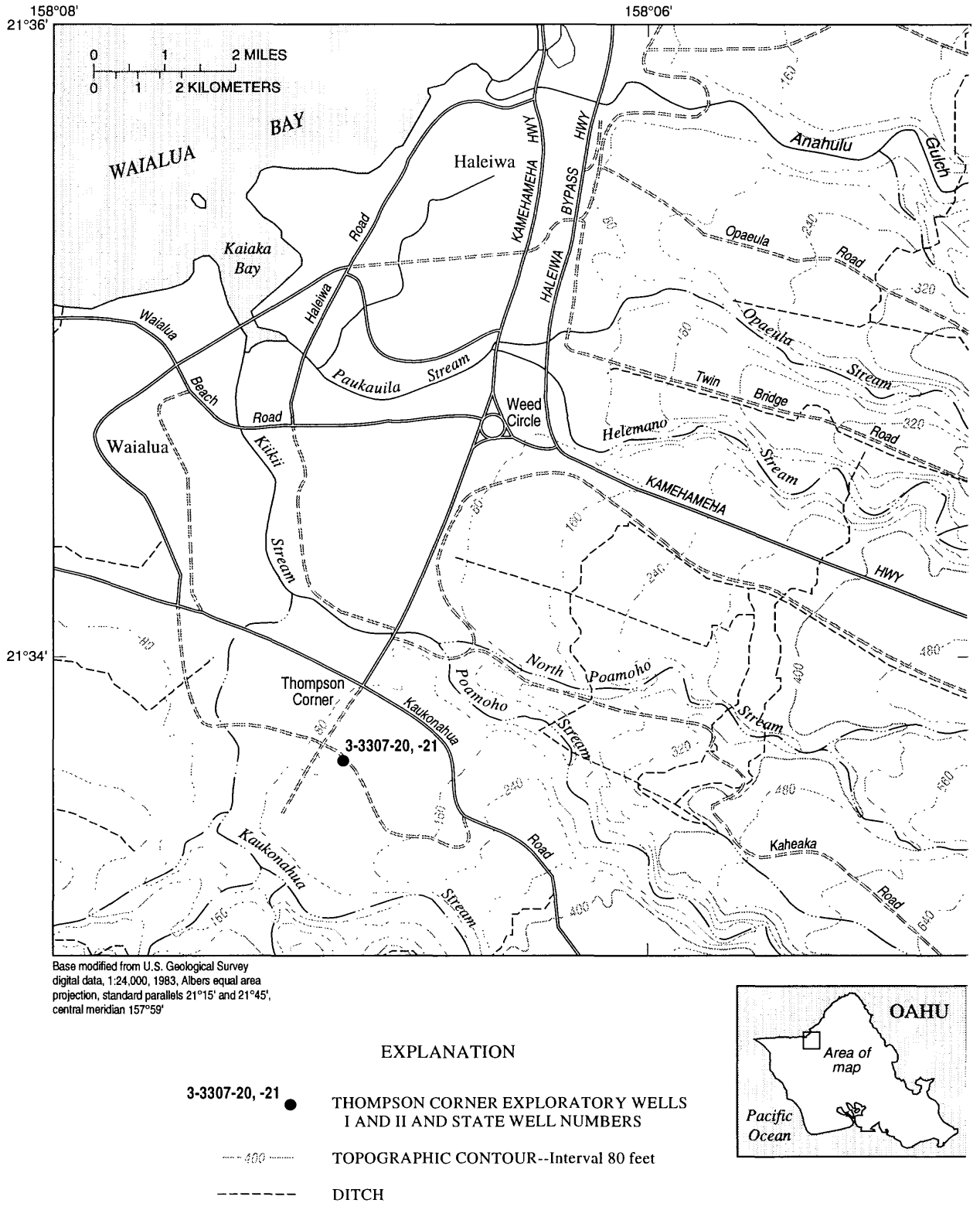

Figure 2. Location of Thompson Corner exploratory wells I and II, Oahu, Hawaii.

primarily for sugarcane irrigation, although there are also several municipal wells and numerous small capacity private wells. Natural ground-water discharge occurs at springs and by subsurface flow through the caprock to the ocean (Rosenau and others, 1971).

Acknowledgments

The USGS gratefully acknowledges the Waialua Sugar Company for their assistance in identifying and preparing the drill site. The USGS also thanks the Castle and Cooke Land Company for permission to drill on their land.

DRILLING, CONSTRUCTION, AND WELL-LOG DATA

Thompson Corner exploratory wells I and II are about 2,000 ft northeast of Thompson Corner along a sugarcane plantation road (fig. 2). Well-construction data is provided in tables 1 and 2 and shown in figures 3 and 4.

Table 1. Construction data for Thompson Corner exploratory well I, Oahu, Hawaii.
[Elevation datum is mean sea level; in., inch; ft, feet; od, outside diameter]

Well name	Thompson Corner exploratory well I
State well number	3-3307-20
Latitude and longitude	21°33'41"N, 158°07'02"W
Hawaii tax map key number	6-5-01-1
Landowner	Castle and Cooke Land Company
Leaseholder	Waialua Sugar Company
Well completed	July 9, 1993
Working days to complete	14 days
Driller	Fred Thibedeau, USGS
Surface hole diameter	17 1/2 in.
Bottom of surface casing elevation	-65 ft
Surface casing diameter and type	12 5/8-in. od steel, 0.25-in. wall thickness
Final hole diameter	12 1/4 in.
Bottom of well elevation	-82 ft
Open interval of well	-65 to -82 ft
Reference mark elevation (bolt)	99.10 ft
Water level and date of measurement	11.32 ft, August 5, 1993

Table 2. Construction data for Thompson Corner exploratory well II, Oahu, Hawaii.
[Elevation datum is mean sea level; in., inch; ft, feet; od, outside diameter]

Well name	Thompson Corner exploratory well II
State well number	3-3307-21
Latitude and longitude	21°33'41"N, 158°07'01"W
Hawaii tax map key number	6-5-01-1
Landowner	Castle and Cooke Land Company
Leaseholder	Waialua Sugar Company
Well completed	August 9, 1993
Working days to complete	15 days
Driller	Fred Thibedeau, USGS
Surface hole diameter	12 1/4 in.
Bottom of surface casing elevation	17 ft
Surface casing diameter and type	8 5/8-in. od steel, 0.25-in. wall thickness
Final hole diameter	7 7/8 in.
Bottom of well elevation	-80 ft
Open interval elevations	17 ft to -80 ft.
Screened interval elevations	20 ft to -80 ft
Inner casing diameter and type	4 1/2-in. od PVC, flush-jointed
Screen type	4 1/2-in. od PVC, flush-jointed, 0.02-in. horizontal slots
Reference mark elevation (bolt)	99.96 ft
Top of casing measuring point elevation	101.40 ft (top of 8 5/8-in. steel casing)
Water level and date of measurement	11.29 ft, August 5, 1993

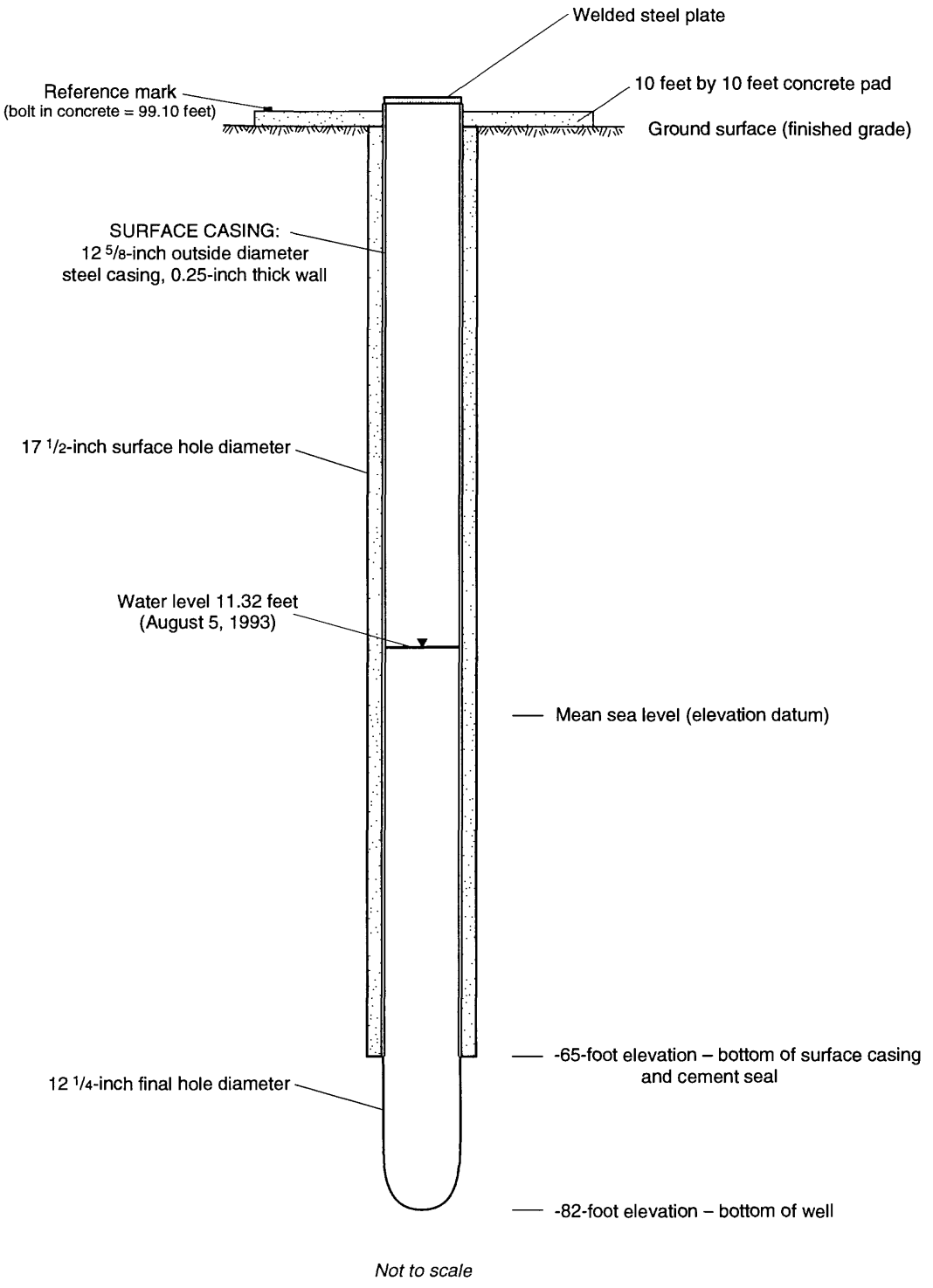

Figure 3. Construction details for Thompson Corner exploratory well I (State well number 3-3307-20), Oahu, Hawaii.

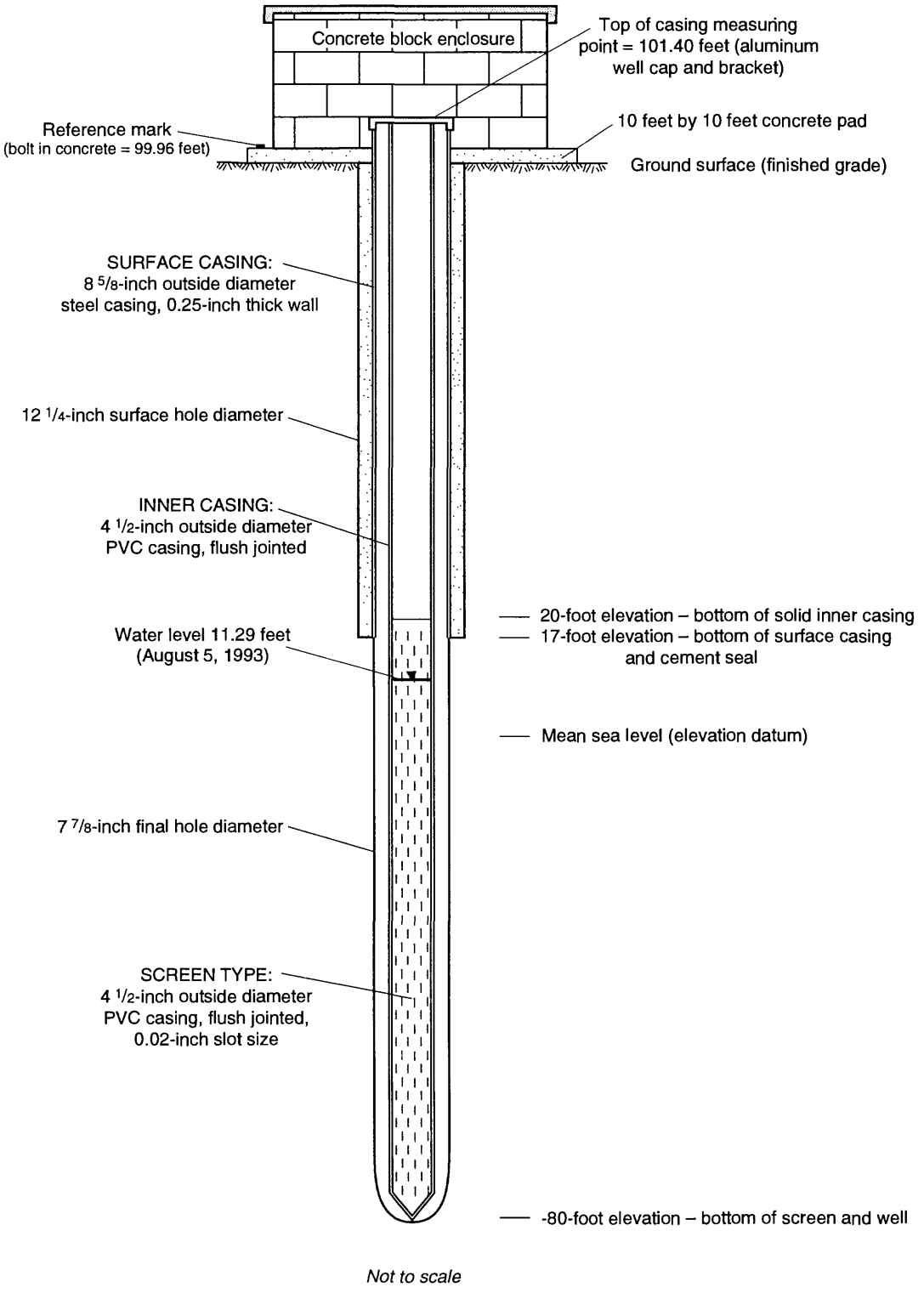

Figure 4. Construction details for Thompson Corner exploratory well II (State well number 3-3307-21), Oahu, Hawaii.

The wells were drilled using an air-rotary drilling system with flush-jointed 4 1/2-in. diameter drill pipe. Drilling foam and polymer were injected into the air-circulation system to assist the removal of drill cuttings and to stabilize the holes.

The first well (State well number 3-3307-20) was constructed as a pumping well for aquifer tests. The well was drilled from an elevation of about 99 ft to about -82 ft with an 8 1/2-in. diameter drill bit. The hole diameter was then enlarged to 17 1/2-in. from the surface to an elevation of -65 ft. The well was cased with 12 1/2-in. outside-diameter casing to the -65 ft elevation. The annular space between the hole and the casing was grouted with cement to provide a surface seal. The well was re-drilled with a 12-in. diameter drill bit to an elevation of -82 ft and left uncased. A water-producing zone of high yield was penetrated within the bottom 20 ft of the hole. The uncased portion, between the -65 and -82-ft elevations of the well, corresponds with the water-producing zone. An 8-in. diameter submersible pump capable of pumping about 600 gal/min was temporarily installed in the well for aquifer tests.

The second well (State well number 3-3307-21) was constructed as an observation well. The well was drilled from an elevation of about 100 ft to about 17 ft using a 12 1/2-in. diameter drill bit. The well was cased with about 85 ft of 8 5/8-in. outside-diameter steel casing to an elevation of 17 ft, and the annular space grouted with cement. The hole was deepened using a 7 7/8-in. diameter drill bit to an elevation of about 0 ft, penetrating about 11 ft below the water table leaving about 17 feet of open hole, and left uncased. The first of two 48-hour, constant-rate, aquifer tests was conducted. After the first test, the observation well was deepened to about the same elevation (-80 ft) as the pumped well, leaving an open hole between the 17 and -80-ft elevations, and left uncased for the second 48-hour aquifer test.

Samples of the materials expelled by the circulation system were collected every 5 ft. Geologic logs (geologic descriptions of the samples recovered from drilling) are listed in tables 3 and 4, and driller's logs (driller's observations while drilling) are presented in tables 5 and 6. From the surface, both wells penetrated about 30 ft of clay and saprolite, 45 ft of slightly weathered basalt, and 105 ft of primarily unweathered basalt with a few thin, reddish clay and clinker layers.

At the conclusion of the aquifer tests, the casing of the pumped well (3-3307-20) was cut to within about 2 in. of the concrete pad and a steel plate welded to the casing to prevent unwanted access. The observation well (3-3307-21) was cased with 4 1/2-in. outside-diameter flush-jointed PVC casing. The observation well was then outfitted for long-term water-level monitoring using a data recorder.

The measuring point (elevation 101.40 ft) for water-level determination by measuring tape for well 3-3307-21 is located at the top of the 8 5/8-in. outside-diameter steel surface casing. An additional reference mark (elevation 99.96 ft.) for the well is located on the top of a stainless steel bolt emplaced in the concrete pad surrounding the well. During the aquifer tests, a temporary measuring point (elevation 101.11 ft.) for the pumped well (3-3307-20) was established at the top of an access tube strapped to the pump column. Because the casing of the well 3-3307-20 was cut and welded closed, only a reference mark still remains. The reference mark (elevation 99.10 ft) is located at the top of a stainless-steel bolt emplaced into the concrete pad of well 3-3307-20.

AQUIFER-TEST DATA

Three aquifer tests were conducted at the Thompson Corner site. Two 48-hour, constant-pumping-rate aquifer tests were conducted on July 28–30, 1993 and August 5–7, 1993, and a step-drawdown test was conducted on August 4, 1993. The two 48-hour aquifer tests were designed to help estimate the horizontal and vertical components of hydraulic conductivity in the vicinity of the test site, and the step-drawdown test was performed to determine the well loss component of the total drawdown.

The first 48-hour aquifer test was conducted with the observation well (Thompson Corner exploratory well II) drilled to an elevation of 0 ft. This configuration, where the open interval of the observation well (17 to 0 ft elevations) is separated from the open interval of the pumped well (-65 to -82 ft elevations) by 65 ft, allows for analysis of the vertical component of the hydraulic conductivity. At least two hard layers of volcanic rock, assumed to be separate flow units, were encountered within the separation interval. The second 48-hour aquifer test was conducted after the observation well was deepened to an elevation of -80 ft. The obser-

vation well was uncased during both aquifer tests. Pumping rate was monitored with a totalizing flow meter and was maintained at about 610 gal/min for both constant-pumping-rate tests.

During the pumping tests, water levels were manually measured with a electric water-level probe. The manually measured data and pumping-rate observations for both aquifer tests are provided in tables 7 and 8. Measurement data for a multiple pumping rate, step-drawdown test are provided in table 9. In addition, vented, submersible pressure transducers connected to recording data loggers were used in both wells to provide higher resolution data (unpublished data in files of the USGS, Honolulu). The data loggers were programmed to sample at 0.5-second intervals during the first 3 or 4 minutes of the drawdown and recovery periods. The sampling rates were subsequently increased to 1 second for the next 3 minutes, 1 minute for the next 55 minutes, and finally 10 minutes for the remainder of the tests. Multiple transducers were used for redundancy in case of transducer failure.

ADDITIONAL INFORMATION

Information for the 12 wells drilled during the north-central Oahu study is listed in table 10. Nine of the wells, including Thompson Corner exploratory wells I and II (State well numbers 3-3307-20 and -21), were drilled in the Waialua ground-water area, and three wells were drilled north of Anahulu Gulch in the Kawailoa ground-water area. Water-level time-series data were collected for all the wells drilled and for numerous other existing wells as part of the overall monitoring effort for the project (unpublished data in files of the USGS, Honolulu). Data were collected using electronic data loggers coupled to shaft encoder-float systems or to pressure transducers.

REFERENCES CITED

Dale, R.H., 1978, A ground-water inventory of the Waialua basal-water body, island of Oahu, Hawaii: U.S. Geological Survey Open-File Report 78-24, 71 p.

Hunt, C.D., Jr., in press, Geohydrology of the island of Oahu, Hawaii: U.S. Geological Survey Professional Paper 1412-B.

Rosenau, J.C., Lubke, E.R., and Nakahara, R.H., 1971, Water resources of north-central Oahu, Hawaii: U.S. Geological Survey Water-Supply Paper 1899-D, 40 p.

Table 3. Geologic log for Thompson Corner exploratory well I (State well number 3-3307-20), Oahu, Hawaii
[Elevation datum is mean sea level]

Depth below grade (feet)	Elevation (feet)	Sample description	Comments
0 to 5	99 to 94	Red clay	
5 to 10	94 to 89	Red clay	
10 to 15	89 to 84	Yellowish-red saprolite	
15 to 20	84 to 79	Yellowish-red saprolite	
20 to 25	79 to 74	Red clay	
25 to 30	74 to 69	Grey, weathered pahoehoe	
30 to 35	69 to 64	Reddish-grey, weathered basalt	
35 to 40	64 to 59	Dark grey, hard, friable clay	
40 to 45	59 to 54	Dark grey, hard, friable clay	
45 to 50	54 to 49	Grey, lightly vesicular, weathered basalt	
50 to 55	49 to 44	Grey basalt	Less weathered than above
55 to 60	44 to 39	Grey, slightly vesicular basalt	
60 to 65	39 to 34	Grey, slightly weathered pahoehoe	
65 to 69.5	34 to 29.5	Grey, slightly weathered pahoehoe	
69.5 to 70	29.5 to 29	Reddish, slightly weathered basalt	
70 to 75	29 to 24	Reddish-grey, highly vesicular, slightly weathered basalt	
75 to 80	24 to 19	Grey, unweathered, nonvesicular, massive basalt	
80 to 85	19 to 14	Grey, unweathered, nonvesicular, massive basalt	
85 to 89	14 to 10	Grey, unweathered, nonvesicular, massive basalt	Rare olivine
89 to 95	10 to 4	Reddish-grey, vesicular basalt	
95 to 103	4 to -4	Reddish-grey to red, weathered, vesicular clinker	
103 to 105	-4 to -6	Brownish-grey, hard, massive basalt	
105 to 110	-6 to -11	Brownish-grey, hard, massive basalt	
110 to 115	-11 to -16	Brownish-grey, hard, massive basalt	
115 to 120	-16 to -21	Brownish-grey, hard, massive basalt	
120 to 128	-21 to -29	Brownish-grey, hard, massive basalt	
128 to 130	-29 to -31	Red clay and clinker	
130 to 135	-31 to -36	Red clay and clinker	
135 to 140.5	-36 to -41.5	Grey, hard, unweathered basalt	Fine cuttings
140.5 to 143.5	-41.5 to -44.5	Grey, unweathered basalt	Darker than above
143.5 to 145	-44.5 to -46	Dark grey, highly vesicular, unweathered basalt	Possibly clinker
145 to 147.5	-46 to -48.5	Dark grey, hard, unweathered basalt	Very fine cuttings
147.5 to 153.25	-48.5 to -54.3	Reddish-dark grey, highly vesicular basalt	
153.25 to 155	-54.3 to -56	Reddish clay	
155 to 157	-56 to -58	Reddish-dark grey, highly vesicular basalt	
157 to 158.5	-58 to -59.5	Reddish clay	
158.5 to 165	-59.5 to -66	Grey, highly vesicular basalt	
165 to 168	-66 to -69	Grey, highly vesicular basalt	Some large cuttings
168 to 170	-69 to -71	Grey, hard, nonvesicular basalt	
170 to 175	-71 to -76	Grey, hard, vesicular and nonvesicular basalt	
175 to 180	-76 to -81	Grey, hard, vesicular and nonvesicular basalt	
180	-81	Reddish, vesicular basalt; dark grey, massive, olivine-phyric basalt	

Table 4. Geologic log for Thompson Corner exploratory well II (State well number 3-3307-21), Oahu, Hawaii.
[Elevation datum is mean sea level]

Depth (feet)	Elevation (feet)	Sample description	Comments
0 to 5	100 to 95	Red clay	
5 to 10	95 to 90	Red clay	
10 to 15	90 to 85	Yellowish-red saprolite	
15 to 20	85 to 80	Yellowish-red saprolite; light grey, weathered basalt	
20 to 25	80 to 75	Reddish-grey saprolite; few chunks red-grey, hard, slightly vesicular basalt	
25 to 30	75 to 70	Red clay; grey vesicular basal chips	
30 to 35	70 to 65	Grey, hard, slightly vesicular basalt; some reddish-brown, weathered material	
35 to 40	65 to 60	Light grey, vesicular, massive, unweathered basalt	
40 to 45	60 to 55	Light grey, vesicular, massive, unweathered basalt	
45 to 50	55 to 50	Grey, vesicular, massive, unweathered basalt	Darker than above
50 to 55	50 to 45	Grey, unweathered basalt	More massive than above
55 to 60	45 to 40	Dark grey, unweathered basalt	Similar to above
60 to 65	40 to 35	Dark grey, unweathered basalt	Similar to above
65 to 70	35 to 30	Dark grey, unweathered basalt	Similar to above
70 to 75	30 to 25	Reddish-grey saprolite; grey, unweathered, nonvesicular basalt	
75 to 80	25 to 20	Reddish-grey, highly weathered basalt	
80 to 85	20 to 15	Grey, weathered, nonvesicular basalt	Soft
85 to 90	15 to 10	Grey, unweathered, vesicular basalt; reddish-brown clay	
90 to 95	10 to 5	Grey, unweathered, slightly vesicular basalt	
95 to 100	5 to 0	Reddish, vesicular, weathered basalt	Possibly clinker
100 to 105	0 to -5	Reddish, nonvesicular, hard basalt	Fine
105 to 110	-5 to -10	Dark grey, massive, hard basalt	
110 to 115	-10 to -15	Dark grey, massive, hard basalt	Darker than above
115 to 120	-15 to -20	Dark grey, massive, hard basalt	Similar to above
120 to 125	-20 to -25	Dark grey, massive, hard basalt	Darker than above
125 to 130	-25 to -30	Dark grey, massive, hard basalt	Similar to above
130 to 135	-30 to -35	Some massive rock as above; some red, hard basalt	
135 to 140	-35 to -40	Red, hard, highly vesicular basalt	
140 to 145	-40 to -45	Grey, hard, highly vesicular basalt	
145 to 150	-45 to -50	Grey, hard, highly vesicular basalt	
150 to 155	-50 to -55	Grey, hard, highly vesicular basalt	
155 to 160	-55 to -60	Grey, hard, highly vesicular basalt	
160 to 165	-60 to -65	Grey, hard, slightly vesicular basalt; some reddish material	
165 to 170	-65 to -70	Grey, highly vesicular basalt	Some large, loose chunks
170 to 175	-70 to -75	Grey, hard, slightly vesicular basalt	Small, angular chips
175	-75	Grey, hard, slightly vesicular basalt	Lighter grey than above

Table 5. Driller's log for Thompson Corner exploratory well I (State well number 3-3307-20), Oahu, Hawaii.
[Elevation datum is mean sea level]

Depth below grade (feet)	Elevation (feet)	Description
0 to 12	99 to 87	Red saprolite
12 to 14	87 to 85	Grey boulder
14 to 18	85 to 81	Red saprolite
18 to 21	81 to 78	Grey boulders
21 to 25	78 to 74	Grey hard rock
25 to 62	74 to 37	Grey firm rock
62 to 63	37 to 36	Grey very soft rock
63 to 66	36 to 33	Grey soft rock
66 to 69.5	33 to 29.5	Grey firm rock
69.5 to 70	29.5 to 29	Red soft rock
70 to 73	29 to 26	Grey firm rock
73 to 74	26 to 25	Grey soft rock
74 to 76	25 to 23	Grey, moist, very soft rock
76 to 85	23 to 14	Grey, moist, firm rock
85 to 89.5	14 to 9.5	Grey, firm, dry rock
89.5 to 92	9.5 to 7	Brownish grey, moist, soft, washed cuttings
92 to 101.5	7 to -2.5	Soft, no return, water measured at 91 ft from pad
101.5 to 103	-2.5 to -4	Soft, circulation returned, lots of water
103 to 125	-4 to -26	Hard, solid rock
125 to 127	-26 to -28	Hard, broken rock
127 to 130	-28 to -31	Red clinkers, soft, broken rock, lots of water
130 to 146.5	-31 to -47.5	Firm rock, highly fractured
146.5 to 161	-47.5 to -62	Grey, broken, soft rock
161 to 164	-62 to -65	Soft
164 to 168	-65 to -69	Weathered, broken
168 to 181	-69 to -82	Hard, broken rock

Table 6. Driller's log for the Thompson Corner exploratory well II (State well number 3-3307-20), Oahu, Hawaii
[Elevation datum is mean sea level]

Depth below grade (feet)	Elevation (feet)	Description
0 to 12	100 to 88	Red saprolite
12 to 13	88 to 87	Grey rock
13 to 16	87 to 84	Red saprolite
16 to 21	84 to 79	Grey, oxidized clay and rock
21 to 24	79 to 76	Red and grey soft rock
24 to 29	76 to 71	Grey, hard rock
29 to 30	71 to 70	Grey, soft rock
30 to 32	70 to 68	Grey, hard rock
32 to 35	68 to 65	Grey moist fractured rock
35 to 36	65 to 64	Grey, firm rock
36 to 36.5	64 to 63.5	Grey, soft rock
36.5 to 45	63.5 to 55	Grey, very hard rock
45 to 48	55 to 52	Grey, soft moist rock
48 to 52	52 to 48	Grey, hard dry rock
52 to 57	48 to 43	Grey, soft moist cuttings
57 to 58	43 to 42	Dry soft rock
58 to 63	42 to 37	Grey, soft rock
63 to 65	37 to 35	Grey, medium firm rock
65 to 72	35 to 28	Grey, moist soft rock
72 to 78	28 to 22	Red, soft rock
78 to 82	22 to 18	Red, grey soft rock
82 to 84	18 to 16	Grey, medium hard rock
84 to 85	16 to 15	Grey, hard rock
85 to 86	15 to 14	Moist, soft rock
86 to 96	14 to 4	Grey, hard, dry rock
96 to 103	4 to -3	Red, packed clinker
103 to 118	-3 to -18	Very hard with few small fractures, water
118 to 126	-18 to -26	More fractured rock, more water
126 to 128	-26 to -28	Large stained fractured chips, significantly more water
128 to 132	-28 to -32	Soft
132 to 133	-32 to -33	Void
133 to 134	-33 to -34	Red, very weathered rock
134 to 136	-34 to -36	Firm
136 to 139	-36 to -39	Soft
139 to 147	-39 to -47	Firm pahoehoe with brown dirt
147 to 157	-47 to -57	Fast, firm, brownish grey pahoehoe
157 to 158	-57 to -58	Red rock
158 to 159	-58 to -59	Pahoehoe, brownish
159 to 161	-59 to -61	Grey, weathered fracture zone
161 to 165	-61 to -65	Firm rock
165 to 166	-65 to -66	Grey, weathered rock
166 to 167	-66 to -67	Firm rock
167 to 170	-67 to -70	Very hard rock
170 to 176	-70 to -76	Soft, coherent rock
176 to 177	-76 to -77	Very hard rock
177 to 180	-77 to -80	Firm rock

Table 7. Water-level measurements for constant-pumping-rate aquifer test of July 28–30, 1993, Thompson Corner exploratory wells I and II (State well numbers 3-3307-20 and -21)

[The measuring point elevation for well 3-3307-20 is 101.11 ft, and the measuring point elevation for well 3-3307-21 is 101.40 ft; --, no measurement; datum for water levels is mean sea level]

Date	Time	Pumped well 3-3307-20		Observation well 3-3307-21		Totalizing flow meter reading, (gallons)
		Depth to water, (feet)	Water level, (feet)	Depth to water, (feet)	Water level, (feet)	
July 28, 1993	11:53:00	Electric measuring tape failed	--	--	--	--
	11:55:00	--	--	90.19	11.21	--
	12:00:00	Start pump	--	--	--	8,948
	12:00:20	--	--	90.19	11.21	--
	12:00:40	--	--	90.19	11.21	--
	12:01:00	--	--	90.19	11.21	--
	12:01:20	--	--	90.19	11.21	--
	12:01:40	--	--	90.19	11.21	--
	12:02:00	--	--	90.19	11.21	--
	12:02:20	--	--	90.20	11.21	--
	12:02:40	--	--	90.19	11.21	--
	12:03:00	--	--	90.20	11.21	--
	12:03:20	--	--	90.20	11.21	--
	12:03:40	--	--	90.20	11.20	--
	12:04:00	--	--	90.20	11.20	--
	12:04:20	--	--	90.20	11.21	--
	12:04:40	--	--	90.20	11.20	--
	12:05:00	--	--	90.20	11.21	--
	12:05:20	--	--	90.20	11.21	--
	12:05:40	--	--	90.20	11.21	--
	12:06:20	--	--	90.20	11.20	--
	12:06:40	--	--	90.20	11.20	--
	12:07:00	--	--	90.20	11.20	--
	12:08:00	--	--	90.20	11.20	--
	12:09:00	--	--	90.20	11.20	--
	12:10:00	--	--	90.20	11.20	--
	12:11:00	--	--	90.20	11.20	--
	12:12:00	--	--	90.20	11.20	--
July 28, 1993	12:13:00	--	--	90.20	11.20	--
	12:14:00	--	--	90.20	11.20	--
	12:15:00	--	--	90.20	11.20	--
	12:20:00	--	--	90.20	11.20	--
	12:25:00	--	--	90.20	11.20	--
	12:50:00	--	--	90.19	11.21	--
	12:55:00	--	--	90.19	11.21	--
	13:08:34	--	--	--	--	50,000
	13:10:35	--	--	--	--	51,000
	13:12:35	--	--	--	--	52,000
	13:14:31	--	--	--	--	53,000
	13:20:25	--	--	--	--	56,300
	13:21:15	--	--	90.19	11.22	--
	13:22:25	--	--	--	--	57,300
	13:23:49	--	--	--	--	58,000
	13:29:48	--	--	--	--	61,000
	13:31:45	--	--	90.18	11.22	--
	13:37:20	--	--	--	--	65,000
	13:58:00	--	--	90.17	11.23	--
	14:00:00	--	--	90.17	11.23	--
	14:20:00	--	--	90.17	11.23	--
	14:24:55	--	--	--	--	91,000
	14:26:43	--	--	--	--	92,000
	14:28:33	--	--	--	--	93,000
	14:40:00	--	--	90.17	11.24	--
	15:30:00	--	--	90.16	11.24	--
	15:36:38	--	--	--	--	131,700
	16:40:00	--	--	90.16	11.24	--

Table 7. Water-level measurements for constant-pumping-rate aquifer test of July 28–30, 1993, Thompson Corner exploratory wells I and II (State well numbers 3-3307-20 and -21)--Continued

[The measuring point elevation for well 3-3307-20 is 101.11 ft, and the measuring point elevation for well 3-3307-21 is 101.40 ft; --, no measurement; datum for water levels is mean sea level]

Date	Time	Pumped well 3-3307-20		Observation well 3-3307-21		Totalizing flow meter reading, (gallons)
		Depth to water, (feet)	Water level, (feet)	Depth to water, (feet)	Water level, (feet)	
	16:42:16	--	--	--	--	171,400
	16:43:55	--	--	--	--	172,400
July 28, 1993	16:45:33	--	--	--	--	173,400
	16:47:12	--	--	--	--	174,400
	17:30:00	--	--	90.16	11.24	--
	17:57:00	90.83	10.28	--	--	--
	17:58:33	--	--	--	--	215,500
	18:00:23	--	--	--	--	216,500
	18:30:00	90.81	10.30	--	--	--
	18:35:00	--	--	90.16	11.24	--
	19:58:00	--	--	90.18	11.22	--
	20:00:00	90.82	10.29	--	--	--
	21:20:00	90.84	10.27	--	--	--
	21:35:00	--	--	90.20	11.20	--
	21:42:30	--	--	--	--	350,000
	21:45:48	--	--	--	--	352,000
	21:47:25	--	--	--	--	353,000
	21:49:03	--	--	--	--	354,000
	22:20:00	--	--	90.20	11.20	--
	22:30:00	90.85	10.26	--	--	--
	23:14:02	--	--	--	--	406,000
	23:15:39	--	--	--	--	407,000
	23:27:05	--	--	--	--	414,000
	23:30:00	90.85	10.26	90.21	11.19	--
July 29, 1993	00:29:00	--	--	90.21	11.19	--
	00:34:00	90.86	10.25	--	--	--
	00:35:44	--	--	--	--	456,000
	00:40:40	--	--	--	--	459,000
	00:43:55	--	--	--	--	461,000
	00:45:33	--	--	--	--	462,000
	00:57:00	90.86	10.25	--	--	--
	01:00:00	--	--	90.21	11.19	--
July 29, 1993	01:56:00	--	--	90.22	11.18	--
	02:03:00	90.86	10.25	--	--	--
	02:08:52	--	--	--	--	513,000
	02:10:32	--	--	--	--	514,000
	02:12:08	--	--	--	--	515,000
	02:13:46	--	--	--	--	516,000
	02:57:00	90.87	10.24	--	--	--
	03:02:00	--	--	90.23	11.17	--
	03:02:49	--	--	--	--	546,000
	03:04:27	--	--	--	--	547,000
	03:06:05	--	--	--	--	548,000
	03:07:43	--	--	--	--	549,000
	04:06:00	--	--	90.26	11.15	--
	04:09:00	90.90	10.21	--	--	--
	04:11:26	--	--	--	--	588,000
	04:13:04	--	--	--	--	589,000
	04:14:43	--	--	--	--	590,000
	04:16:21	--	--	--	--	591,000
	05:25:00	90.91	10.20	--	--	--
	05:30:00	--	--	90.28	11.13	--
	05:31:53	--	--	--	--	632,000
	05:33:57	--	--	--	--	633,000
	05:35:50	--	--	--	--	634,000
	05:37:43	--	--	--	--	635,000

Table 7. Water-level measurements for constant-pumping-rate aquifer test of July 28–30, 1993, Thompson Corner exploratory wells I and II (State well numbers 3-3307-20 and -21)--Continued

[The measuring point elevation for well 3-3307-20 is 101.11 ft, and the measuring point elevation for well 3-3307-21 is 101.40 ft; --, no measurement; datum for water levels is mean sea level]

Date	Time	Pumped well 3-3307-20		Observation well 3-3307-21		Totalizing flow meter reading, (gallons)
		Depth to water, (feet)	Water level, (feet)	Depth to water, (feet)	Water level, (feet)	
	06:20:00	--	--	90.29	11.12	--
	06:22:00	90.93	10.18	--	--	--
	07:48:00	90.94	10.17	--	--	--
	07:52:00	--	--	90.31	11.09	--
	07:55:58	--	--	--	--	714,000
	07:57:37	--	--	--	--	715,000
July 29, 1993	07:59:15	--	--	--	--	716,000
	08:00:53	--	--	--	--	717,000
	08:33:00	--	--	90.31	11.10	--
	08:37:00	90.94	10.17	--	--	--
	08:57:00	--	--	90.29	11.11	--
	09:54:00	90.94	10.17	--	--	--
	09:58:45	--	--	--	--	789,000
	10:00:24	--	--	--	--	790,000
	10:02:01	--	--	--	--	791,000
	10:03:39	--	--	--	--	792,000
	10:56:00	--	--	90.28	11.12	--
	11:00:00	90.92	10.19	--	--	--
	11:02:28	--	--	--	--	828,000
	11:04:06	--	--	--	--	829,000
	11:05:45	--	--	--	--	830,000
	11:07:25	--	--	--	--	831,000
	11:55:00	90.90	10.21	--	--	--
	12:05:00	--	--	90.26	11.15	--
	13:20:00	--	--	90.22	11.18	--
	13:40:00	90.84	10.27	--	--	--
	14:47:00	90.87	10.24	--	--	--
	14:50:00	--	--	90.21	11.19	--
	15:32:00	--	--	90.20	11.20	--
	15:35:00	90.85	10.26	--	--	--
	18:05:00	90.84	10.27	--	--	--
	18:07:00	--	--	90.19	11.21	--
	19:30:00	--	--	90.20	11.20	--
	19:32:00	90.82	10.29	--	--	--
	20:35:00	90.87	10.24	--	--	--
	20:43:00	--	--	90.22	11.18	--
July 29, 1993	22:19:00	90.88	10.23	90.23	11.18	--
	23:09:00	90.88	10.23	--	--	--
	23:13:00	--	--	90.26	11.15	--
	23:14:49	--	--	--	--	1,276,000
	23:16:27	--	--	--	--	1,277,000
	23:18:04	--	--	--	--	1,278,000
July 30, 1993	00:00:00	--	--	90.23	11.17	--
	00:05:00	90.88	10.23	--	--	--
	00:07:03	--	--	--	--	1,308,000
	00:08:41	--	--	--	--	1,309,000
	00:10:19	--	--	--	--	1,310,000
	01:00:00	90.88	10.23	--	--	--
	01:04:12	--	--	--	--	1,343,000
	01:05:50	--	--	--	--	1,344,000
	01:07:27	--	--	--	--	1,345,000
	01:10:00	--	--	90.24	11.17	--
	02:00:00	--	--	90.24	11.17	--
	02:05:00	90.89	10.22	--	--	--
	02:06:15	--	--	--	--	1,381,000
	02:07:53	--	--	--	--	1,382,000

Table 7. Water-level measurements for constant-pumping-rate aquifer test of July 28–30, 1993, Thompson Corner exploratory wells I and II (State well numbers 3-3307-20 and -21)--Continued

[The measuring point elevation for well 3-3307-20 is 101.11 ft, and the measuring point elevation for well 3-3307-21 is 101.40 ft; --, no measurement; datum for water levels is mean sea level]

Date	Time	Pumped well 3-3307-20		Observation well 3-3307-21		Totalizing flow meter reading, (gallons)
		Depth to water, (feet)	Water level, (feet)	Depth to water, (feet)	Water level, (feet)	
	02:09:30	--	--	--	--	1,383,000
	03:00:00	90.89	10.22	--	--	--
	03:05:05	--	--	--	--	1,417,000
	03:06:44	--	--	--	--	1,418,000
	03:08:22	--	--	--	--	1,419,000
	03:11:00	--	--	90.26	11.14	--
	04:02:00	--	--	90.27	11.13	--
	04:06:00	90.92	10.19	--	--	--
	04:07:13	--	--	--	--	1,455,000
	04:08:52	--	--	--	--	1,456,000
July 30, 1993	04:10:30	--	--	--	--	1,457,000
	04:55:00	90.93	10.18	--	--	--
	04:57:47	--	--	--	--	1,486,000
	04:59:25	--	--	--	--	1,487,000
	05:01:03	--	--	--	--	1,488,000
	05:05:00	--	--	90.28	11.12	--
	05:50:00	--	--	90.29	11.11	--
	05:55:00	90.95	10.16	--	--	--
	05:56:30	--	--	--	--	1,522,000
	05:58:08	--	--	--	--	1,523,000
	05:59:46	--	--	--	--	1,524,000
	06:59:00	90.96	10.15	--	--	--
	07:01:45	--	--	--	--	1,562,000
	07:03:24	--	--	--	--	1,563,000
	07:05:02	--	--	--	--	1,564,000
	07:14:00	--	--	90.32	11.08	--
	07:51:00	--	--	90.32	11.09	--
	07:55:00	90.96	10.15	--	--	--
	07:57:17	--	--	--	--	1,596,000
	07:58:55	--	--	--	--	1,597,000
	08:00:33	--	--	--	--	1,598,000
	09:04:00	90.96	10.15	--	--	--
	09:06:00	--	--	90.32	11.09	--
	09:09:11	--	--	--	--	1,640,000
	09:10:49	--	--	--	--	1,641,000
	09:12:27	--	--	--	--	1,642,000
	09:56:00	--	--	90.32	11.09	--
	10:00:00	90.96	10.15	--	--	--
	10:03:06	--	--	--	--	1,673,000
	10:04:45	--	--	--	--	1,674,000
July 30, 1993	10:06:23	--	--	--	--	1,675,000
	11:02:00	90.93	10.18	--	--	--
	11:10:00	--	--	90.31	11.09	--
	11:30:00	--	--	90.30	11.10	--
	11:37:00	--	--	90.30	11.10	--
	11:40:00	90.90	10.21	--	--	--
	12:00:00	stop pump	--	--	--	1,744,543
	12:00:25	--	--	90.28	11.12	--
	12:00:50	--	--	90.29	11.11	--
	12:01:30	--	--	90.28	11.12	--
	12:02:00	--	--	90.29	11.11	--
	12:02:45	--	--	90.29	11.11	--
	12:03:30	--	--	90.29	11.12	--
	12:04:00	--	--	90.29	11.11	--
	12:05:30	--	--	90.29	11.11	--
	12:06:00	--	--	90.29	11.12	--

Table 7. Water-level measurements for constant-pumping-rate aquifer test of July 28–30, 1993, Thompson Corner exploratory wells I and II (State well numbers 3-3307-20 and -21)--Continued

[The measuring point elevation for well 3-3307-20 is 101.11 ft, and the measuring point elevation for well 3-3307-21 is 101.40 ft; --, no measurement; datum for water levels is mean sea level]

Date	Time	Pumped well 3-3307-20		Observation well 3-3307-21		Totalizing flow meter reading, (gallons)
		Depth to water, (feet)	Water level, (feet)	Depth to water, (feet)	Water level, (feet)	
	12:07:00	--	--	90.29	11.12	--
	12:15:00	--	--	90.28	11.12	--
	12:30:00	--	--	90.28	11.12	--
	13:58:00	--	--	90.23	11.18	--
	14:00:00	89.92	11.19	--	--	--

Table 8. Water-level measurements for constant-pumping-rate aquifer test of August 5–7, 1993, Thompson Corner exploratory wells I and II (State well numbers 3-3307-20 and 21)

[The measuring point elevation for well 3-3307-20 is 101.11 ft, and the measuring point elevation for well 3-3307-21 is 101.40 ft; --, no measurement; datum for water levels is mean sea level]

Date	Time	Pumped Well 3-3307-20		Observation Well 3-3307-21		Totalizing flow meter reading, (gallons)
		Depth to water, (feet)	Water level, (feet)	Depth to water, (feet)	Water level, (feet)	
August 5, 1993	15:51:00	89.79	11.32	90.11	11.29	--
	16:08:00	89.79	11.32	--	--	--
	16:22:00	89.80	11.31	90.11	11.29	--
	16:26:00	--	--	90.11	11.29	--
	16:26:30	--	--	90.11	11.29	--
	16:30:00	start pump		90.11	11.29	1,829,330
	16:30:15	--	--	90.11	11.29	--
	16:30:30	--	--	90.14	11.27	--
	16:30:45	--	--	90.14	11.27	--
	16:31:00	--	--	90.14	11.26	--
	16:31:15	--	--	90.14	11.26	--
	16:31:30	--	--	90.14	11.26	--
	16:32:00	--	--	90.14	11.26	--
	16:32:30	--	--	90.14	11.26	--
	16:33:00	--	--	90.14	11.26	--
	16:33:30	--	--	90.14	11.26	--
	16:34:00	--	--	90.14	11.26	--
	16:34:30	--	--	90.14	11.26	--
	16:35:00	--	--	90.14	11.26	--
	16:36:00	--	--	90.14	11.26	--
	16:37:00	--	--	90.14	11.26	--
	16:38:00	--	--	90.14	11.26	--
	16:39:00	--	--	90.14	11.26	--
	16:40:00	--	--	90.15	11.26	--
	16:42:36	--	--	--	--	1,837,000
	16:44:14	--	--	--	--	1,838,000
	16:45:00	--	--	90.15	11.25	--
	16:45:00	--	--	90.15	11.25	--
August 5, 1993	16:50:00	--	--	90.14	11.26	--
	16:52:24	--	--	--	--	1,843,000
	16:55:00	--	--	90.14	11.26	--
	16:57:17	--	--	--	--	1,846,000
	17:00:00	--	--	90.14	11.26	--
	17:00:00	--	--	90.14	11.26	--
	17:05:00	90.75	10.36	--	--	--
	17:10:22	--	--	--	--	1,854,000
	17:11:00	90.75	10.36	--	--	--
	17:23:00	90.75	10.36	--	--	--
	17:23:00	90.75	10.36	--	--	--
	17:26:00	--	--	90.15	11.26	--
	17:28:21	--	--	--	--	1,865,000
	17:30:00	--	--	90.14	11.26	--
	17:30:00	--	--	90.14	11.26	--
	17:45:00	--	--	90.14	11.26	--
	17:45:00	--	--	90.14	11.26	--
	17:46:21	--	--	--	--	1,876,000
	17:46:21	--	--	--	--	1,876,000
	18:00:00	--	--	90.15	11.26	--
	18:00:00	--	--	90.15	11.26	--
	18:02:44	--	--	--	--	1,886,000

Table 8. Water-level measurements for constant-pumping-rate aquifer test of August 5–7, 1993, Thompson Corner exploratory wells I and II (State well numbers 3-3307-20 and 21)--Continued

[The measuring point elevation for well 3-3307-20 is 101.11 ft, and the measuring point elevation for well 3-3307-21 is 101.40 ft; --, no measurement; datum for water levels is mean sea level]

Date	Time	Pumped Well 3-3307-20		Observation Well 3-3307-21		Totalizing flow meter reading, (gallons)
		Depth to water, (feet)	Water level, (feet)	Depth to water, (feet)	Water level, (feet)	
	18:07:00	90.73	10.38	--	--	--
	18:18:36	--	--	--	--	1,914,000
	18:48:00	90.73	10.38	--	--	--
	18:52:00	--	--	90.15	11.26	--
	20:00:00	--	--	90.16	11.25	--
	20:02:00	90.75	10.36	--	--	--
	20:05:36	--	--	--	--	1,961,000
	21:06:00	90.76	10.35	--	--	--
August 5, 1993	21:07:55	--	--	--	--	1,99,9000
	21:09:32	--	--	--	--	2,000,000
	21:12:00	--	--	90.17	11.24	--
	21:58:00	--	--	90.17	11.24	--
	22:02:00	90.77	10.34	--	--	--
	22:03:37	--	--	--	--	2,033,000
	23:04:00	90.79	10.32	--	--	--
	23:05:54	--	--	--	--	2,071,000
	23:10:00	--	--	90.19	11.21	--
	23:57:00	--	--	90.19	11.21	--
August 6, 1993	00:00:00	90.80	10.31	--	--	--
	00:01:36	--	--	--	--	2,105,000
	00:57:00	90.80	10.31	--	--	--
	00:58:56	--	--	--	--	2,140,000
	01:03:00	--	--	90.19	11.21	--
	01:58:00	--	--	90.20	11.21	--
	02:02:00	90.78	10.33	--	--	--
	02:02:46	--	--	--	--	2,179,000
	02:59:00	90.80	10.31	--	--	--
	03:00:00	--	--	--	--	2,214,000
	03:02:00	--	--	90.19	11.21	--
	04:16:00	--	--	90.19	11.21	--
	04:19:00	90.78	10.33	--	--	--
	04:20:10	--	--	--	--	2,263,000
	06:00:00	90.79	10.32	--	--	
	06:01:30	--	--	--	--	2,325,000
	06:04:00	--	--	90.18	11.22	--
	06:58:00	--	--	90.18	11.22	--
	07:01:00	90.76	10.35	--	--	--
	07:02:01	--	--	--	--	2,362,000
August 6, 1993	08:03:00	90.79	10.32	--	--	--
	08:04:00	--	--	--	--	2,400,000
	08:07:00	--	--	90.19	11.21	--
	09:00:00	--	--	90.20	11.20	--
	09:02:30	90.82	10.29	--	--	--
	09:03:00	--	--	--	--	2,436,000
	10:00:00	90.82	10.29	--	--	--
	10:02:02	--	--	--	--	2,472,000
	10:04:00	--	--	90.21	11.19	--
	11:00:00	--	--	90.22	11.19	--
	11:03:00	90.83	10.28	--	--	--
	11:04:13	--	--	--	--	2,510,000

Table 8. Water-level measurements for constant-pumping-rate aquifer test of August 5–7, 1993, Thompson Corner exploratory wells I and II (State well numbers 3-3307-20 and 21)--Continued

[The measuring point elevation for well 3-3307-20 is 101.11 ft, and the measuring point elevation for well 3-3307-21 is 101.40 ft; --, no measurement; datum for water levels is mean sea level]

Date	Time	Pumped Well 3-3307-20		Observation Well 3-3307-21		Totalizing flow meter reading, (gallons)
		Depth to water, (feet)	Water level, (feet)	Depth to water, (feet)	Water level, (feet)	
	12:00:00	90.83	10.28	--	--	--
	12:03:00	--	--	90.22	11.19	--
	12:04:30	--	--	--	--	2,547,000
	12:58:00	--	--	90.21	11.19	--
	13:03:00	90.82	10.29	--	--	--
	13:03:48	--	--	--	--	2,583,000
	13:58:00	90.81	10.30	--	--	--
	13:59:29	--	--	--	--	2,617,000
	14:02:00	--	--	90.21	11.19	--
	14:58:00	--	--	90.20	11.20	--
	15:02:00	90.80	10.31	--	--	--
	15:03:24	--	--	--	--	2,656,000
	15:59:00	90.79	10.32	--	--	--
	16:00:45	--	--	--	--	2,691,000
	16:04:00	--	--	90.18	11.22	--
	16:57:00	--	--	90.18	11.23	--
	17:00:00	90.78	10.33	--	--	--
	17:01:21	--	--	--	--	2,728,000
August 6, 1993	18:01:00	90.78	10.33	--	--	--
	18:01:54	--	--	--	--	2,765,000
	18:06:00	--	--	90.17	11.24	--
	19:00:00	--	--	90.17	11.24	--
	19:05:00	90.77	10.34	--	--	--
	19:05:44	--	--	--	--	2,804,000
	19:56:00	90.78	10.33	--	--	--
	19:58:06	--	--	--	--	2,836,000
	20:01:00	--	--	90.17	11.24	--
	20:51:00	--	--	90.18	11.23	--
	20:55:00	90.78	10.33	--	--	--
	20:55:24	--	--	--	--	2,871,000
	21:58:00	90.78	10.33	--	--	--
	21:59:12	--	--	--	--	2,910,000
	22:01:00	--	--	90.18	11.22	--
	22:56:00	--	--	90.20	11.21	--
	23:00:00	90.81	10.30	--	--	--
	23:01:25	--	--	--	--	2,948,000
August 7, 1993	00:03:00	90.81	10.30	--	--	--
	00:05:16	--	--	--	--	2,987,000
	00:08:00	--	--	90.20	11.20	--
	00:59:00	--	--	90.21	11.19	--
	01:05:00	90.82	10.29	--	--	--
	01:05:49	--	--	--	--	3,024,000
	02:02:00	90.82	10.29	--	--	--
	02:04:44	--	--	--	--	3,060,000
	02:08:00	--	--	90.21	11.19	--
	03:02:00	--	--	90.21	11.19	--
	03:06:00	90.82	10.29	--	--	--
	03:06:57	--	--	--	--	3,098,000
August 7, 1993	04:05:00	90.82	10.29	--	--	--
	04:07:31	--	--	--	--	3,135,000

Table 8. Water-level measurements for constant-pumping-rate aquifer test of August 5–7, 1993, Thompson Corner exploratory wells I and II (State well numbers 3-3307-20 and 21)--Continued

[The measuring point elevation for well 3-3307-20 is 101.11 ft, and the measuring point elevation for well 3-3307-21 is 101.40 ft; --, no measurement; datum for water levels is mean sea level]

Date	Time	Pumped Well 3-3307-20		Observation Well 3-3307-21		Totalizing flow meter reading, (gallons)
		Depth to water, (feet)	Water level, (feet)	Depth to water, (feet)	Water level, (feet)	
	04:11:00	--	--	90.21	11.19	--
	05:06:00	--	--	90.21	11.19	--
	05:10:00	90.82	10.29	--	--	--
	05:11:21	--	--	--	--	3,174,000
	06:02:00	90.81	10.30	--	--	--
	06:03:44	--	--	--	--	3,206,000
	06:06:00	--	--	90.21	11.20	--
	06:55:00	--	--	90.20	11.20	--
	06:58:00	90.81	10.30	--	--	--
	06:59:22	--	--	--	--	3,240,000
	07:56:00	90.81	10.30	--	--	--
	07:56:39	--	--	--	--	3,275,000
	07:59:00	--	--	90.20	11.20	--
	08:55:00	--	--	90.20	11.20	--
	08:58:00	90.81	10.30	--	--	--
	08:58:55	--	--	--	--	3,313,000
	10:02:00	90.81	10.30	--	--	--
	10:02:49	--	--	--	--	3,352,000
	10:05:00	--	--	90.20	11.20	--
	10:58:00	--	--	90.20	11.20	--
	11:01:00	90.80	10.31	--	--	--
	11:01:48	--	--	--	--	3,388,000
	12:06:00	90.80	10.31	--	--	--
	12:07:24	--	--	--	--	3,428,000
	12:09:00	--	--	90.20	11.20	--
	13:00:00	--	--	90.20	11.20	--
	13:03:00	90.80	10.31	--	--	--
	13:04:49	--	--	--	--	3,463,000
August 7, 1993	14:13:00	90.80	10.31	--	--	--
	14:15:19	--	--	--	--	3,506,000
	14:18:00	--	--	90.19	11.22	--
	15:01:00	--	--	90.18	11.23	--
	15:04:00	90.77	10.34	--	--	--
	15:06:09	--	--	--	--	3,537,000
	15:53:00	90.77	10.34	--	--	--
	15:55:20	--	--	--	--	3,567,000
	15:58:00	--	--	90.16	11.24	--
	16:22:00	--	--	90.16	11.25	--
	16:23:12	--	--	--	--	3,584,000
	16:26:00	--	--	90.16	11.25	
	16:30:00	stop pump	--	90.15	11.25	3,588,169
	16:35:00	--	--	90.12	11.28	--
	16:41:00	--	--	90.12	11.29	--
	16:46:00	--	--	90.12	11.28	--
	16:49:00	89.79	11.32	--	--	--
	16:55:00	89.79	11.32	--	--	--
	16:58:00	--	--	90.11	11.29	--
	17:11:00	--	--	90.11	11.29	--

Table 9. Water-level measurements for step-drawdown test using pumped well Thompson Corner exploratory well I (State well number 3-3307-20), August 4, 1993

[Waialua Sugar Co. Pump 2 may have turned on during last step. The measuring point elevation for well 3-3307-20 is 101.11 ft; --, no measurement; datum for water levels is mean sea level]

Time	Depth to Water (feet)	Elevation of water surface (feet)	Totalizing flow meter reading (gallons)
15:49	89.69	11.419	--
15:52	90.49	10.619	--
15:53:19	--	--	1,773,000
15:54	90.49	10.619	--
15:57	90.492	10.617	--
16:00	90.488	10.621	--
16:04	90.491	10.618	--
16:06	90.492	10.617	--
16:09	90.49	10.619	--
16:14	90.492	10.617	--
16:16:37	--	--	1,786,000
16:17	90.488	10.621	--
pumping rate adjusted from 16:20–16:32			
16:33	90.55	10.559	--
16:35:56	--	--	1,797,000
16:37	90.55	10.559	--
16:40	90.55	10.559	--
16:43	90.552	10.557	--
16:45	90.552	10.557	--
16:48	90.551	10.558	--
16:51	90.551	10.558	--
16:54	90.55	10.559	--
16:56	90.55	10.559	--
16:58	90.55	10.559	--
16:58:51	--	--	1,810,300
pumping rate adjusted at 16:59			
17:01	90.65	10.459	--
17:03	90.643	10.466	--
17:04:57	--	--	1,814,000
17:05	90.645	10.464	--
17:07	90.64	10.469	--
17:09	90.642	10.467	--
17:11	90.645	10.464	--
17:14	90.64	10.469	--
17:16	90.635	10.474	--
17:18	90.638	10.471	--
17:20	90.635	10.474	--
17:22	90.641	10.468	--
17:24	90.66	10.449	--
17:26	90.65	10.459	--
17:27:48	--	--	1,828,000

Table 10. Construction data for wells drilled during the study, Oahu, Hawaii

State well number	Well name	Latitude	Longitude	Hawaii state tax map key number	Landowner	Well completed	Working days to complete
3-3204-01	Kaheaka exploratory well	21°32'52"	158°04'52"	6-5-01-2	Castle and Cooke Land Company	March 2, 1994	16 days
3-3307-20	Thompson Corner exploratory well I	21°33'41"	158°07'02"	6-5-01-1	Castle and Cooke Land Company	July 9, 1993	14 days
3-3307-21	Thompson Corner exploratory well II	21°33'41"	158°07'02"	6-5-01-1	Castle and Cooke Land Company	August 9, 1993	15 days
3-3406-12	Twin Bridge Road deep monitor well	21°34'56"	158°06'10"	6-4-01-1	Castle and Cooke Land Company	March 9, 1994	27 days
3-3406-13	Kaamooloa exploratory well	21°34'06"	158°06'36"	6-5-01-2	Castle and Cooke Land Company	January 12, 1994	4 days
3-3406-14	Helemano exploratory well I	21°34'58"	158°06'21"	6-2-07-11	Castle and Cooke Land Company	October 15, 1993	11 days
3-3406-15	Helemano exploratory well II	21°34'58"	158°06'21"	6-2-07-11	Castle and Cooke Land Company	November 15, 1993	15 days
3-3407-37	Kiikii exploratory well	21°34'28"	158°07'16"	6-6-23-3	Castle and Cooke Land Company	April 21, 1994	27 days
3-3503-01	North Upper Anahulu exploratory well	21°35'30"	158°03'25"	6-2-09-1	Bishop Estate	May 5, 1994	8 days
3-3505-25	North Lower Anahulu exploratory well	21°35'45"	158°05'04"	6-2-09-1	Bishop Estate	December 23, 1993	7 days
3-3505-26	Opaeula exploratory well	21°35'11"	158°05'14"	6-2-10-1	Bishop Estate	October 4, 1993	10 days
3-3604-01	Kawailoa deep monitor well	21°36'24"	158°04'44"	6-1-05-1	Bishop Estate	January 9, 1994	28 days

Table 10. Construction data for wells drilled during the study, Oahu, Hawaii--Continued

State well number	Well name	Bottom of surface casing elevation (feet)	Surface casing outside diameter (inch)	Hole diameter (inch)	Bottom of well elevation (feet)	Open interval elevations (feet)	Inner casing outside diameter (inch) and type	Screened interval elevations (feet)	Measuring point elevation (feet)	Water level	
										Height above sea level (feet)	Date and time
3-3204-01	Kaheaka exploratory well	643	8 5/8	6 3/4	-55	643 to -55	4 1/2, steel	25 to -55	741.59 (top of casing)	12.44	Jan. 27,1995 17:20
3-3307-20	Thompson Corner exploratory well I	-65	12 5/8	12 1/4	-82	-65 to -82	12 5/8, steel	-65 to -82	99.10 (bolt)	11.32	Aug 5, 1993 15:51
3-3307-21	Thompson Corner exploratory well II	17	8 5/8	7 7/8	-80	17 to -80	4 1/2, PVC	20 to -80	101.40 (top of casing)	11.29	Aug. 5, 1993 15:51
3-3406-12	Twin Bridge Road deep monitor well	9	6 5/8	6 1/4	-596	9 to -596	4 1/2, steel	24 to -596	53.10 (top of casing)	11.10	Feb. 15, 1995 12:09
3-3406-13	Kaamooloa exploratory well	10	6 5/8	6 1/4	-10	10 to -10	4 1/2, PVC	10 to -10	42.35 (top of casing)	11.87	Feb. 13, 1995 14:45
3-3406-14	Helemano exploratory well I	-51	8 5/8	7 7/8	-78.5	-72 to -78.5	4 1/2, PVC	-68.5 to -78.5	13.79 (top of casing)	10.92	Feb. 15, 1995 12:26
3-3406-15	Helemano exploratory well II	-52	8 5/8	7 7/8	-291	-271 to -291	4 1/2, steel	-271 to -291	14.41 (top of casing)	11.15	Feb. 15, 1995 12:28
3-3407-37	Kiikii exploratory well	-115	8 5/8	6 3/4	-135	-125 to -135	4 1/2, steel	-115 to -135	14.68 (top of casing)	11.70	Feb. 13, 1995 13:44
3-3503-01	North Upper Anahulu exploratory well	592	8 5/8	6 3/4	-103	592 to -103	4 1/2, steel	17 to -103	671.74 (top of casing)	7.15	Feb 14, 1995 13:54
3-3505-25	North Lower Anahulu exploratory well	182	8 5/8	7 7/8	-18	182 to -18	4 1/2, PVC	22 to -18	234.24 (top of casing)	4.75	Feb.14, 1995 15:08
3-3505-26	Opaeula exploratory well	229	6 5/8	6 1/4	-65	229 to -65	4 1/2, PVC	15 to -65	288.08 (top of casing)	10.52	Feb. 15, 1995 11:14
3-3604-01	Kawailoa deep monitor well	190	6 5/8	6 1/4	-392	190 to -392	4 1/2, steel	9 to -391	309.01 (top of casing)	4.40	Feb. 14, 1995 14:18