USGS-OFR-83-853

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

GEOHYDROLOGIC DATA FOR TEST WELL USW H-5, YUCCA MOUNTAIN AREA, NYE COUNTY, NEVADA

by

C. B. Bentley, J. H. Robison, and R. W. Spengler

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CONVERSION TABLE

Multiply metric unit	*by*	*To obtain inch-pound unit*
millimeter (mm)	0.03937	inch (in.)
kilometer (km)	0.6214	mile (mi)
meter (m)	3.281	foot (ft)
degree Celsius (°C)	°F=(9/5x°C)+32	degree Fahrenheit (°F)
milligram per liter (mg/L)	[1]1.0	part per million (ppm)
microgram per liter (µg/L)	[1]1.0	part per billion (ppb)
liter per second (L/s)	15.85	gallon per minute (gal/min)

[1]Approximate.

National Geodetic Vertical Datum of 1929--a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called Mean Sea Level; it is referred to as sea level in this report.

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ABSTRACT

This report presents data on drilling operations, lithology, borehole geophysics, water-level monitoring, core analysis, ground-water chemistry, pumping tests, and packer-injection tests for test well USW H-5. The well is one of a series of test wells drilled in and near the southwestern part of the Nevada Test Site, Nye County, Nevada, in cooperation with the U.S. Department of Energy. These test wells are part of the Nevada Nuclear Waste Storage Investigations to identify suitable sites for storage of high-level radioactive wastes.

Test well USW H-5 was drilled to a total depth of 1,219 meters through volcanic rocks consisting mostly of ash-flow tuff. Depth to water in the well ranged between 703.8 and 707.2 meters below land surface, at an approximate altitude of 704 meters above sea level. Drawdown in the well exceeded 6 meters after test pumping more than 3,000 minutes at a rate of 10 liters per second. Borehole-flow surveys showed that about 90 percent of the water in the well is contributed by the zone between 707 and about 820 meters below land surface. Two composite water samples collected after well completion contained 206 and 220 milligrams per liter of dissolved solids. Sodium and bicarbonate were the predominant dissolved anion and cation. The concentration of dissolved silica was 48 milligrams per liter in both samples, which is a relatively large concentration for most natural waters.

INTRODUCTION

The U.S. Geological Survey has been conducting investigations at Yucca Mountain, Nevada, to evaluate the hydrologic and geologic suitability of the site for storing high-level nuclear waste in an underground mined repository. These investigations are part of the Nevada Nuclear Waste Storage Investigations being conducted in cooperation with the U.S. Department of Energy, Nevada Operations Office. Test drilling has been a principal method of investigation. This report presents geohydrologic and drill-hole data from test well USW H-5.

Test well USW H-5 is located in Nye County, Nevada, about 140 km northwest of Las Vegas in the southern part of the State (fig. 1). It is on the crest of Yucca Mountain, northwest of Jackass Flats (fig. 2). Location of the site is Nevada State Coordinate System Central Zone N 766,643 and E 558,943. Altitude of the land surface at the well site is 1,478.5 m above sea level.

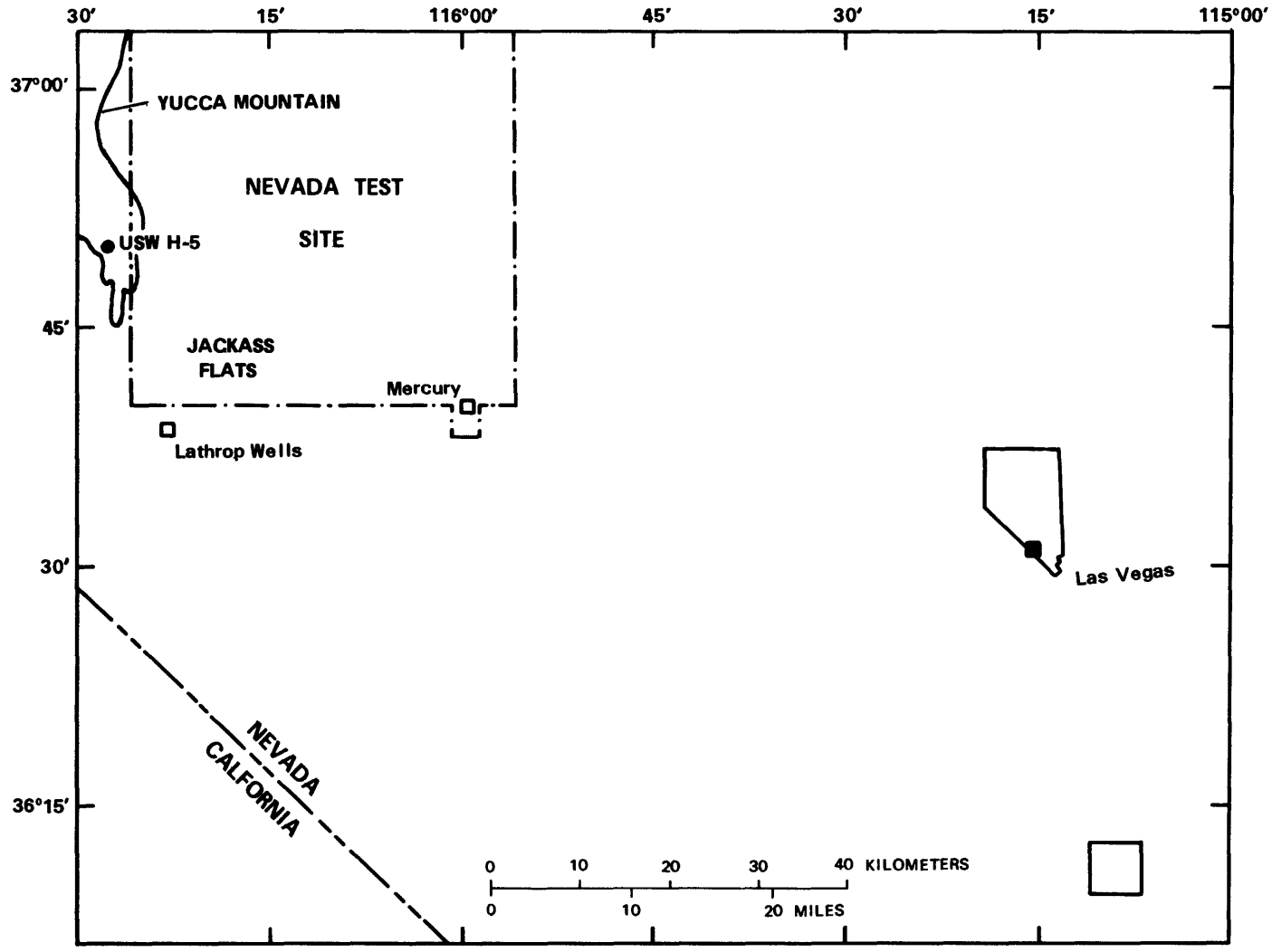

Figure 1.--Location of test well USW H-5 in southern Nevada.

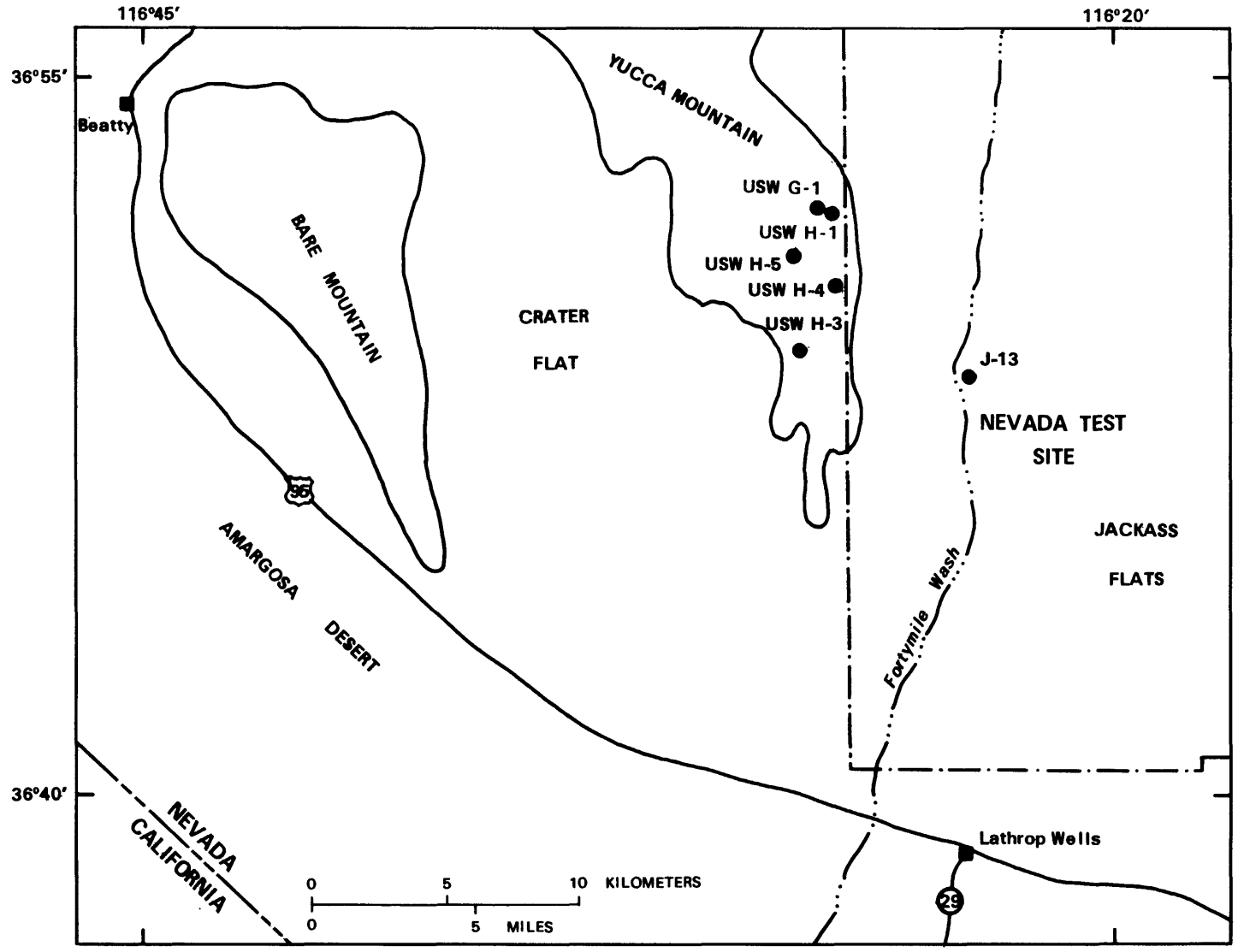

Figure 2.--Geographic features and other wells in vicinity of test well USW H-5. (Wells are indicated by darkened circle.)

DRILLING OPERATIONS

Drilling of test well USW H-5 started on May 19, 1982; total depth of 1,219 m was reached on June 23, 1982. The rotary-drilling fluid was air foam, consisting of air, detergent, and water. Well deviation was less than 2° from vertical. Well construction is shown in figure 3. Detailed drilling history is contained in the files of the engineering consulting firm, Fenix and Scisson, Inc., Las Vegas, Nevada.

LITHOLOGIC SAMPLING AND WELL LOGGING

Lithologic Log

Lithology penetrated in the drilling of test well USW H-5, as determined from rock-bit cuttings and core, is shown in table 1. Ash-flow tuffs are the predominant rock type in most of the subsurface section. Thin beds of airfall and bedded tuffs separate the ash-flow tuff units. The tuffs display various degrees of welding, alteration, and zeolitization. The lowermost 173 m of the hole was drilled in what appears to be dacitic and zeolitic lava. In most of the report, shortened names of stratigraphic units are used (For the complete designation of formations and members, see table 1).

Geophysical Well Logs

Geophysical logs were run in test well USW H-5 to define lithology, correlate with logs of nearby wells, collect data on porosity and fractures, obtain fluid levels, locate casing perforations and cement, and gage the diameter of the well. Geophysical logs were used to help select intervals for hydraulic testing. A summary of geophysical logs made in this well and the intervals logged are listed in table 2.

Geophysical logs that can be related directly to water-yielding zones include: (1) The self-potential curve on electric logs; (2) the optical television log that shows water seeps above the water table and low-angle fractures in the water-yielding zone; and (3) the temperature log that shows gradient changes opposite water-yielding zones.

Hydrologic Properties of Core Samples

Conventional-core samples were not collected during drilling operations. Seven sidewall-core samples were obtained from the depth interval 508 to 599 m. These samples were used for lithologic description, but were not of suitable quality or quantity for determination of hydrologic properties.

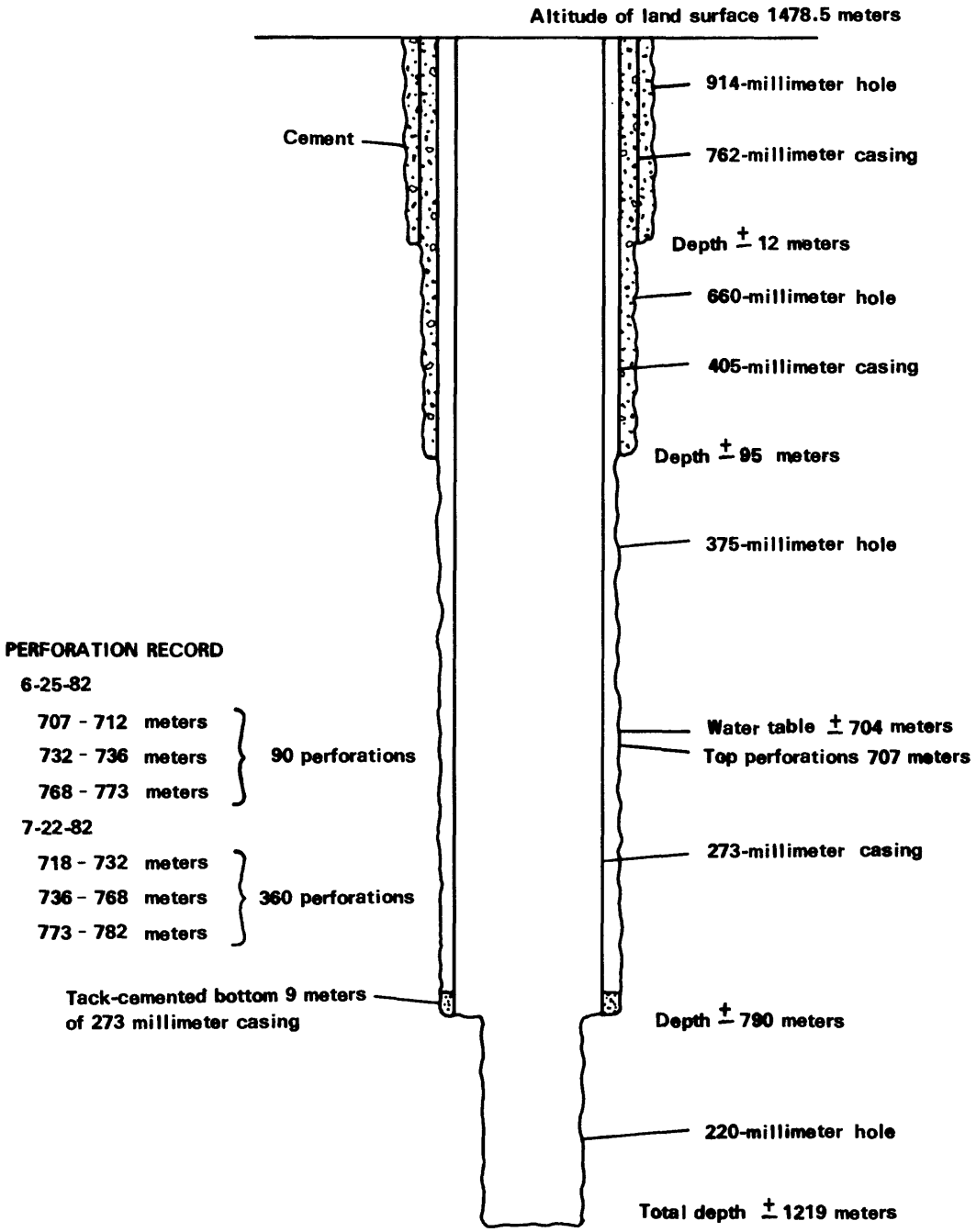

Figure 3.-- Well construction.

Table 1.--*Lithologic log*

Stratigraphy and lithologic description	Thickness of interval (meters)	Depth to bottom of interval (meters)[1]
Paintbrush Tuff of Tertiary age		
Tiva Canyon Member		
Tuff, ash-flow, brownish-gray, densely welded, devitrified (probable vapor-phase crystallization from 10.7-12.2 meters).	12.2	12.2
Tuff, ash-flow, light-brownish-gray and light gray, densely welded, devitrified (probable lithophysal zone); 5 percent phenocrysts of sanidine and plagioclase.	51.8	64.0
Tuff, ash-flow, light-brownish-gray to brownish gray, densely welded, devitrified; pumice, light gray, devitrified; less than 1 percent phenocrysts.	45.7	109.7
Tuff, ash-flow, dark-yellowish-brown, moderately welded, devitrified; pumice, dark-yellowish brown, devitrified; 2 percent phenocrysts (sanidine and plagioclase); rare grayish-red volcanic lithic fragments.	9.2	118.9
Tuff, ash-flow, pale-yellowish-brown, partially welded, devitrified; pumice, pale-yellowish brown and brownish gray; 2 percent phenocrysts (sanidine and plagioclase); interval from 121.9 124.9 meter contains grayish-orange, argillic pumice fragments.	6.1	124.9
Tuff, ash-flow, grayish-orange, nonwelded, vitric; pumice, light-brown, argillic; less than 1 per cent phenocrysts; abundant black and light-brown glass shards.	22.9	147.8
Bedded tuff (unnamed)		
Tuff, bedded, bedded/ash-fall(?), moderate-reddish orange vitric, abundant grayish pink and white vitric pumice.	1.6	149.4

Table 1.--*Lithologic log*--Continued

Stratigraphy and lithologic description	Thickness of interval (meters)	Depth to bottom of interval (meters)[1]
Paintbrush Tuff--Continued		
Pah Canyon Member		
Tuff, ash-flow, moderate-orange-pink, dusky yellow, nonwelded, vitric; pumice, dusky yellow, vitric; 5 percent phenocrysts (sanidine, plagioclase, biotite).	13.7	163.1
Bedded tuff (unnamed)		
Tuff, bedded(?), ash-fall grayish-pink, vitric.	2.1	165.2
Topopah Spring Member		
Tuff, ash-flow, moderate-red, nonwelded, vitric; pumice, dominantly moderate red; sparse bronze biotite.	7.9	173.1
Tuff, ash-flow, moderate-red, densely welded, (vitrophyre).	0.6	173.7
Tuff, ash-flow, grayish-red, densely welded, devitrified; 10 percent phenocrysts [sanidine, plagioclase, bronze biotite; (caprock)].	6.1	179.8
Tuff, ash-flow, pale brown, moderately welded, vapor phase; pumice, dominantly light gray, vapor phase; 5 to 10 percent phenocrysts (sanidine, plagioclase, biotite).	28.6	208.5
Tuff, ash-flow, grayish-red and medium-light gray (mottled), densely welded, devitrified; pumice, very light gray to white, devitrified, some vapor-phase crystallization; less than 2 percent phenocrysts (sanidine and plagioclase); probable lithophysal zone.	218.2	426.7
Tuff, ash-flow, light-brown and brownish-gray (mottled), densely welded, devitrified; less than 2 percent phenocrysts.	55.5	482.2
Tuff, ash-flow, black, densely welded (vitrophyre).	22.2	504.4

Table 1.--*Lithologic log*--Continued

Stratigraphy and lithologic description	Thickness of interval (meters)	Depth to bottom of interval (meters)[1]
Paintbrush Tuff--Continued		
Topopah Spring Member--Continued		
Tuff, ash-flow, black and pale yellowish-brown, moderately to partially welded, vitric; pumice, light brown, vitric; less than 3 percent phenocrysts (sanidine and plagioclase); most of bit-cutting samples composed of black glass shards (sidewall sample collected at 508 meters).	13.5	517.9
Bedded tuff (unnamed)		
Tuff, ash-fall, yellowish-gray, vitric; pale reddish-brown volcanic lithic fragments; bedding identified in television-camera log.	3.4	521.2
Rhyolite Lava and Tuff of Calico Hills (undivided)		
Tuffaceous beds of Calico Hills		
Tuff, ash-flow, very-pale-orange, white, and moderate-orange-pink, non-to-partially welded, vitric; pumice, white, vitric; less than 5 percent phenocrysts (sanidine, plagioclase, quartz, biotite); black, glassy lithic fragments are common; in television-camera log, top of a lithic-rich zone was recognized at 528.2 meters, and bedding planes were recognized at 531.9, 532.8, 534.6, 535.2, 541.0, and 548.3 meters; sidewall samples collected at 537.1, 548.6, 564.5, and 571.5 meters.	51.8	573.0
Tuff, bedded, reworked, ash-fall (?), yellowish-gray zeolitic; subequal proportions of phenocrysts and subrounded pumice fragments; in television-camera log, a coarse pumice ash-fall was identified at 573.3 meters, and bedding planes were recognized at 573.0, 573.3, 574.8, 576.7, 577.3, 577.6, 578.8, 580.3, 581.6, 582.5, 583.1, 585.5, and 589.8 meters; sidewall sample collected at 584.3 meters contains about 25 percent phenocrysts of sanidine plagioclase, quartz, and biotite in a zeolitic groundmass.	19.8	592.8

Table 1.--*Lithologic log*--Continued

Stratigraphy and lithologic description	Thickness of interval (meters)	Depth to bottom of interval (meters)[1]
Crater Flat Tuff of Tertiary age		
Prow Pass Member		
Tuff, ash-flow, grayish-orange, nonwelded, vitric; pumice, very pale orange, vitric; 7 to 10 percent phenocrysts (quartz, sanidine, plagioclase, biotite, pyroxene); sidewall sample collected at 599.2 meters.	7.6	600.5
Tuff, ash-flow, yellowish-gray and light-brownish gray partially welded, devitrified and vapor phase crystalization; pumice, yellowish-gray to white, vapor phase; 10 to 12 percent phenocrysts [quartz, sanidine, plagioclase, biotite, orthopyroxene (?)]; rare mudstone lithic fragments; probable pale-yellow-brown bedded interval between 600.5-603.5(?) meters.	47.2	647.7
Tuff, ash-flow, grayish-orange and yellowish-gray, nonwelded, zeolitized; pumice, grayish-yellow, yellowish-gray, dusky yellow, zeolitized; 10 percent phenocrysts (quartz, sanidine, plagioclase, biotite); rare mudstone lithic fragments; upper 12.2 meters of interval may be slightly silicified; analysis of bit-cutting samples from interval indicate a clinoptilolite/mordenite content of more than 60 percent.[2]	35.1	682.8
Bedded tuff (unnamed)		
Tuff, bedded, light brown, poorly sorted; pumice very pale-orange, zeolitic(?); in television-camera log, bedding planes identified at 684.0, 684.3, and 684.9 meters.	7.0	689.8
Bullfrog Member		
Tuff, ash-flow, light-olive-gray and greenish-gray, partially welded(?), vapor phase; pumice, yellowish-gray, light gray, vapor-phase crystalization; 10-15 percent phenocrysts (quartz, plagioclase, sanidine, abundant biotite); bit cuttings from 758.9-792.5 meters are very fine-grained and difficult to analyze.	81.3	771.1

Table 1.--*Lithologic log*--Continued

Stratigraphy and lithologic description	Thickness of interval (meters)	Depth to bottom of interval (meters)[1]
Crater Flat Tuff--Continued		
Bullfrog Member--Continued		
Tuff, ash-flow, very-pale-orange to grayish-orange, partially welded(?) devitrified; very fine-grained bit cuttings.	24.4	795.5
Tuff, ash-flow, yellowish-gray and light-brownish gray, partially to moderately welded, devitrified and zeolitic; pumice, yellowish-gray and light brown, devitrified and zeolitic; 7 percent phenocrysts (quartz, plagioclase, sanidine, biotite).	18.3	813.8
Tuff, ash-flow, light-brown and grayish-orange, moderately to densely welded, devitrified; pumice, light-brown, devitrified; 15 to 20 percent phenocrysts (quartz, plagioclase, sanidine, biotite); rare brownish-gray rhyolitic-lithic fragments.	12.2	826.0
Tuff, ash-flow, light-brown, partially welded, devitrified; pumice, light brown and moderate greenish-yellow, devitrified and zeolitic; 10 to 15 percent phenocrysts (quartz, sanidine, plagioclase hornblende, biotite); x-ray analysis of bit-cutting samples from this interval indicate more than 50 percent clinoptilolite and more than 10 percent opaline silica.	0.9	826.9
Bedded tuff (unnamed)		
Tuff, bedded, reworked, moderate-reddish-brown, white pale olive, moderately indurated, abundant white pumice fragments.	8.8	835.8
Tram Member		
Tuff, ash-flow, pale red, moderate-orange-pink, moderately welded(?), devitrified; pumice, white to grayish-orange-pink, devitrified; 15 to 20 percent phenocrysts (quartz, sanidine, plagioclase, biotite; rare grayish-red rhyolitic lithic fragments.	14.6	850.4

Table 1.--*Lithologic log*--Continued

Stratigraphy and lithologic description	Thickness of interval (meters)	Depth to bottom of interval (meters)[1]
Crater Flat Tuff--Continued		
Tram Member--Continued		
Tuff, ash-flow, light-brown, light-olive-gray, light-brownish-gray, partially welded, devitrified; pumice, light-brown, very-pale-brown, very-pale-orange, devitrified; 10 percent phenocrysts; grayish-red and medium-gray volcanic lithic fragments.	134.1	984.5
Tuff, ash-flow, grayish-orange and dark-yellowish-orange, partially welded, devitrified [slightly altered to zeolites(?)]; pumice, white, grayish orange-pink and dark-yellowish-brown; 10 to 15 percent phenocrysts; abundant grayish-red and medium-gray volcanic-lithic fragments.	27.4	1,011.9
Tuff, ash-flow, grayish-red, partially welded, zeolitic; pumice, moderate-orange-pink and grayish-red, zeolitic; 10 percent phenocrysts (quartz, plagioclase, sanidine, biotite); abundant grayish-red and medium-gray volcanic lithic fragments; x-ray analysis of bit-cutting samples indicates this interval contains 50 percent clinoptilolite.	28.1	1,040.0
Bedded tuff (unnamed)		
Tuff, bedded, reworked, brownish-gray and olive gray, zeolitic.	3.0	1,043.0
Lava (unnamed)		
Lava, grayish-green, moderate-yellow-green, dark greenish-gray, altered to zeolites(?), abundant biotite and hornblende(?).	20.8	1,063.8

Table 1.--*Lithologic log*--Continued

Stratigraphy and lithologic description	Thickness of interval (meters)	Depth to bottom of interval (meters)[1]
Lava--Continued		
Lava, dusky-yellow and light-olive, grayish-red, dark-reddish-brown, pale-red, greenish-gray, dacitic(?) zeolitic, 25 to 30 percent phenocrysts, (sanidine, plagioclase, abundant biotite and hornblende); x-ray analysis indicates parts of interval may contain as much as 30 percent clinoptilolite; interval from 1,063.8-1,109.5 meters is, in part, glassy.	155.4	1,219.2
	Total Depth[1]	1,219.2

[1]Depth to bottom of individual interval and total depth are accurate only to the nearest meter, but are reported to tenths of a meter to agree with the thickness of individual units. Total depth probably is 1,219 meters ±0.5 meter.

[2]X-ray analyses by P. D. Blackman (U.S. Geological Survey).

Table 2.--*Summary of geophysical well logs*

Geophysical log	Intervals logged (meters below land surface)	Geophysical log	Intervals logged (meters below land surface)
Acoustic	788-1,216	Neutron, compensated	87- 787
Acoustic fracture	788-1,218		704-1,218
Caliper	0- 93	Gamma ray	85- 786
	76- 315		0-1,119
	79- 788		3-1,218
	686-1,212	Geophone	93- 785
	733-1,214		785-1,212
	766-1,104	Gyroscopic	0-1,213
Density, borehole compensated	84- 788	Magnetometer	95- 786
	704-1,218	Spectralog	3-1,218
Density	6- 94		15-1,218
Electric	3- 94	Televiewer, acoustical	787-1,051
	88- 785	Television, optical	94- 703
	788-1,218		784-1,041
Epithermal neutron	79- 788	Temperature	0- 786
	0- 802		3-1,212
			6-1,210

Water Levels

Water-level observations and measurements in test well USW H-5 were made during and after the drilling for the purpose of: (1) Locating any perched water zones above the water table; (2) identifying depth at which groundwater saturation occurs; (3) determining composite hydraulic head in the well; and (4) identifying hydraulic heads in various water-bearing zones. Water-level measurements are listed in table 3.

HYDROLOGIC TESTING AND WATER SAMPLING

Pumping Tests

Drawdown and recovery tests were made in conjunction with four pumping periods, after test well USW H-5 had been drilled to its total depth, cased to 790 m, and casing perforated below 707 m. Pumping tests are summarized in table 4. Data plots of the drawdown and recovery tests for the third pumping period, and of the recovery test for the fourth pumping period are shown in

Table 3.--*Water levels*

[Altitude of land surface at well is 1,478.5 meters; water level in well accurate to ±0.5 meter]

Date	Depth zone (meters)	Water level in well (meters)		Remarks
		Depth to water below land surface	Altitude of water surface above sea level	
6-14-82----	704- 792	704.2	774.3	
6-27-82----	707-1,219	705.0	773.5	
6-28-82----	---do.---	705.8	772.7	
6-29-82----	---do.---	705.0	773.5	
6-29-82----	---do.---	705.1	773.4	Pump on and off during previous 3 hours.
6-29-82----	---do.---	703.9	774.6	
7-06-82----	---do.---	706.3	772.2	2-1/2 days recovery after pumping 4 days at 10 liters per second.
7-12-82----	---do.---	704.9	773.6	
7-13-82----	790- 796	704.6	773.9	
7-14-82----	796- 815	704.7	773.8	
7-14-82----	815- 834	704.8	773.7	
7-15-82----	1,015-1,034	704.8	773.7	
7-16-82----	1,033-1,052	704.7	773.8	
7-18-82----	834- 895	704.0	774.5	
7-18-82----	888- 949	704.2	774.3	
7-18-82----	949-1,010	704.0	774.5	
7-19-82----	1,052-1,219	704.2	774.3	
7-25-82----	707-1,219	704.4	774.1	

figures 4 through 6. Drawdown-test data were plotted, using drawdown versus time after start of pumping as the coordinates. Recovery-test data were plotted with residual drawdown (recovery) against time after pumping stopped as the coordinates. The first two pumping tests were terminated prematurely by pump failure, and water-level observations were not recorded during recovery following the first pumping test. The fourth pumping test was made primarily to perform a borehole-flow survey, and drawdown data were incomplete; however, complete recovery data were obtained.

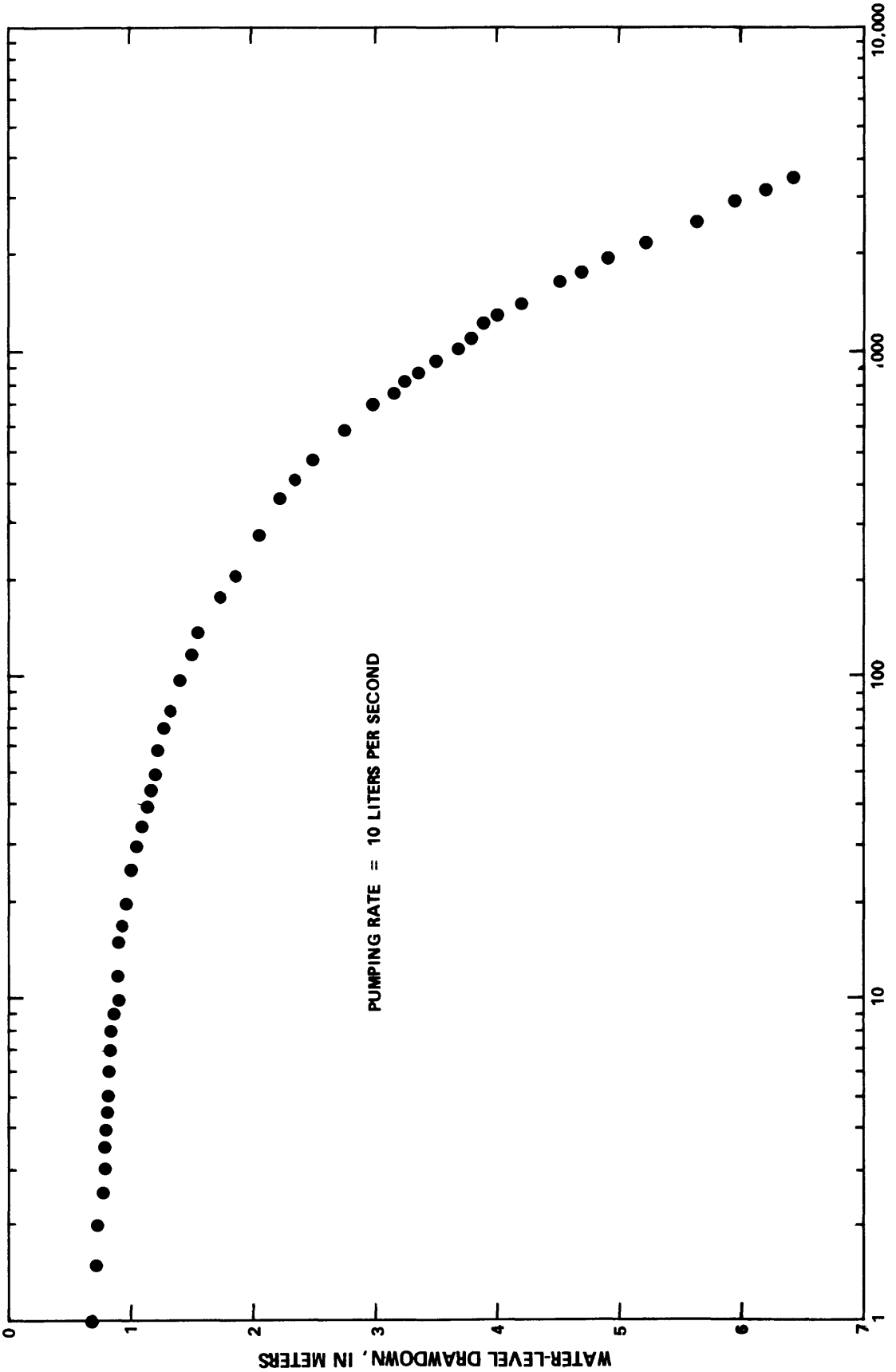

Figure 4.--Water-level drawdown, pumping test 3, depth interval from 707 to 1,219 meters.

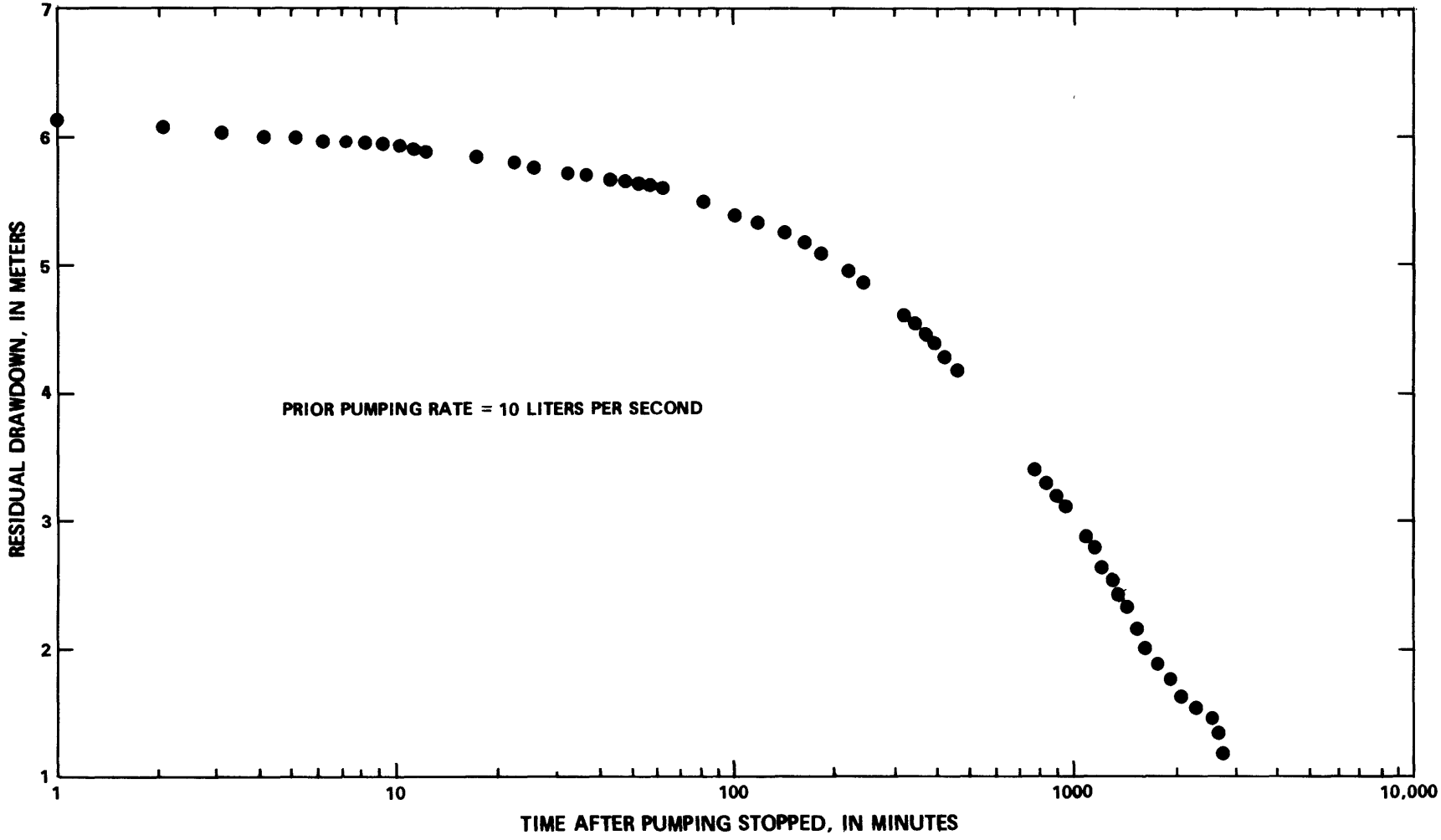

Figure 5.--Water-level recovery, pumping test 3, depth interval from 707 to 1,219 meters.

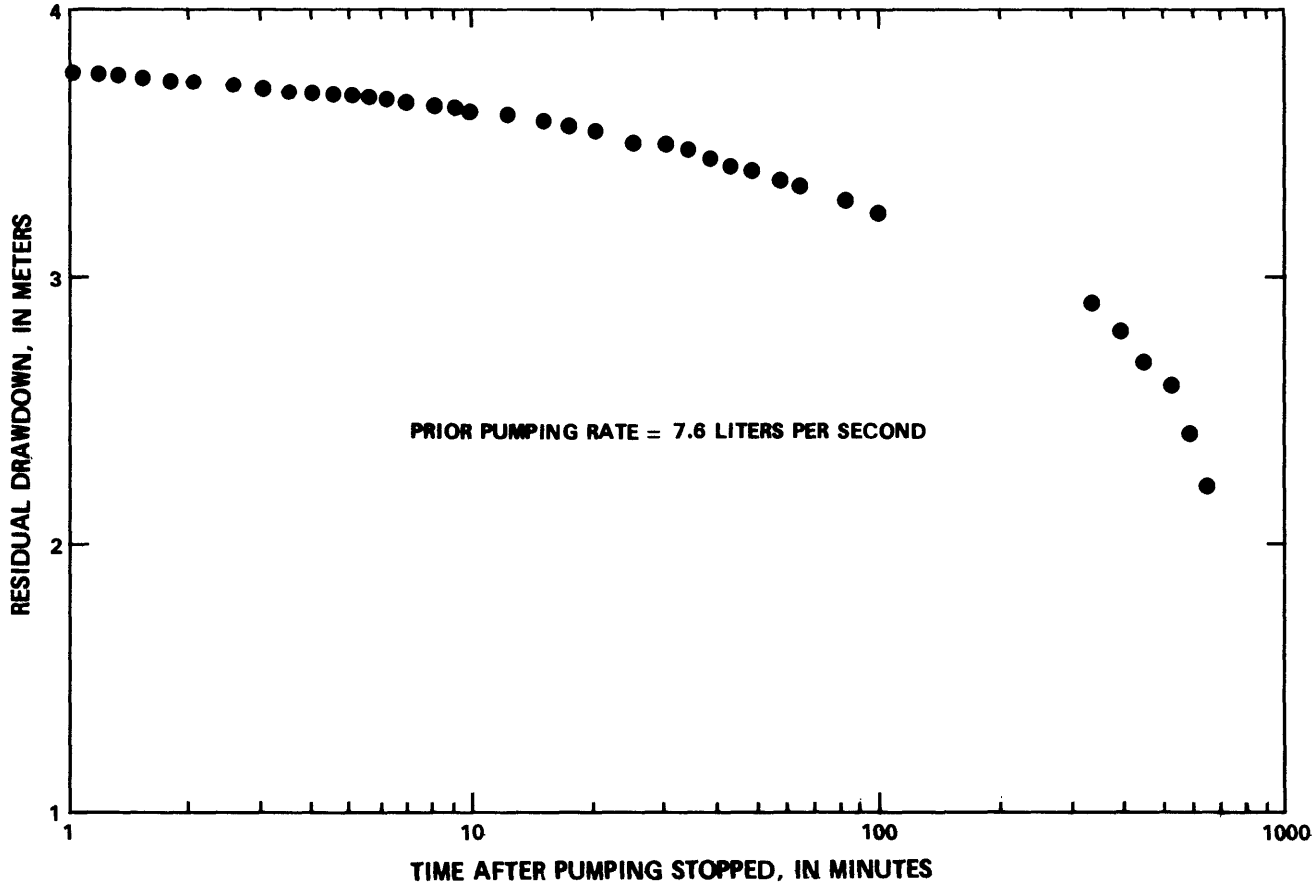

Figure 6.--Water-level recovery, pumping test 4, depth interval from 707 to 1,219 meters.

Table 4.--*Summary of pumping tests for the depth interval from 707 to 1,219 meters in the Bullfrog Member and Tram Member of the Crater Flat Tuff and lava*

Type of test	Pumping rate (liters per second)	Pumping/recovery period (minutes)
Drawdown (first test)---------	13	100
Drawdown (second test)--------	12	55
Recovery (second test)--------	[1]12	183
Drawdown (third test)---------	10	5,298
Recovery (third test)---------	[1]10	3,681
Recovery (fourth test)--------	[1]7.6	720

[1]Pumping rate prior to recovery.

Borehole-Flow Surveys

Borehole-flow surveys with a radioactive tracer were used to measure vertical flow of water in test well USW H-5, while water was being pumped from the well. Iodine-131 was released into the well at selected intervals, and was tracked past two gamma detectors to determine velocity of the water. Velocity, multiplied by the cross-sectional area of the hole determined from caliper logs, defined rate of flow in the well at a given depth. Borehole-flow surveys were made in connection with pumping periods 3 and 4, after the well had been cased and the casing perforated; results of these surveys are shown in figures 7 and 8.

Packer-Injection Tests

Packer-injection tests were conducted by using inflatable packers to isolate test zones; tests were performed at intervals where hole size and configuration allowed setting of the packers. Intervals tested are listed in table 5. Water was injected into the interval between two packers, or between one packer and the bottom of the hole. Decline of hydraulic head with time was monitored in the isolated interval. Eleven tests were conducted in test well USW H-5 for the intervals between 790 and 1,219 m (total depth). Injection curves are plotted in figures 9 through 19. The ratio of hydraulic head after injection (H_t) to initial hydraulic head (H_o) is plotted against time since injection began.

Chemical Analyses of Water

Composite water samples were collected for chemical analysis from test well USW H-5 near the end of the third and fourth drawdown tests. The first sample was collected after the casing in the upper part of the saturated zone was perforated with 90 holes; the second sample was collected after the casing

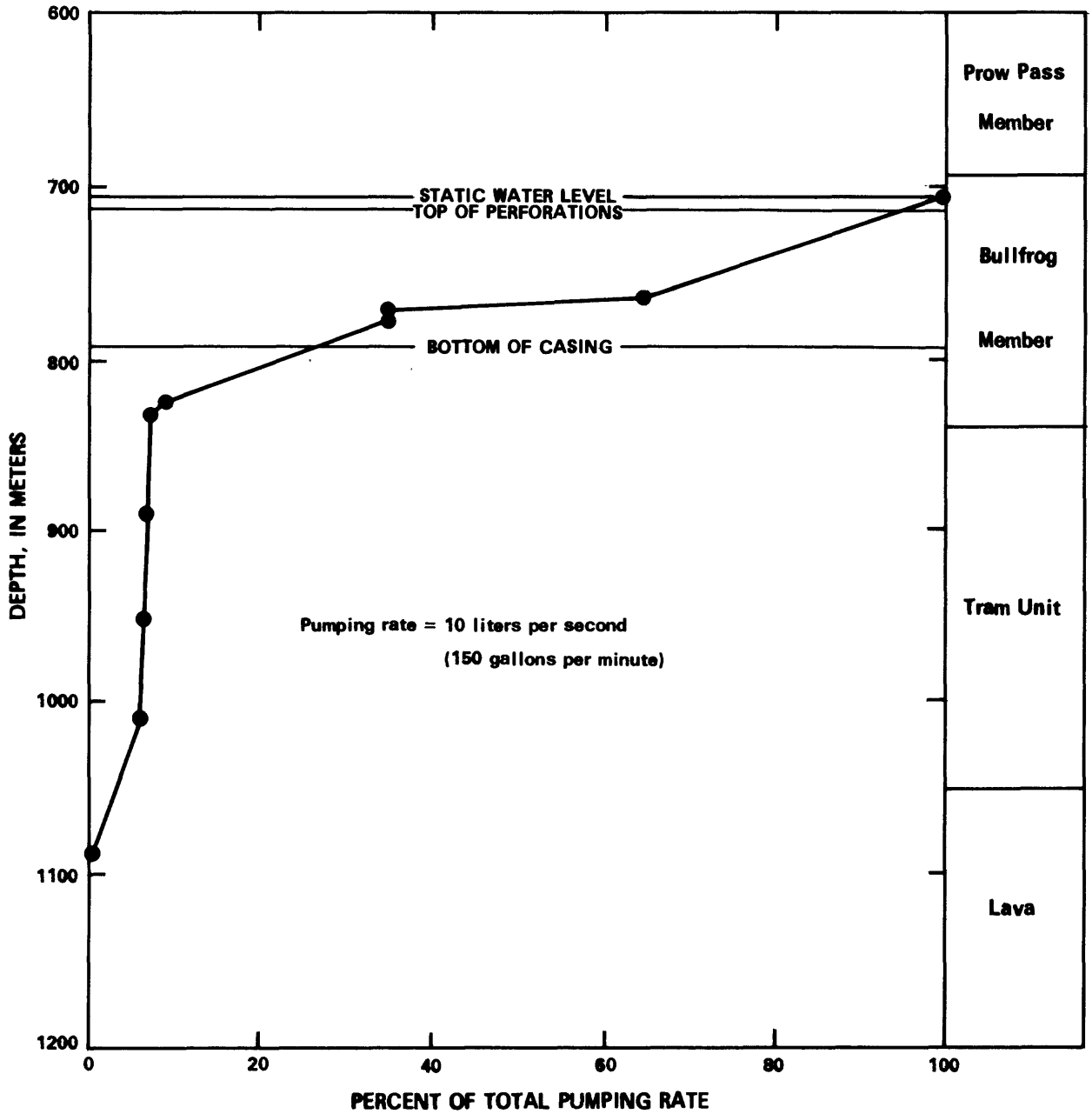

Figure 7.--Borehole-flow survey 1 showing percent of total pumping rate produced by intervals.

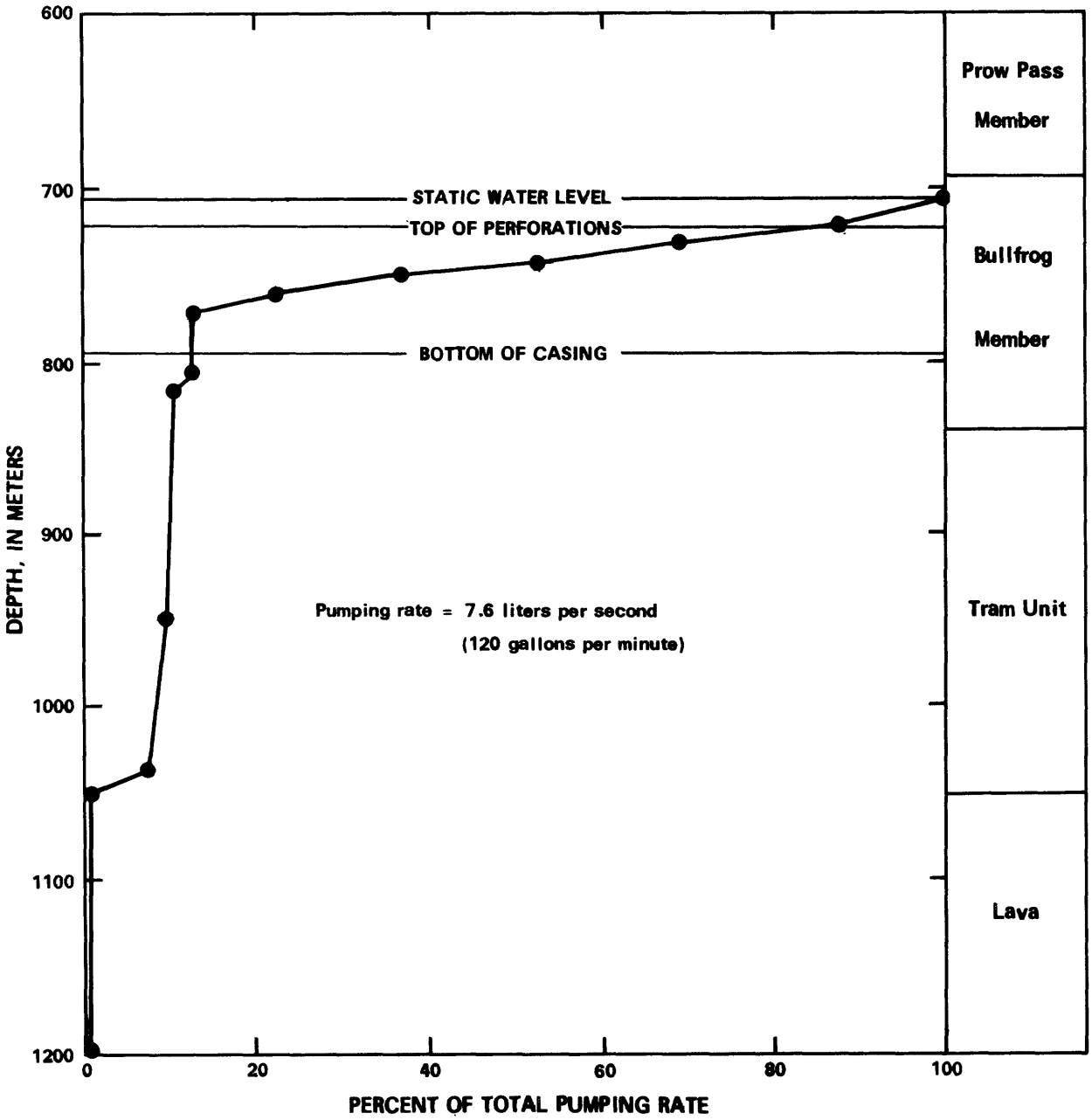

Figure 8.--Borehole-flow survey 2 showing percent of total pumping rate produced by intervals.

Table 5.--*Summary of packer-injection test*

Test interval (meters)	Stratigraphic unit(s) tested	Length of injection period (minutes)
790- 796	Bullfrog Member	114
796- 815	------do.------	120
815- 834	------do.------	60
887- 947	Tram Member	60
888- 949	------do.------	60
949-1,010	------do.------	180
1,015-1,033	------do.------	150
1,015-1,033	------do.------	150
1,033-1,052	Tram Member and lava	120
1,139-1,200	lava	120
1,052-1,219	------do.------	60

in the upper part of the water zone was perforated with an additional 360 holes (see fig. 3 for perforated intervals). Results of these analyses are listed in table 6. Two composite water samples collected after well completion contained 206 and 220 mg/L of dissolved solids. Sodium and bicarbonate were the predominant dissolved anion and cation. The concentration of dissolved silica was 48 mg/L in both samples, which is a relatively large concentration for most natural waters.

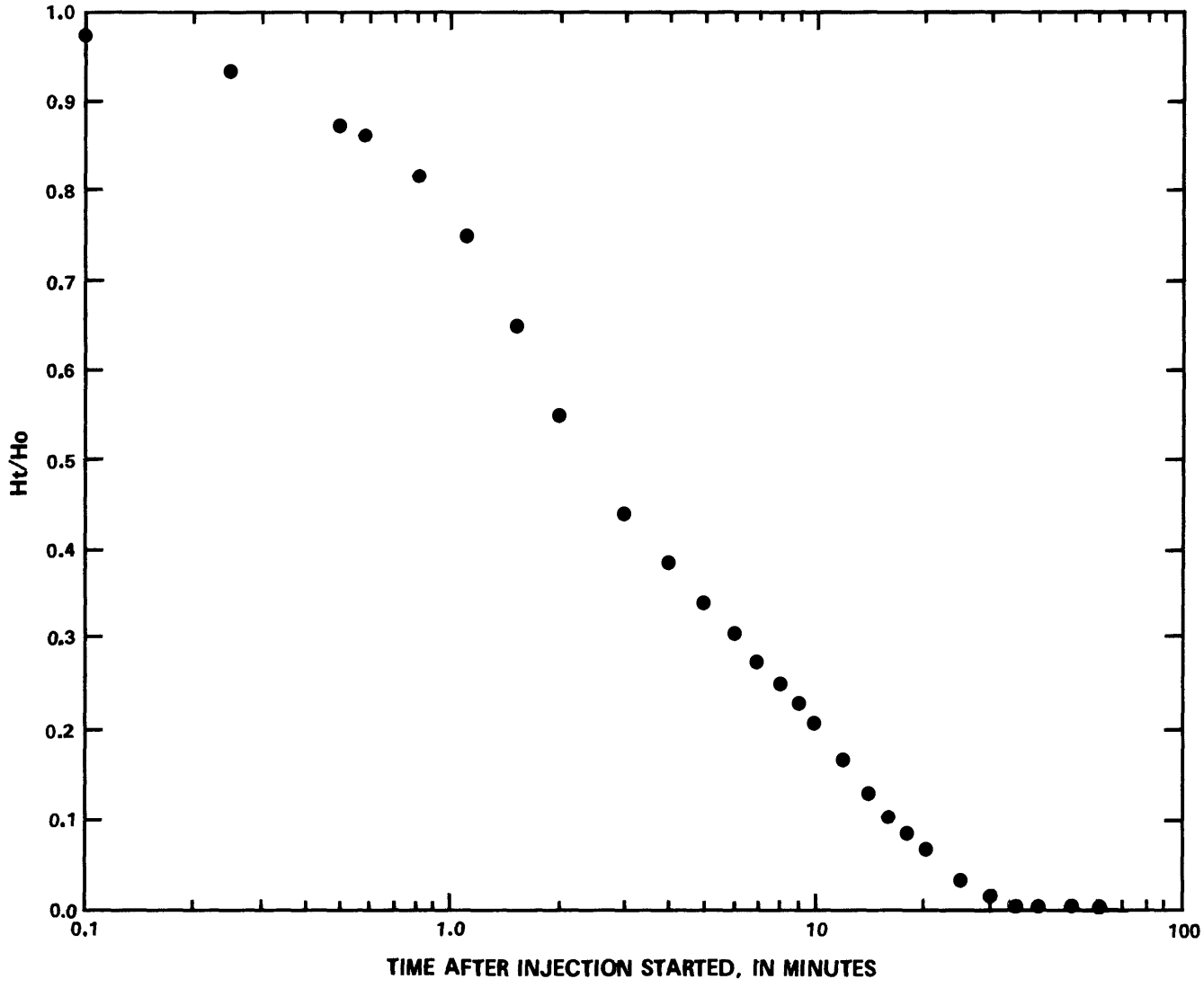

Figure 9.--Packer-injection test for depth interval from 790 to 796 meters.

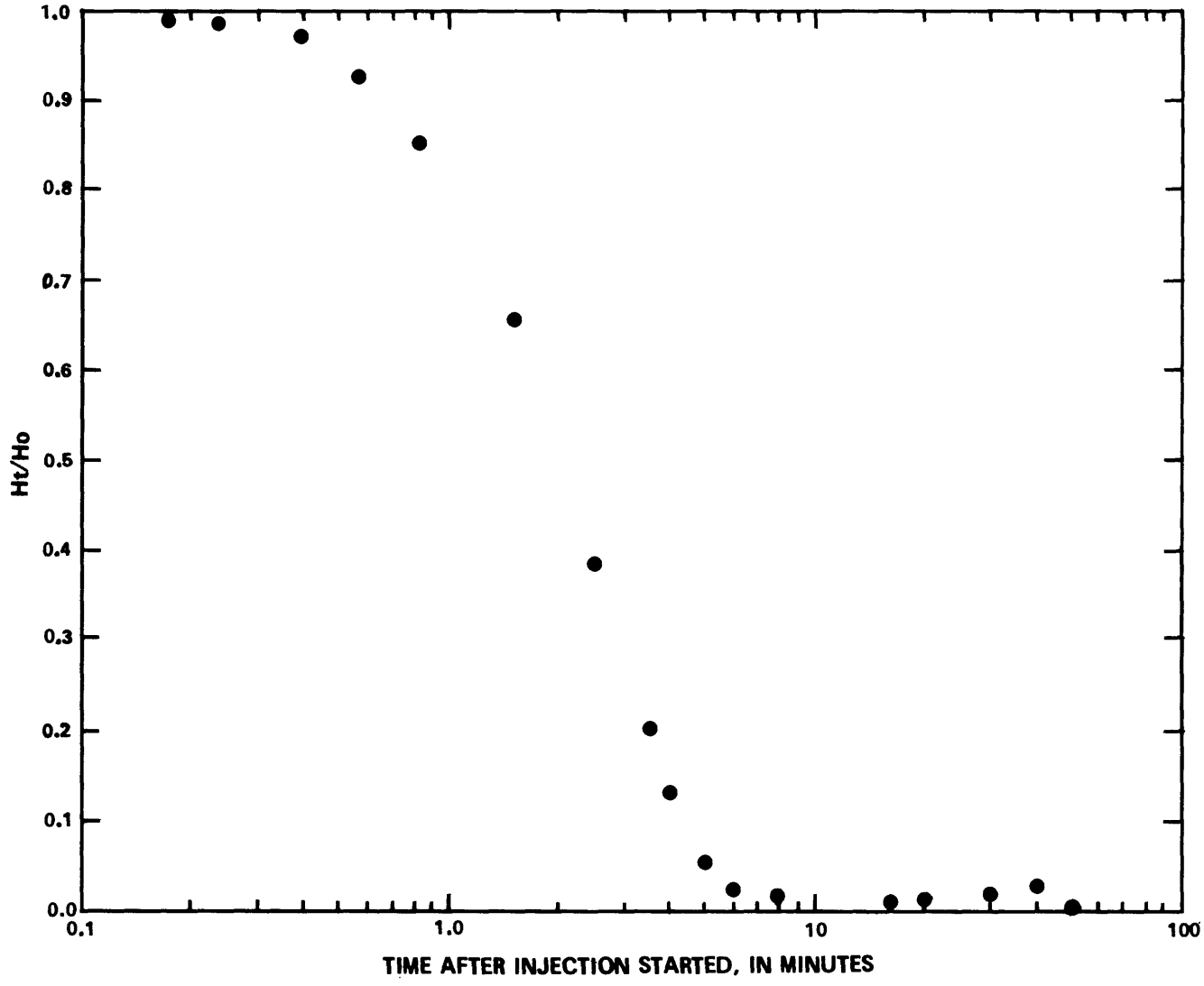

Figure 10.--Packer-injection test for depth interval from 796 to 815 meters.

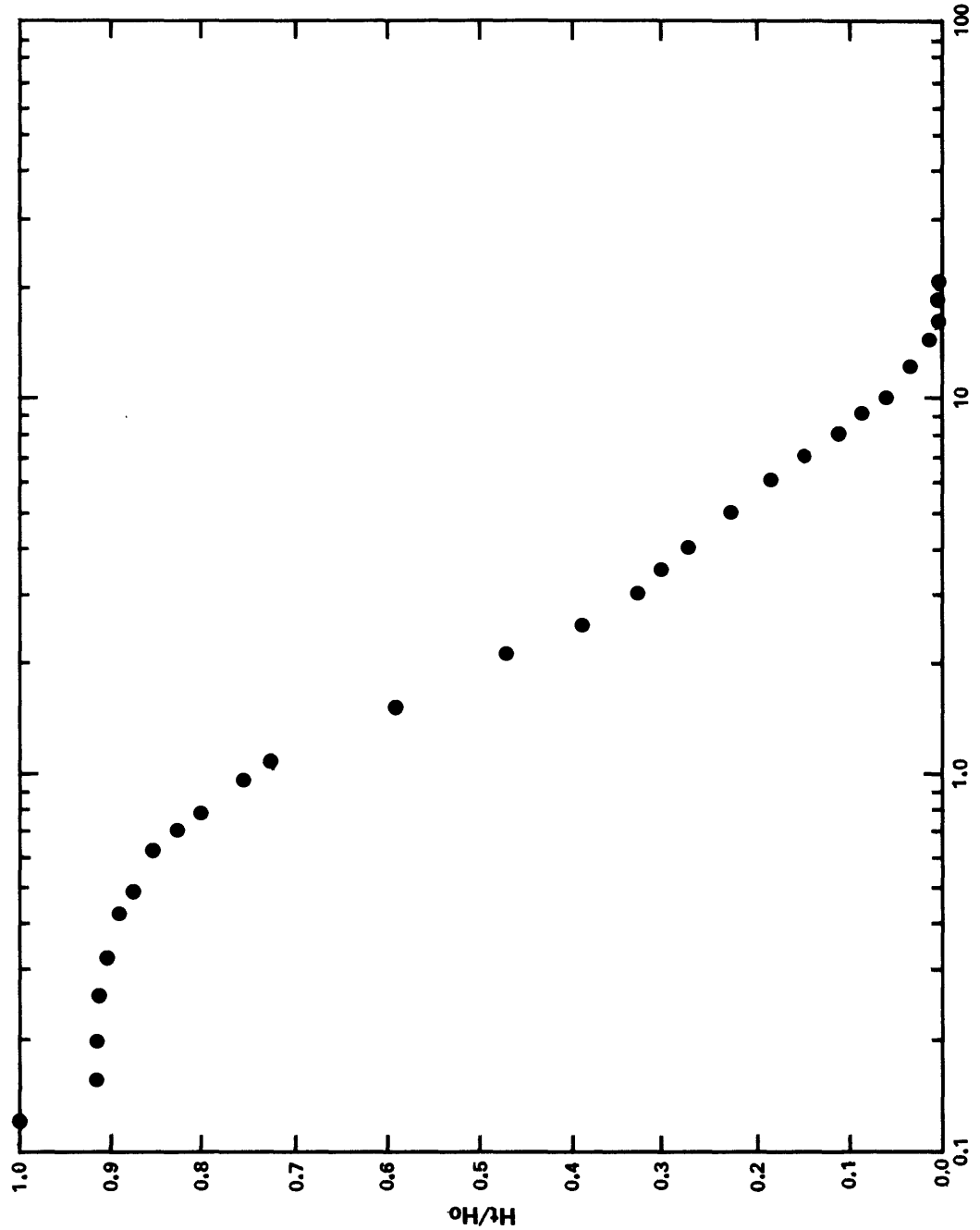

Figure 11.--Packer injection test for depth interval from 815 to 834 meters.

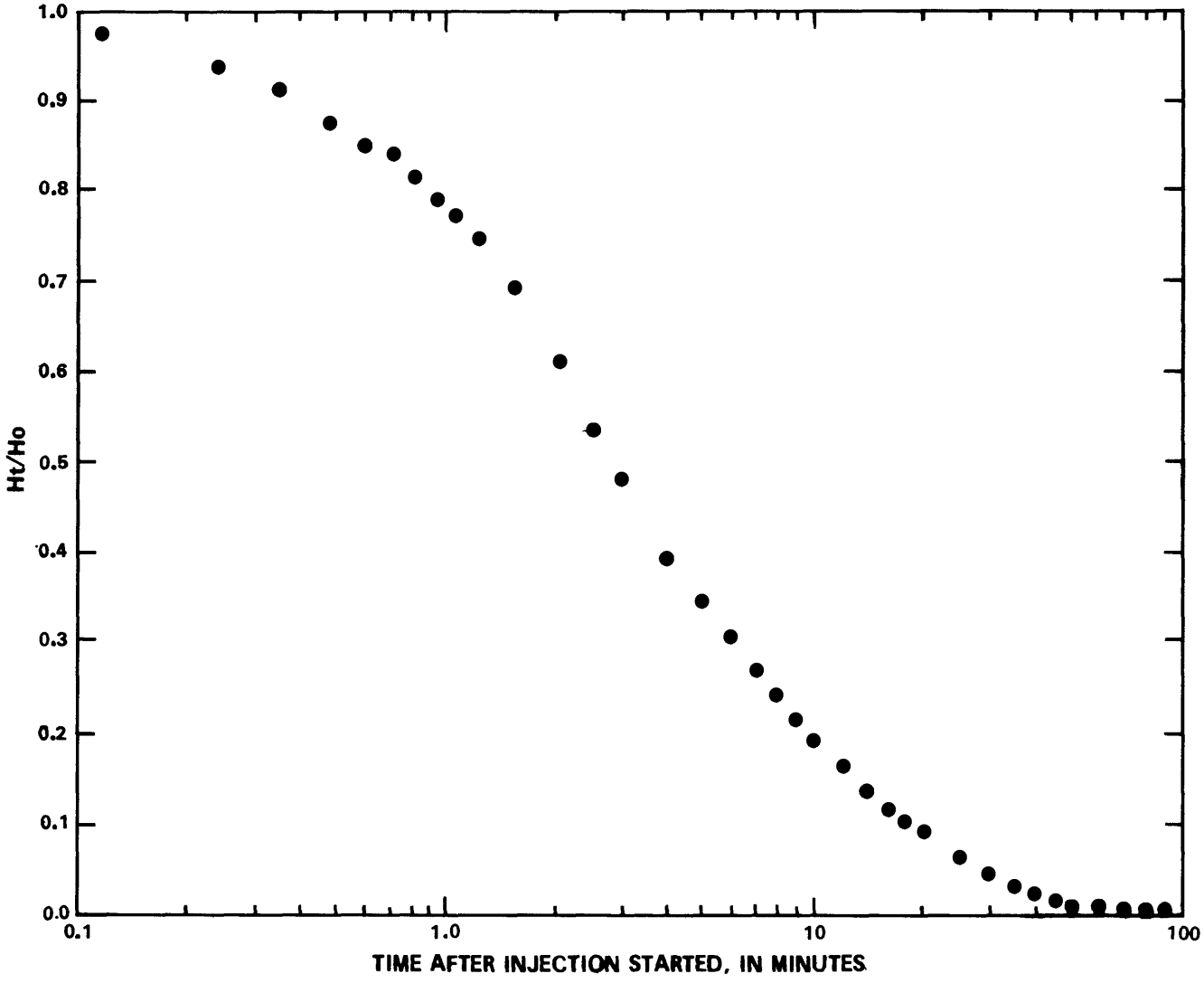

Figure 12.--Packer-injection test for depth interval from 834 to 895 meters.

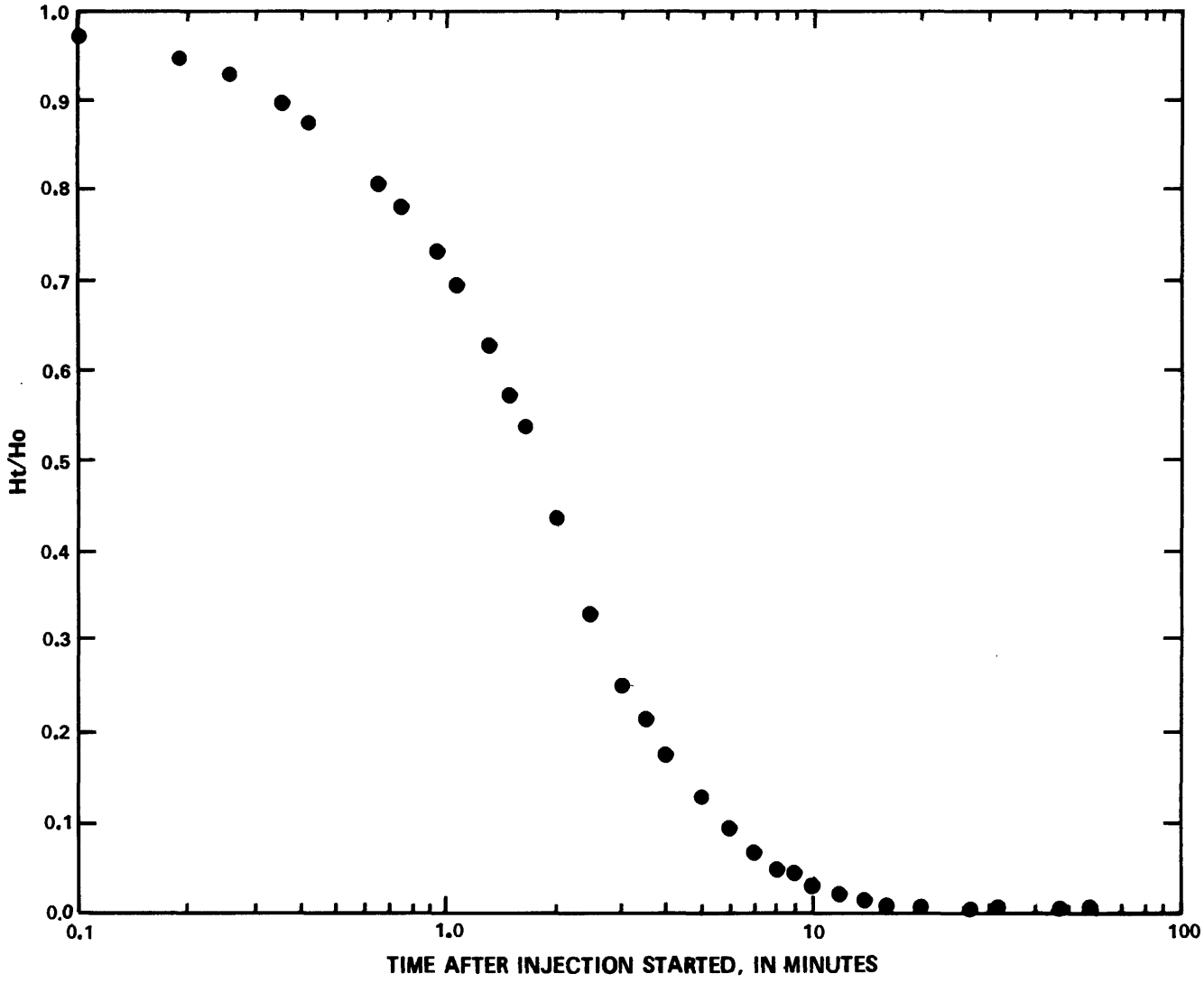

Figure 13.--Packer-injection test for depth interval from 887 to 947 meters.

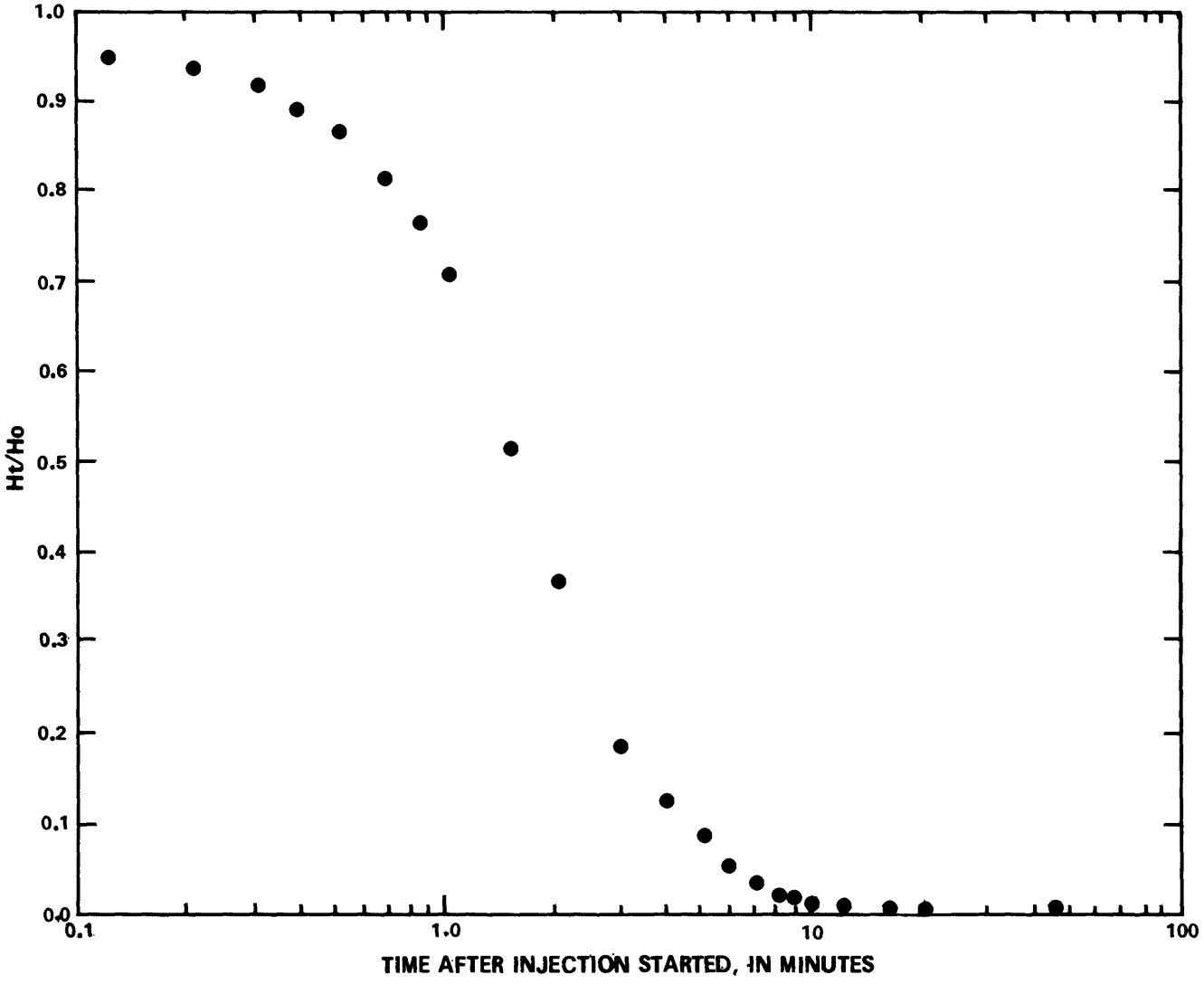

Figure 14.--Packer-injection test for depth interval from 888 to 949 meters.

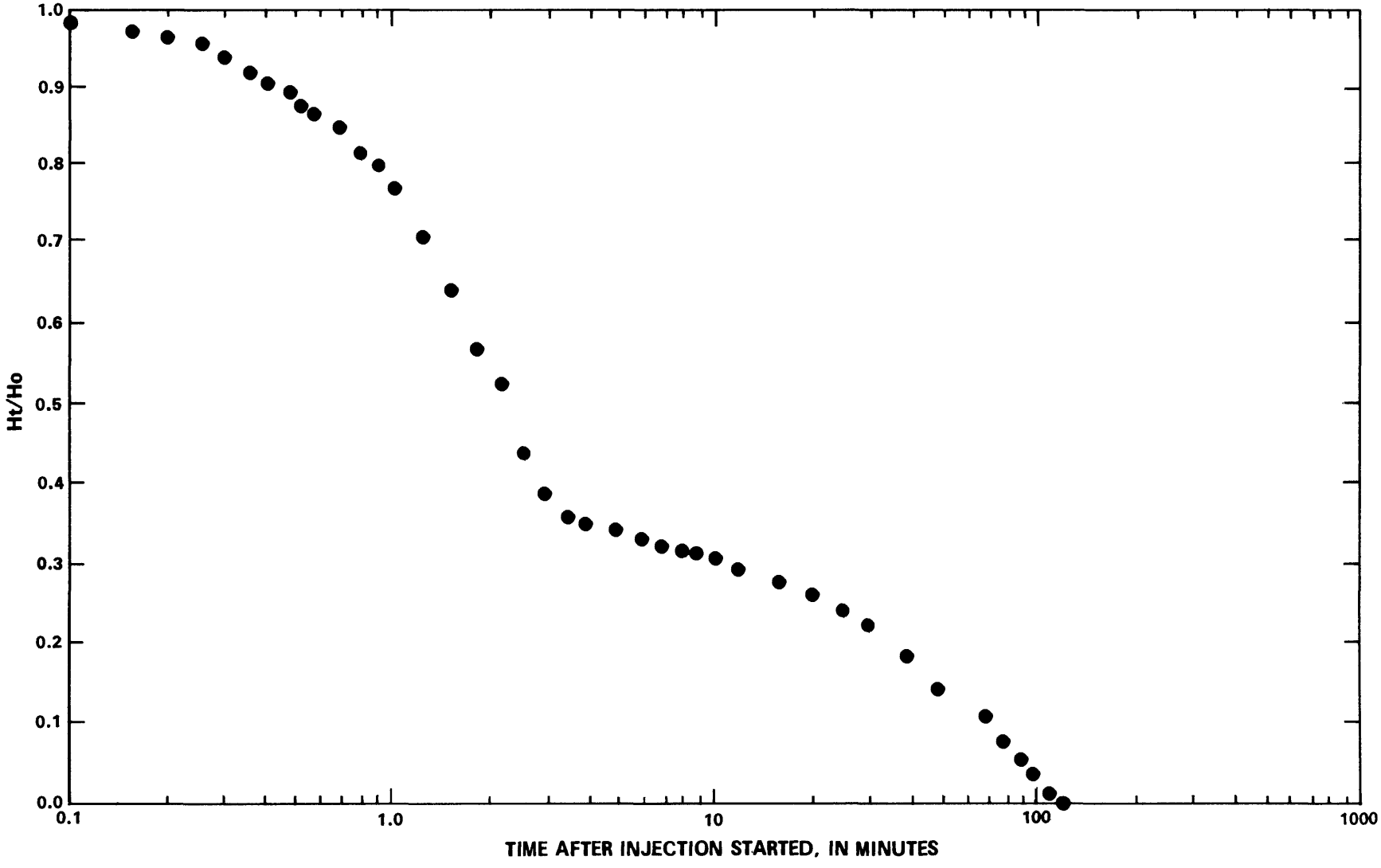

Figure 15.--Packer-injection test for depth interval from 949 to 1,010 meters.

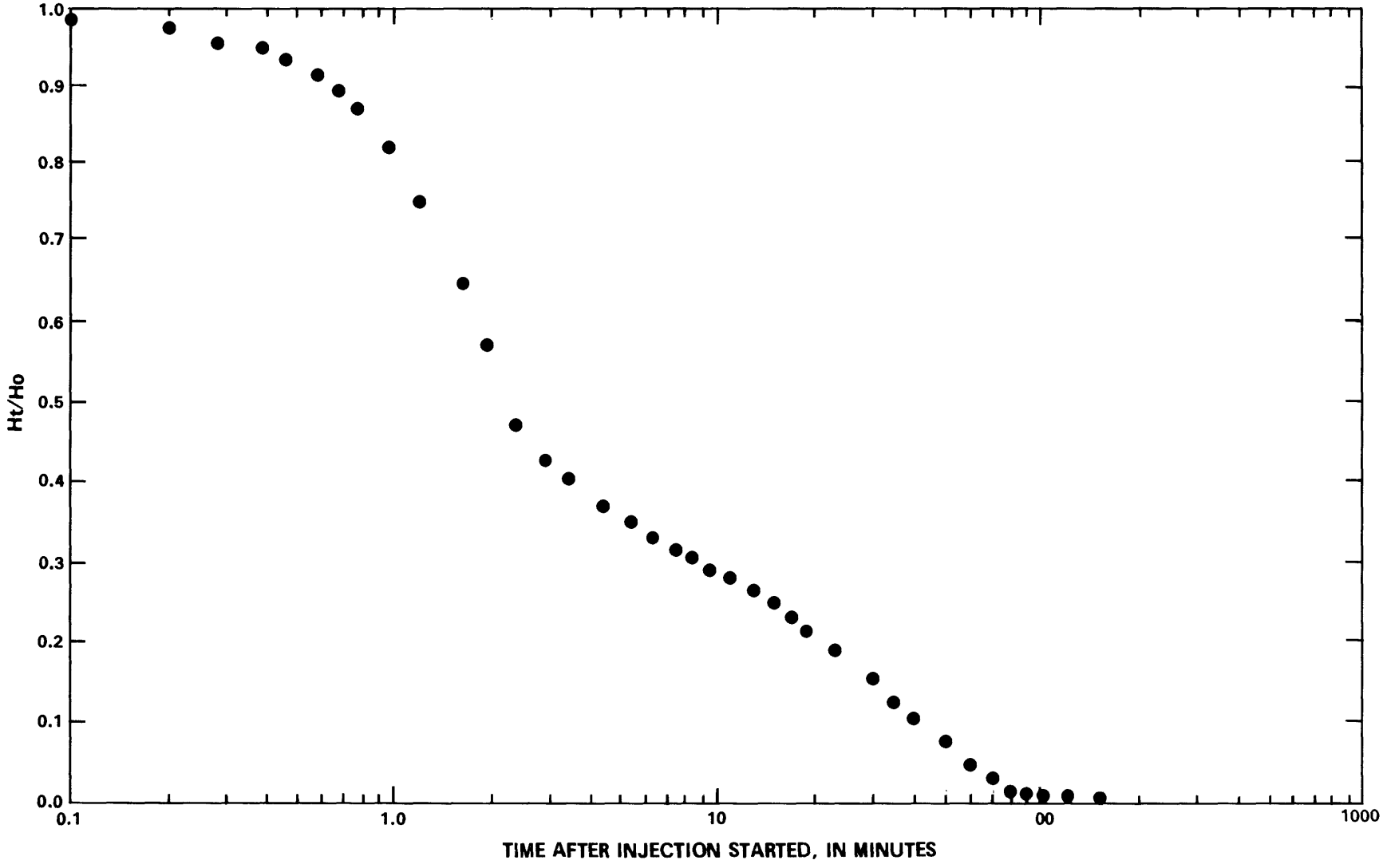

Figure 16.--Packer-injection test for depth interval form 1,015 to 1,033 meters (first test).

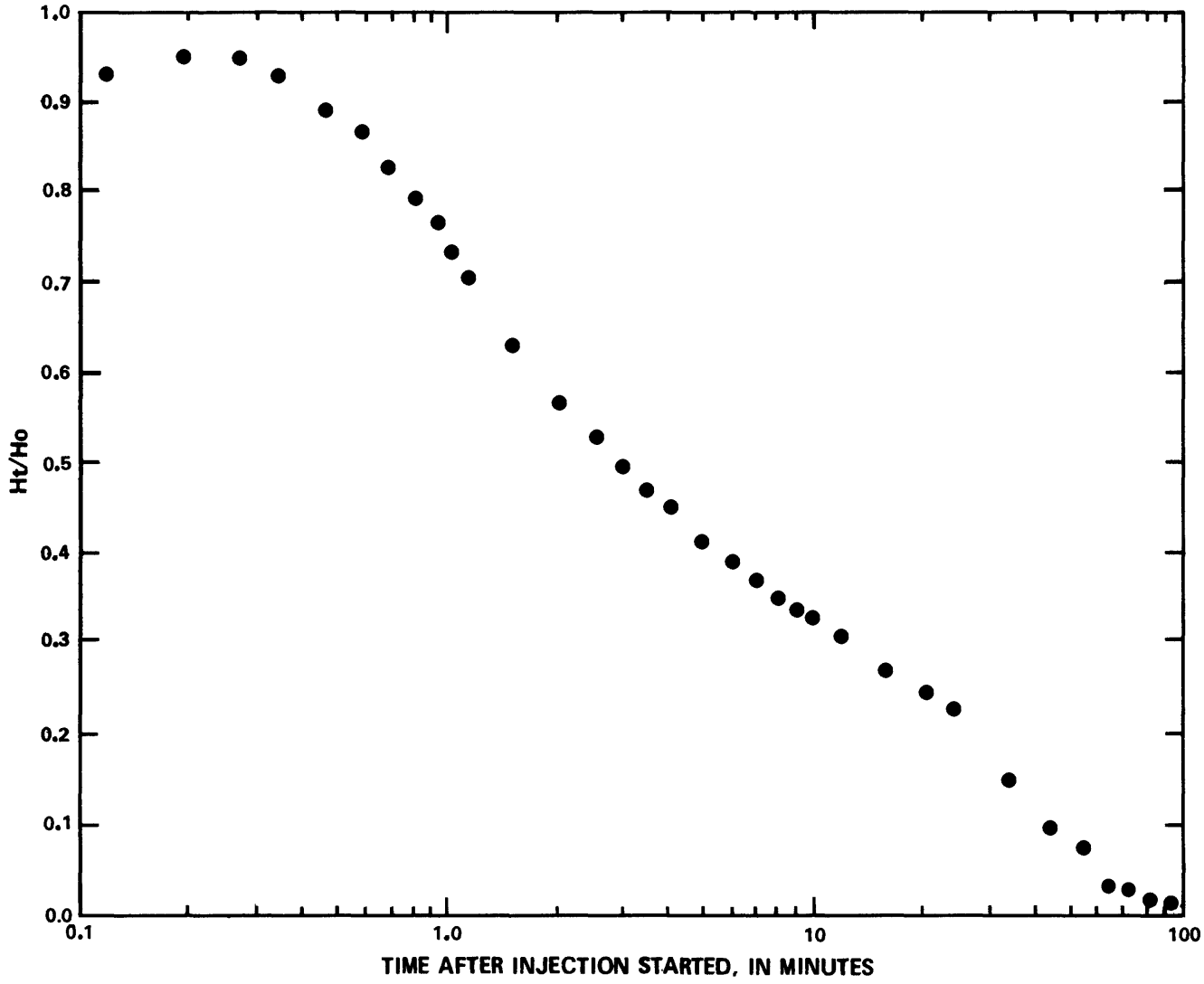

Figure 17.--Packer-injection test for depth interval from 1,015 to 1,033 meters (second test).

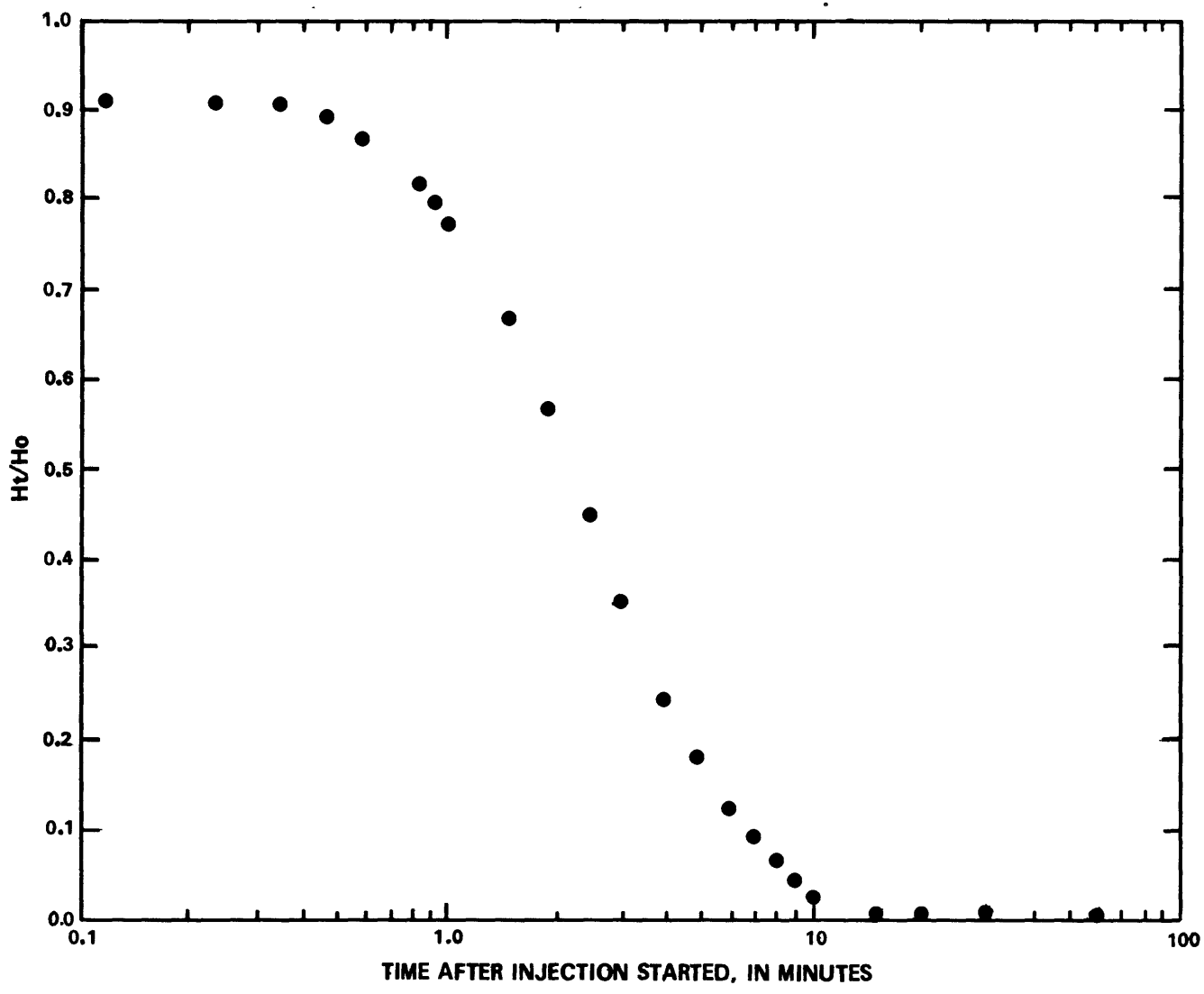

Figure 18.--Packer injection test for depth interval from 1,033 to 1,052 meters.

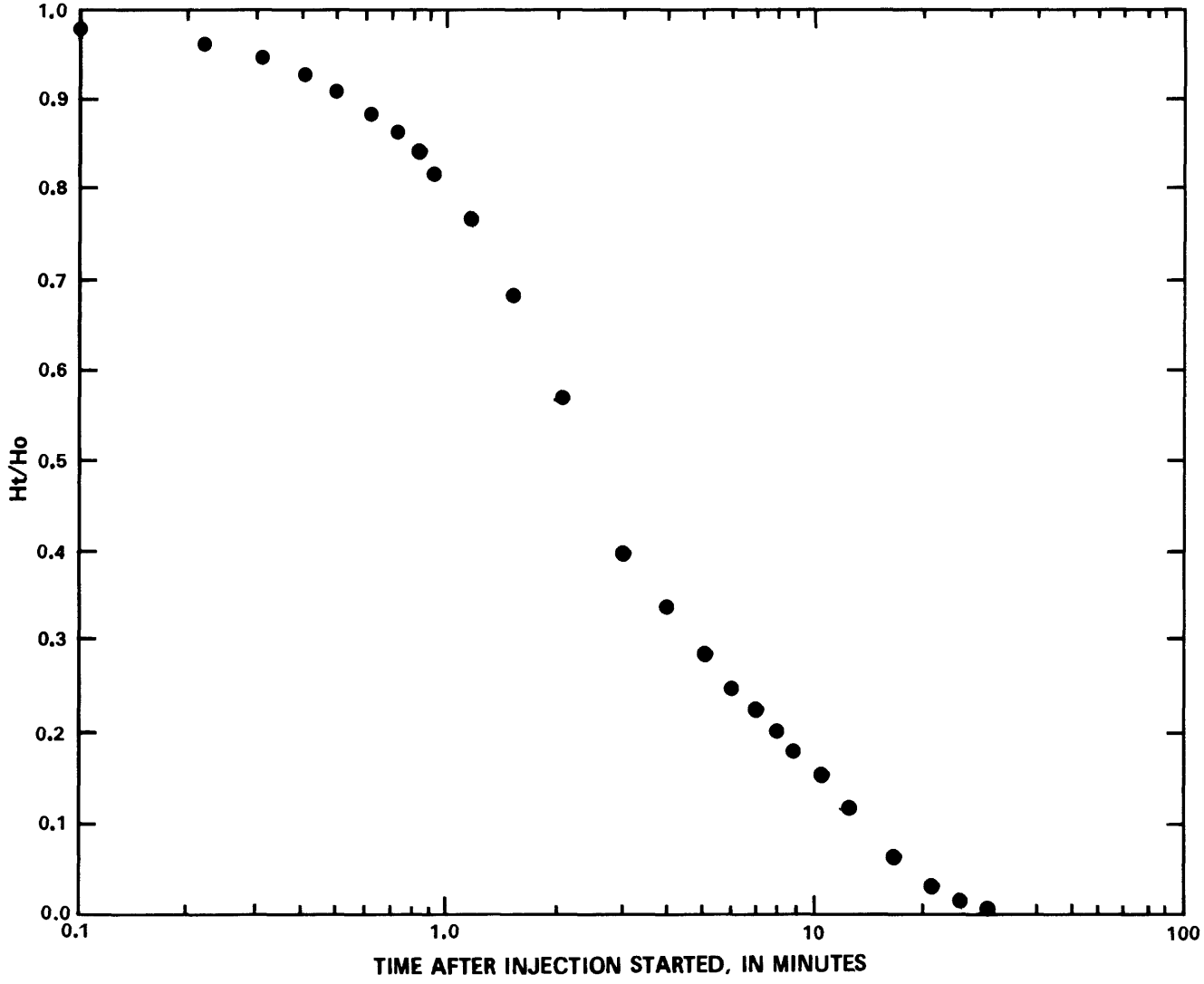

Figure 19.--Packer-injection test for depth interval from 1,052 to 1,219 meters.

Table 6.--*Results of chemical analyses of water samples from depth interval between 707 and 1,219 meters*

[Analyses by U.S. Geological Survey, Denver, Colo.; all dissolved constituents are in milligrams per liter unless otherwise indicated]

Dissolved constituent or property	Concentration or value	
	Sample taken 07-03-82	Sample taken 07-26-82
Bicarbonate	124	124
Calcium (Ca)	1.9	2.0
Chloride (Cl)	6.1	6.6
Fluoride (F)	1.4	1.4
Lithium (Li), in micrograms per liter	62	71
Magnesium (Mg)	0.01	0.01
Potassium (K)	2.1	2.1
Silica (SiO_2)	48	48
Sodium (Na)	60	60
Strontium (Sr), in micrograms per liter	9	4
Sulfate (SO_4)	16	16
Dissolved solids (residue on evaporation)	220	206
Temperature, in degrees Celsius	36.5	35.3
Specific conductance, onsite, in microsiemens per centimeter at 25° Celsius	[1]275	278
Specific conductance, laboratory, in microsiemens per centimeter at 25° Celsius	273	276
pH, onsite, in standard units	7.8	7.9
pH, laboratory, in standard units	7.8	8.0
Tritium, in picocuries per liter	200	200
Oxygen 18-16 ($\delta^{18}O$)[2]	-13.6	-13.6
Deuterium/hydrogen ($\delta^{2}H$)[3]	-102	-101
Carbon 13-12 ($\delta^{13}C$)[4]	-10.3	-10.3
Carbon-14, percent of modern standard	18.2	21.4

[1]Equivalent to micromhos per centimeter at 25° Celsius.

[2]Deviation of oxygen-18/oxygen-16 ratio of sample from standard mean ocean water (SMOW) relative to SMOW, in parts per thousand.

[3]Deviation of deuterium/hydrogen ratio of sample from standard mean ocean water (SMOW) relative to SMOW, in parts per thousand.

[4]Deviation of carbon-13/carbon-12 ratio of sample from PeeDee belemnite standard (PDB) relative to PDB, in parts per thousand.

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