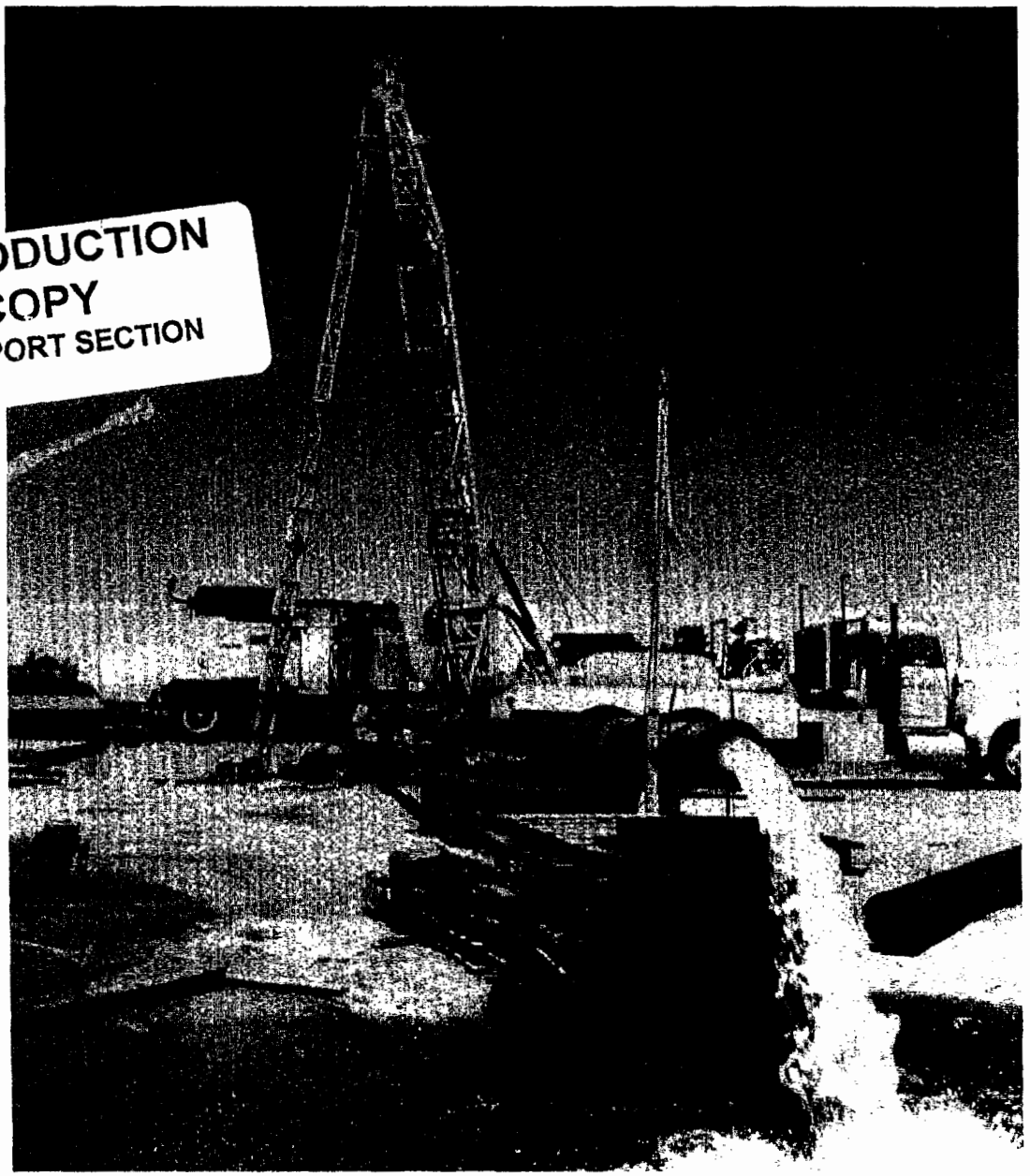
LA-10327-PR
Progress Report

c. 3

Water Supply at Los Alamos During 1983



Los Alamos National Laboratory
Los Alamos, New Mexico 87545

Los Alamos National Laboratory is operated by the University of California for the United States Department of Energy under contract W-7405-ENG-36

The four most recent reports in this series, unclassified, are LA-8504-PR, LA-8977-PR, LA-9734-PR, and LA-9896-PR.

Cover design by James M. Cruz, Group IS-12
Prepared by Kathy Derouin, Group HSE-8

LA-10327-PR
Progress Report
UC-11
Issued: February 1985

Water Supply at Los Alamos During 1983

W. D. Purtymun
N. M. Becker
M. Maes

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

WATER SUPPLY AT LOS ALAMOS DURING 1983

by

W. D. Purtymun, N. M. Becker, and M. Maes

ABSTRACT

Municipal and industrial water supply for Los Alamos during 1983 consisted of 1463×10^6 gal from wells in three fields and 38.2×10^6 gal from the gallery in Water Canyon. About 3.4×10^6 gal of water from Guaje Reservoir and 1.4×10^6 gal from Los Alamos Reservoir were used for irrigation; thus, the total use was about 1506×10^6 gal. High-yield Well PM-4 produced 452×10^6 gal or about 30% of the total production at Los Alamos during 1983. The primary and secondary chemical quality and radioactivity in water from wells and distribution system are in compliance with federal regulations.

I. INTRODUCTION

This report summarizes pumpage and aquifer conditions for wells in the Los Alamos, Guaje, and Pajarito well fields (Fig. 1). These wells supply most of the water used for municipal and industrial purposes in Los Alamos and at the Los Alamos National Laboratory. The gallery in Water Canyon supplies the balance of the water to the system. A summary of surface water from Guaje and Los Alamos Reservoirs used for irrigation is included in the report. Chemical quality of water from the wells, gallery, and surface water sources is also discussed.

This report is a joint effort between the Environmental Surveillance Group (HSE-8) of the Los Alamos National Laboratory and the Water, Gas, and Waste Water Department of the Zia Company Utility Division. Its purpose is to ensure a continuing historical record and to provide guidance for management of water resources and long-range planning for the water supply system. We have issued one summary report (1947-1971) and twelve annual reports as a result of these studies.[1-13] An additional report summarizes the hydrology of the main aquifer with reference to future development of ground water supplies.[14]

The Zia Company Utility Division is the support contractor to the Department of Energy (DOE) and Los Alamos National Laboratory. The Zia Company maintains and operates the water supply system. Water is pumped from wells, through distribution lines, and lifted by booster pumps through chlorination stations into reservoirs for storage and distribution to the community and Laboratory areas (Fig. 1). Water from the gallery flows by gravity through a microfilter station and is pumped into one of the system reservoirs for distribution. The Zia Company Utility Division maintains monthly records of hours of operation on each well, along with daily and monthly production records. Monthly average nonpumping and pumping water levels are computed from air-line pressure or transducer data recorded continuously at each well. These data provide input for calculating pumping rates, drawdown (difference between nonpumping and pumping water levels), specific capacity (pump rate per unit drawdown), and other well-field statistics included in this report.

TABLE I

PRODUCTION IN MILLIONS OF GALLONS
FROM WELLS AND GALLERY
1947-1983

Year	Los Alamos Field	Guaje Field	Pajarito Field	Water Canyon Gallery	Production Total
1947	147	0	0	84	231
1948	264	0	0	97	361
1949	302	0	0	92	394
1950	547	3	0	54	604
1951	702	68	0	39	809
1952	448	350	0	48	846
1953	444	372	0	39	855
1954	380	374	0	40	794
1955	407	375	0	33	815
1956	437	506	0	23	966
1957	350	378	0	40	768
1958	372	395	0	60	827
1959	391	478	0	54	923
1960	530	533	0	48	1111
1961	546	624	0	54	1224
1962	577	597	0	67	1241
1963	539	654	0	51	1244
1964	627	665	0	45	1337
1965	447	571	99	72	1189
1966	450	613	127	82	1272
1967	373	464	481	56	1374
1968	345	474	584	65	1468
1969	331	435	569	80	1415
1970	360	423	595	65	1443
1971	412	484	657	37	1590
1972	380	467	662	40	1549
1973	406	475	685	49	1615
1974	369	453	802	35	1659
1975	356	431	749	42	1578
1976	343	531	817	41	1732
1977	345	515	614	57	1531
1978	302	444	690	45	1481
1979	289	456	662	44	1451
1980	339	485	743	32	1599
1981	336	469	701	45	1551
1982	317	422	773	46	1558
1983	221	338	904	38	1501
Total	14 731	15 322	11 914	1939	43 906

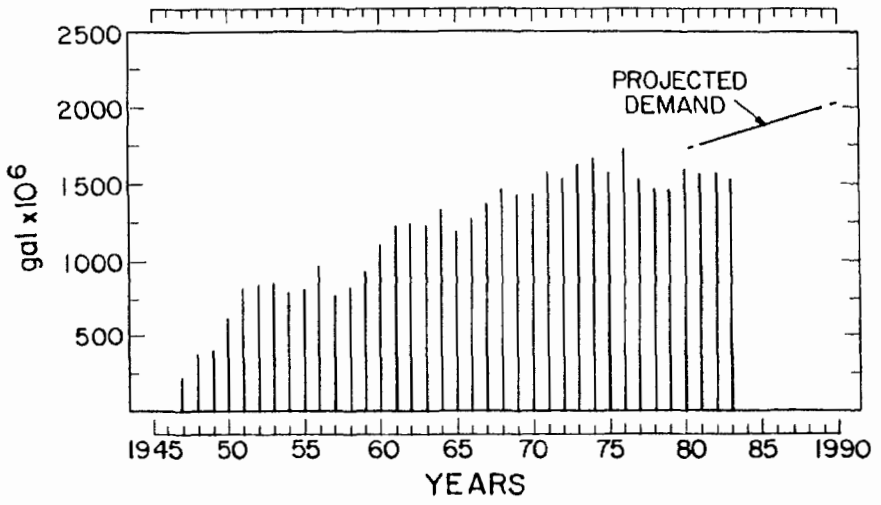


Fig. 2. Water production and use, 1947 to 1983, and projected demand, 1981 to 1990.

The projected demand for the Laboratory and community was made for the period 1981 through 1990 based on past production (Fig. 2). The projected demand shows an annual increase of about 25×10^6 gal. The actual amount of water used is variable, dependent mainly on the weather. A cool summer with lots of precipitation will result in a reduced water demand, whereas a hot, dry summer will require additional water production. The 1983 production fell below the projected demand by about 225×10^6 gal.

The peak demand period for 1983 was a 12-day period, June 30 to July 11, when pumpage was 91×10^6 gal or about 7.6×10^6 gal per day. The peak demand period was down about 54×10^6 gal from the peak demand period in 1982 (Table II).

The total production from the well fields and gallery has been $43{,}906 \times 10^6$ gal. Of this amount the wells have produced $41{,}967 \times 10^6$ gal or about 97% of the total production used for water supply (Table I). The gallery in Water Canyon has produced the remaining 3% or about 1939×10^6 gal. The average annual pumping rate and discharge rate from the gallery, the annual production, percentage of production by well field and gallery, and percentage of production by individual wells and gallery for 1983 are compared to similar data for 1982 (Table III). The average annual nonpumping and pumping water levels and specific capacity for individual wells in the three well fields in 1983 are compared with similar data for 1982 (Table IV).

A. Los Alamos Well Field

The Los Alamos Well Field is composed of six supply wells and one observation well. The production in 1983 was from five wells. Well LA-6 is on standby status because of an excessive amount of natural arsenic in the water.[15] Pumpage from the well field decreased 95×10^6 gal, from 316×10^6 gal in 1982 to 221×10^6 gal in 1983 (Table III). The well field produced about 15% of the total production in 1983.

The average annual water level in Observation Well LA-1 was about 52 feet higher in 1983 than in 1982 as Well LA-1B was down for repair from March through November 1983. Well LA-1B is located about 150 feet northeast of Well LA-1. Pumping of Well LA-1B causes water level decline in LA-1; water level recovers when the pumping ends.

Pumpage from Well LA-1B declined from 108.1×10^6 gal in 1982 to 12.1×10^6 gal in 1983. As a result, both the annual pumping and nonpumping water levels were higher in 1982 than when pumping was greatest in 1983 (Table IV). After the pump was repaired, the pumping rate increased slightly from the previous year to 495 gpm in 1983. Also, the specific capacity had increased slightly.

Pumpage from Well LA-2 increased from 51.2×10^6 gal in 1982 to 54.5×10^6 gal in 1983. Water levels were higher in 1983 than in 1982, while the pumping rate increased from 269 gpm in 1982 to 330 gpm in 1983. The increase in production in 1983 was not

	June 11-July 12 1976	May 31-June 18 1977	June 9-June 28 1978	July 24-August 7 1979	June 15-July 28 1980	June 8-June 28 1981	June 23-July 11 1982	June 30-July 11 1983
No. of Days	32	19	20	15	33	21	19	12
Total Production (gal)	299×10^6	149×10^6	149×10^6	115×10^6	269×10^6	167×10^6	145×10^6	91×10^6
Av Daily Production (gal)	9.3×10^6	7.8×10^6	7.4×10^6	7.7×10^6	8.2×10^6	7.9×10^6	8.1×10^6	7.6×10^6
No. of Days Exceeding (gal)								
10×10^6	14	2	--	--	--	--	--	--
9×10^6	9	4	--	--	7	3	1	--
8×19^6	4	4	7	4	15	7	9	6
7×10^6	3	4	8	6	6	8	9	2
$<7 \times 10^6$	2	5	5	5	5	3	0	4

Well LA-4	---	---	---	0	557	61.5	28	4
Well LA-5	467	102.3	33	6	458	78.1	35	5
Well LA-6	---	---	---	---	---	---	---	---
Subtotal	1469	316.5	100	20	2098	220.9	100	15
Guaje Well Field								
Well G-1	313	69.0	17	4	303	52.2	16	3
Well G-1A	505	109.7	26	7	498	86.7	26	6
Well G-2	476	25.7	6	2	441	16.5	5	1
Well G-3	239	51.0	12	3	239	31.3	9	2
Well G-4	297	65.2	15	4	270	42.2	12	3
Well G-5	522	38.2	9	3	420	73.2	22	5
Well G-6	281	63.6	15	4	301	35.4	10	2
Subtotal	2633	422.4	100	27	2472	337.5	100	22
Pajarito Field								
Well PM-1	589	99.6	13	7	585	86.5	10	6
Well PM-2	1386	359.3	46	23	1369	157.9	17	10
Well PM-3	1402	238.1	31	15	1386	207.6	23	14
Well PM-4	1460	76.2	10	5	1432	452.5	50	30
Well PM-5	---	---	---	---	---	---	---	---
Subtotal	4838	773.2	100	50	4770	904.5	100	60
Water Canyon Gallery								
Subtotal	95	45.9	100	3	73	38.2	100	3
Total	9035	1558.0	---	100	9413	1501.1	---	100

TABLE IV

HYDROLOGIC CHARACTERISTICS, 1982 AND 1983

	1982			1983		
	Water Levels		Specific	Water Levels		Specific
	Nonpumping (ft)	Pumping (ft)	Capacity (gpm/ft)	Nonpumping (ft)	Pumping (ft)	Capacity (gpm/ft)
Los Alamos Well Field						
Well LA-1	98	---	---	46	---	---
Well LA-1B	71	180	4.5	61	160	5.0
Well LA-2	161	348	1.4	121	321	1.6
Well LA-3	118	246	1.9	89	203	2.0
Well LA-4	---	---	---	287	392	5.3
Well LA-5	168	299	3.4	154	295	3.2
Well LA-6	90	---	---	81	---	---
Guaje Well Field						
Well G-1	278	443	1.9	272	443	1.8
Well G-1A	305	347	12.0	301	336	14.2
Well G-2	352	399	10.1	356	399	10.3
Well G-3	349	459	2.2	340	463	1.9
Well G-4	386	578	1.5	---	---	---
Well G-5	455	510	9.5	445	492	8.9
Well G-6	588	669	3.5	582	668	3.5
Pajarito Well Field						
Well PM-1	748	770	26.8	747	769	26.6
Well PM-2	874	934	23.1	876	935	23.2
Well PM-3	762	785	60.9	762	785	60.3
Well PM-4	1050	1091	35.6	1066	1101	40.9
Well PM-5	---	---	---	---	---	---

reflected in lower water levels due to the decline in pumpage from Well LA-1B and from Well LA-3, which was down for repair from August through December. Specific capacity in 1983 was about the same as in 1982.

Water levels in Well LA-3 were higher in 1983 than 1982 as the well was down for repairs. Production dropped from 54.9×19^6 gal in 1982 to 14.7×10^6 gal in 1983.

Well LA-4 was down for repairs since September 1981 and was returned to service in March 1983. During 1983 the production was 61.5×10^6 gal; the well had an average pumping rate of 557 gpm with a specific capacity of 5.3 gpm/ft of drawdown. This compares favorably with the pumping rate of 579 gpm and specific capacity of 5.6 gpm/ft of drawdown in 1981 before the well was repaired.

Pumpage from Well LA-5 decreased about 24×10^6 gal from 1982 to 1983. As a result, water levels, nonpumping and pumping, were higher in 1983 than 1982. Pumping rates varied slightly as did specific capacity; however, the change was small and not significant.

Well LA-6 was not pumped into the distribution system in 1983. The well was pumped for less than 15 minutes to collect a sample for chemical analyses.

The distribution of pumpage should be about 40% from the lower field (Wells LA-1B, LA-2, and LA-3) and about 60% from the upper field (Wells LA-4 and LA-5). This will result in a uniform water level decline throughout the well field. In 1983 the distribution of pumpage was 37% from the lower field and 63% from the upper field, which is sufficient to maintain a balanced water level decline in the field.

B. Guaje Well Field

The Guaje Well Field is composed of seven wells (Fig. 1). Well G-2 was down for repair for part of the year. Well G-3 failed in mid-December and was out of production for the remainder of the month. The pumpage from the well field decreased 84×10^6 gal from 422×10^6 gal in 1982 to 338×10^6 gal in 1983 (Table III). The well field produced about 22% of the total production in 1983.

Pumpage from Well G-1 decreased about 17×10^6 gal from 1982 to 1983. Water levels were slightly higher in 1983 when compared with 1982. Pumping rate and specific capacity of the well did not change but remained about the same at 303 gpm and 1.8 gpm/ft of drawdown (Tables III and IV).

Pumpage from Well G-1A decreased about 23×10^6 gal from 1982 to 1983, resulting in higher non-pumping and pumping water levels in 1983 when compared with those water levels in 1982. Pumping rates and specific capacities did not change significantly from 1982 to 1983 (Tables III and IV).

Pumpage from Well G-2 was down about 9×10^6 gal from 1982 to 1983. Total pumpage in 1983 was only 16.5×19^6 gal. The well has been out of service for repair for the past 3 years. The water levels for both 1982 and 1983 have remained about the same as has the pumping rate and specific capacity (Tables III and IV).

Pumpage from Well G-3 declined about 19×10^6 gal from 1982 to 1983. The pump failed in December. The pumping rates declined from 374 gpm in 1976 to 249 gpm in 1983. Specific capacities declined from 5.3 gpm/ft of drawdown to 1.9 gpm/ft of drawdown during the same period. The pump was pulled for repairs in January 1984.

Pumpage from Well G-4 declined about 23×10^6 gal from 1982 to 1983. The transducer in the well failed; therefore, no water levels were recorded for 1983. The pumping rate declined from 297 gpm in 1982 to 270 gpm in 1983.

Pumpage from Well G-5 increased about 35×10^6 gal from 1982 to 1983. The well was down for repairs for part of 1982. Water levels were higher in 1983 than 1982 because of the decline in pumping rate from 522 gpm to 420 gpm in 1983. Specific capacity also declined slightly (Tables III and IV).

Pumpage from Well G-6 declined 28×10^6 gal from 1982 to 1983. Water levels rose in response to decline in production. Pumping rates were higher in 1983 than 1982 because of higher water levels. No change was noted in the specific capacity of the well.

C. Pajarito Well Field

The Pajarito Well Field is composed of five wells (Fig. 1). Production was from four of the wells. Well PM-5, a new well completed in August 1982, has not been added into the distribution system. The well house and distribution lines have just been completed (July 1984). The pumpage from the well field has increased 131×10^6 gal, from 773×10^6 gal in 1982 to 904×10^6 gal in 1983. The field produced 60% of the production in 1983 compared with 50% in 1982.

The production from Well PM-1 decreased 13×10^6 gal from 1982 to 1983. Water levels, pumping rates, and specific capacity of the well did not change significantly from 1982 to 1983.

The production from Well PM-2 decreased about 202×10^6 gal from 1982 to 1983. The decline in production was mainly caused by high production from Well PM-4, which replaced the high demand from Well PM-2. Water levels, the pumping rate, and the specific capacity did not change significantly from 1982 to 1983 (Tables III and IV).

Pumpage from Well PM-3 declined 30×10^6 gal from 1982 to 1983. There was no significant change in the water levels, pumping rate, or specific capacity from 1982 to 1983.

Pumpage from Well PM-4 increased 376×10^6 gal from 1982 to 1983. In 1982 the well was only in operation from July through December. The non-pumping water level declined about 16 feet from 1982 to 1983, whereas the pumping level declined about 10 feet. The pumping rate declined about 28 gpm, whereas specific capacity increased from 35.6 gpm/ft of drawdown to 40.9 gpm/ft of drawdown from 1982 to 1983. The increase in specific capacity indicates some additional development of the well (removal of lost circulation material and drilling mud from the aquifer and gravel pack increasing permeability of the aquifer). The well is equipped

with a natural gas engine; thus the well is not restricted to available electric power as are the pumps on the other wells. The electrical power restriction is to prevent additional costs to peak electrical demand.

Well PM-5 should be "on line" in late 1984. The well should produce about 1200 gpm. The static water level is at a depth of about 1208 feet.

D. Pump Failure and Rehabilitation

During 1983, five wells were out of service because of electrical or pump failure. While the pumps were out of Wells LA-3 and G-3, the wells, casing, and screen were cleaned and rehabilitated by using a brush or a bailer to clean the casing and screen walls. The bailer was used as a "surge block" to move the gravel pack. A sand pump was used to remove sand accumulations from the bottom of the well.

The pump in Well LA-1B failed and the well was out of service from March to November 1983. A bore hole TV log was run in the well to the bottom, a depth of 1655 feet. The well has accumulated about 95 feet of sediments as the total cased depth of the well is 1750 feet. The well casing and screen had some moderate to heavy scale below a depth of about 1050 feet; however, a decision was made not to remove any sediments from the bottom of the well or clean the screen or casing. The roll of the camera at a depth of about 400 feet (below pump setting) indicated an abrupt bend in the casing. Because the casing is wrought iron, it is extremely brittle. To run a bailer or brush in the hole, especially if the casing has an abrupt bend, could cause the casing to shatter resulting in the casing collapse. The casing is reduced from a 16-inch diameter to a 12-inch diameter at a depth of 650 feet.

The pump in Well LA-3 failed in August. The well was still out of service in December. A bore hole TV log run of the well indicated that the well was filled with sediments to a depth of 724 feet. Total depth of the well is 870 feet. The screen and casing were cleaned and the sediments were removed to a depth of 816 feet before the pump was replaced in the well.

Pump failure and other problems at Well G-2 resulted in the well being out of service since May 1981. It was returned to service in February 1982. The pump failed again in June 1982 and the well was not returned to service until November 1983. No bore hole TV logs were run of the well in 1983.

The pump on Well G-3 failed in December 1983. The pump was pulled out in January 1984 and bore hole TV logs were run of the well on February 2, 1984, before cleanup and rehabilitation. Another log was run on March 8, 1984 and again on April 26, 1984, before returning the pump to the well. The log of February indicated the well was open to 1304 feet (total depth of casing 1800 feet). When the pump was out of the well in 1976, the sediments were cleaned to a depth of 1701 feet before removal of sediments became too difficult to continue. Cleaning out sediments from the well in February-March 1984 resulted in a large amount of gravel from the gravel pack in the sediments. As a result, the TV camera was again run in the well to locate a hole or tear in the casing or screen through which the gravel could enter the well. At this time, March 5, 1984, the well was open to 1327 feet. The only place in the screen through which the gravel could enter the well was a 2-inch by 2-inch hole ripped out of a louver in the screen at a depth of 535 feet. The sediments, which include a large amount of gravel from the gravel pack, were removed from a depth of 1327 feet (March) to 1631 feet before the pump was returned to this well in May 1984. The casing reduces from a 12-inch diameter to a 10-inch diameter at a depth of 690 feet.

An electrical fire in the control panel of Well PM-2 occurred in December 1983. The well was returned to service after electrical equipment repair and cleanup at the well house in May 1984.

III. WATER CANYON

The gallery in Water Canyon is dug back about 30 feet into the Bandelier Tuff. The gallery or tunnel is framed to keep the walls and ceiling from collapsing. The floor of the gallery acts as a catchment basin for the distribution line to the microfilter station. The microfilter station is located near S-Site along the northwestern edge of the Laboratory property.

The water occurs in a fractured, moderately welded to a welded tuff. Beneath the welded tuff is a nonwelded tuff (few fractures) that tends to perch the water in the overlying fractured tuff. Recharge to the aquifer is rapid. In the spring when snowmelt occurs, the discharge of the gallery increases. The increase in discharge results in a large suspended sediment load in the water. When the load reaches the limits for domestic use, a turbidity control switches the flow to waste to keep it out of the distribution system.

The gallery is a valuable source of water supply. During 1983, about 3% of this total municipal and industrial supply was obtained from the gallery. The production decreased about 8×10^6 gal from 46×10^6 gal in 1982 to 38×10^6 gal in 1983. The average annual discharge decreased also from 95 gpm in 1982 to 73 gpm in 1983 (Table III). Since 1947, the total

production from the gallery has been 1939 × 10^6 gal (Table I).

IV. GUAJE AND LOS ALAMOS RESERVOIRS

Water from Guaje and Los Alamos Reservoirs was used for municipal and industrial supply at Los Alamos during the early days of the Manhattan Project. Use of the water from the reservoirs for municipal supply was discontinued about 1959 because of intermittent periods of turbidity caused by runoff and difficulties in maintaining bacteriological levels that were below limits for municipal water supply. Both the areas are open for recreational use. Water from the reservoirs has been available for irrigation of lawns and shrubs in the community and Laboratory through a separate distribution line.

Guaje Reservoir in upper Guaje Canyon has a capacity of 0.25 × 10^6 gal, with a drainage area of 5.6 mi^2. The reservoir is for diversion rather than storage, as perennial flow is maintained by springs in the canyon above the reservoir. Water flows by gravity through 6.8 miles of distribution lines for irrigation of lawns and shrubs at Cumbres Junior High School and Guaje Pine Cemetery. The line from the reservoir is not a part of or connected to the municipal water distribution system.

Annual production from Guaje Reservoir used for municipal supply from 1947 through 1958 ranged from an estimated 24 × 10^6 gal to 213 × 10^6 gal (Table V). There is no record of water used for irrigation from 1958 through 1971. Since 1972 the amount of water used for irrigation has ranged from 2.7 × 10^6 gal to 9.7 × 10^6 gal. The amount used in 1983 was 3.4 × 10^6 gal, the same amount used in 1982.

Los Alamos Reservoir in upper Los Alamos Canyon has a capacity of 13.4 × 10^6 gal, with a drainage area of 6.4 mi^2. The reservoir is used for storage and recreation. Water flows by gravity through about 2.6 miles of distribution lines for irrigation of lawns and shrubs at the Laboratory's Health Research Building, the Los Alamos High School, and Mesa School. The line from the reservoir is not connected to the municipal distribution system.

Annual production from Los Alamos Reservoir used for municipal supply from 1947 through 1958 ranged from 4.8 × 10^6 gal to 54.8 × 10^6 gal (Table V). There is no record of water from the reservoir used for irrigation from 1959 through 1978. Since 1978 the amount used has ranged from 1.3 × 10^6 gal to 2.8 × 10^6 gal. The amount used in 1983 was 1.4 × 10^6 gal, a decrease of 1.4 × 10^6 gal from 2.8 × 10^6 gal used in 1982 (Table V).

V. CHEMICAL QUALITY OF WATER

The quality of water is monitored to determine if the water from wells and in the distribution system meets federal requirements (Standards) for municipal supply. Water samples are collected at wells and at six stations in the distribution system (five fire stations and at Bandelier National Monument).

Primary drinking water standards are related directly to safety of drinking water supplies. Listed in Table VI are 10 primary standards. Comparing these standards with maximum concentrations from wells and distribution systems shows that all constituents were below the standards.

Secondary standards are not related to the safety of drinking water, but to the aesthetic quality. Listed in Table VI are eight secondary standards. All waters from wells and gallery, and the distribution system stations are below the secondary drinking water standards except iron in water from Water Canyon Gallery. The iron concentration was 1.48 mg/ℓ compared with the standard of 0.3 mg/ℓ. Dilution in the distribution system reduces the level of iron to less than 0.3 mg/ℓ (Table VI).

Radiochemical standards are related to safety of drinking water. Radioactivity in the water from the wells, gallery, and distribution station is low, below limits of detection or natural radioactivity in the aquifer (gross alpha, gross beta, total uranium). All concentrations reported were below standards (Table VI).

Water from Well LA-6 is not used as part of the municipal supply because the arsenic concentration in the water exceeds the primary standards. The arsenic is of natural origin in the aquifer. Water could not be mixed with other water to reduce the concentrations in the distribution system to a level below the standards. Arsenic concentrations in 1983 were still high at 0.110 mg/ℓ.

Individual radiochemical analysis, primary chemical standards, secondary chemical standards and miscellaneous chemical constituents for each well, the gallery, stations, and the distribution system are presented in "Environmental Surveillance at Los Alamos During 1983."[16]

VI. SUMMARY AND CONCLUSIONS

Field operations in 1983 were satisfactory even though several wells were down at various times because of pump failure. The loss of production from

TABLE V

PRODUCTION FROM GUAJE AND LOS ALAMOS RESERVOIRS
(1947-1958 and 1972-1983)

Year	Guaje Reservoir[a] (10^6gal)	Los Alamos Reservoir (10^6gal)
1947	87.8	21.7
1948	119.8	31.9
1949	116.1	14.7
1950	79.9	20.6
1951	41	10.5
1952	131	33.6
1953	58	14.8
1954	66	16.9
1955	71	18.1
1956	24	4.8
1957	213	54.8
1958	193	49.4
1972	5.8	---
1973	9.7	---
1974	4.9	---
1975	5.3	---
1976	4.4	---
1977	4.1	---
1978	2.8	---
1979	3.7	1.3
1980	4.7	2.3
1981	2.7	2.1
1982	3.4	2.8
1983	3.4	1.4

[a]Production Guaje Reservoir, 1951-1958, estimated.

Note: Municipal supply production, 1947-1958; irrigation production, 1972-1983.

these wells did not cause a water shortage as the peak demand period was the lowest in the past 7 years (Table II). The addition of the high-yield Well PM-4 to the system in 1982 with another high-yield Well PM-5 to be added later this year will provide additional flexibility to the system in terms of pumpage.

The distribution of pumpage from the Los Alamos Well Fields (60% from Wells LA-4 and LA-5; 40% from Wells LA-1B, LA-2, and LA-3) should be continued. This will help stabilize the water level decline throughout the well field.

TABLE VI

CHEMICAL AND RADIOCHEMICAL QUALITY OF WATER FOR MUNICIPAL USE

		Maximum Concentrations		
	Units	Supply Wells and Gallery	Distribution System	Standards
Primary Chemical Standards[a]				
Ag	mg/ℓ	<0.005	<0.005	0.05
As	mg/ℓ	0.009	0.007	0.05
Ba	mg/ℓ	0.06	0.04	1.0
Cd	mg/ℓ	<0.002	<0.002	0.01
Cr	mg/ℓ	0.025	0.020	0.05
F	mg/ℓ	1.8	1.0	2.0
Hg	mg/ℓ	<0.002	<0.002	0.002
NO_3	mg/ℓ	4.0	3.3	45
Pb	mg/ℓ	<0.003	<0.003	0.05
Se	mg/ℓ	<0.003	<0.003	0.01
Secondary Chemical Standards[b]				
Cl	mg/ℓ	14	7	250
Cu	mg/ℓ	0.01	<0.01	1.0
Fe	mg/ℓ	1.48	0.045	0.3
Mn	mg/ℓ	0.006	<0.001	0.05
SO_4	mg/ℓ	14	8	250
Zn	mg/ℓ	0.02	0.05	5.0
TDS[c]	mg/ℓ	229	197	500
Ph	---	8.4	8.4	6.5 - 8.6
Radiochemical Standards[a]				
^{137}Cs	10^{-9} mCi/mℓ	5 ± 44	75 ± 82	200
^{238}Pu	10^{-9} mCi/mℓ	0.060 ± 0.040	0.029 ± 0.036	15
^{239}Pu	10^{-9} mCi/mℓ	0.050 ± 0.040	0.051 ± 0.036	15
Gross Alpha	10^{-9} mCi/mℓ	7.0 ± 4.0	2.7 ± 1.8	15
Gross Beta	10^{-9} mCi/mℓ	15 ± 3.4	5.0 ± 1.4	---
Total U	mg/ℓ	4.8 ± 0.8	3.7 ± 0.8	20
^{3}H	10^{-6} mCi/mℓ	0.9 ± 0.4	4.4 ± 1.0	1800[d]

[a]Reference 17.
[b]Reference 18.
[c]Total Dissolved Solids.
[d]Reference 19.

ACKNOWLEDGMENTS

Pumping statistics were compiled by Glenn Bryant and G. H. Powell (Zia Company Utility Division). Typesetting and compiling the finished report were done by Kathy Derouin, HSE-8.

REFERENCES

1. W. D. Purtymun and J. E. Herceg, Compilers, "Summary of Los Alamos Municipal Well-Field Characteristics, 1947-1971," Los Alamos Scientific Laboratory report LA-5040-MS (1972).

2. W. D. Purtymun and J. E. Herceg, "Water Supply at Los Alamos During 1971," Los Alamos Scientific Laboratory report LA-5039-MS (1972).

3. W. D. Purtymun and J. E. Herceg, "Water Supply at Los Alamos During 1972," Los Alamos Scientific Laboratory report LA-5296-MS (1973).

4. W. D. Purtymun and J. E. Herceg, "Water Supply at Los Alamos During 1973," Los Alamos Scientific Laboratory report LA-5636-MS (1974).

5. W. D. Purtymun, "Water Supply at Los Alamos During 1974," Los Alamos Scientific Laboratory report LA-5998-MS (1975).

6. W. D. Purtymun, "Water Supply at Los Alamos During 1975," Los Alamos Scientific Laboratory report LA-6461-PR (1976).

7. W. D. Purtymun, "Water Supply at Los Alamos During 1976," Los Alamos Scientific Laboratory report LA-6814-PR (1977).

8. W. D. Purtymun, "Water Supply at Los Alamos During 1977," Los Alamos Scientific Laboratory report LA-7436-MS (1978).

9. W. D. Purtymun, "Water Supply at Los Alamos During 1978," Los Alamos Scientific Laboratory report LA-8074-PR (1979).

10. W. D. Purtymun, "Water Supply at Los Alamos During 1979," Los Alamos Scientific Laboratory report LA-8504-PR (1980).

11. W. D. Purtymun and Max Maes, "Water Supply at Los Alamos During 1980," Los Alamos National Laboratory report LA-8977-PR (1981).

12. W. D. Purtymun, N. M. Becker, and Max Maes, "Water Supply at Los Alamos During 1981," Los Alamos National Laboratory report LA-9734-PR (1983).

13. W. D. Purtymun, N. M. Becker, and M. Maes, "Water Supply at Los Alamos During 1982," Los Alamos National Laboratory report LA-9896-PR (1984).

14. W. D. Purtymun, "Hydrologic Characteristics of the Main Aquifer in the Los Alamos Area: Development of Ground Water Supplies," Los Alamos National Laboratory report LA-9957-MS (1984).

15. W. D. Purtymun, "Hydrologic Characteristics of the Los Alamos Well Field with Reference to the Occurrence of Arsenic in Well LA-6," Los Alamos Scientific Laboratory report LA-7012-MS (1977).

16. Environmental Surveillance Group, HSE-8, "Environmental Monitoring at Los Alamos During 1983," Los Alamos National Laboratory report LA-10100-ENV (1984).

17. US Environmental Protection Agency, "National Interim Primary Drinking Water Regulations," EPA-570/9-76-003, US Government Printing Office, Washington, DC (1976).

18. US Environmental Protection Agency, "National Secondary Drinking Water Regulations," Fed. Reg. **44**, No. 140 (July 19, 1979).

19. International Commission on Radiological Protection, "Recommendations of the International Commission on Radiological Protection," adopted January 17, 1977, Annals at the ICRP (3) (1977).

APPENDIX A

ANNUAL AQUIFER CHARACTERISTICS

Well LA-1

Year	Pump Time (h)	Pumpage (million gal)	Pump Rate (gpm)	Water Level Nonpump (ft)
1947	3468	54.0	259.5	--
1948	2988	34.7	193.6	--
1949	1361	26.7	327.0	--
1950	563	10.5	310.8	19.0
1951	1215	14.6	d00.3	59.0
1952	286	3.4	198.1	40.0
1953	0	0.0	0.0	36.0
1954	0	0.0	0.0	44.0
1955	690	9.7	234.3	51.0
1956	39	0.0	0.0	33.0
1957	0	0.0	0.0	33.0
1958	0	0.0	0.0	10.0
1959	0	0.0	0.0	13.0
1960	0	0.0	0.0	13.0
1961	0	0.0	0.0	59.0
1962	0	0.0	0.0	84.0
1963	0	0.0	0.0	90.0
1964	0	0.0	0.0	95.0
1965	0	0.0	0.0	76.0
1966	0	0.0	0.0	70.0
1967	0	0.0	0.0	52.0
1968	0	0.0	0.0	42.0
1969	0	0.0	0.0	38.0
1970	0	0.0	0.0	37.0
1971	0	0.0	0.0	51.0
1972	0	0.0	0.0	49.0
1973	0	0.0	0.0	55.0
1974	0	0.0	0.0	53.0
1975	0	0.0	0.0	58.0
1976	0	0.0	0.0	69.0
1977	0	0.0	0.0	74.0
1978	0	0.0	0.0	68.0
1979	0	0.0	0.0	38.0
1980	0	0.0	0.0	40.0
1981	0	0.0	0.0	51.0
1982	0	0.0	0.0	98.0
1983	0	0.0	0.0	46.0

APPENDIX A (cont)

Well LA-1B

Year	Pump Time (h)	Pumpage (million gal)	Pump Rate (gpm)	Water Level		Draw-down (ft)	Specific Capacity (gpm/ft)
				Nonpump (ft)	Pump (ft)		
1960	415	36.3	1457.8	7.0	111.0	104.0	14.0
1961	3727	124.7	557.6	54.0	154.0	100.0	5.6
1962	3936	129.1	546.7	72.0	169.0	97.0	5.6
1963	3649	117.4	536.2	74.0	170.0	96.0	5.6
1964	4174	130.3	520.3	81.0	183.0	102.0	5.1
1965	3007	97.9	542.6	63.0	170.0	107.0	5.1
1966	2589	83.9	540.1	50.0	169.0	119.0	4.5
1967	2519	84.9	561.7	39.0	153.0	114.0	4.9
1968	2183	74.0	565.0	32.0	147.0	115.0	4.9
1969	2244	75.7	562.2	22.0	142.0	120.0	4.7
1970	2369	79.7	560.7	22.0	143.0	121.0	4.6
1971	2633	89.1	564.0	31.0	162.0	131.0	4.3
1972	2215	75.3	566.6	31.0	163.0	132.0	4.3
1973	2628	87.2	553.0	37.0	170.0	133.0	4.2
1974	2282	73.9	539.7	35.0	161.0	126.0	4.3
1975	2308	74.4	537.3	42.0	168.0	126.0	4.3
1976	2521	79.6	526.2	50.0	176.0	126.0	4.2
1977	2782	84.2	504.4	47.0	167.0	120.0	4.2
1978	2306	75.6	546.3	42.0	162.0	120.0	4.6
1979	1354	45.9	564.6	13.0	134.0	121.0	4.7
1980	1955	62.9	536.3	21.0	146.0	125.0	4.3
1981	2299	73.9	537.7	26.0	144.0	118.0	4.5
1982	3707	108.1	486.0	71.0	180.0	109.0	4.5
1983	407	12.1	495.0	61.0	160.0	99.0	5.0

APPENDIX A (cont)

Well LA-2

Year	Pump Time (h)	Pumpage (million gal)	Pump Rate (gpm)	Water Level		Draw-down (ft)	Specific Capacity (gpm/ft)
				Nonpump (ft)	Pump (ft)		
1947	963	27.6	477.7	---	---	---	---
1948	3659	59.3	270.1	---	---	---	---
1949	1654	41.8	421.2	---	---	---	---
1950	614	15.6	423.5	59.0	285.0	226.0	1.9
1951	2415	57.7	398.2	111.0	305.0	194.0	2.1
1952	1980	46.3	389.7	101.0	300.0	199.0	2.0
1953	2201	47.2	357.4	100.0	301.0	201.0	1.8
1954	2601	56.8	364.0	116.0	---	---	---
1955	2223	49.4	370.4	110.0	---	---	---
1956	1805	44.2	408.1	84.0	---	---	---
1957	1066	29.6	462.8	53.0	277.0	224.0	2.1
1958	1166	31.1	444.5	60.0	270.0	210.0	2.1
1959	1599	40.7	424.2	71.0	303.0	232.0	1.8
1960	2169	51.6	396.5	76.0	305.0	229.0	1.7
1961	2149	44.4	344.3	101.0	313.0	212.0	1.6
1962	1823	35.7	326.4	111.0	314.0	203.0	1.6
1963	1999	40.7	339.3	127.0	332.0	205.0	1.7
1964	1924	34.2	296.3	137.0	347.0	210.0	1.4
1965	1911	39.8	347.1	121.0	330.0	209.0	1.7
1966	1070	21.4	333.3	108.0	340.0	232.0	1.4
1967	238	4.9	343.1	78.0	304.0	226.0	1.5
1968	502	11.3	375.2	64.0	305.0	241.0	1.6
1969	155	3.8	408.6	50.0	297.0	247.0	1.7
1970	341	7.2	351.9	59.0	310.0	251.0	1.4
1971	1787	31.8	296.6	88.0	318.0	230.0	1.3
1972	2189	39.3	299.2	96.0	322.0	226.0	1.3
1973	2625	46.7	296.5	106.0	334.0	228.0	1.3
1974	2033	36.8	301.7	109.0	325.0	216.0	1.4
1975	2310	40.2	290.0	103.0	320.0	217.0	1.3
1976	2488	39.9	267.3	113.0	322.0	209.0	1.3
1977	2775	42.5	255.3	118.0	314.0	196.0	1.3
1978	2299	39.5	286.4	112.0	338.0	226.0	1.3
1979	1353	26.2	323.0	75.0	316.0	241.0	1.3
1980	1960	33.8	287.4	84.0	318.0	234.0	1.2
1981	1911	34.4	300.0	94.0	336.0	242.0	1.2
1982	3174	51.2	269.0	161.0	348.0	187.0	1.4
1983	2752	54.5	330.0	121.0	321.0	200.0	1.6

APPENDIX A (cont)

Well LA-3

Year	Pump Time (h)	Pumpage (million gal)	Pump Rate (gpm)	Water Level		Draw-down (ft)	Specific Capacity (gpm/ft)
				Nonpump (ft)	Pump (ft)		
1947	1476	64.9	732.8	---	---	---	---
1948	3647	82.5	377.0	---	---	---	---
1949	1505	41.7	461.8	---	---	---	---
1950	2793	57.8	344.9	97.0	231.0	134.0	2.6
1951	3554	66.9	313.7	116.0	233.0	117.0	2.7
1952	2514	58.6	388.5	94.0	218.0	124.0	3.1
1953	3104	69.7	374.2	103.0	229.0	126.0	3.0
1954	2595	57.3	368.0	101.0	225.0	124.0	3.0
1955	2195	48.7	369.8	91.0	226.0	135.0	2.7
1956	1849	42.1	379.5	74.0	222.0	148.0	2.6
1957	1080	26.1	402.8	56.0	219.0	163.0	2.5
1958	1612	33.6	347.4	49.0	225.0	176.0	2.0
1959	1821	35.0	320.3	54.0	231.0	177.0	1.8
1960	2174	38.4	294.4	68.0	230.0	162.0	1.8
1961	1939	34.7	298.3	85.0	189.0	104.0	2.9
1962	2361	45.4	320.5	93.0	192.0	99.0	3.2
1963	2128	42.5	332.9	81.0	197.0	116.0	2.9
1964	2574	50.4	326.3	104.0	217.0	113.0	2.9
1965	1961	43.4	368.9	79.0	220.0	141.0	2.6
1966	2236	46.1	343.6	81.0	219.0	138.0	2.5
1967	2274	47.4	347.4	86.0	218.0	132.0	2.6
1968	2127	42.7	334.6	82.0	251.0	169.0	2.0
1969	2072	40.1	322.6	58.0	246.0	188.0	1.7
1970	2303	44.0	318.4	55.0	241.0	186.0	1.7
1971	2556	45.4	296.0	77.0	250.0	173.0	1.7
1972	2205	39.7	300.1	73.0	251.0	178.0	1.7
1973	977	20.3	346.3	65.0	248.0	183.0	1.9
1974	2291	43.5	316.5	73.0	244.0	171.0	1.9
1975	2306	43.3	313.0	80.0	253.0	173.0	1.8
1976	2474	42.3	285.0	88.0	260.0	172.0	1.7
1977	2779	47.3	283.7	89.0	248.0	159.0	1.8
1978	2308	42.4	306.4	87.0	250.0	163.0	1.9
1979	1343	28.1	348.1	58.0	243.0	185.0	1.9
1980	1952	35.1	299.9	61.0	237.0	176.0	1.7
1981	2297	41.5	301.1	70.0	240.0	170.0	1.8
1982	3691	54.9	247.0	118.0	246.0	128.0	1.9
1983	949	14.7	258.0	89.0	203.0	129.0	2.0

APPENDIX A (cont)

Well LA-4

Year	Pump Time (h)	Pumpage (million gal)	Pump Rate (gpm)	Water Level		Draw-down (ft)	Specific Capacity (gpm/ft)
				Nonpump (ft)	Pump (ft)		
1948	1570	42.7	453.3	---	---	---	---
1949	940	37.5	664.9	---	---	---	---
1950	4350	164.9	631.8	278.0	353.0	75.0	8.4
1951	4909	173.6	589.4	285.0	357.0	72.0	8.2
1952	3429	119.6	581.3	267.0	339.0	72.0	8.1
1953	3034	109.1	599.3	264.0	335.0	71.0	8.4
1954	2133	78.2	611.0	255.0	329.0	74.0	8.3
1955	2647	94.5	595.0	268.0	341.0	73.0	8.2
1956	3402	120.2	588.9	273.0	346.0	73.0	8.1
1957	2844	105.4	617.7	270.0	345.0	75.0	8.2
1958	2973	110.3	618.3	270.0	342.0	72.0	8.6
1959	3084	113.5	613.4	275.0	346.0	71.0	8.6
1960	4084	145.6	594.2	296.0	365.0	69.0	8.6
1961	3687	129.7	586.3	296.0	365.0	69.0	8.5
1962	3688	129.3	584.3	286.0	359.0	73.0	8.0
1963	3718	130.5	585.0	280.0	351.0	71.0	8.2
1964	4500	155.0	574.1	291.0	361.0	70.0	8.2
1965	3110	111.4	597.0	279.0	349.0	70.0	8.5
1966	3279	115.6	587.6	285.0	356.0	71.0	8.3
1967	2127	77.1	604.1	278.0	350.0	72.0	8.4
1968	2276	81.7	598.3	280.0	351.0	71.0	8.4
1969	1694	61.8	608.0	282.0	358.0	76.0	8.0
1970	2333	83.5	596.5	286.0	363.0	77.0	7.7
1971	2519	89.0	588.9	287.0	373.0	86.0	6.8
1972	2322	82.6	592.9	282.0	367.0	85.0	7.0
1973	2616	92.4	588.7	294.0	377.0	83.0	7.1
1974	2306	82.2	594.1	286.0	367.0	81.0	7.3
1975	2319	82.3	591.5	272.0	355.0	83.0	7.1
1976	2802	98.2	584.1	277.0	373.0	96.0	6.1
1977	2741	96.4	586.2	278.0	374.0	96.0	6.1
1978	2248	80.1	594.2	271.0	368.0	97.0	6.1
1979	2964	104.6	587.9	280.0	376.0	96.0	6.1
1980	3322	115.3	578.5	284.0	385.0	101.0	5.7
1981	2573	89.4	579.1	289.0	393.0	104.0	5.6
1982	0	0	0	---	---	---	---
1983	1840	61.5	557.0	287.0	392.0	105.0	5.3

APPENDIX A (cont)

Well LA-5

Year	Pump Time (h)	Pumpage (million gal)	Pump Rate (gpm)	Water Level		Draw-down (ft)	Specific Capacity (gpm/ft)
				Nonpump (ft)	Pump (ft)		
1948	1171	40.4	575.0	---	---	---	---
1949	1763	58.5	553.0	---	---	---	---
1950	4052	130.1	535.1	131.0	254.0	123.0	4.4
1951	6004	187.4	520.2	162.0	272.0	110.0	4.7
1952	3425	109.6	533.3	147.0	259.0	112.0	4.8
1953	3278	103.9	528.3	141.0	257.0	116.0	4.6
1954	2546	80.1	524.4	137.0	259.0	122.0	4.3
1955	3158	97.3	513.5	145.0	267.0	122.0	4.2
1956	3476	104.5	501.1	150.0	276.0	126.0	4.0
1957	2868	86.0	499.8	150.0	277.0	127.0	3.9
1958	3009	89.9	498.0	151.0	277.0	126.0	4.0
1959	3088	93.5	504.6	155.0	280.0	125.0	4.0
1960	4088	119.1	485.6	168.0	288.0	120.0	4.0
1961	3534	100.3	473.0	165.0	288.0	123.0	3.8
1962	3735	107.7	480.6	172.0	---	---	---
1963	3726	105.0	469.7	171.0	---	---	---
1964	4236	118.8	467.4	184.0	---	---	---
1965	1740	50.5	483.7	180.0	---	---	---
1966	2817	79.3	469.2	180.0	---	---	---
1967	2533	73.7	484.9	168.0	---	---	---
1968	2233	63.3	472.5	161.0	300.0	139.0	3.4
1969	2402	68.5	475.3	161.0	298.0	137.0	3.5
1970	2353	66.1	468.2	157.0	300.0	143.0	3.3
1971	2659	74.4	466.3	155.0	302.0	147.0	3.2
1972	2301	64.4	466.5	153.0	304.0	151.0	3.1
1973	2476	68.3	459.7	156.0	308.0	152.0	3.0
1974	1903	52.5	459.8	154.0	306.0	152.0	3.0
1975	2318	63.9	459.4	149.0	309.0	160.0	2.9
1976	2799	77.6	462.1	150.0	310.0	160.0	2.9
1977	2665	74.8	467.8	147.0	303.0	156.0	3.0
1978	2274	64.9	475.8	145.0	299.0	154.0	3.1
1979	2964	84.0	472.4	149.0	301.0	152.0	3.1
1980	3316	92.2	463.6	153.0	300.0	147.0	3.2
1981	3523	96.5	456.5	158.0	304.0	146.0	3.1
1982	3654	102.3	467.0	168.0	299.0	136.0	3.4
1983	2842	78.1	458.0	154.0	295.0	141.0	3.2

APPENDIX A (cont)

Well LA-6

Year	Pump Time (h)	Pumpage (million gal)	Pump Rate (gpm)	Water Level		Draw-down (ft)	Specific Capacity (gpm/ft)
				Nonpump (ft)	Pump (ft)		
1948	116	4.9	704.0	---	---	---	---
1949	2451	95.8	651.4	---	---	---	---
1950	4490	167.9	623.2	83.0	136.0	53.0	11.8
1951	5882	201.6	571.2	115.0	160.0	45.0	12.7
1952	3168	110.3	580.3	108.0	151.0	43.0	13.5
1953	3177	113.8	597.0	95.0	139.0	44.0	13.6
1954	2894	107.1	616.8	92.0	135.0	43.0	14.3
1955	2911	108.0	618.3	97.0	140.0	43.0	14.4
1956	3438	125.8	609.9	106.0	149.0	43.0	14.2
1957	2833	102.4	602.4	107.0	152.0	45.0	13.4
1958	2957	106.9	602.5	108.0	131.0	43.0	14.0
1959	3096	108.3	583.0	115.0	158.0	43.0	13.6
1960	4084	138.6	565.6	130.0	172.0	42.0	13.5
1961	3284	112.5	571.0	129.0	171.0	42.0	13.6
1962	3886	129.4	555.0	135.0	175.0	40.0	13.9
1963	2953	102.9	580.8	125.0	171.0	46.0	12.6
1964	4244	138.3	543.1	132.0	172.0	40.0	13.6
1965	3145	103.8	550.1	120.0	160.0	40.0	13.8
1966	3173	104.0	546.3	129.0	169.0	40.0	13.7
1967	2511	85.4	566.8	118.0	158.0	40.0	14.2
1968	2111	71.6	565.3	109.0	150.0	41.0	13.8
1969	2402	81.6	566.2	109.0	151.0	42.0	13.5
1970	2337	79.1	564.1	106.0	149.0	43.0	13.1
1971	2472	82.5	556.2	119.0	160.0	41.0	13.6
1972	2317	79.2	569.7	117.0	155.0	38.0	15.0
1973	2638	90.6	572.4	118.0	155.0	37.0	15.5
1974	2337	79.8	569.1	120.0	156.0	36.0	15.8
1975	1571	51.9	550.6	113.0	151.0	38.0	14.5
1976	175	5.1	485.7	96.0	---	---	---
1977	---	---	---	82.0	---	---	---
1978	33	1.1	572.7	77.0	142.0	65.0	8.8
1979	6	0.2	555.6	80.0	146.0	66.0	8.4
1980	4	0.1	520.8	82.0	142.0	60.0	8.7
1981	2.3	0.08	579.8	84.0	141.0	57.0	10.2
1982	---	---	---	90.0	---	---	---
1983	---	---	---	81.0	---	---	---

APPENDIX A (cont)

Well G-1

Year	Pump Time (h)	Pumpage (million gal)	Pump Rate (gpm)	Water Level		Draw-down (ft)	Specific Capacity (gpm/ft)
				Nonpump (ft)	Pump (ft)		
1950	0	2.8	0.0	195.0	---	---	---
1951	1168	37.7	538.0	202.0	309.0	107.0	5.0
1952	2476	75.5	508.2	213.0	295.0	82.0	6.2
1953	3275	97.3	495.2	221.0	292.0	71.0	7.0
1954	2616	77.8	495.7	221.0	290.0	69.0	7.2
1955	2406	70.5	488.4	226.0	295.0	69.0	7.1
1956	2958	83.2	468.8	235.0	303.0	68.0	6.9
1957	2098	55.9	444.1	236.0	307.0	71.0	6.3
1958	2460	68.1	461.4	238.0	308.0	70.0	6.6
1959	2952	82.4	465.2	245.0	314.0	69.0	6.7
1960	3564	96.0	448.9	254.0	325.0	71.0	6.3
1961	4236	112.4	442.2	260.0	333.0	73.0	6.1
1962	3431	93.6	454.7	258.0	342.0	84.0	5.4
1963	4519	114.9	423.8	265.0	348.0	83.0	5.1
1964	4374	113.8	433.6	269.0	352.0	83.0	5.2
1965	3530	90.7	428.2	268.0	352.0	84.0	5.1
1966	4074	102.6	419.7	269.0	363.0	94.0	4.5
1967	2615	69.9	445.5	266.0	362.0	96.0	4.6
1968	2996	78.9	438.9	264.0	366.0	102.0	4.3
1969	2657	68.3	428.4	266.0	376.0	110.0	3.9
1970	2712	64.7	397.6	264.0	377.0	113.0	3.5
1971	2908	67.9	389.2	258.0	378.0	120.0	3.2
1972	2865	66.1	384.5	264.0	389.0	125.0	3.1
1973	2997	67.5	375.4	271.0	403.0	132.0	2.8
1974	2767	62.3	375.3	283.0	412.0	129.0	2.9
1975	2467	55.7	376.3	293.0	411.0	118.0	3.2
1976	2962	65.1	366.3	---	---	---	---
1977	2734	57.9	353.0	275.0	426.0	151.0	2.3
1978	2656	56.0	351.4	270.0	419.0	149.0	2.4
1979	2998	61.7	342.9	271.0	422.0	151.0	2.3
1980	3459	68.3	329.0	273.0	428.0	155.0	2.1
1981	4427	81.6	307.2	275.0	444.0	169.0	1.8
1982	3678	69.0	313.0	278.0	443.0	165.0	1.9
1983	2871	52.2	303.0	272.0	443.0	171.0	1.8

APPENDIX A (cont)

Well G-1A

Year	Pump Time (h)	Pumpage (million gal)	Pump Rate (gpm)	Water Level		Draw-down (ft)	Specific Capacity (gpm/ft)
				Nonpump (ft)	Pump (ft)		
1954	108	4.6	709.9	--	--	--	--
1955	1531	53.0	577.0	265.0	316.0	51.0	11.3
1956	3130	107.7	573.5	273.0	323.0	50.0	11.5
1957	2470	87.0	587.0	274.0	327.0	53.0	11.1
1958	2670	92.5	577.4	279.0	331.0	52.0	11.1
1959	2965	102.7	577.3	284.0	333.0	49.0	11.8
1960	3641	122.8	562.1	291.0	342.0	51.0	11.0
1961	4297	147.3	571.3	298.0	350.0	52.0	11.0
1962	3972	136.1	571.1	295.0	344.0	49.0	11.7
1963	4525	149.7	551.4	301.0	350.0	49.0	11.3
1964	3852	129.3	559.4	302.0	353.0	51.0	11.0
1965	3505	116.5	554.0	302.0	353.0	51.0	10.9
1966	3964	133.4	560.9	306.0	355.0	49.0	11.4
1967	2720	91.3	559.4	302.0	351.0	49.0	11.4
1968	3089	103.2	556.8	302.0	352.0	50.0	11.1
1969	2695	90.7	560.9	303.0	356.0	53.0	10.6
1970	2772	92.5	556.2	300.0	357.0	57.0	9.8
1971	3313	111.8	562.4	303.0	361.0	58.0	9.7
1972	2879	94.0	544.2	302.0	361.0	59.0	9.2
1973	2760	87.9	530.8	302.0	362.0	60.0	8.8
1974	2974	92.7	519.5	307.0	355.0	48.0	10.8
1975	2740	85.3	518.9	304.0	351.0	47.0	11.0
1976	2983	91.6	511.8	302.0	350.0	48.0	10.7
1977	2942	88.7	502.5	302.0	350.0	48.0	10.5
1978	2631	77.9	493.5	300.0	345.0	45.0	11.0
1979	2974	88.0	493.9	301.0	345.0	44.0	11.0
1980	3480	103.2	494.4	305.0	345.0	40.0	12.4
1981	4212	131.2	519.1	307.0	347.0	40.0	13.0
1982	3618	109.7	505.0	305.0	347.0	42.0	12.0
1983	2901	86.7	498.0	301.0	336.0	35.0	14.2

APPENDIX A (cont)

Well G-2

Year	Pump Time (h)	Pumpage (million gal)	Pump Rate (gpm)	Water Level		Draw-down (ft)	Specific Capacity (gpm/ft)
				Nonpump (ft)	Pump (ft)		
1951	123	3.9	528.5	259.0	---	---	---
1952	2372	78.3	550.2	279.0	327.0	48.0	11.5
1953	3254	105.6	540.9	290.0	334.0	44.0	12.3
1954	2682	86.3	536.3	291.0	335.0	44.0	12.2
1955	2487	78.8	528.1	299.0	345.0	46.0	11.5
1956	3109	95.8	513.6	310.0	357.0	47.0	10.9
1957	2458	76.1	516.0	311.0	360.0	49.0	10.5
1958	2707	80.1	493.2	315.0	361.0	46.0	10.7
1959	2938	84.6	479.9	320.0	363.0	43.0	11.2
1960	3535	96.6	455.4	328.0	370.0	42.0	10.8
1961	3982	105.3	440.7	336.0	375.0	39.0	11.3
1962	4076	99.8	408.1	338.0	374.0	36.0	11.3
1963	4563	105.7	386.1	344.0	379.0	35.0	11.0
1964	4541	105.3	386.5	346.0	380.0	34.0	11.4
1965	3535	82.6	389.4	346.0	381.0	35.0	11.1
1966	3994	94.7	395.2	349.0	383.0	34.0	11.6
1967	2743	67.6	410.7	344.0	379.0	35.0	11.7
1968	2732	66.5	405.7	344.0	379.0	35.0	11.6
1969	2679	68.6	426.8	344.0	381.0	37.0	11.5
1970	2431	62.8	430.5	343.0	381.0	38.0	11.3
1971	3420	87.4	425.9	345.0	384.0	39.0	10.9
1972	2887	73.4	423.7	348.0	388.0	40.0	10.6
1973	2816	72.4	428.5	344.0	385.0	41.0	10.5
1974	3056	82.0	447.2	347.0	390.0	43.0	10.4
1975	2724	74.5	455.8	341.0	384.0	43.0	10.6
1976	2990	81.1	452.1	344.0	388.0	44.0	10.3
1977	2981	80.4	449.5	346.0	388.0	42.0	10.7
1978	2562	71.6	451.9	345.0	386.0	41.0	11.0
1979	2975	80.0	448.0	347.0	388.0	41.0	11.0
1980	3478	92.4	443.0	350.0	389.0	39.0	11.4
1981	1432	38.3	445.8	352.0	390.0	38.0	11.7
1982	2833	25.7	476.0	352.0	399.0	47.0	10.1
1983	624	16.5	441.0	356.0	399.0	43.0	10.3

APPENDIX A (cont)

Well G-3

Year	Pump Time (h)	Pumpage (million gal)	Pump Rate (gpm)	Water Level		Draw-down (ft)	Specific Capacity (gpm/ft)
				Nonpump (ft)	Pump (ft)		
1951	192	7.3	633.7	281.0	--	--	--
1952	2379	65.4	458.2	310.0	358.0	48.0	9.5
1953	3192	76.4	398.9	322.0	360.0	38.0	10.5
1954	2675	66.1	411.8	322.0	370.0	48.0	8.6
1955	2369	69.4	488.3	316.0	368.0	52.0	9.4
1956	3149	87.9	465.2	324.0	380.0	56.0	8.3
1957	2517	70.2	464.8	324.0	385.0	61.0	7.6
1958	2562	69.5	452.1	323.0	386.0	63.0	7.2
1959	2931	74.6	424.2	326.0	395.0	69.0	6.1
1960	3591	82.5	382.9	335.0	407.0	72.0	5.3
1961	3612	79.9	368.7	343.0	414.0	71.0	5.2
1962	4057	83.7	343.9	348.0	418.0	70.0	4.9
1963	4555	86.7	317.2	352.0	422.0	70.0	4.5
1964	4487	78.6	292.0	355.0	424.0	69.0	4.2
1965	3498	65.6	312.6	350.0	419.0	69.0	4.5
1966	3991	73.7	307.8	353.0	420.0	67.0	4.6
1967	2752	52.9	320.4	344.0	418.0	74.0	4.3
1968	3086	56.5	305.1	341.0	418.0	77.0	4.0
1969	2672	50.8	316.9	338.0	417.0	79.0	4.0
1970	2736	55.4	337.5	336.0	419.0	83.0	4.1
1971	3337	64.2	320.6	342.0	423.0	81.0	4.0
1972	2838	50.9	298.9	341.0	421.0	80.0	3.7
1973	2843	47.3	277.3	341.0	418.0	77.0	3.6
1974	3006	49.3	273.3	342.0	424.0	82.0	3.3
1975	2632	43.1	272.9	341.0	428.0	87.0	3.1
1976	2971	82.6	463.4	359.0	447.0	88.0	5.3
1977	2961	78.9	444.1	353.0	448.0	95.0	4.7
1978	2590	66.4	427.5	345.0	443.0	98.0	4.4
1979	3014	69.0	381.0	345.0	450.0	105.0	3.6
1980	3448	61.8	298.6	348.0	453.0	105.0	2.8
1981	4315	66.6	257.2	357.0	467.0	110.0	2.3
1982	3550	51.0	239.0	349.0	459.0	110.0	2.2
1983	2183	31.3	239.0	340.0	463.0	123.0	1.9

APPENDIX A (cont)

Well G-4

Year	Pump Time (h)	Pumpage (million gal)	Pump Rate (gpm)	Water Level		Draw-down (ft)	Specific Capacity (gpm/ft)
				Nonpump (ft)	Pump (ft)		
1951	---	12.5	---	357.0	477.0	120.0	---
1952	2401	56.9	395.0	374.0	474.0	100.0	3.9
1953	2677	55.2	343.7	380.0	472.0	92.0	3.7
1954	2256	58.8	434.4	383.0	526.0	143.0	3.0
1955	1172	22.7	322.8	378.0	481.0	103.0	3.1
1956	1800	33.9	313.9	377.0	491.0	114.0	2.8
1957	1324	24.2	304.6	373.0	498.0	125.0	2.4
1958	1970	35.9	303.7	370.0	490.0	120.0	2.5
1959	1819	31.6	289.5	378.0	494.0	116.0	2.5
1960	2457	37.0	251.0	385.0	509.0	124.0	2.0
1961	2787	45.0	269.1	389.0	512.0	123.0	2.2
1962	2738	41.7	253.8	386.0	505.0	119.0	2.1
1963	3519	46.4	219.8	388.0	504.0	116.0	1.9
1964	3561	42.9	200.8	396.0	499.0	103.0	1.9
1965	2100	23.8	188.9	394.0	492.0	98.0	1.9
1966	2219	33.6	252.4	391.0	498.0	107.0	2.4
1967	2690	44.8	277.6	388.0	509.0	121.0	2.3
1968	2083	31.4	251.2	386.0	509.0	123.0	2.0
1969	1309	17.4	221.5	387.0	505.0	118.0	1.9
1970	606	7.7	211.8	384.0	504.0	120.0	1.8
1971	1640	21.0	213.4	389.0	503.0	114.0	1.9
1972	2840	33.3	195.4	391.0	507.0	116.0	1.7
1973	3006	37.2	206.3	392.0	521.0	129.0	1.6
1974	2672	34.3	213.9	392.0	519.0	127.0	1.7
1975	1977	41.0	345.6	403.0	559.0	156.0	2.2
1976	2859	57.8	336.9	406.0	571.0	165.0	2.0
1977	2954	62.4	352.1	406.0	589.0	183.0	1.9
1978	2607	49.5	316.5	398.0	589.0	191.0	1.7
1979	2974	52.9	296.4	395.0	586.0	191.0	1.6
1980	2235	35.6	265.7	394.0	580.0	186.0	1.4
1981	432	8.2	316.4	385.0	573.0	188.0	1.7
1982	3657	65.2	297.0	386.0	578.0	192.0	1.5
1983	2604	42.2	270.0	---	---	---	---

APPENDIX A (cont)

Well G-5

Year	Pump Time (h)	Pumpage (million gal)	Pump Rate (gpm)	Water Level		Draw-down (ft)	Specific Capacity (gpm/ft)
				Nonpump (ft)	Pump (ft)		
1951	---	6.7	---	414.0	---	---	---
1952	2579	73.8	476.9	422.0	480.0	58.0	8.2
1953	1433	37.8	439.6	425.0	467.0	42.0	10.5
1954	2617	80.9	515.2	429.0	473.0	44.0	11.7
1955	2529	80.4	529.9	427.0	472.0	45.0	11.8
1956	3052	97.0	529.7	431.0	478.0	47.0	11.3
1957	2385	64.1	447.9	424.0	466.0	42.0	10.7
1958	1523	49.1	537.3	428.0	477.0	49.0	11.0
1959	2917	101.7	581.1	435.0	495.0	60.0	9.7
1960	2828	98.0	577.6	437.0	501.0	64.0	9.0
1961	3908	134.0	571.5	438.0	507.0	69.0	8.3
1962	4186	142.0	565.4	440.0	511.0	71.0	8.0
1963	4528	151.0	555.8	441.0	513.0	72.0	7.7
1964	4532	150.4	553.1	446.0	516.0	70.0	7.9
1965	3520	117.1	554.5	443.0	516.0	73.0	7.6
1966	2555	83.2	542.7	445.0	520.0	75.0	7.2
1967	2405	80.0	554.4	444.0	519.0	75.0	7.4
1968	2513	81.2	538.5	443.0	517.0	74.0	7.3
1969	2649	83.3	524.1	450.0	520.0	70.0	7.5
1970	2771	88.9	534.7	453.0	521.0	68.0	7.9
1971	2657	88.3	553.9	450.0	521.0	71.0	7.8
1972	2902	92.4	530.7	441.0	514.0	73.0	7.3
1973	3003	97.5	541.1	444.0	515.0	71.0	7.6
1974	2054	69.0	559.9	440.0	513.0	73.0	7.7
1975	2266	74.7	549.4	433.0	500.0	67.0	8.2
1976	2955	95.0	535.8	442.0	504.0	62.0	8.6
1977	2836	92.1	541.3	444.0	504.0	60.0	9.0
1978	2608	84.2	538.4	442.0	502.0	60.0	9.0
1979	2766	86.5	521.5	442.0	502.0	60.0	8.7
1980	2896	89.0	512.4	442.0	502.0	60.0	8.5
1981	2124	66.7	523.4	451.0	528.0	77.0	6.8
1982	1219	38.2	522.0	455.0	510.0	55.0	9.5
1983	2904	73.2	420.0	445.0	492.0	47.0	8.9

APPENDIX A (cont)

Well G-6

Year	Pump Time (h)	Pumpage (million gal)	Pump Rate (gpm)	Nonpump (ft)	Pump (ft)	Draw-down (ft)	Specific Capacity (gpm/ft)
1964	1912	45.0	392.3	581.0	659.0	78.0	5.0
1965	3200	74.9	390.1	582.0	660.0	78.0	5.0
1966	3931	92.2	390.9	585.0	658.0	73.0	5.4
1967	2454	57.8	392.6	580.0	653.0	73.0	5.4
1968	2597	56.2	360.7	574.0	647.0	73.0	4.9
1969	2698	55.6	343.5	568.0	636.0	68.0	5.1
1970	2765	51.0	307.4	569.0	634.0	65.0	4.7
1971	2932	42.8	243.3	573.0	629.0	56.0	4.3
1972	2516	57.0	377.6	578.0	670.0	92.0	4.1
1973	2991	65.3	363.9	579.0	667.0	88.0	4.1
1974	2950	63.8	360.5	579.0	665.0	86.0	4.2
1975	2717	56.7	347.8	577.0	659.0	82.0	4.2
1976	2966	57.8	324.8	584.0	662.0	78.0	4.2
1977	2954	54.4	306.9	586.0	659.0	73.0	4.2
1978	2218	38.4	288.9	581.0	645.0	64.0	4.5
1979	1030	18.2	295.1	579.0	645.0	66.0	4.8
1980	1789	34.5	321.5	583.0	670.0	87.0	3.7
1981	4302	76.5	296.4	586.0	673.0	87.0	3.4
1982	3763	63.6	281.0	588.0	669.0	81.0	3.5
1983	1960	35.4	301.0	582.0	668.0	86.0	3.5

APPENDIX A (cont)

Well PM-1

Year	Pump Time (h)	Pumpage (million gal)	Pump Rate (gpm)	Water Level		Draw-down (ft)	Specific Capacity (gpm/ft)
				Nonpump (ft)	Pump (ft)		
1965	2754	99.2	600.3	746.0	786.0	40.0	15.0
1966	3086	108.0	583.3	740.0	779.0	39.0	15.0
1967	2870	111.0	644.6	737.0	781.0	44.0	14.6
1968	1846	68.1	614.8	735.0	769.0	34.0	18.1
1969	951	34.4	602.9	733.0	766.0	33.0	18.3
1970	1781	66.2	619.5	733.0	769.0	36.0	17.2
1971	2728	101.0	617.1	733.0	766.0	33.0	18.7
1972	2415	84.9	585.9	735.0	762.0	27.0	21.7
1973	1688	46.5	459.1	736.0	755.0	19.0	24.2
1974	2649	96.3	605.9	740.0	768.0	28.0	21.6
1975	2567	94.8	615.5	741.0	766.0	25.0	24.6
1976	2933	106.8	606.9	744.0	767.0	23.0	26.4
1977	2969	105.4	591.7	745.0	767.0	22.0	26.9
1978	2544	90.6	593.3	745.0	767.0	22.0	27.0
1979	2350	83.4	591.5	744.0	766.0	22.0	26.9
1980	2786	98.7	590.7	746.0	769.0	23.0	25.7
1981	2789	98.5	588.6	747.0	769.0	22.0	26.8
1982	2820	99.6	589.0	748.0	770.0	22.0	26.8
1983	2464	86.5	585.0	747.0	769.0	22.0	26.6

APPENDIX A (cont)

Well PM-2

Year	Pump Time (h)	Pumpage (million gal)	Pump Rate (gpm)	Water Level		Draw-down (ft)	Specific Capacity (gpm/ft)
				Nonpump (ft)	Pump (ft)		
1966	221	18.9	1425.3	826.0	889.0	63.0	22.6
1967	4336	370.0	1422.2	834.0	888.0	54.0	26.3
1968	3865	328.2	1415.3	838.0	889.0	51.0	27.8
1969	3304	279.9	1411.9	838.0	890.0	52.0	27.2
1970	3529	300.6	1419.7	839.0	893.0	54.0	26.3
1971	4035	339.5	1402.3	841.0	898.0	57.0	24.6
1972	4611	385.3	1392.7	845.0	902.0	57.0	24.4
1973	4571	380.6	1387.7	849.0	907.0	58.0	23.9
1974	5443	450.9	1380.7	853.0	912.0	59.0	23.4
1975	4644	385.3	1382.8	854.0	913.0	59.0	23.4
1976	5382	442.0	1368.8	866.0	924.0	58.0	23.6
1977	3306	272.8	1375.3	868.0	924.0	56.0	24.6
1978	4743	388.4	1364.9	871.0	928.0	57.0	23.9
1979	4671	381.8	1362.2	872.0	924.0	52.0	26.2
1980	5023	409.6	1359.2	873.0	931.0	58.0	23.4
1981	4551	370.1	1355.4	876.0	934.0	58.0	23.4
1982	4319	359.3	1386.0	874.0	934.0	60.0	23.1
1983	1922	157.9	1369.0	876.0	935.0	59.0	23.2

APPENDIX A (cont)

Well PM-3

Year	Pump Time (h)	Pumpage (million gal)	Pump Rate (gpm)	Water Level		Draw-down (ft)	Specific Capacity (gpm/ft)
				Nonpump (ft)	Pump (ft)		
1968	2327	187.4	1342.2	743.0	771.0	28.0	47.9
1969	3241	254.7	1309.8	746.0	772.0	26.0	50.4
1970	2905	227.8	1306.9	750.0	774.0	24.0	54.5
1971	2774	216.3	1299.6	751.0	774.0	23.0	56.5
1972	2445	192.1	1309.5	752.0	775.0	23.0	56.9
1973	3256	257.8	1319.6	755.0	778.0	23.0	57.4
1974	3241	255.3	1312.9	756.0	779.0	23.0	57.1
1975	3421	269.3	1312.0	757.0	780.0	23.0	57.0
1976	3171	268.3	1410.2	758.0	784.0	26.0	54.2
1977	2792	235.5	1405.8	758.0	784.0	26.0	54.1
1978	2516	211.0	1397.6	759.0	784.0	25.0	55.9
1979	2359	197.2	1393.0	760.0	784.0	24.0	58.0
1980	2796	234.4	1397.2	760.0	785.0	25.0	55.9
1981	2784	232.4	1391.3	761.0	786.0	25.0	55.6
1982	2831	238.1	1402.0	762.0	785.0	23.0	60.9
1983	2496	207.6	1386.0	762.0	785.0	23.0	60.3

APPENDIX A (cont)

Well PM-4

Year	Pump Time (h)	Pumpage (million (gal)	Pump Rate (gpm)	Water Level		Draw-down (ft)	Specific Capacity (gpm/ft)
				Nonpump (ft)	Pump (ft)		
1982	869	76.2	1460	1050	1091	41	35.6
1983	5267	452.5	1432	1066	1101	35	40.9

APPENDIX A (cont)

Water Canyon Gallery

Year	Time (h)	Production (million gal)	Discharge Rate (gpm)
1947	8760	84.0	159.8
1948	8784	97.0	184.0
1949	8760	92.0	175.0
1950	8760	54.0	102.7
1951	8760	39.0	74.2
1952	8784	48.0	91.1
1953	8760	39.0	74.2
1954	8760	40.0	76.1
1955	8760	33.0	62.8
1956	8784	23.0	43.6
1957	8760	40.0	76.1
1958	8760	60.0	114.2
1959	8760	54.0	102.7
1960	8784	48.0	91.1
1961	8760	54.0	102.7
1962	8760	67.0	127.5
1963	8760	51.0	97.0
1964	8784	45.0	85.4
1965	8760	72.0	137.0
1966	8760	82.0	156.0
1967	8760	56.0	106.5
1968	8784	65.0	123.3
1969	8760	80.0	152.2
1970	8760	65.0	123.7
1971	8760	37.0	70.4
1972	8784	40.0	75.9
1973	8760	49.0	93.2
1974	8760	35.0	66.6
1975	8760	42.0	79.9
1976	8784	41.0	77.8
1977	8760	57.0	108.4
1978	8760	45.0	86.2
1979	8760	44.0	83.7
1980	8784	32.0	60.7
1981	8760	45.5	86.6
1982	8760	45.9	94.9
1983	8760	38.2	72.7

APPENDIX B

ANNUAL AVERAGE WATER LEVELS

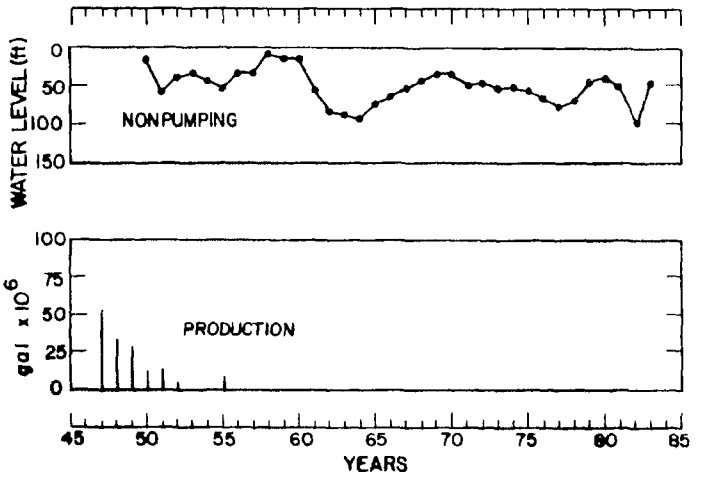


Fig. B1.
Annual average nonpumping water level and annual production, Los Alamos Well LA-1.

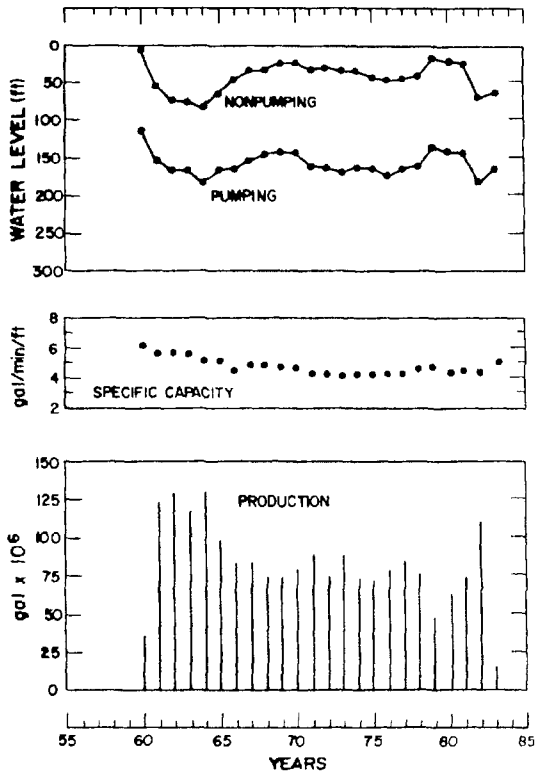


Fig. B2.
Annual average nonpumping and pumping water levels, annual average specific capacity, and annual production, Los Alamos Well LA-1B.

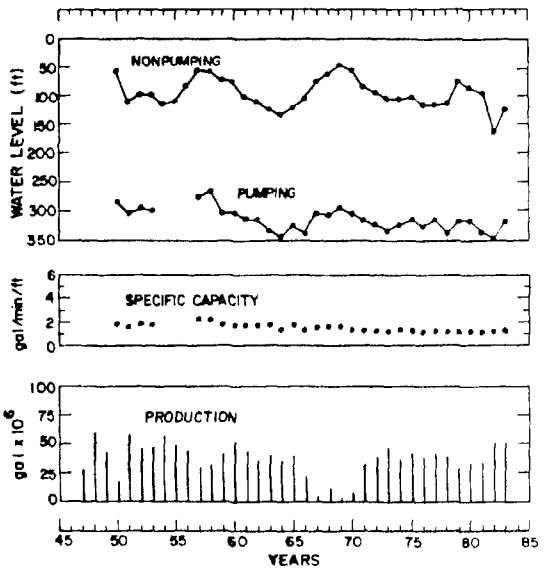


Fig. B3.
Annual average nonpumping and pumping water levels, annual average specific capacity, and annual production, Los Alamos Well LA-2.

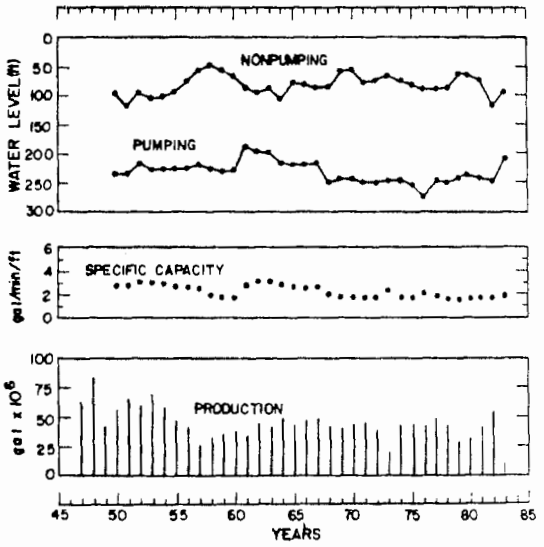


Fig. B4.
Annual average nonpumping and pumping water levels, annual average specific capacity, and annual production, Los Alamos Well LA-3.

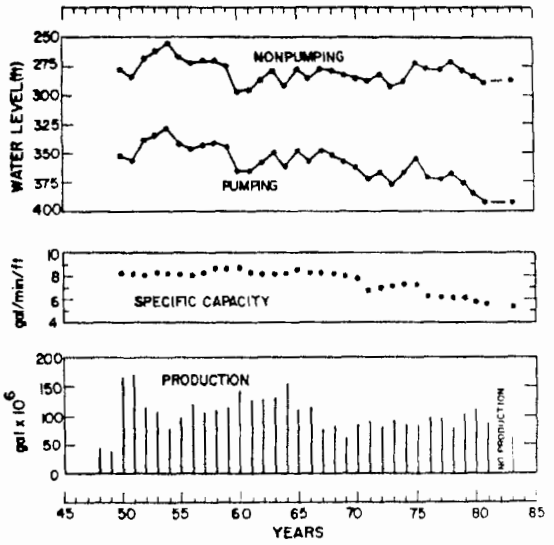


Fig. B5.
Annual average nonpumping and pumping water levels, annual average specific capacity, and annual production, Los Alamos Well LA-4.

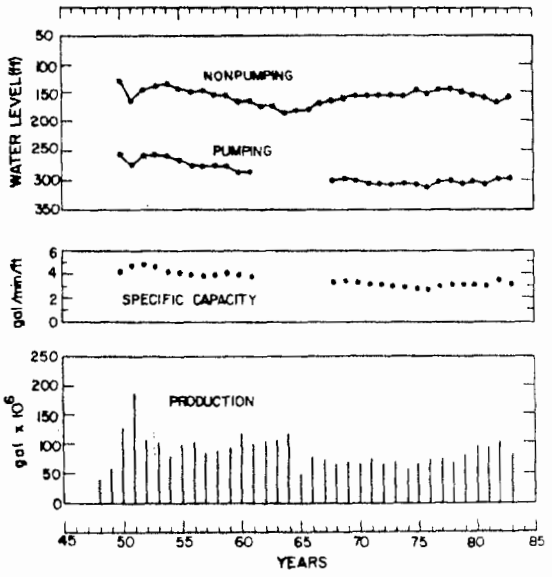


Fig. B6.
Annual average nonpumping and pumping water levels, annual average specific capacity, and annual production, Los Alamos Well LA-5.

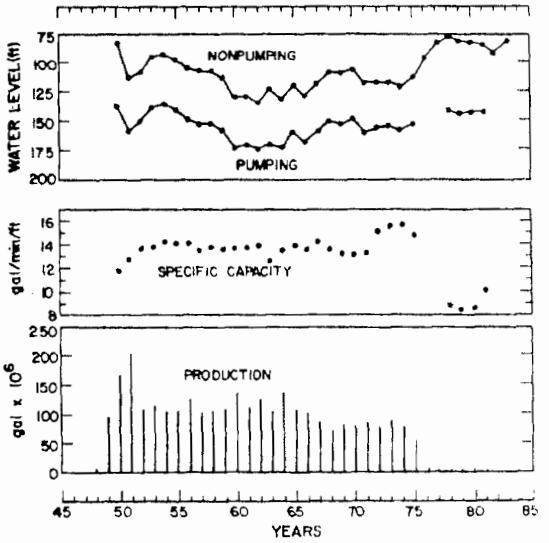


Fig. B7.
Annual average nonpumping and pumping water levels, annual average specific capacity, and annual production, Los Alamos Well LA-6.

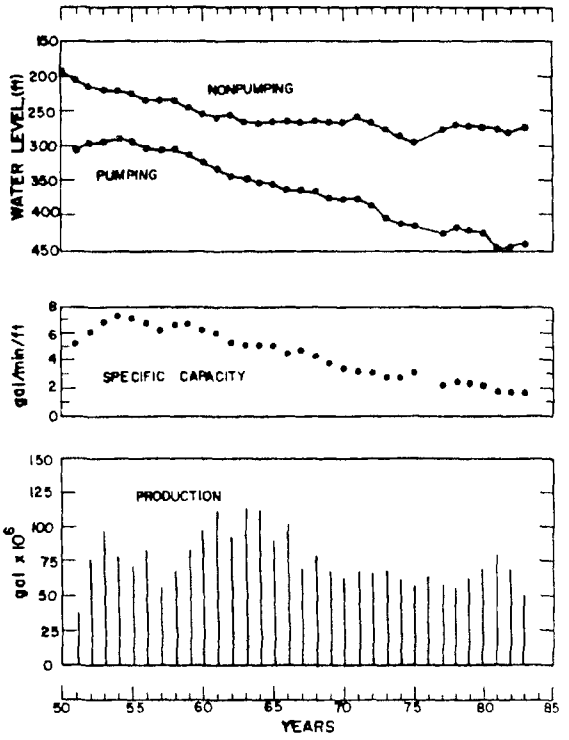


Fig. B8.
Annual average nonpumping and pumping water levels, annual average specific capacity, and annual production, Guaje Well G-1.

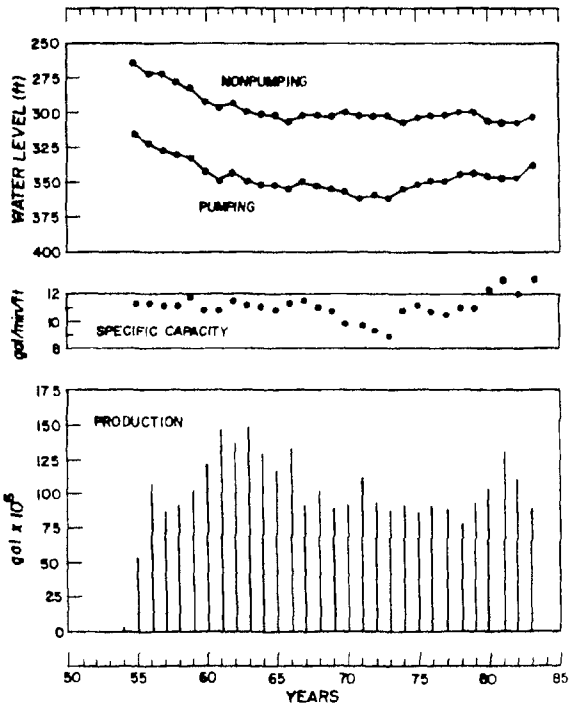


Fig. B9.
Annual average nonpumping and pumping water levels, annual average specific capacity, and annual production, Guaje Well G-1A.

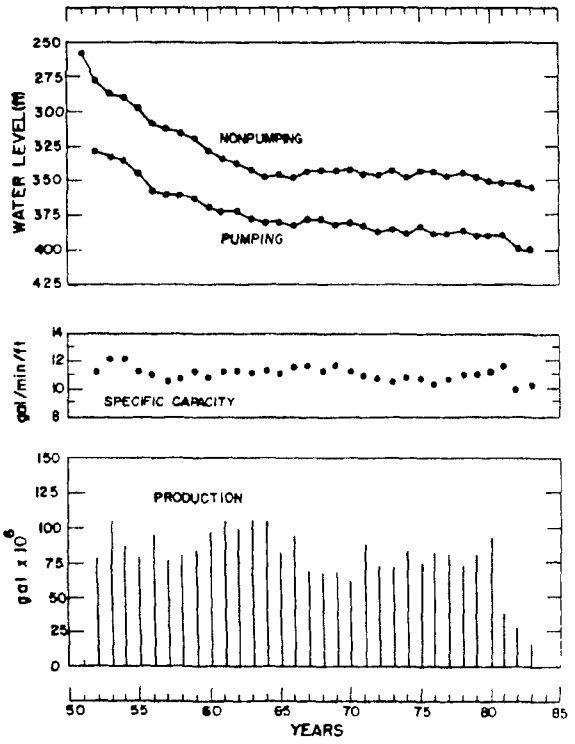


Fig. B10.
Annual average nonpumping and pumping water levels, annual average specific capacity, and annual production, Guaje Well G-2.

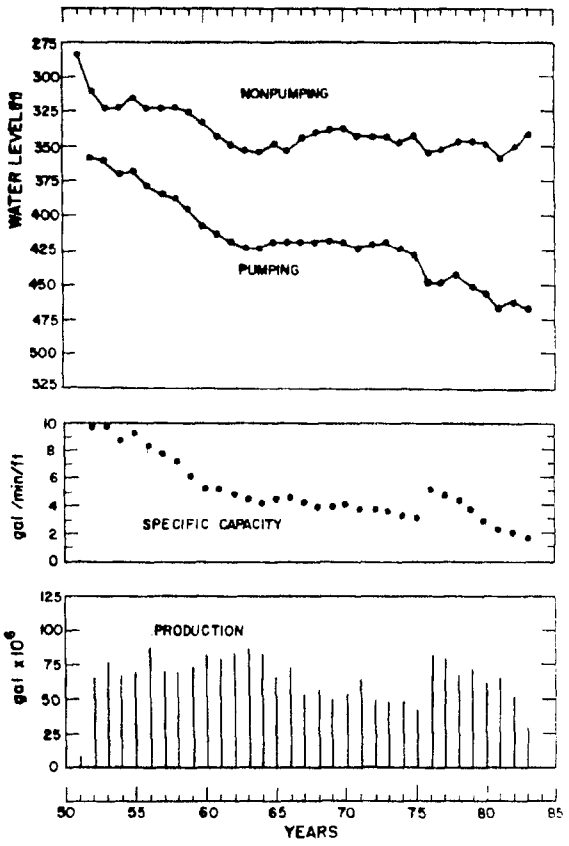


Fig. B11.
Annual average nonpumping and pumping water levels, annual average specific capacity, and annual production, Guaje Well G-3.

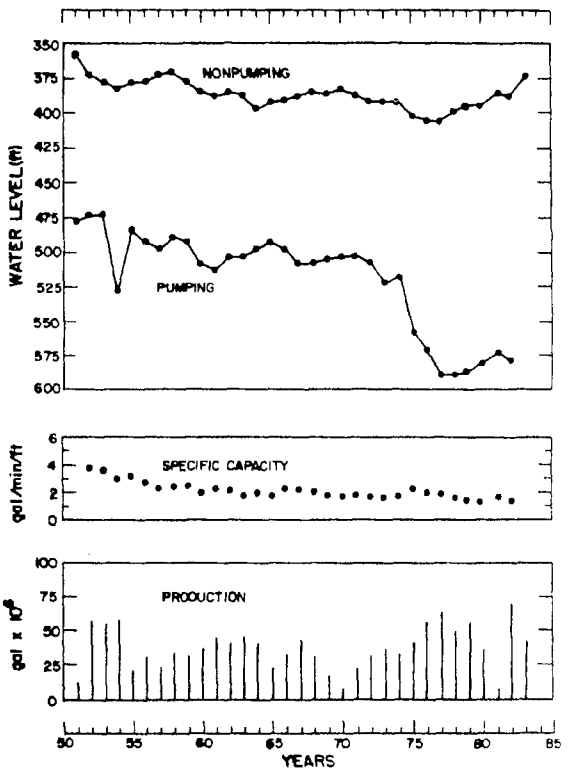


Fig. B12.
Annual average nonpumping and pumping water levels, annual average specific capacity, and annual production, Guaje Well G-4.

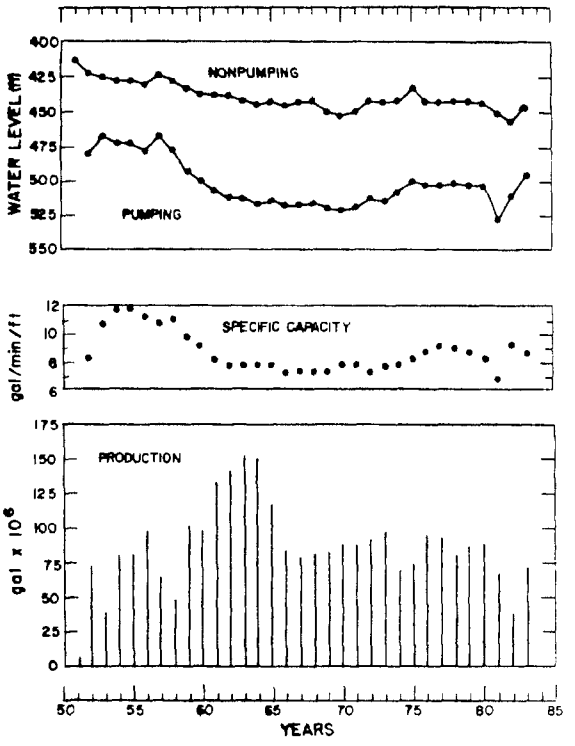


Fig. B13.
Annual average nonpumping and pumping water levels, annual average specific capacity, and annual production, Guaje Well G-5.

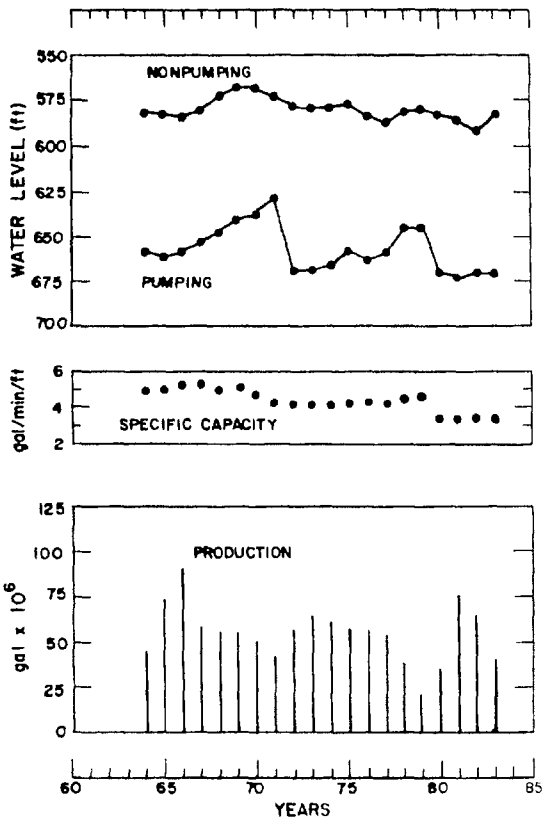


Fig. B14.
Annual average nonpumping and pumping water levels, annual average specific capacity, and annual production, Guaje Well G-6.

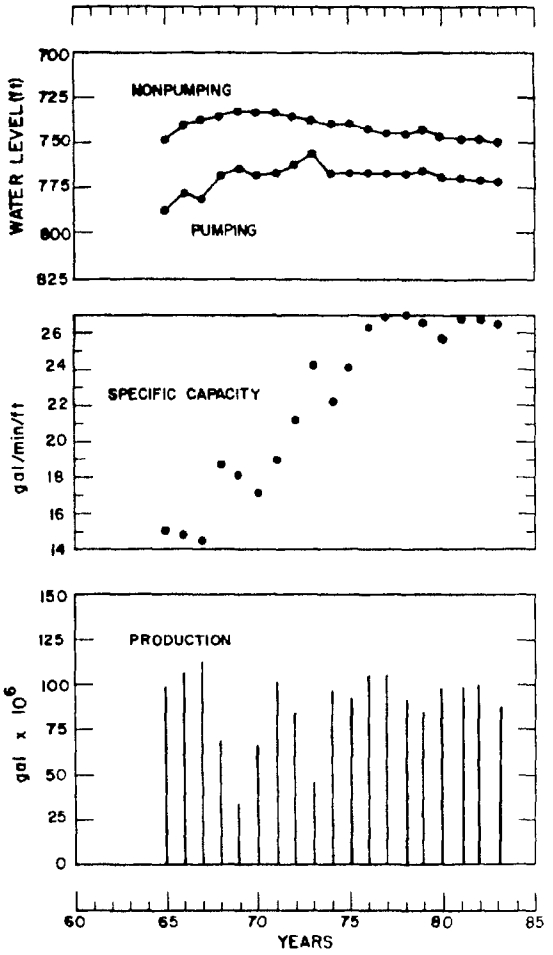


Fig. B15.
Annual average nonpumping and pumping water levels, annual average specific capacity, and annual production, Pajarito Well PM-1.

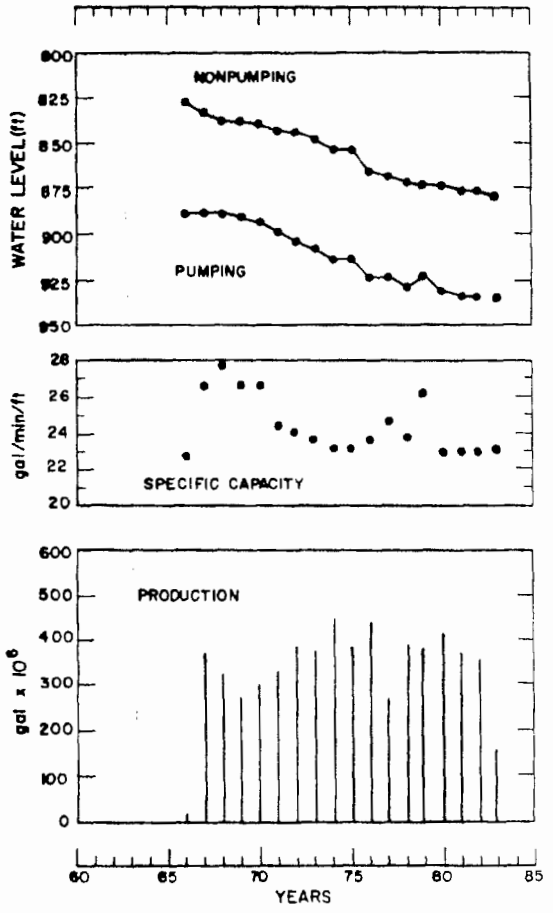


Fig. B16.
Annual average nonpumping and pumping water levels, annual average specific capacity, and annual production, Pajarito Well PM-2.

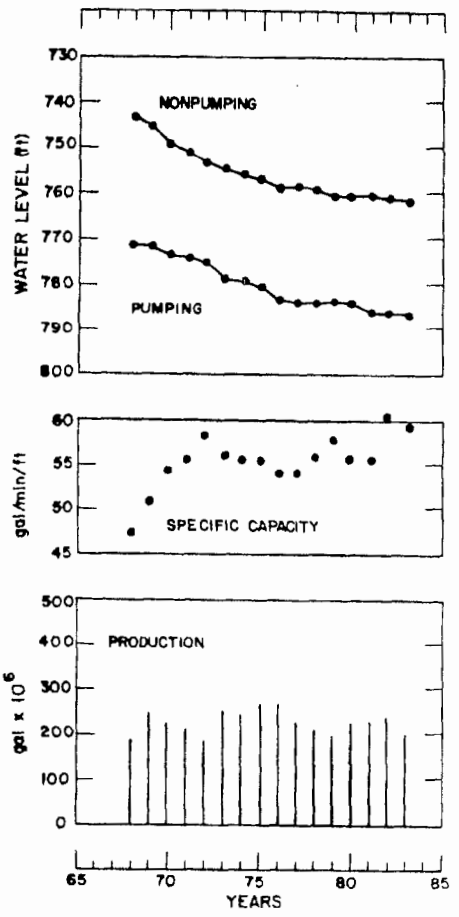


Fig. B17.
Annual average nonpumping and pumping water levels, annual average specific capacity, and annual production, Pajarito Well PM-3.

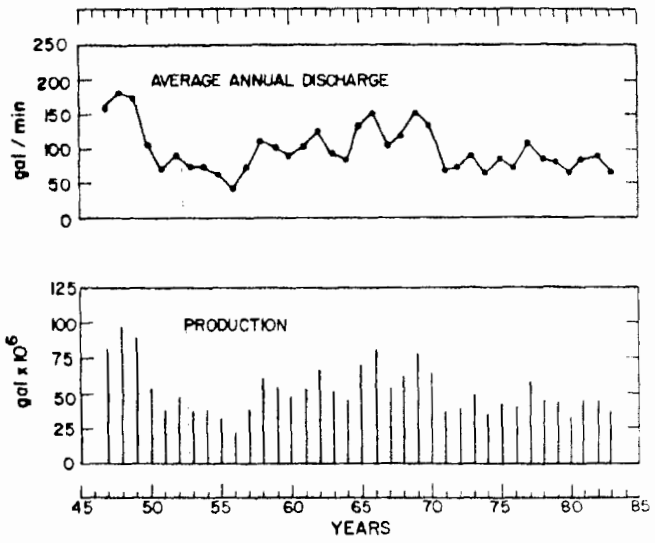


Fig. B18.
Annual average discharge and annual production from the gallery in Water Canyon.

Printed in the United States of America
Available from
National Technical Information Service
US Department of Commerce
5285 Port Royal Road
Springfield, VA 22161

Microfiche (A01)

Page Range	NTIS Price Code	Page Range	NTIS Price Code	Page Range	NTIS Price Code	Page Range	NTIS Price Code
001-025	A02	151-175	A08	301-325	A14	451-475	A20
026-050	A03	176-200	A09	326-350	A15	476-500	A21
051-075	A04	201-225	A10	351-375	A16	501-525	A22
076-100	A05	226-250	A11	376-400	A17	526-550	A23
101-125	A06	251-275	A12	401-425	A18	551-575	A24
126-150	A07	276-300	A13	426-450	A19	576-600	A25
						601-up*	A99

*Contact NTIS for a price quote.