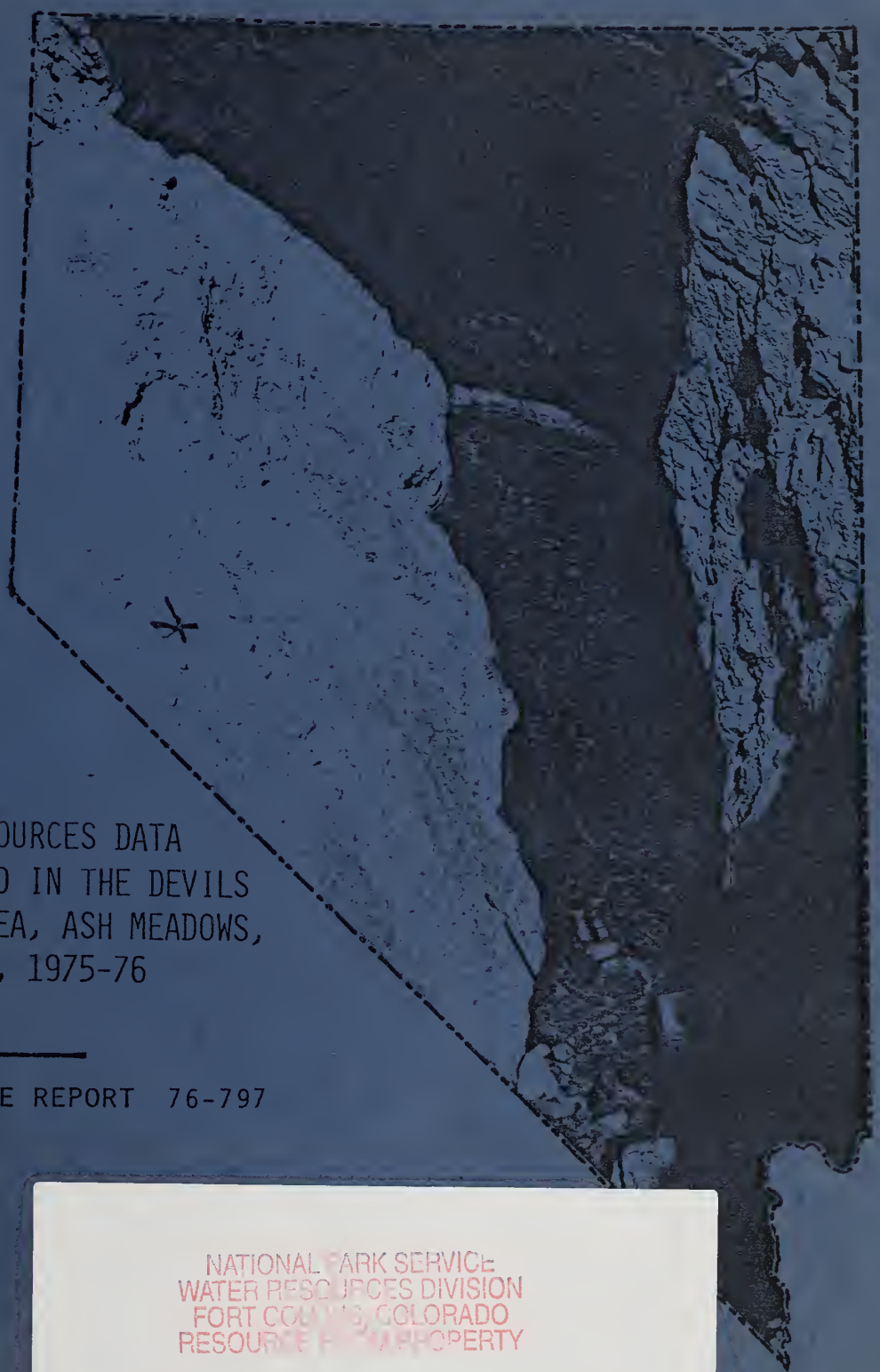
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



WATER RESOURCES DATA COLLECTED IN THE DEVILS HOLE AREA, ASH MEADOWS, NEVADA, 1975-76

OPEN-FILE REPORT 76-797

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WATER-RESOURCES DATA COLLECTED IN THE DEVILS HOLE AREA, ASH MEADOWS, NEVADA, 1975-76

by W. T. Hanes

Open-File Report 76-797

Prepared in cooperation with the

National Park Service

Carson City, Nevada

1976

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CONVERSION FACTORS

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

English	Multiply by	Metric
acres	4,047	m^2 (square meters)
ft^3/s (cubic feet per second)	0.02832	m^3/s (cubic meters per second)
ft (feet)	0.3048	m (meters)
gpm (gallons per minute)	0.06308	l/s (liters per second)
mi (miles)	1.609	km (kilometers)

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INTRODUCTION

The U.S. Geological Survey collected water-level, spring-flow, and power-consumption data in the Devils Hole area from July 1975 through June 1976. The work for this fourth annual data report was done in cooperation with the National Park Service.

Continuous recorders were used to monitor water levels in Devils Hole, three observation wells, and the flow from four springs. Also, monthly readings were made on two wells to help define a general trend of ground-water levels. Monthly meter readings of six electrically powered irrigation wells provided a record of power consumption, which in turn, is an index of the amount of water pumped.

The purpose of the work is to observe the effects, if any, of ground-water withdrawals from specified irrigation wells in the Ash Meadows area on (1) the water level in Devils Hole, and (2) the flow of four springs in the area.

This annual report is primarily a presentation of the data collected through the 1975-76 fiscal year. A report titled "Effect of Irrigation on Desert Pupfish Habitats in Ash Meadows, Nye County, Nevada," (W. W. Dudley and J. D. Larson, 1974) gives interpretations. Readers seeking this type of information are urged to refer to that report.

LOCATION OF DEVILS HOLE

Devils Hole is a 40-acre (162,000 m^2) tract of Death Valley National Monument, about 65 miles (105 km) west of Las Vegas, Nevada, 12 miles (19 km) northeast of Death Valley Headquarters, Death Valley National Monument (fig. 1). Devils Hole is in the SW¼SE¼ sec. 36, T. 17 S., R. 50 E., in the Amargosa Desert (Nevada hydrographic area 230) along the east side of the area known as Ash Meadows and is reached from Death Valley Junction by taking a paved road, which trends northeastward, to the California-Nevada boundary, then northward along a dirt road past Ash Meadows Rancho. Devils Hole is at the south end of an unnamed ridge.

The area studied is in the Ash Meadows quadrangle, Nevada-California (scale 1:62,500), of the U.S. Geological Survey (1952). The quadrangle shows the principal highways, the secondary and dirt roads in the vicinity of Devils Hole, the principal springs in Ash Meadows, and the topography (contour interval 40 ft, or 12 m).

Figure 1.—Index map showing location of Ash Meadows and Devils Hole.

WATER-LEVEL FLUCTUATIONS

Figure 2 shows the location of Devils Hole and the wells and springs in Ash Meadows.

Devils Hole

Two recorders are used to monitor the water level in Devils Hole; one is a conventional recorder using a float and stilling well, while the other is a remote recorder which operates via a pressure transducer. The remote recorder was installed so that interested parties could monitor the water level from outside the fence enclosure without having to enter Devils Hole.

The water level in Devils Hole is referenced to a copper nail and washer on the south side of the hole. Figure 3 shows the monthly instantaneous lows in Devils Hole for 1968, prior to pumping, through June 1975. Beginning in 1969, the water level declined from about 1.4 feet (0.4 m) below the copper washer to a maximum of 3.87 feet (1.17 m) below in September 1972. Since that time, the monthly instantaneous lows have shown an increasing upward trend, apparently in response to decreased and controlled pumping from production wells believed to affect the water level in Devils Hole. These wells being numbers 1, 2, 3, 4, 5, and 17 (fig. 2), (Dudley, 1974, p. 77). Injection of water into well S17 E50 36DD1 may also partially explain this trend.

Figure 4 shows the mean daily water level and the 5-day instantaneous low and high. The accompanying bar graph shows total monthly power consumption from wells 1, 2, 3, 4, 5, and 17. The inverse correlation between power consumed for pumping and changes in the water level in Devils Hole is considered good (Larson, 1975, p. 4).

Observation Wells

Well S17 E50 36DD1 is about 900 ft (274 m) east of Devils Hole (fig. 2). The well has been used for artificial recharge for several years. The recharge, supplied from King Spring at a rate of 400 ft /s (23 l/s) (Larson, 1974), was begun in an attempt to offset the effects of nearby pumping on the water level in Devils Hole. At this time no quantitative information is available on the effectiveness of the injection procedure. Figure 5 shows the mean daily water level in well S17 E50 36DD1. A dashed line indicates periods of estimated water levels and circles indicate instantaneous measurements. Also shown in figure 5 are the dates during which injection of water into the well took place. The District Court reports indicate continuous injection from March 15 through June 30, 1976. Low water levels during the periods April 5-20 and May 12-31 may be due to changes in the rate of injection.

Much of the 1975 water-level record was unusable because the water-level recorder then in use either could not accurately record the water level during periods of rapid change or it malfunctioned. Numerous rapid water-level changes

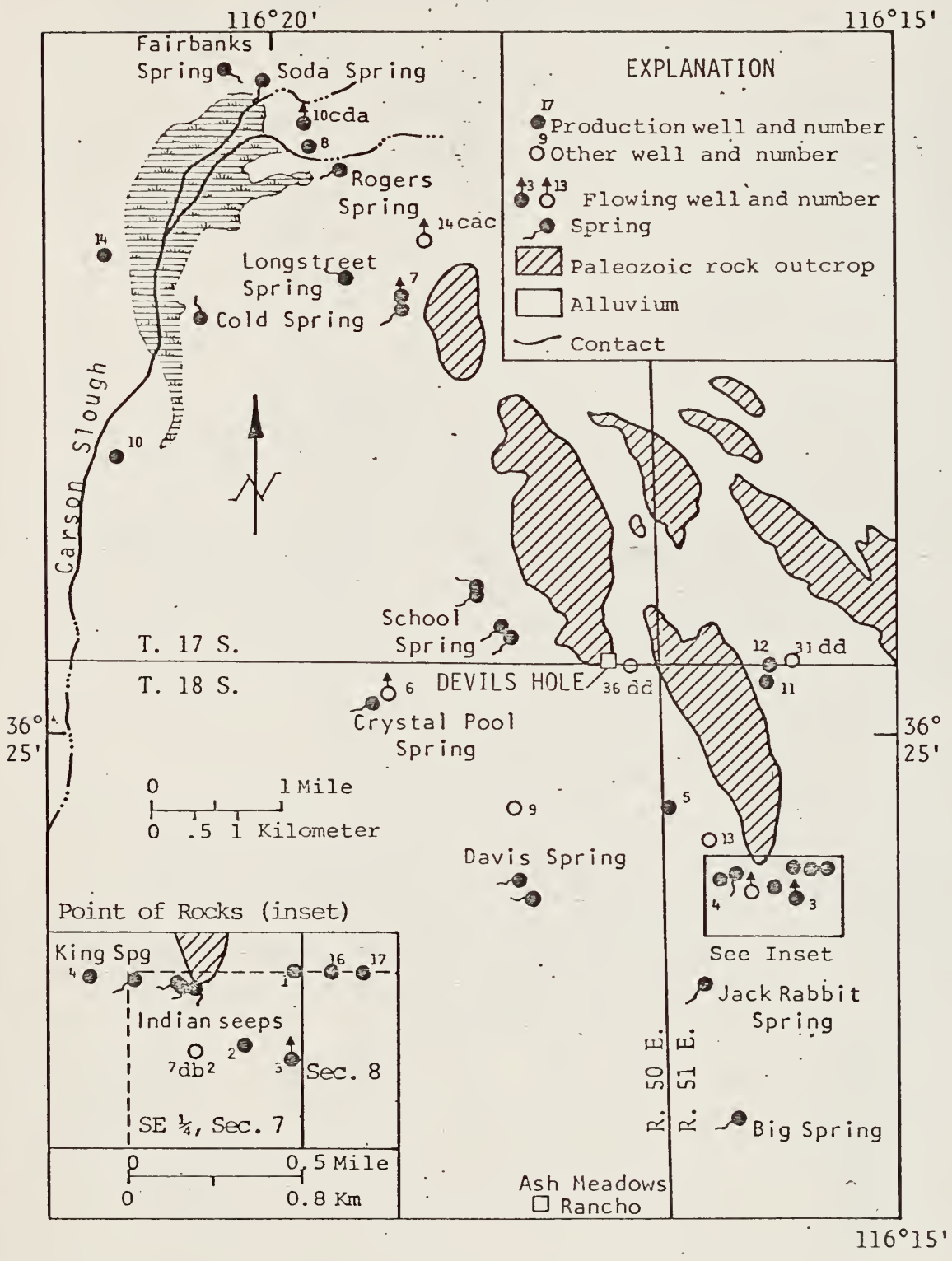

Figure 2.—Locations of Devils Hole, wells, and springs in Ash Meadows, Nye County.

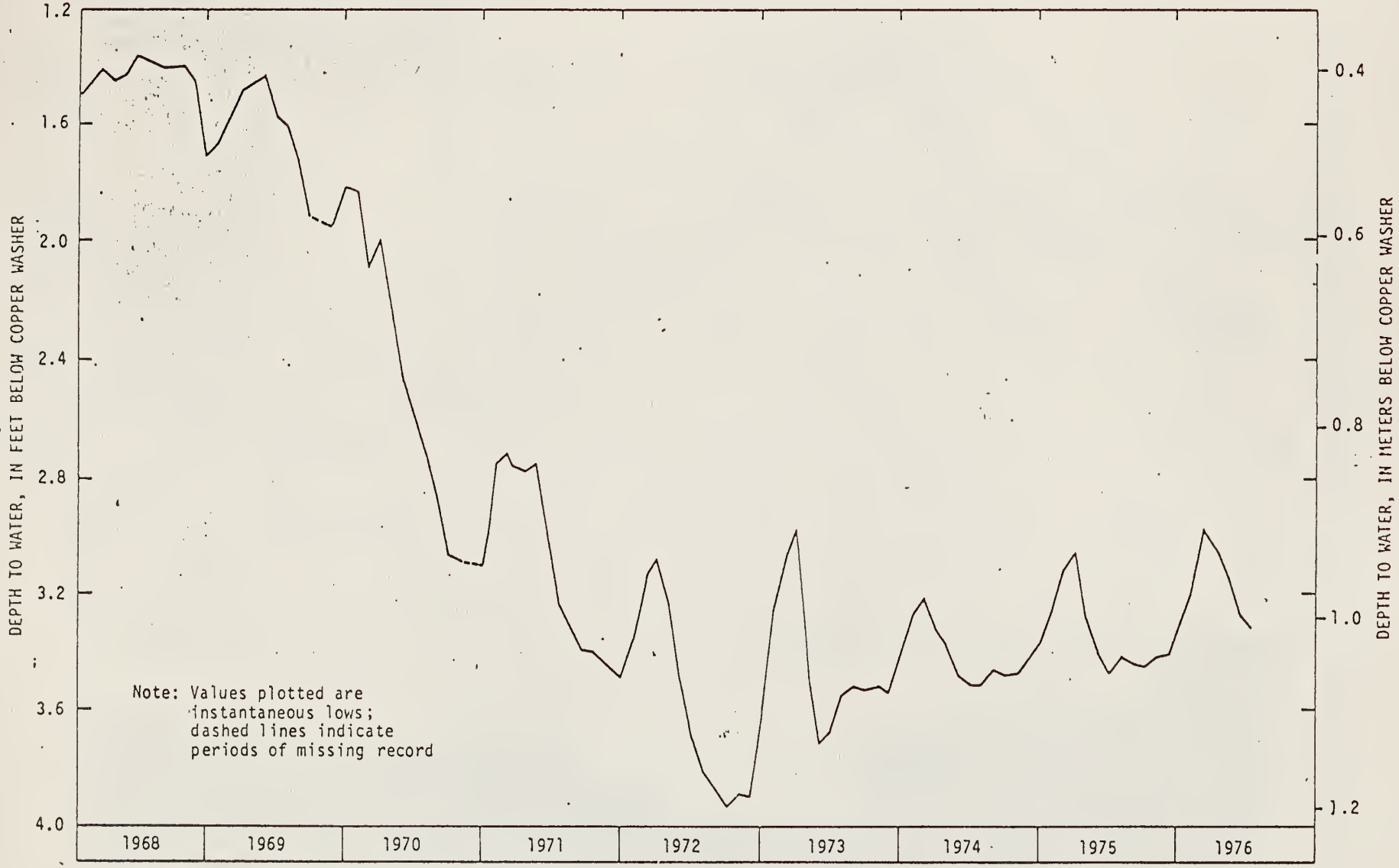

Figure 3.--Monthly low water levels in Devils Hole.

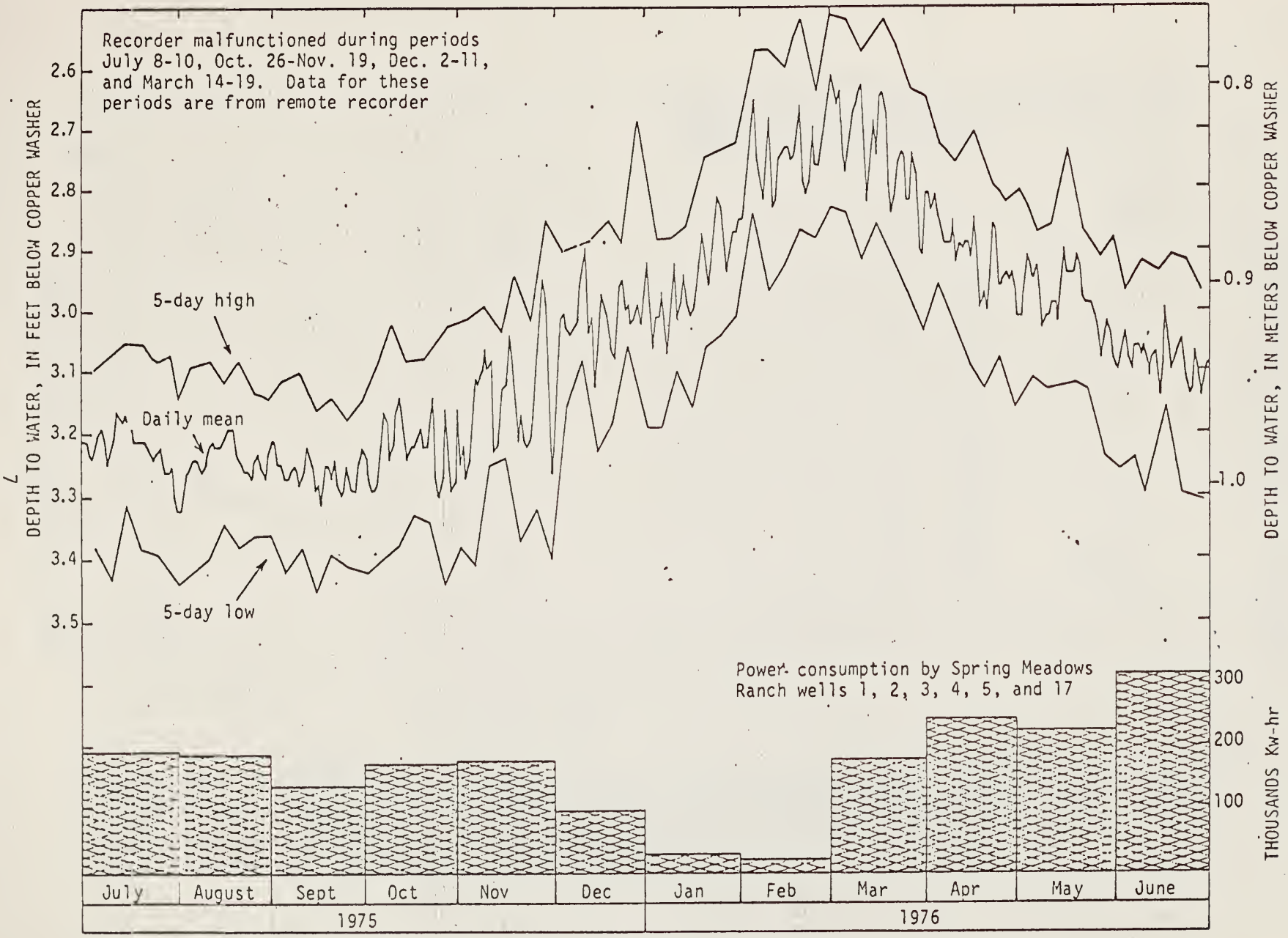

Figure 4.--Water-level fluctuations in Devils Hole and power consumption by irrigation wells.

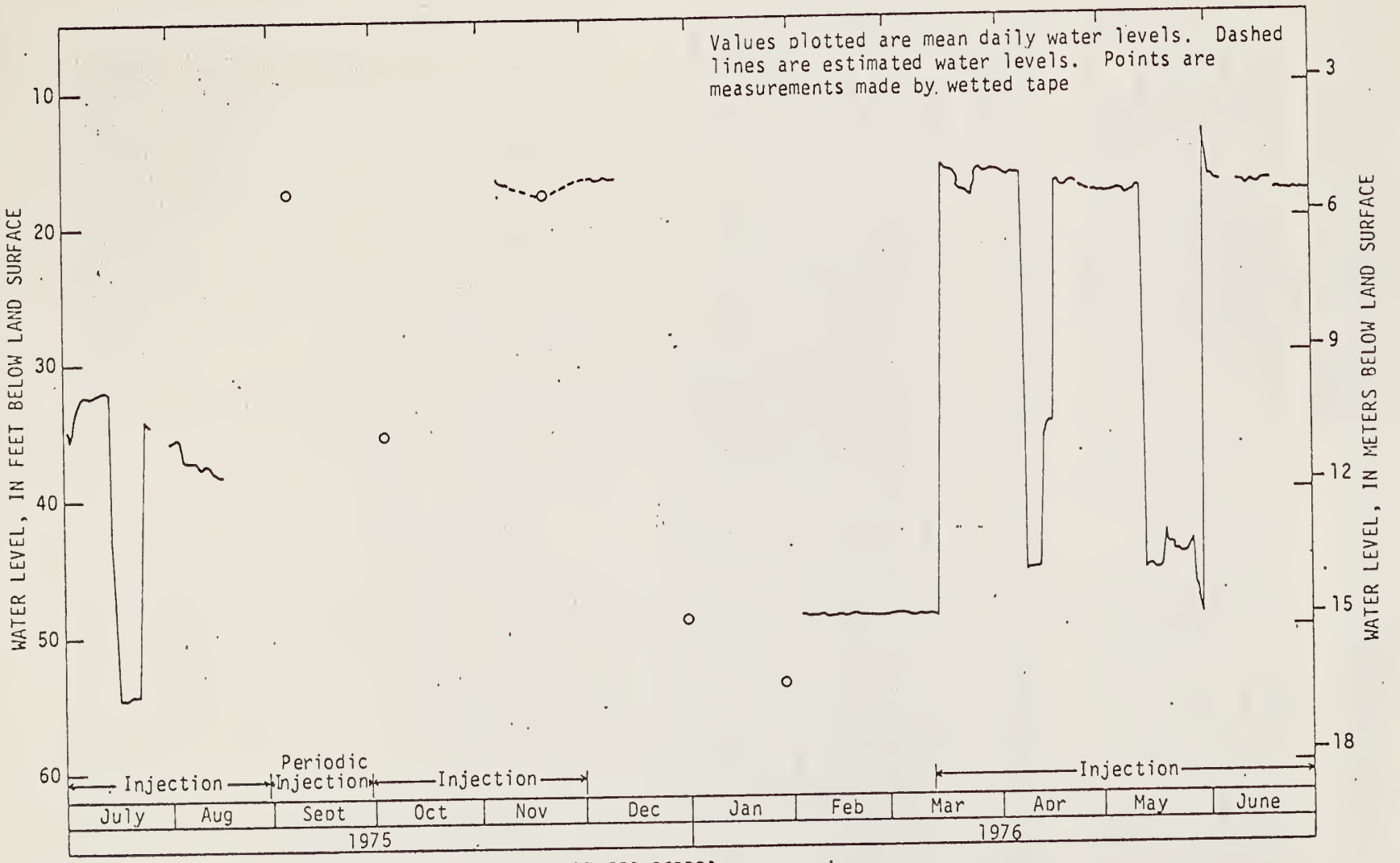

Figure 5.--Water-level fluctuations in well S17 E50 36DDD1.

caused by starting, stopping, or changing the rate of injection accounted for most of the difficulty. Another type of recorder was installed early in 1976, and has eliminated much of the problem.

Observation well S18 E51 7BDB1 (well 13, fig. 2) is about 1.5 miles (2.4 km) southeast of Devils Hole. Figure 6 depicts the mean daily water level in the well, and the times that seven production wells, believed to significantly affect Devils Hole, were pumping. Pumping from wells 4 and 5, which are the two wells closest to well 7BDB1 (see fig. 2), appears to have the most effect on well 7BDB1. Periodic pumping of wells 4 and 5 in August 1974, and cessation of pumping of well 4 in May 1975 is associated with large water-level changes in well 7BDB1.

Water-level measurements were made on wells S18 E51 7DB2, S18 E51 6AA (well 12, fig. 2) and S18 E51 7BBB1 (well 5, fig. 2). These data are also shown in figure 6.

Observation well S18 E51 7DB2 is at the west edge of the major well field in Ash Meadows, near Point of Rocks (fig. 2). It appears that most, if not all, of the production wells affect the water level in well 7DB2 to some degree (see fig. 6). Observation well S18 E51 6AA1 (well 12, fig. 2) is about 1 mile (1.6 km) east of Devils Hole and about 1.5 miles (2.4 km) north of the major well field in Ash Meadows. The water level varied 1.80 feet (0.55 m) during the 1975-76 study year. Observation well S18 E51 7BBB1 (well 5, fig. 2) is pumped seasonally; however, monthly water-level measurements were made when the well was not pumping. Most water levels rose during the period of least pumping, December 1975-February 1976.

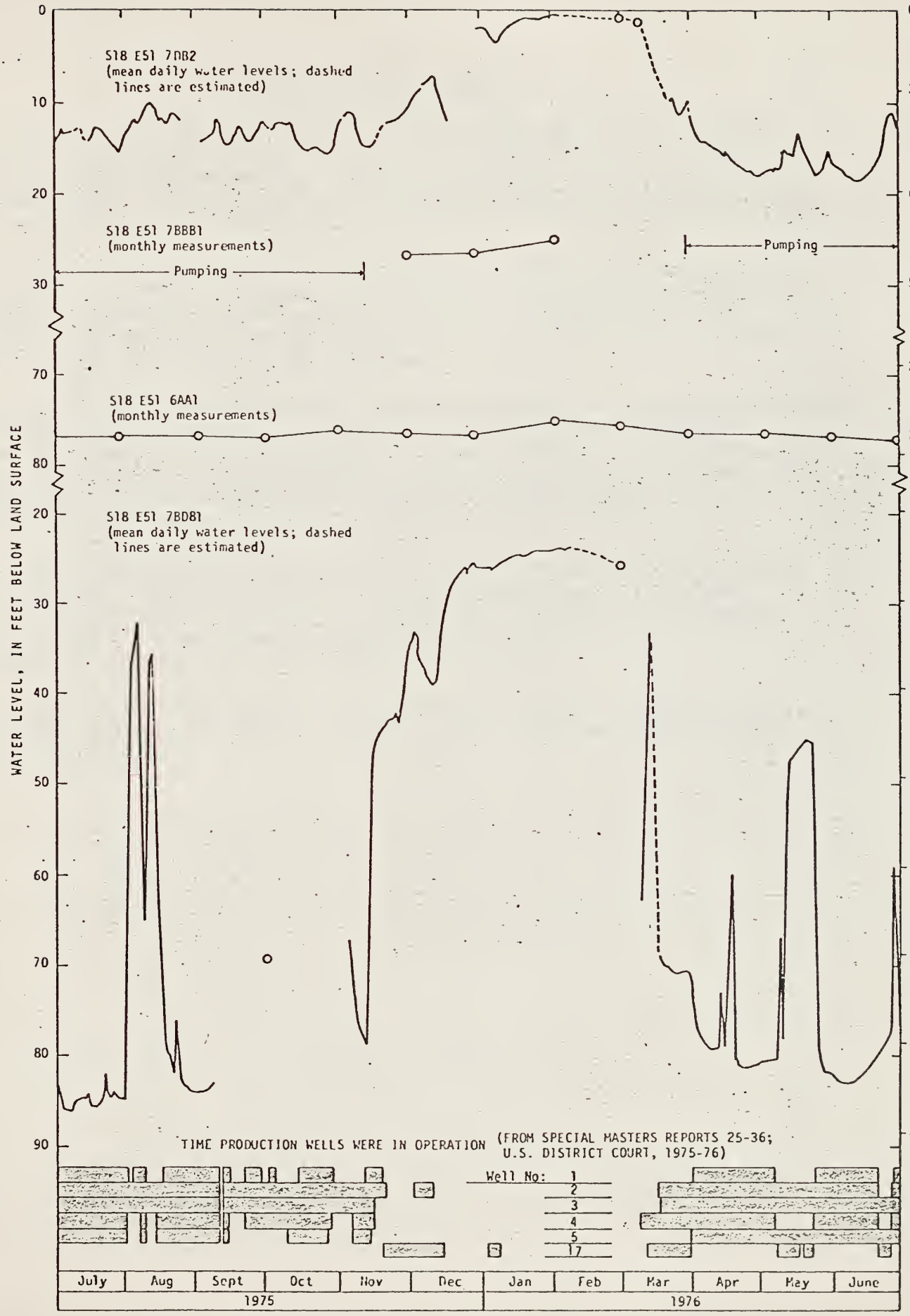

Figure 6.--Water-level fluctuations in observation wells.

SPRING-FLOW FLUCTUATIONS

The locations of the principal springs in Ash Meadows are shown in figure 2. The springs are generally aligned in a northwest-trending direction and are structurally controlled, probably by faulting southwest of the springs. Figure 7 shows the average discharge of four selected springs from July 1975 through June 1976.

Fairbanks Spring and Big Spring, which are in the extreme northern and southern parts of Ash Meadows respectively, show little effect of pumping. An increase in the monthly average flow at Fairbanks Spring in September can be attributed to runoff and surficial recharge in the surrounding area caused by a large cloudburst.

In July 1975 a Balmer-Bowlus flume was installed at Big Spring, replacing a Cipolletti weir. The location of the new flume lowered the water level in the pool approximately 7 inches (Bob Love, oral commun., June 29, 1976). It is not known how much the lowering of the water level in the pool and dewatering of the saturated area surrounding the pool affected the succeeding flow.

Jack Rabbit Spring, which is about 1 mile (1.6 km) southwest of the major pumping field, is affected strongly by pumping of well 2. The effects can be seen in a matter of minutes after well 2 begins pumping (Dudley, 1974). Jack Rabbit Spring flowed during the winter months but flowed very infrequently during non-winter months.

Point of Rocks Spring has a flow pattern similar to Big Spring and Fairbanks Spring. All the springs had a general increase in flow during the winter months.

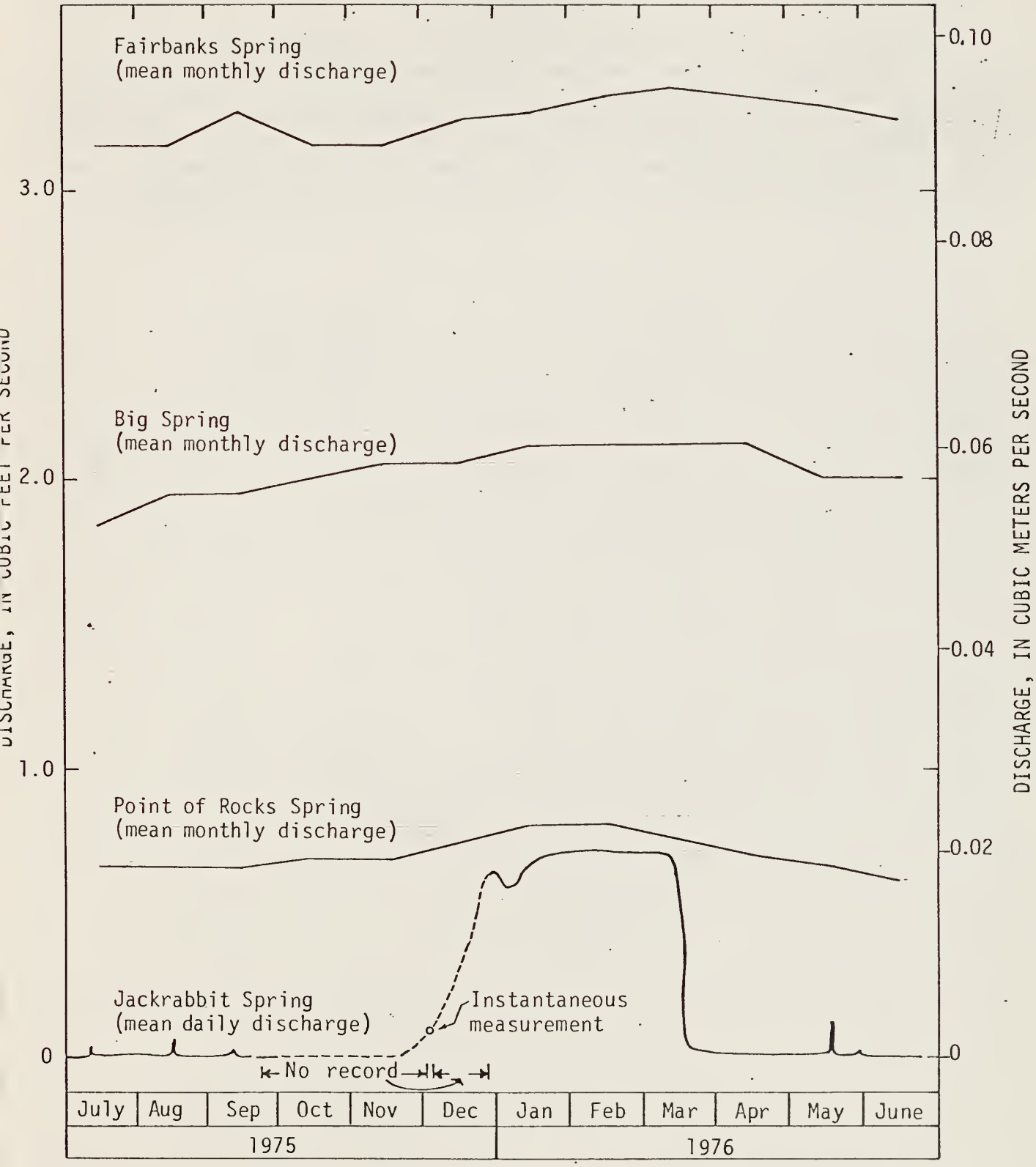

Figure 7.--Average discharge of four selected springs.

POWER CONSUMPTION

Power consumption data for irrigation wells 1, 2, 3, 4, 5, and 17 are collected monthly. Electric meters are read each month to obtain total kilowatt-hours of power used each month. Table 1 is a summary of the power used. Totals are by wells and by months from July 1975 to June 1976. No attempt has been made in this monitoring program to convert kilowatt-hours consumed to acre-feet of water pumped. Total power used for the year was nearly 2 million kilowatt-hours, about a 43 percent increase over the previous study year.

TABLE 1.---Power consumption, in kilowatt-hours, for irrigation wells in Ash Meadows (rounded to 3 significant figures)

MONTH	Well Number 1	2	3	4	5	17	TOTAL
1974							
JUL	42,300	27,100	24,100	47,600	49,900	0	191,000
AUG	46,400	43,900	22,900	39,400	37,600	0	190,000
SEP	33,300	35,000	19,600	30,700	16,200	0	135,000
OCT	31,200	47,700	24,200	40,100	28,200	0	171,000
NOV	18,900	17,100	14,600	15,400	39,800	65,800	172,000
DEC	0	22,700	0	0	13,700	59,000	95,400
1975							
JAN	70	0	0	0	0	24,200	24,300
FEB	730	0	0	0	0	18,200	18,900
MAR	12,300	8,730	24,300	39,400	2,360	91,500	179,000
APR	50,500	44,900	46,700	50,900	53,000	40	246,000
MAY	19,500	33,600	41,300	23,200	46,700	62,600	227,000
JUN	41,900	31,300	43,700	45,200	128,000	27,400	318,000
TOTAL	297,000	312,000	261,000	332,000	415,000	349,000	1,970,000

REFERENCES

Dudley, W. W., Jr., and Larson, J. D., 1974, Effect of irrigation pumping on desert pupfish habitats in Ash Meadows, Nye County, Nevada: Denver, Colo., U.S. Geol. Survey open-file report 74-188, 142 p.

Larson, J. D., 1974a, Water-resources data collected in the Devils Hole area, Nevada 1972-73: Carson City, Nev., U.S. Geol. Survey Water Resources Inv. 61-73, 20 p.

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MARCH 3, 1849