DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH THE
ARIZONA DEPARTMENT OF WATER RESOURCES

WATER-RESOURCES INVESTIGATIONS
OPEN-FILE REPORT 80-1192
SHEET 1 OF 2
DEPTH TO WATER, ALTITUDE OF THE WATER LEVEL,
WELL DEPTH, AND HYDROGRAPHS OF THE WATER LEVEL

MAPS SHOWING GROUND-WATER CONDITIONS IN THE UPPER SAN PEDRO BASIN AREA, PIMA, SANTA CRUZ, AND COCHISE COUNTIES, ARIZONA–1978

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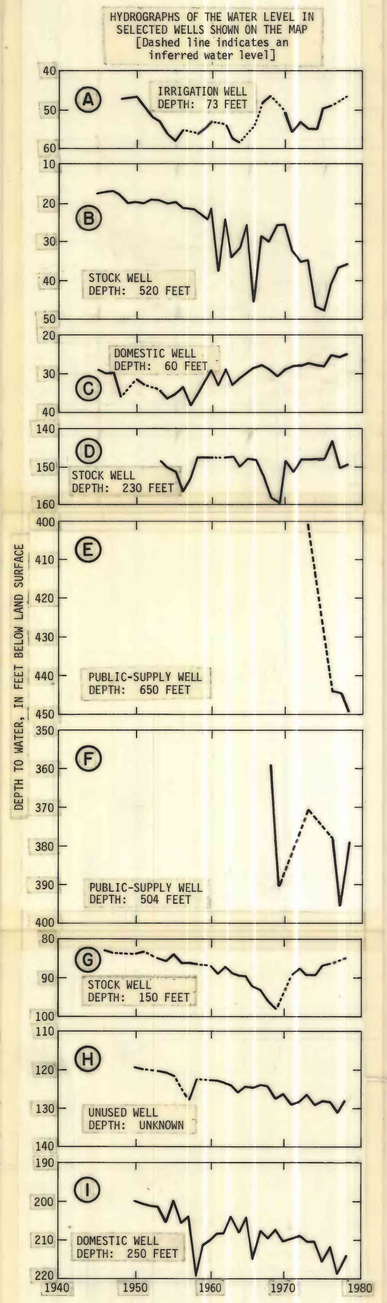
HYDROGRAPHS OF THE WATER LEVEL IN SELECTED WELLS SHOWN ON THE MAP

[Dashed line indicates an inferred water level]



CONVERSION FACTORS

For readers who prefer to use metric units rather than inch-pound units, the conversion factors for the terms used in this report are listed below:

Multiply inch-pound unit	By	To obtain metric unit
foot (ft)	0.3048	meter (m)
square mile (mi^2)	2.590	square kilometer (km^2)
acre-foot (acre-ft)	0.001233	cubic hectometer (hm^3)
gallon per minute (gal/min)	0.06309	liter per second (L/s)

ESTIMATED GROUND-WATER PUMPAGE IN THE UPPER SAN PEDRO BASIN AREA

[Numbers rounded to nearest thousand acre-feet]

Year[1]	Pumpage, in thousands of acre-feet
1966	35
1967	34
1968	29
1969	28
1970	33
1971	36
1972	38
1973	41
1974	45
1975	[2]52
1976	[2]59
1977	[2]51
TOTAL	[2]481

[1]Pumpage not estimated prior to 1966.
[2]Previously published figure revised.

EXPLANATION

DEPTH TO WATER, IN FEET BELOW LAND SURFACE

- Less than 100
- 100 to 200
- 200 to 300
- 300 to 400
- Greater than 400
- Insufficient data

4150—?— WATER-LEVEL CONTOUR—Shows altitude of the water level. Dashed where inferred. Queried where uncertain. Contour interval 50, 100, and 200 feet. Datum is mean sea level

290R(1950) / 3890 / 330 — WELL IN WHICH DEPTH TO WATER WAS MEASURED IN 1977-78—Upper number, 290R(1950), is depth to water in feet below land surface [R, depth to water reported; F, flowing; (1950), year in which depth to water was determined if other than 1977-78]. Middle number, 3890, is altitude of the water level in feet above mean sea level. Lower number, 330, is depth of well in feet

3700 / 5E(1951) — SPRING—Upper number, 3700, is altitude of the land surface in feet above mean sea level. Lower number, 5E(1951), is discharge of spring in gallons per minute [E, discharge estimated; (1951), year in which discharge was determined]

A — WELL FOR WHICH A HYDROGRAPH IS SHOWN

APPROXIMATE BOUNDARY OF THE MAIN WATER-BEARING UNITS—The main water-bearing units are flood-plain alluvium and valley-fill deposits. The flood-plain alluvium consists of gravel, sand, and silt. The upper part of the valley-fill deposits consists of clayey and silty gravel beds near the mountains and silt and sandy silt in the central part of the area. The lower part of the valley-fill deposits consists of gravel, sandstone, and siltstone beds. Granitic and consolidated sedimentary rocks that make up the mountains may yield a few gallons per minute where fractured and saturated

APPROXIMATE AREA WHERE GROUND WATER OCCURS UNDER ARTESIAN PRESSURE

PERENNIAL REACH OF THE SAN PEDRO RIVER

GENERALIZED DIRECTION OF GROUND-WATER FLOW

ARBITRARY BOUNDARY OF GROUND-WATER AREA

The upper San Pedro basin area includes about 1,800 mi^2 in southeastern Arizona. The main water-bearing units are the flood-plain alluvium and the valley-fill deposits (Roeske and Werrell, 1973, p. 9). Granitic rocks and consolidated sedimentary rocks, which make up the mountains that surround the area, may yield a few gallons per minute of water to wells where fractured and saturated. A few springs are present in the mountains, but most discharge only a few gallons per minute. Some springs in the Huachuca Mountains discharge several hundred gallons per minute, but the discharge fluctuates greatly (Brown and others, 1966, p. 32-39).

The flood-plain alluvium consists of gravel, sand, and silt, is 40 to 150 ft thick, and is at the surface near the San Pedro River and its tributaries. Well yields, except those for domestic and livestock wells, generally are between 200 and 1,800 gal/min (Roeske and Werrell, 1973, p. 13). The valley-fill deposits are made up of an upper part and a lower part. The upper part consists of clayey and silty gravel beds near the mountains and silt and sandy silt in the central part of the area; the unit generally ranges from 300 to 800 ft in thickness. The lower part of the valley-fill deposits consists of gravel, sandstone, and siltstone beds and is a few tens of feet thick along the mountains to possibly more than 1,000 ft thick in the center of the area. Wells in the valley-fill deposits generally yield between 100 and 2,800 gal/min (Roeske and Werrell, 1973, p. 13).

In the upper San Pedro basin area ground water generally occurs under water-table conditions in the flood-plain alluvium and under artesian and water-table conditions in the valley-fill deposits. Ground water is under artesian pressure in two areas along the San Pedro River—between Palominas and Hereford and between Saint David and Benson. For the most part, ground water is under artesian pressure at depths of more than 300 ft in the lower part of the valley-fill deposits where saturated gravel beds are overlain by confining silt or clay beds. Ground water generally is under water-table conditions in the upper part of the valley fill, but in a few places where sand and gravel beds are overlain by silt beds, ground water is under artesian conditions. Discharges from artesian wells in the upper part of the valley fill are not as great as those in the lower part of the valley fill.

Ground water moves from the mountain fronts toward the San Pedro River and then northward parallel to the flow of the river. The flow of the San Pedro River is perennial where the river intercepts the water table north of Hereford to just south of Fairbank.

The main use of ground water is for irrigation. During 1966-77, about 481,000 acre-ft of ground water was withdrawn. In 1977 about 51,000 acre-ft of water was withdrawn, of which about 36,000 acre-ft was for irrigation, more than 7,000 acre-ft was for industrial use, and nearly 8,000 acre-ft was for public-supply, domestic, and livestock uses. Ground-water withdrawals have had little effect on water levels except near Sierra Vista and Fort Huachuca, where annual water-level declines have averaged 2 to 10 ft in recent years, although year-to-year changes are erratic (see hydrographs E and F). North of Sierra Vista, the water levels in three wells in sec. 35, T. 21 S., R. 20 E., declined 41, 43, and 48 ft from 1973 to 1978. The 4,150-foot contour near Sierra Vista indicates that a small cone of depression has formed owing to the withdrawal of ground water in the area. In the rest of the area water levels generally have declined less than 10 ft since the late 1960's.

The hydrologic data on which these maps are based are available, for the most part, in computer-printout form and may be consulted at the Arizona Department of Water Resources, 222 North Central Avenue, Suite 850, Phoenix, and at U.S. Geological Survey offices in: Federal Building, 301 West Congress Street, Tucson, and Valley Center, Suite 1880, Phoenix. Material from which copies can be made at private expense is available at the Tucson and Phoenix offices of the U.S. Geological Survey.

SELECTED REFERENCES

Arizona Bureau of Mines, 1959, Geologic map of Cochise County, Arizona: Arizona Bureau of Mines map, scale 1:375,000.

Arizona Crop and Livestock Reporting Service, 1974, Cropland atlas of Arizona: Phoenix, Arizona Crop and Livestock Reporting Service duplicated report, 68 p.

Brown, D. E., Carmony, N. B., and Turner, R. M., compilers, 1978, Drainage map of Arizona showing perennial streams and some important wetlands: Arizona Game and Fish Department map, scale 1:1,000,000.

Brown, S. G., Davidson, E. S., Kister, L. R., and Thomsen, B. W., 1966, Water resources of Fort Huachuca Military Reservation, southeastern Arizona: U.S. Geological Survey Water-Supply Paper 1819-D, 57 p.

Bureau of Water Quality Control, 1978, Drinking water regulations for the State of Arizona: Arizona Department of Health Services duplicated report, 39 p.

Davidson, E. S., and White, N. D., 1963, San Pedro River valley, in Annual report on ground water in Arizona, spring 1962 to spring 1963, by N. D. White, R. S. Stulik, E. K. Morse, and others: Arizona State Land Department Water-Resources Report 15, p. 68-76.

Heindl, L. A., 1952, Upper San Pedro basin, Cochise County, in Ground water in the Gila River basin and adjacent areas, Arizona—a summary, by L. C. Halpenny and others: U.S. Geological Survey open-file report, p. 69-86.

National Academy of Sciences and National Academy of Engineering, 1973 [1974], Water quality criteria, 1972: U.S. Environmental Protection Agency Report, EPA-R3-73-033, 594 p.

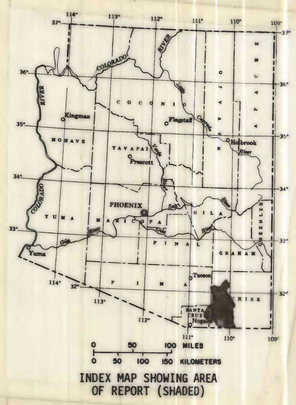
Roeske, R. H., and Werrell, W. L., 1973, Hydrologic conditions in the San Pedro River valley, Arizona: Arizona Water Commission Bulletin 4, 76 p.

U.S. Environmental Protection Agency, 1976 [1978], Quality criteria for water: U.S. Environmental Protection Agency publication, 256 p.

_____1977a, National interim primary drinking water regulations: U.S. Environmental Protection Agency Report, EPA-570/9-76-003, 159 p.

_____1977b, National secondary drinking water regulations: Federal Register, v. 42, no. 62, March 31, 1977, p. 17143-17147.

Wilson, E. D., Moore, R. T., and O'Haire, R. T., 1960, Geologic map of Pima and Santa Cruz Counties, Arizona: Arizona Bureau of Mines map, scale 1:375,000.



5 0 5 MILES
5 0 5 10 KILOMETERS
CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100-FOOT INTERVALS
DATUM IS MEAN SEA LEVEL

BASE FROM U.S. GEOLOGICAL SURVEY
DOUGLAS 1:250,000, 1959,
NOGALES 1:250,000, 1956, AND
TUCSON 1:250,000, 1956

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