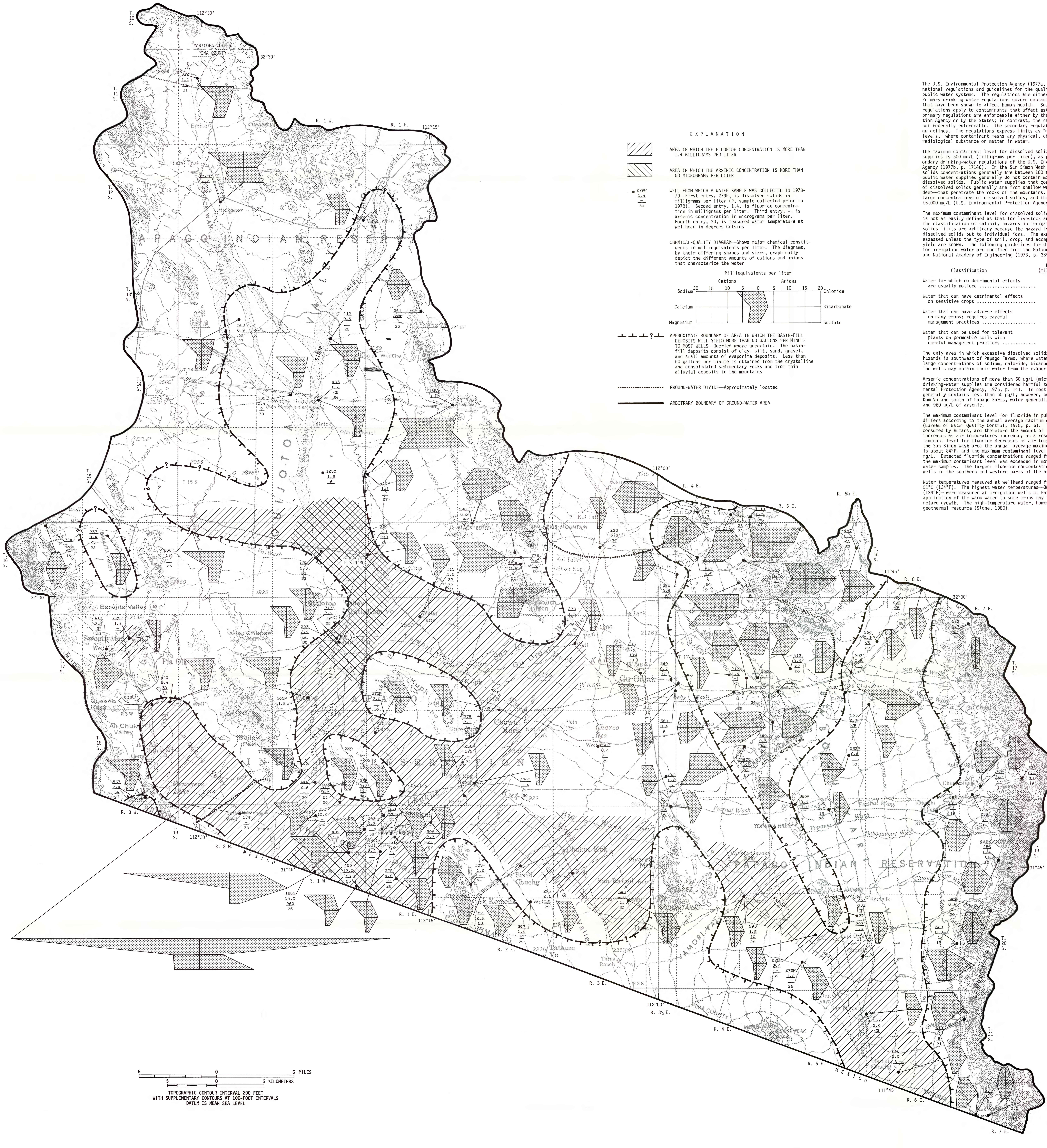
PREPARED IN COOPERATION WITH THE
U.S. BUREAU OF INDIAN AFFAIRS AND THE ARIZONA DEPARTMENT OF WATER RESOURCES



EXPLANATION

AREA IN WHICH THE FLUORIDE CONCENTRATION IS MORE THAN 1.4 MILLIGRAMS PER LITER

AREA IN WHICH THE ARSENIC CONCENTRATION IS MORE THAN 50 MICROGRAMS PER LITER

● 279P / 1.4 / – / 30 — WELL FROM WHICH A WATER SAMPLE WAS COLLECTED IN 1978-79—First entry, 279P, is dissolved solids in milligrams per liter (P, sample collected prior to 1978). Second entry, 1.4, is fluoride concentration in milligrams per liter. Third entry, -, is arsenic concentration in micrograms per liter. Fourth entry, 30, is measured water temperature at wellhead in degrees Celsius

CHEMICAL-QUALITY DIAGRAM—Shows major chemical constituents in milliequivalents per liter. The diagrams, by their differing shapes and sizes, graphically depict the different amounts of cations and anions that characterize the water

Milliequivalents per liter
Cations
Anions
20 15 10 5 0 5 10 15 20
Sodium
Calcium
Magnesium
Chloride
Bicarbonate
Sulfate

APPROXIMATE BOUNDARY OF AREA IN WHICH THE BASIN-FILL DEPOSITS WILL YIELD MORE THAN 50 GALLONS PER MINUTE TO MOST WELLS—Queried where uncertain. The basin-fill deposits consist of clay, silt, sand, gravel, and small amounts of evaporite deposits. Less than 50 gallons per minute is obtained from the crystalline and consolidated sedimentary rocks and from thin alluvial deposits in the mountains

GROUND-WATER DIVIDE—Approximately located

ARBITRARY BOUNDARY OF GROUND-WATER AREA

The U.S. Environmental Protection Agency (1977a, b) has established national regulations and guidelines for the quality of water provided by public water systems. The regulations are either primary or secondary. Primary drinking-water regulations govern contaminants in drinking water that have been shown to affect human health. Secondary drinking-water regulations apply to contaminants that affect esthetic quality. The primary regulations are enforceable either by the Environmental Protection Agency or by the States; in contrast, the secondary regulations are not Federally enforceable. The secondary regulations are intended as guidelines. The regulations express limits as "maximum contaminant levels," where contaminant means any physical, chemical, biological, or radiological substance or matter in water.

The maximum contaminant level for dissolved solids in public water supplies is 500 mg/L (milligrams per liter), as proposed in the secondary drinking-water regulations of the U.S. Environmental Protection Agency (1977b, p. 17146). In the San Simon Wash area the dissolved-solids concentrations generally are between 180 and 4,900 mg/L, and public water supplies generally do not contain more than 500 mg/L of dissolved solids. Public water supplies that contain more than 500 mg/L of dissolved solids generally are from shallow wells—less than 60 ft deep—that penetrate the rocks of the mountains. Livestock can tolerate large concentrations of dissolved solids, and the approximate limit is 15,000 mg/L (U.S. Environmental Protection Agency, 1976, p. 208).

The maximum contaminant level for dissolved solids in irrigation water is not as easily defined as that for livestock and public supplies. For the classification of salinity hazards in irrigation water, the dissolved-solids limits are arbitrary because the hazard is related not only to dissolved solids but to individual ions. The exact hazard cannot be assessed unless the type of soil, crop, and acceptable reduction in crop yield are known. The following guidelines for dissolved-solids values for irrigation water are modified from the National Academy of Sciences and National Academy of Engineering (1973, p. 335).

Classification	Dissolved solids (milligrams per liter)
Water for which no detrimental effects are usually noticed	Less than 500
Water that can have detrimental effects on sensitive crops	500-1,000
Water that can have adverse effects on many crops; requires careful management practices	1,000-2,000
Water that can be used for tolerant plants on permeable soils with careful management practices	2,000-5,000

The only area in which excessive dissolved solids may cause salinity hazards is southwest of Papago Farms, where water samples contained large concentrations of sodium, chloride, bicarbonate, and sulfate. The wells may obtain their water from the evaporite deposits.

Arsenic concentrations of more than 50 μg/L (micrograms per liter) in drinking-water supplies are considered harmful to humans (U.S. Environmental Protection Agency, 1976, p. 14). In most of the area the water generally contains less than 50 μg/L; however, between Pisinimo and Kom Vo and south of Papago Farms, water generally contains between 60 and 960 μg/L of arsenic.

The maximum contaminant level for fluoride in public water supplies differs according to the annual average maximum daily air temperature (Bureau of Water Quality Control, 1978, p. 6). The amount of water consumed by humans, and therefore the amount of fluoride ingested, increases as air temperatures increase; as a result, the maximum contaminant level for fluoride decreases as air temperatures increase. In the San Simon Wash area the annual average maximum daily air temperature is about 84°F, and the maximum contaminant level for fluoride is 1.4 mg/L. Detected fluoride concentrations ranged from 0 to 54 mg/L, and the maximum contaminant level was exceeded in more than one-third of the water samples. The largest fluoride concentrations were in water from wells in the southern and western parts of the area.

Water temperatures measured at wellhead ranged from 15°C (59°F) to 51°C (124°F). The highest water temperatures—38°C (100°F) to 51°C (124°F)—were measured at irrigation wells at Papago Farms. Direct application of the warm water to some crops may injure the plants or retard growth. The high-temperature water, however, is a potential geothermal resource (Stone, 1980).

BASE FROM U.S. GEOLOGICAL SURVEY
AJO 1:250,000, 1953-69,
LUKEVILLE 1:250,000, 1963-76,
NOGALES 1:250,000, 1956-69, AND
TUCSON 1:250,000, 1956-69

CHEMICAL QUALITY OF GROUND WATER

Unsurveyed township lines extrapolated (dotted) by Heindl and others (1962)

MAPS SHOWING GROUND-WATER CONDITIONS IN THE SAN SIMON WASH AREA, PAPAGO INDIAN RESERVATION, ARIZONA—1979

BY
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