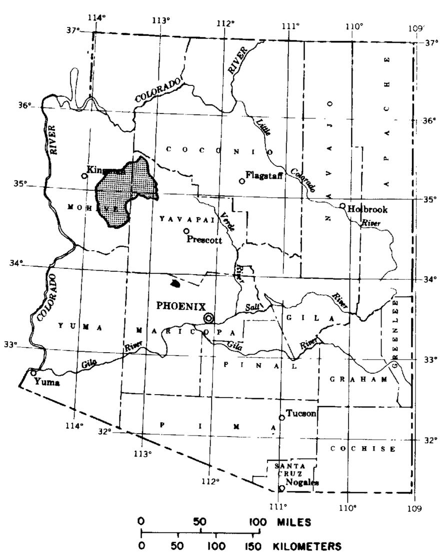
PREPARED IN COOPERATION WITH THE UNITED STATES GEOLOGICAL SURVEY







INDEX MAP SHOWING AREA OF REPORT (SHADED)

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 | 0.3048 | meter |
| mile | 1.609 | kilometer |
| square mile | 2.590 | square kilometer |
| acre | 0.4047 | square hectometer |
| acre-foot | 0.001233 | cubic hectometer |
| gallon per minute | 0.06309 | liter per second |
| gallons per day per foot | 0.0000133 | liters per second per meter |

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100-FOOT INTERVALS
DATUM IS MEAN SEA LEVEL
SCALE 1:125,000

## EXPLANATION

WELL FIELD CHECKED IN 1980--First number, 324, is depth to water in feet below land surface (R, reported; F, flowing; U, measurement was unobtainable). Second number, 4956, is the altitude of the water level in feet above mean sea level. Third number, 300, is specific conductance in micromhos per centimeter at 25°C (specific conductance is an indication of dissolved-solids concentration). Fourth number, 0.7, is fluoride concentration in milligrams per liter

SPRING FIELD CHECKED IN 1980--First number, 400, is estimated discharge in gallons per minute. Second number, 1870, is altitude of the land surface in feet above mean sea level. Third number, 1510, is specific conductance in micromhos per centimeter at 25°C (specific conductance is an indication of dissolved-solids concentration). Fourth number, 2.4, is fluoride concentration in milligrams per liter

SPRING FIELD CHECKED PRIOR TO 1980--First number, 1, is estimated discharge in gallons per minute. Second number, 3320, is altitude of the land surface in feet above mean sea level. Third number, 629, is specific conductance in micromhos per centimeter at 25°C (specific conductance is an indication of dissolved-solids concentration). Fourth number, 1.8, is fluoride concentration in milligrams per liter

WATER-LEVEL CONTOUR--Shows altitude of the water level. Dashed where approximate. Queried where uncertain. Contour interval 100 and 200 feet. Datum is mean sea level

UNCONSOLIDATED DEPOSITS ALONG THE CENTRAL VALLEY--Includes the upper basin fill and stream and flood-plain alluvium

VOLCANIC, GRANITIC, OR METAMORPHIC ROCK--Water may occur in weathered or fractured zones, joint systems, or thin veneers of alluvial or fluvial sediment overlying crystalline rocks or local tuffaceous units. (Based on Davidson, 1973, and Arizona Bureau of Mines, 1958)

SEDIMENTARY ROCKS--Deeper wells probably obtain water from limestone. (Based on Arizona Bureau of Mines, 1958)

APPROXIMATE BOUNDARY BETWEEN UNCONSOLIDATED DEPOSITS ALONG THE CENTRAL VALLEY AND VOLCANIC, GRANITIC, OR METAMORPHIC ROCK

APPROXIMATE BOUNDARY BETWEEN VOLCANIC, GRANITIC, OR METAMORPHIC ROCK AND SEDIMENTARY ROCK. Queried where uncertain

WELL FOR WHICH A HYDROGRAPH IS SHOWN

ARBITRARY BOUNDARY OF GROUND-WATER AREA

DS=438

DISSOLVED SOLIDS--Number, 438, is dissolved-solids concentration in milligrams per liter determined as residue at 180°C

CHEMICAL QUALITY DIAGRAM--Shows major constituents in milliequivalents per liter. The diagrams are in a variety of shapes and sizes, providing a means of comparing, correlating, and characterizing similar or dissimilar types of water. [(1977), year sample collected if other than 1980]

## INTRODUCTION

The Big Sandy area includes about 1,900 $mi^2$ in Mohave and Yavapai Counties in northwest Arizona. The area is drained by the Big Sandy River, which flows southward along the western part of the area; flow is ephemeral throughout most of its length, but near Wikieup, flow is perennial. The major tributaries of the Big Sandy River are Knight Creek and Trout Creek, which drain the northeastern part of the area; Trout Creek is perennial in parts of its reach (Davidson, 1973, p. 10).

During the last ten years, the primary use of ground water in the area has changed from agriculture to mining. In 1980 about 2,000 acre-feet of ground water was withdrawn; about 95 percent of the water was transported by pipeline to the Bill Williams area for use in mining operations.

Only selected wells are shown on the map in areas of high well density. The hydrologic data on which this map is based was compiled in 1980 and is available, for the most part, in computer-printout form and may be consulted at the Department of Water Resources, 99 East Virginia Avenue, 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.

## HYDROLOGIC SETTING

In the Big Sandy area ground water occurs in three hydrologic settings: in unconsolidated deposits along the central valley; in volcanic, granitic, or metamorphic rocks in the Hualapai, Peacock, Aquarius, and Mohon Mountains; and in sedimentary rocks in the extreme northeastern part of the area. Most of the ground-water development has been along the central valley where the main water-bearing units are the upper basin fill and the stream and flood-plain alluvium as described by Davidson (1973, p. 23-27). The depth to water below land surface in this part of the area is from less than 10 to 660 feet.

The upper basin fill is about 150 to 300 feet thick and is a loosely consolidated silty gravel to a sandy silt (Davidson, 1973, p. 24). The upper basin fill may yield as much as 1,000 gal/min of water to wells (Davidson, 1973, p. 25). The specific capacities of several wells tested that were completed in this unit were 100 to 120 gal/min per foot of drawdown (Davidson, 1973, p. 25). Specific capacity of a well is its yield per unit of drawdown, usually expressed as gallons per minute per foot of drawdown; it is an indication of how well an aquifer transmits water but the value also is affected by well construction and development. Transmissivity is a better measure of an aquifer's ability to transmit water. Values of transmissivities from two aquifer tests in the Wikieup area, ranged from 100,000 to 150,000 gallons per day per foot (Davidson, 1973, p. 25). Transmissivity of an aquifer is defined as the rate at which water is transmitted through a unit width of the aquifer under a unit of hydraulic gradient (Lohman and others, 1972, p. 13).

The stream and flood-plain alluvium is 30 to 40 feet thick and consists of unconsolidated gravel and sand. Wells greater than 40 feet deep that tap the stream and flood plain alluvium along the Big Sandy River near Wikieup also tap the upper basin fill. Properly constructed, these wells can yield as much as 1,000 gal/min. Specific capacities of wells in the Wikieup area that penetrate both the upper basin fill and the stream and flood-plain alluvium can be as high as 130 gal/min per foot of drawdown. Transmissivity of the stream and flood-plain alluvium in the same area is about 250,000 to 300,000 gallons per day per foot (Davidson, 1973, p. 26). There have been no significant changes in water level in the unconsolidated deposits along the central valley as Hydrographs A, B, and C indicate.

The northeast part of the Big Sandy area is underlain by sedimentary rocks, predominantly limestone (Arizona Bureau of Mines, 1958), which may be a major regional aquifer that extends to adjacent areas to the north and the east. The depth to water in this part of the area ranges from 32 feet in a well in Section 4, T. 19 N., R. 8 W. to a reported 950 feet in a well in Section 14, T. 23 N., R. 10 W. There are no driller's logs available for the few wells in this area and thus the areal extent of this aquifer is unknown.

East of the Aquarius Mountains, volcanic and pyroclastic rocks yield some water to wells. Depth to water in this part of the Big Sandy area ranges from 6 feet below land surface in a well in Section 4, T. 20 N., R. 10 W. to 422 feet in a well in Section 10, T. 18 N., R. 9 W. The extreme range in depths to water reflects the complex geology of the area. Few wells have been drilled in the area and little drill-log data are available, thus the extent of the water-bearing units is unknown. The boundary between the sedimentary rocks and volcanic rocks shown on the map is based on the surface geology as mapped by Arizona Bureau of Mines (Arizona Bureau of Mines, 1958). It is possible that the sedimentary rocks that are on the surface in the northeast part of the area underlie the volcanic rocks in the area and the deeper wells reflect water levels in the sedimentary rocks.

Water is also produced from wells drilled in granitic and gneissic rocks of the Hualapai, Peacock, and Aquarius Mountains. Most of these wells yield small amounts of water from fractured or weathered zones or thin alluvium overlying the crystalline rocks.

## WATER QUALITY

In the Big Sandy area, the ground water generally is of good chemical quality with respect to dissolved solids. The dissolved-solids concentrations shown on the map range from 282 to 1,800 mg/L (milligrams per liter). For water from wells and springs for which a complete chemical analysis is not available, the dissolved-solids values may be estimated by multiplying the specific conductance by 0.6, which is the approximate ratio of dissolved solids to specific conductance. The maximum contaminant level for dissolved solids in public water supplies is 500 mg/L, as proposed in the secondary drinking-water regulations of the U.S. Environmental Protection Agency (1977b, p. 17146) in accordance with provisions of the Safe Drinking Water Act (Public Law 93-523). 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 for the States. The regulations express limits as "maximum contaminant levels" where contaminant means any physical, chemical, biological, or radiological substance or matter in water.

Fluoride concentrations in water samples from wells and springs in the Big Sandy area ranged from 0.2 to 20.0 mg/L. 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 annual average maximum daily air temperature in the area is about 83°F (Sellers and Hill, 1974, p. 556); therefore, the maximum contaminant level for fluoride is 1.4 mg/L. Higher fluoride concentrations are mainly in water from wells along the mountain drainages.

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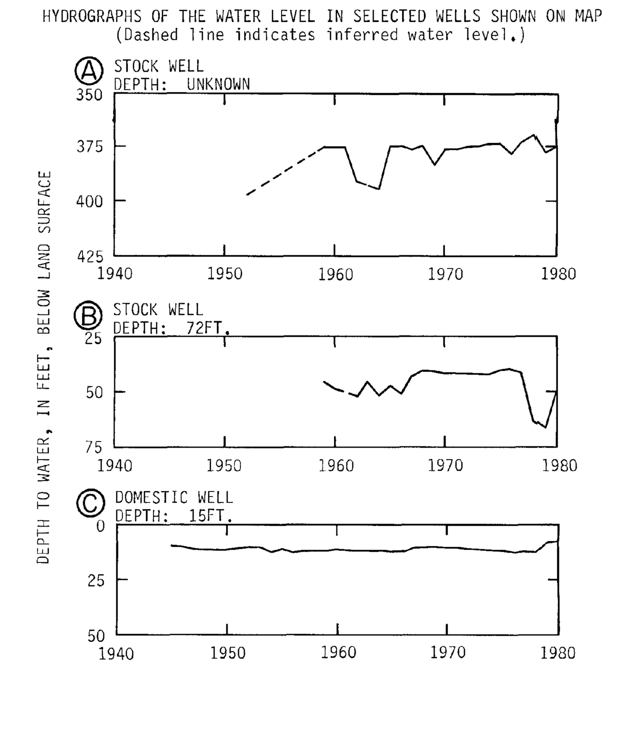
HYDROGRAPHS OF THE WATER LEVEL IN SELECTED WELLS SHOWN ON MAP
(Dashed line indicates inferred water level.)




BASE FROM U.S. GEOLOGICAL SURVEY
PRESCOTT, AZ, 1954, REV. 1970 1:250,000
WILLIAMS, AZ, 1954, REV. 1970 1:250,000

DEPTH TO WATER, ALTITUDE OF THE WATER LEVEL, AND WATER QUALITY

# MAP SHOWING GROUND-WATER CONDITIONS IN THE BIG SANDY AREA YAVAPAI AND MOHAVE COUNTIES, ARIZONA--1980

BY
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