DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COORATION WITH THE
STATE GEOLOGICAL SURVEY OF KANSA, THE DIVISION OF WATER RESOURCES
OF THE STATE BOARD OF AGRICULTRE, THE DIVISION OF SANITATION OF
THE KANSAS STATE BOARD OF HIALTH, AND THE CITY OF WICHITA

HYDROLOGIC INVESTIGATIONS
ATLAS HA-58

Base map adapted from topographic maps prepared by the Army Map Service, U.S. Corps of Engineers

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.—62103

Geologic and hydrologic data from published reports of the State Geological Survey of Kansas and from unpublished field data of the State and Federal Geological Surveys

FIGURE 1. MAP SHOWING THE AVAILABILITY OF GROUND WATER, LOCATION OF SELECTED WELLS, AND CITIES WITH PUBLIC WATER SUPPLY SYSTEMS

SCALE 1:250 000

4 2 0 4 8 12 16 20 MILES

1962

TRUE NORTH MAGNETIC NORTH

APPROXIMATE MEAN DECLINATION, 1962

EXPLANATION

Area underlain by sand and gravel with a saturated thickness of 10 to 40 feet, and in which wells yielding 50 to 500 gpm of good quality water can be constructed.

Area underlain by sand and gravel with saturated thickness of 40 to 300 feet, and in which wells yielding 500 to 1,500 gpm of good quality water can be constructed.

Area underlain by gypsiferous shales in which wells less than 150 feet deep yielding as much as 350 gpm can be constructed. Water from these rocks contains objectionable quantities of dissolved minerals but is usable.

Areas not covered by patterns are underlain by shale or alternating beds of limestone and shale. Well yields in these areas are generally small. East of Wichita, well yields up to 600 gpm are possible locally from limestones less than 200 feet below the surface, but well yield and water quality are not predictable.

3

Location of selected well for which information is given in table 2. Number by well symbol is the number of wells at approximately the same location. Wells are listed separately in table 2 and where combined under a single well symbol are so indicated under remarks.

Spring

Newton

Cities with name underscored are those having municipal water systems for which information is given in table 1.

6 INCH PIPELINE

Location and size of water transmission pipeline where a part of a municipal water system.

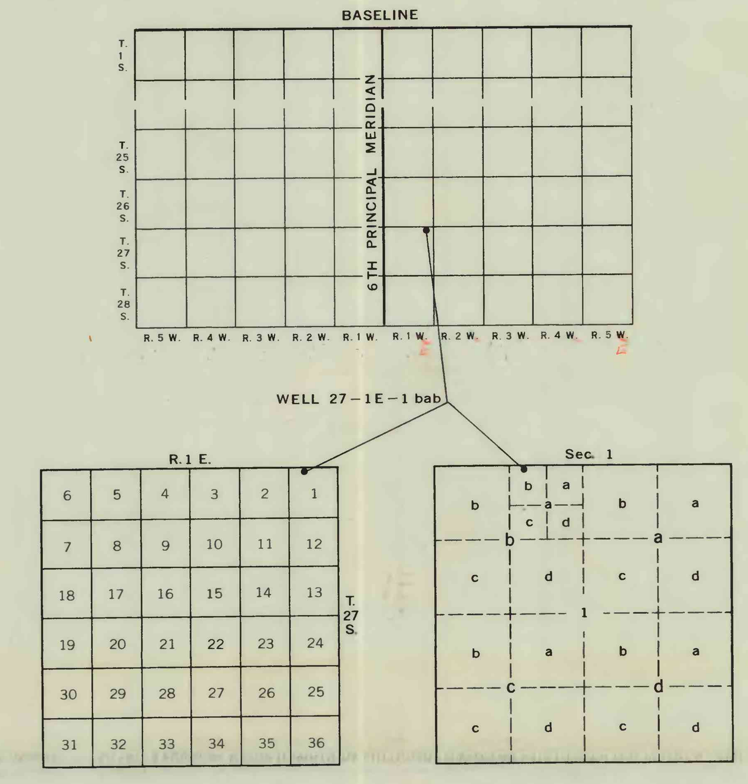
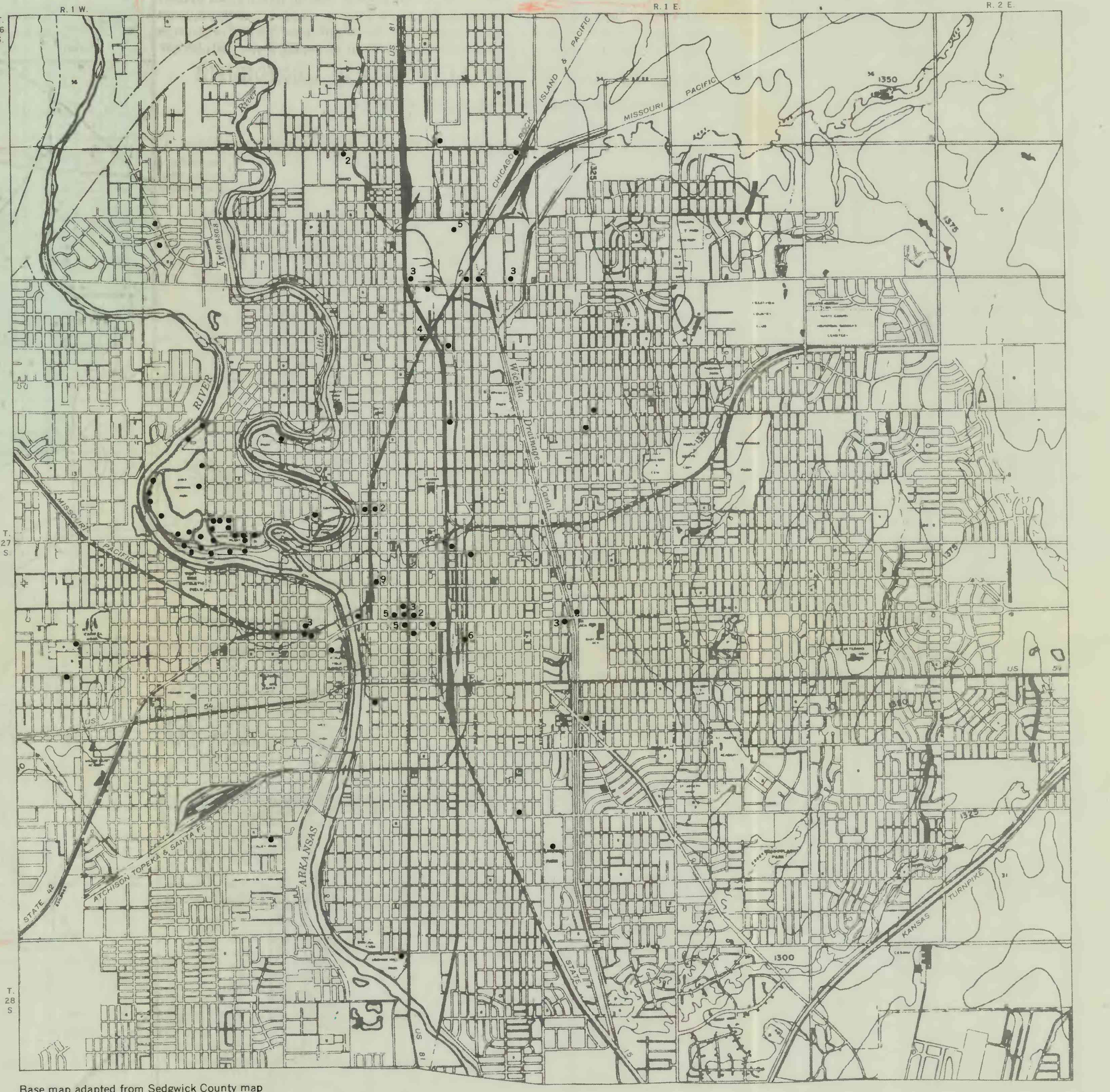


FIGURE 3. SKETCH ILLUSTRATING THE WELL-NUMBERING SYSTEM USED IN TABLE 2.



Base map adapted from Sedgwick County map prepared by the Wichita–Sedgwick County Metropolitan Area Planning Department

FIGURE 2. ENLARGED MAP OF METROPOLITAN WICHITA SHOWING THE LOCATION OF SELECTED WELLS IN THE CITY.

SCALE 1:48 000

1 ½ 0 1 2 MILES

EMERGENCY WATER SUPPLIES IN THE WICHITA AREA, KANSAS

In the event of war, attack on the United States by nuclear weapons and the use of chemical and biological warfare techniques would create serious difficulties to the continued supply of uncontaminated water. Ground-water supplies from properly constructed and protected wells would be least subject to contamination. This report shows by maps and tables, the location of ground-water pumping plants and areas where ground-water supplies could be readily developed for emergency use within a 50-mile radius of the city of Wichita, Kans.

Cities that have public water-supply systems are listed alphabetically in table 1 by counties and by cities within the counties. Selected wells are plotted on maps (figs. 1 and 2) and are tabulated by counties in table 2. Wells too closely spaced to be legibly shown on figures 1 and 2 are shown by a single well symbol and such combinations are given in the remarks in table 2. The location of each well is indicated by the well number. (See fig. 3.) The first number indicates the township; the second, the range; and the third, the section. The 6th principal meridian passes through the city of Wichita; range numbers east of this meridian are followed by E, and range numbers west of this meridian are followed by W. The first lowercase letter following the section number indicates the quarter section; the second the quarter-quarter section; and the third, the quarter-quarter-quarter section (10-acre tract). These letters are arranged counterclockwise and begin with "a" in the northeast quarter. Where more than one well is located within a subdivision of a section the well number is followed by a number indicating the order in which the wells were inventoried.

The yield to be expected from individual wells depends on the type and thickness of the water-bearing material underlying the well site and is shown by patterns on figure 1. Much of the area west of Wichita is underlain by silt, sand, and gravel, and well yields are highest where the saturated thickness is greatest. East of Wichita, and in other parts of the area where bedrock is at or near the surface, well yields depend on the number of solution channels or crevices penetrated by the well bore and generally cannot be predicted for individual well sites.

Depth to water below the land surface in most of the selected wells shown on figures 1 and 2 is given in table 2. In the areas underlain by sand and gravel (see fig. 1), the depth to water is the least adjacent to the major streams and increases gradually in depth with distance from the stream. Adjacent to the Arkansas River and its principal tributaries, the depth to water generally is less than 10 feet and increases to as much as 40 feet near the sides of the valleys. In McPherson and northern Harvey Counties and in the interstream areas of Reno, Kingman, and Harper Counties, the depth to water ranges from about 40 feet to more than 70 feet. In the areas where wells are in shale or limestone the water generally is under some artesian pressure, and the depth to water given in table 2 is not indicative of the depth where water will be found in a bore hole. In these areas the depth of existing wells is approximately the depth at which water will be found.

Most conventional methods of well construction and development are applicable in the area, but certain methods which are in common use have some advantages. In areas underlain by sand and gravel a reverse circulation rotary drill is commonly used, and wells are completed by placing graded gravel in the annulus around the well casing and screen and sealing the annulus at the surface with clay or cement. Wells to a depth of 250 feet contructed by this method can usually be completed, cleaned, and placed in production in less than 36 hours. Wells constructed with conventional rotary drills can be completed in about the same length of time but usually require a longer period for cleaning owing to the use of drilling mud that must be removed from the wall of the well bore before the water is suitable for use. Satisfactory wells can be completed in sand and gravel without the use of a gravel envelope around the well screen. However, a gravel envelope usually prevents fine sand from entering the well, allows a wider range in choice of screen slot openings, and speeds completion of the well. Where wells are drilled in shale or limestone bedrock, percussion drills (cable tool) commonly, are used although conventional rotary drills are satisfactory. Wells drilled in these rocks are usually cased to a depth required to shut out surface seepage and caving formations and the casing is cemented in place to prevent leakage around the casing.

Most of the ground water readily available in the Wichita area is of satisfactory chemical quality for emergency domestic use with no treatment other than chlorination. Water from the sand and gravel is moderately hard, and adjacent to the Arkansas River it contains sufficient dissolved salt to give the water a "flat" taste. In and adjacent to some of the oil fields in eastern McPherson, Sumner, and Cowley Counties the salt content of the water may render it unusable for most purposes. Water from the gypsiferous shales and most limestones east of Wichita is very hard and commonly contains sufficient sulfate in solution to give the water a slightly bitter taste. For people not accustomed to this water it may have a mild cathartic effect but otherwise it is not harmful.

Contamination of ground water by radioactive fallout or by chemical or biological agents probably would not pose a serious problem in the immediate post-attack period except in localized areas. The long-term effects of such contamination are not known at this time. Water in the Arkansas River is in direct communication with ground water in the adjacent alluvial sand and gravel, and exchange of ground water and surface water takes place readily in a zone about the width of the channel meander belt. If water-soluble contaminants were present in the river water, shallow wells adjacent to the river probably would be contaminated within a short time. Insoluble particles and biological contaminants probably would be filtered out of percolating rain water by the rock material near the surface, although some contaminants might reach the water table through soil cracks, root tubes, or animal burrows. Contaminants of this type are not commonly found in ground water withdrawn from properly constructed wells. Water-soluble radioactive and chemical materials could cause long-term contaminantion of aquifers, but contamination might be reduced to safe levels by dilution or base exchange reactions with clay particles in the aquifers.

Estimates of the possibility of contamination of individual wells given in table 2 probable indicate a greater possibility of contamination than might actually occur. Most wells in the metropolitan area of Wichita (fig. 2) are well protected and of good construction, but they might be contaminated by leakage from storm and sanitary sewers. Heavy pumpage might cause infiltration of contaminated water from the Arkansas and Little Arkansas Rivers and the Wichita drainage canal. Many shallow irrigation wells south of Wichita and elsewhere in the area are not constructed to prevent surface seepage around the well. Many of these wells are pumped with portable centrifugal pumps; the pumps are removed after the irrigation season, and the wells stand open. Recharge from precipitation is quite rapid in the sandy soils near the Arkansas River and would afford maximum opportunity for introduction of water-soluble contaminants to the ground-water reservoir.

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For sale by U. S. Geological Survey, price 50 cents