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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

HYDROLOGIC DATA FROM SELECTED WELLS IN THE HELENA VALLEY, LEWIS AND CLARK COUNTY, MONTANA

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U.S. GEOLOGICAL SURVEY

Open-File Report 79-1676

Prepared in cooperation with

Lewis and Clark County

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By Joe A. Moreland, Robert B. Leonard,
T. E. Reed, Richard O. Clausen, and Wayne A. Wood

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METRIC CONVERSION TABLE

The following factors can be used to convert inch-pound units in this report to the International System (SI) of metric units.

Multiply inch-pound unit	By	To obtain SI unit
acre	4047	square meter (m^2)
foot (ft)	0.3048	meter (m)
gallon per minute (gal/min)	0.06309	liter per second (L/s)
inch (in.)	0.02540	meter (m)
mile (mi)	1.609	kilometer (km)

temperature, degrees Celsius (^{o}C) = 0.556 (^{o}F-32)

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ABSTRACT

Hydrologic data were collected during 1978-79 to aid in evaluating the hydrologic conditions in shallow aquifers beneath the Helena valley. The locations of 52 shallow test wells augered during the study are shown on a map at a scale of 1:48,000. Periodic water-level measurements and water-quality analyses for the test holes are listed in tables. Water temperature, specific conductance, and nitrate concentration are given for water samples collected from 98 domestic wells, and chemical analyses are included for 11 domestic and irrigation wells. In addition, water-level drawdown and recovery data are plotted on graphs for five pumped wells and three observation wells.

INTRODUCTION

During 1978 and 1979, personnel of the Montana district, U.S. Geological Survey, and the City-County Health Department, Lewis and Clark County, collected hydrologic information from wells in the Helena valley (fig. 1). This informa-

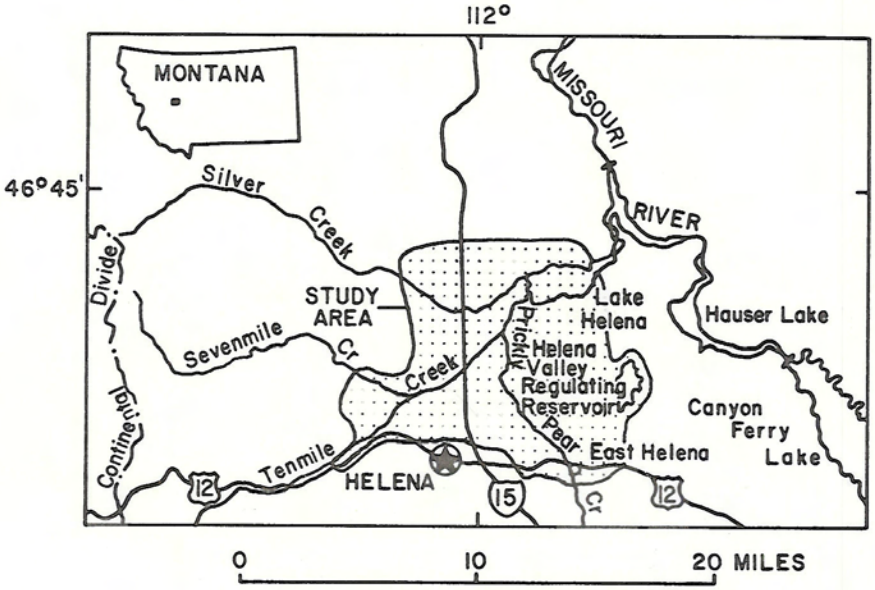

Figure 1.--Map showing location of Helena valley

tion was collected as part of a cooperative investigation by the U.S. Geological Survey and Lewis and Clark County to evaluate the hydrologic conditions in shallow aquifers underlying the Helena valley. This report, which contains the information obtained during the study, was prepared to make the data readily available to interested parties.

At the beginning of the study, 52 shallow test wells were augered at selected sites to provide information on water levels, water quality, and lithology (pl. 1). The wells ranged in depth from 19.6 to 67.0 feet. Each well was cased with 1.5-inch diameter steel pipe. A 3-foot screened drive point, 1.25 inches in diameter, was installed at the bottom of each test well to limit inflow to a specific level. The augered holes were backfilled with fine-grained material to restrict vertical circulation of water in the borehole.

After the test wells were installed, water levels were measured periodically. In addition, most wells were pumped or bailed to obtain water samples for laboratory determination of chemical constituents. Water-level measurements are listed in table 1; water-quality analyses are listed in table 2. Several of the shallower wells were dry throughout the period of study.

In May and June 1979, field water-quality parameters were measured in 98 domestic wells throughout the Helena valley (pl. 1). Although information about well depths or perforated intervals was lacking, the field measurements provide important information about the quality of water from aquifers currently being used as a domestic supply for valley residents. Water temperature, specific conductance, and nitrate concentrations (reported as nitrogen) are listed in table 3.

To further document the quality of water in aquifers used as a domestic supply, water samples were collected from 11 domestic and irrigation wells (pl. 1) for laboratory analysis. These analyses are listed in table 4.

Aquifer tests were performed on five wells to provide information on aquifer characteristics. Water-level drawdowns and recoveries were recorded in the pumped wells and, where available, in nearby observation wells. Drawdown and recovery information is shown on figures 3-18 in the data section of this report.

Geophysical logs were obtained from selected wells and test holes to determine the vertical and areal extent of fine-grained sediments in the valley. The locations of wells for which gamma-ray logs are available are shown on plate 1. The logs are on file in the U.S. Geological Survey office in Helena.

NUMBERING SYSTEM FOR WELLS

In this report, locations are numbered according to geographic position within the rectangular grid system used by the U.S. Bureau of Land Management (fig. 2). The location number consists of as many as 14 characters. The first three characters specify the township and its position north (N) of the Montana Base Line. The next three characters specify the

range and its position west (W) of the Montana Principal Meridian. The next two characters are the section number. The next three or four characters designate the quarter section (160-acre tract), quarter-quarter section (40-acre tract), quarter-quarter-quarter section (10-acre tract), and quarter-quarter-quarter-quarter section ($2\frac{1}{2}$-acre tract), respectively, in which the well is located. The subdivisions of the section are designated A, B, C, and D in a counterclockwise direction, beginning in the northeast quadrant. The final two characters are sequence numbers that represent the order in which the wells are inventoried. For example, as shown on figure 2, well 11N03W21BAAA01 is the first well inventoried in the NE$\frac{1}{4}$NE$\frac{1}{4}$NE$\frac{1}{4}$NW$\frac{1}{4}$ sec. 21, T. 11 N., R. 3 W.

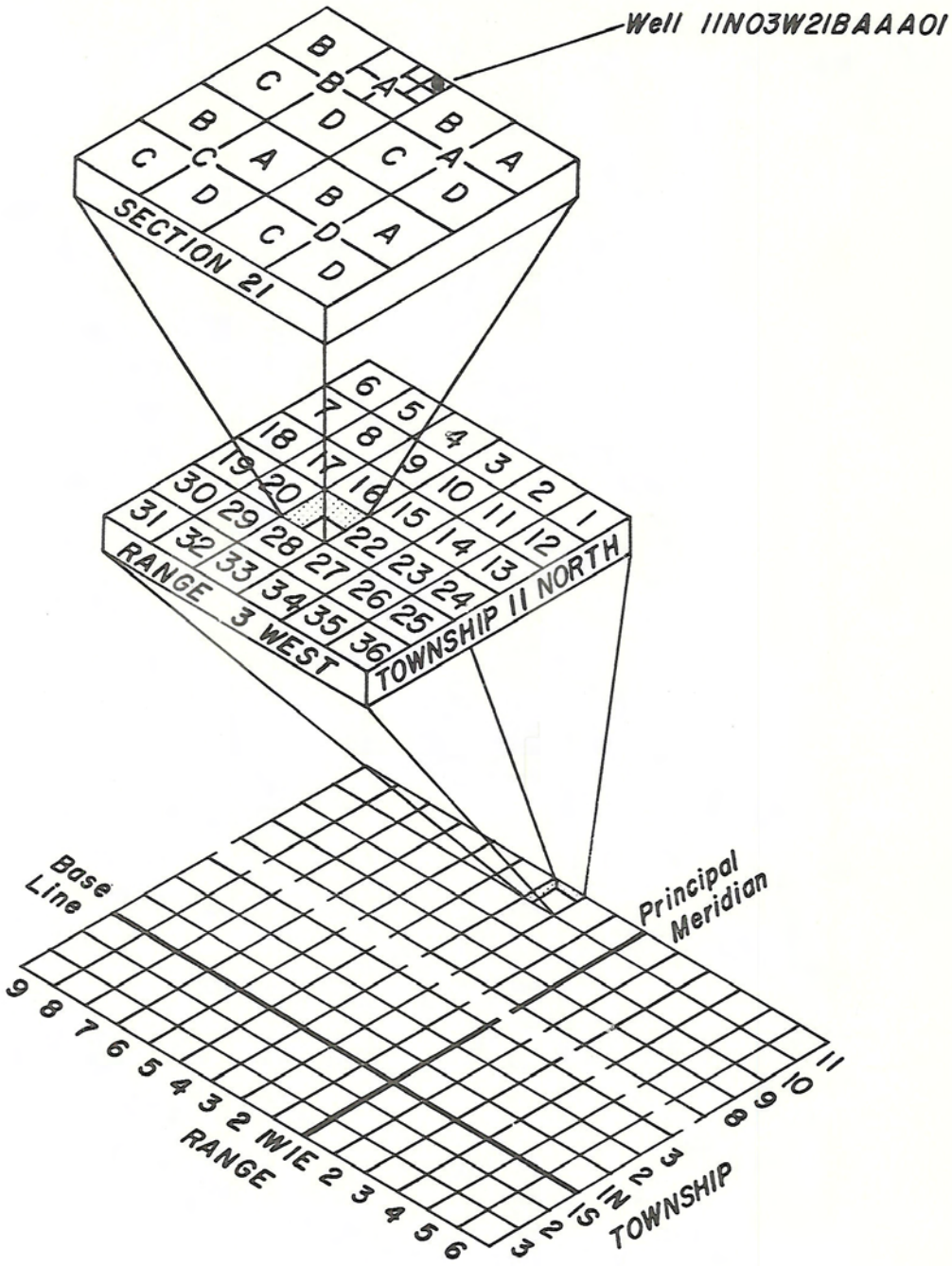

Figure 2.--System for numbering wells.

DATA

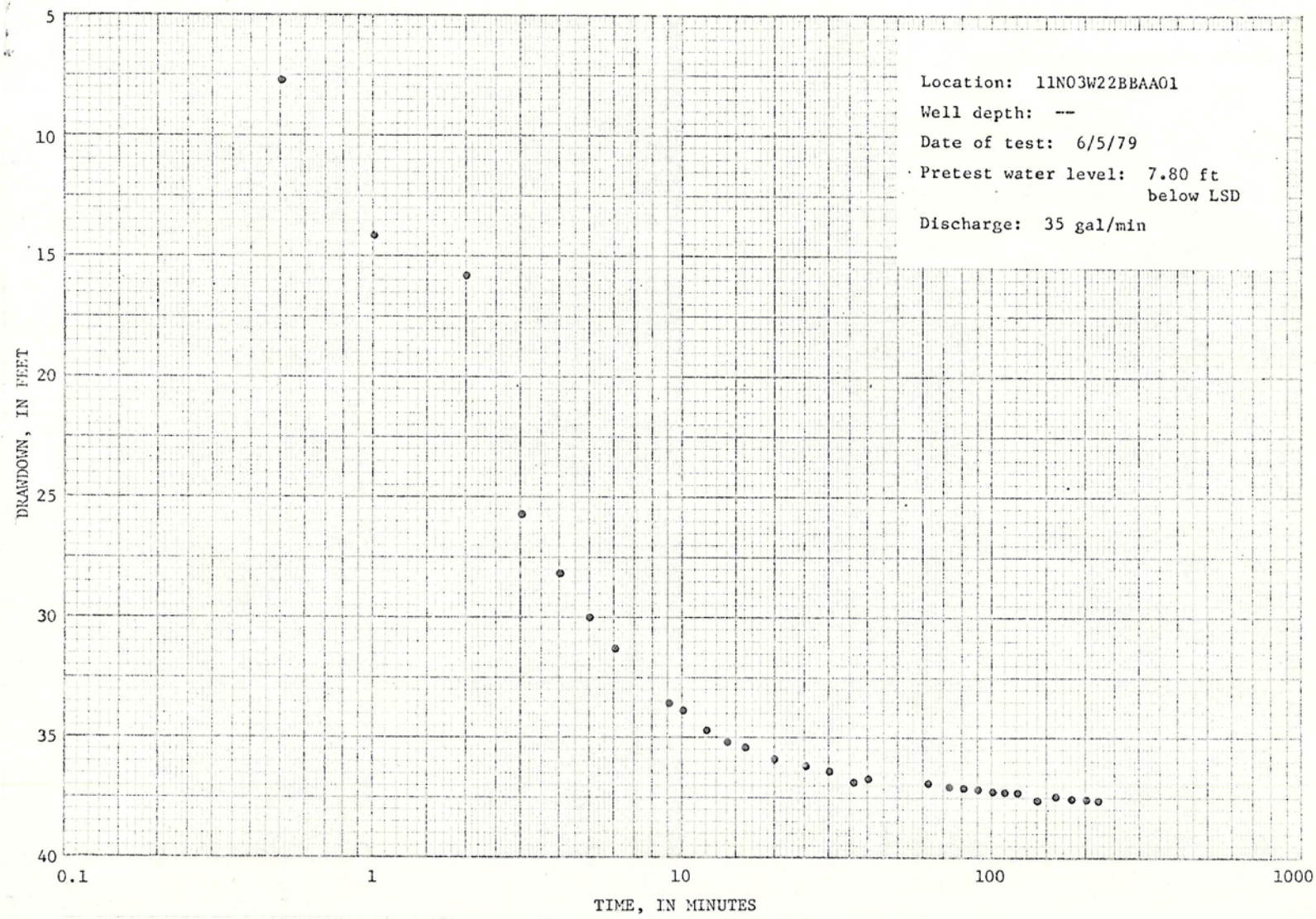

Figure 3.--Drawdown in pumped well 11N03W22BBAA01.