DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

Prepared in cooperation with the
INDIANA DEPARTMENT OF NATURAL RESOURCES

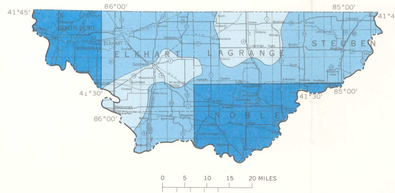
HYDROLOGIC INVESTIGATIONS
ATLAS HA-537 (SHEET 2 OF 3)

GROUND WATER

ESTIMATING SHORT-TERM YIELDS

INTRODUCTION

The information on this sheet gives the basic facts needed to estimate the quantity and quality of ground water available for short pumping periods (24 hours or less in any 48-hour period) from the principal (most used) aquifer underlying any part of the basin. The map below shows the relative accuracy of the maps on this sheet (excluding water quality), as determined by the areal distribution of the data used.



THE ACCURACY OF THE DATA IS MODERATE TO GOOD FOR MOST OF THE STUDY AREA

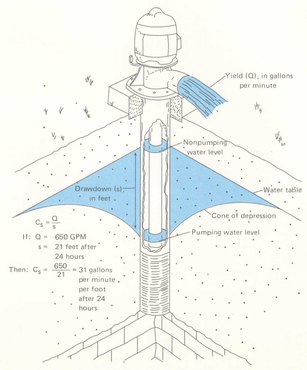
EXPLANATION

Accuracy good - Data from detailed reports and drillers' logs, many including specific capacity tests. Reconnaissance report covers entire area

Accuracy moderate to good - Data mainly from drillers' logs, many including specific capacity tests. Reconnaissance report covers entire area

Accuracy fair to moderate - Data from reconnaissance report and a few drillers' logs

Basin boundary



SPECIFIC CAPACITY INDICATES AN AQUIFER'S CAPABILITY TO YIELD WATER TO WELLS. — *Specific capacity (C_s) is the number of gallons per minute of water that a well will yield for each foot that the water level is lowered during pumping. It is obtained by dividing the yield (Q) by the drawdown (s), each measured at a specific time, usually 24 hours after pumping begins.*

ESTIMATING SHORT-TERM WELL YIELDS

Estimates of the short-term well yields that might be expected from the principal aquifer underlying any area of the basin can be made by using the specific capacity and available drawdown values shown on the maps. The relation between well yield and values of specific capacity and drawdown is:

Well yield		*Specific capacity*		*Available drawdown*
(Q, in gallons per minute)	=	(C_s, in gallons per minute per foot of drawdown)	x	(Sa, in feet)

Well yields estimated by this method are only approximate. Thus, they cannot be considered as firm or be used as well-design criteria. No allowances are made for mutual interference between wells, for drawdown effects caused by aquifer boundaries, or for sustained pumping.

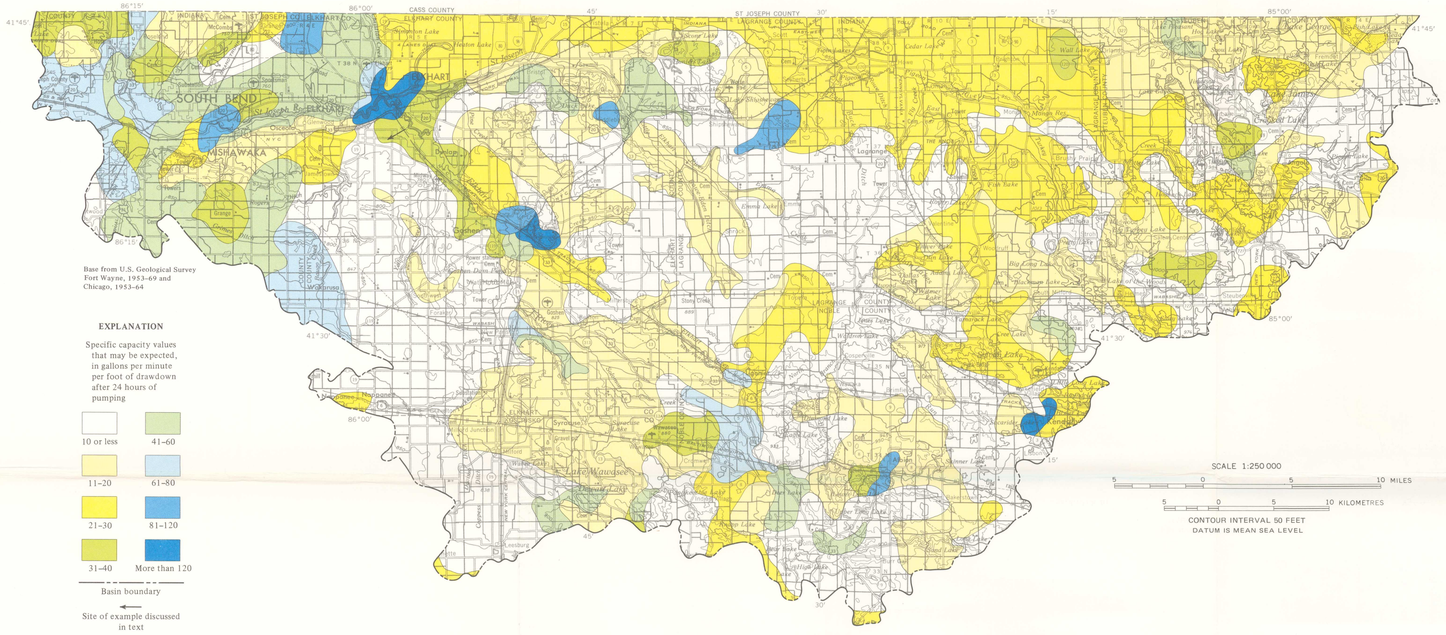
EXAMPLE: Estimate the anticipated short-term well yield available from the principal aquifer at Elkhart (location indicated on the maps by an arrow). From the maps, the range of specific capacity at this site is found to be 31 to 40 gpm (gallons per minute) per foot of drawdown, and the average minimum available drawdown to be 21 to 30 feet. Therefore, the range in well yield is estimated to be:

$Q = C_s \times Sa$

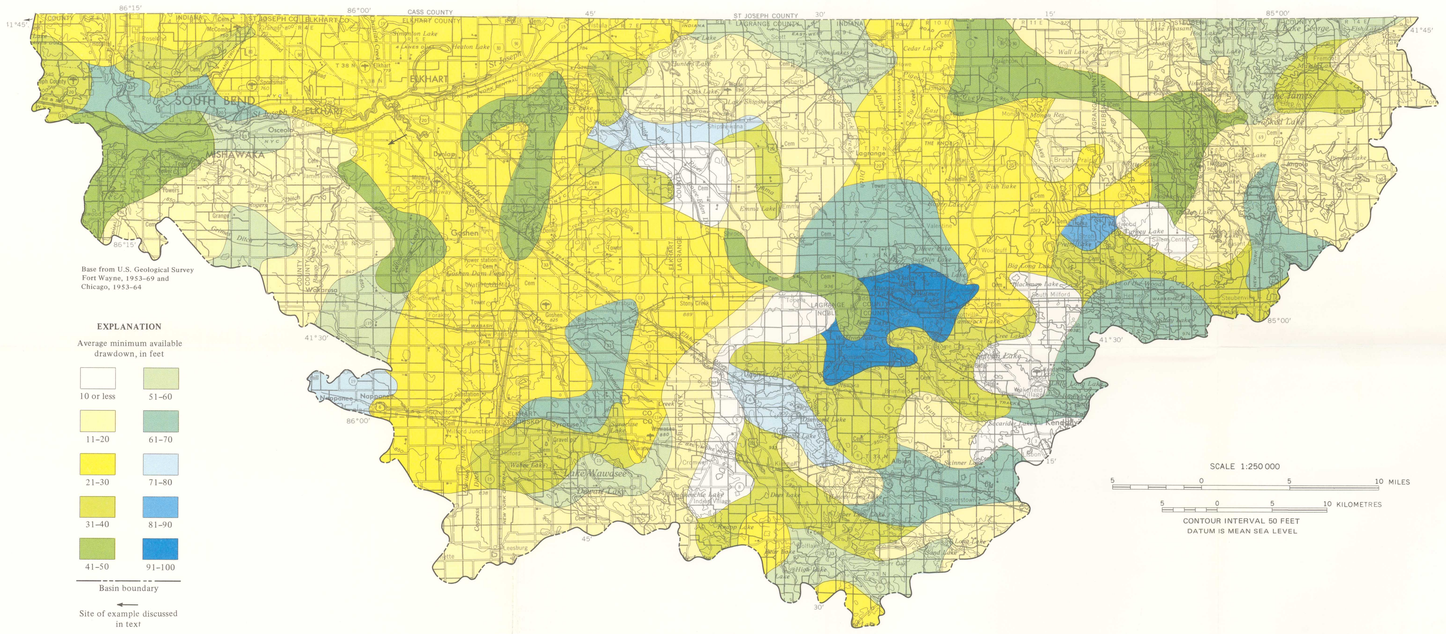
$= 31 \times 21$ to 40×30

$= 650$ to $1{,}200$ gpm

A well near the example site has a specific capacity of 35 gpm and yields about 1,400 gpm with 40 feet of drawdown.



SPECIFIC CAPACITY FOR THE MOST COMMONLY USED AQUIFERS. — *Wells are assumed to be 12 inches in diameter; open to the entire thickness of the aquifer; screened, if in a sand or gravel aquifer; properly developed; and 100-percent efficient. The aquifer zones were assumed to have lateral continuity. All values of specific capacity have been adjusted to a 24-hour period of continuous pumping.*



MINIMUM AVAILABLE DRAWDOWNS IN THE MOST COMMONLY USED AQUIFERS. — *In water-table aquifers, the minimum available drawdown for optimum operating efficiency is equivalent to two-thirds of the minimum saturated thickness of the aquifer. In artesian aquifers, the minimum available drawdown is equivalent to the distance from the lowest observed water level to the top of the aquifer.*

DEPTH TO AQUIFER

EXPLANATION

780-800 Elevation of top of aquifer, in feet above mean sea level

Elevation of top of aquifer ranges from 660 to 780 feet above mean sea level

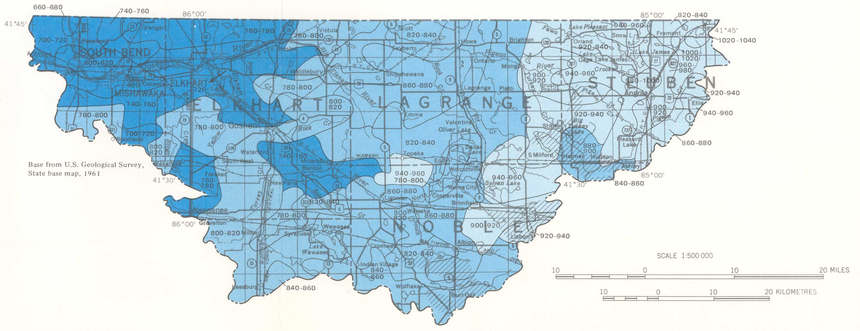
Elevation of top of aquifer ranges from 780 to 900 feet above mean sea level

Elevation of top of aquifer ranges from 900 to 1040 feet above mean sea level

Generally, 40 percent of the wells are completed in an aquifer more than 60 feet deeper than the indicated top of the principal aquifer

Basin boundary

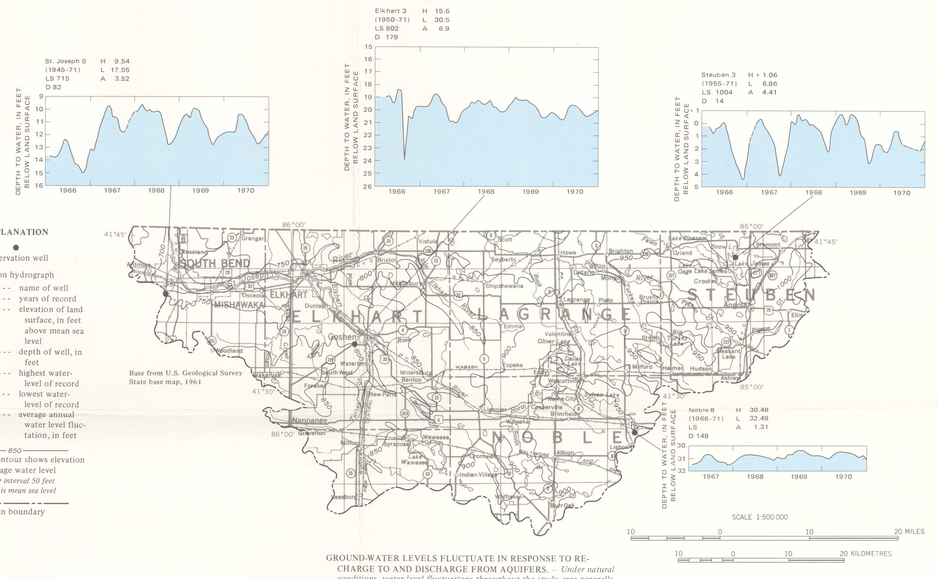
Site of example discussed in text



ELEVATION OF THE TOP OF THE PRINCIPALLY USED AQUIFER RANGES FROM 660 TO 1,040 FEET ABOVE MEAN SEA LEVEL. — *Where the aquifer is unconfined, the map reflects the top of the saturated zone; where confined, the lower surface of the confining bed is depicted.*

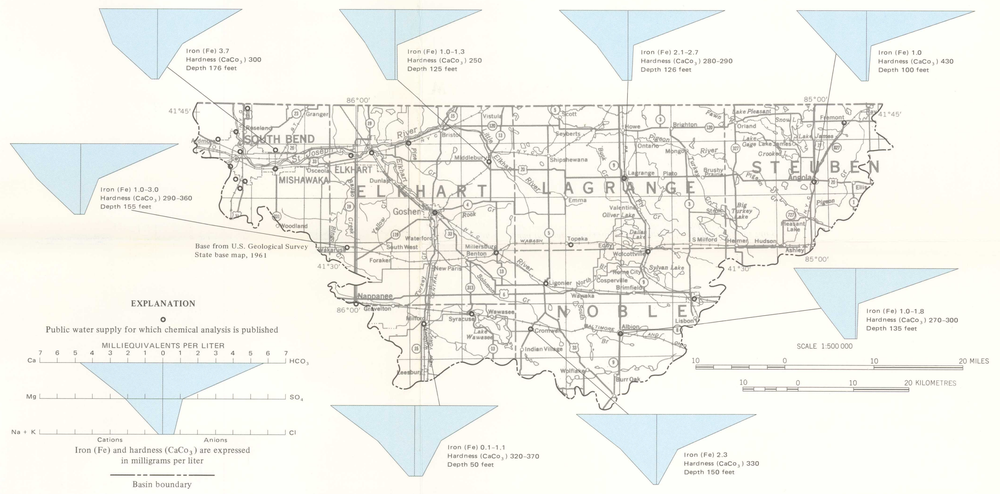
Estimates of the depth from the land surface to the top of the principal aquifer may be made by subtracting elevations presented on this map from elevations of land surface. If the elevation of land surface is not known, it can be obtained from topographic maps, which are available from the U.S. Geological Survey, Washington, D.C. 20244 and the Indiana Department of Natural Resources, Indianapolis, Ind. 46204. EXAMPLE: Estimate the depth from land surface to the top of the principal aquifer at Elkhart (location indicated on map by arrow). The elevation of land surface is about 765 feet above mean sea level (from Elkhart quadrangle, 7½-minute series topographic map), and the range in elevation of the top of the aquifer is 720 to 740 feet above mean sea level. Therefore, the estimated depth from land surface to the principal aquifer is 25 to 45 feet.

WATER LEVELS



GROUND-WATER LEVELS FLUCTUATE IN RESPONSE TO RECHARGE TO AND DISCHARGE FROM AQUIFERS. — *Under natural conditions, water-level fluctuations throughout the study area generally average less than 10 feet each year. In areas affected by pumping, fluctuations may be much greater. The hydrographs illustrate fluctuations above and below the average water level.*

QUALITY OF WATER



THE GROUND WATER IS OF GOOD CHEMICAL QUALITY FOR MOST USES. — *With the exception of high iron content, generally more than 0.3 mg/l (milligrams per liter), the concentrations of all chemical constituents are within the recommended limits for public water supplies suggested by the U.S. Public Health Service (1962). The water is of the calcium magnesium bicarbonate type and very hard (more than 18 mg/l). Although not considered injurious to health, high iron content may impart a taste to water and cause rusty stains on fabrics, porcelain, and other materials. Hard water consumes soap before a lather will form, deposits a soap curd, and forms a scale in boilers, water heaters, and pipes.*

The diagrams illustrate a similarity of the fresh water throughout the basin in Indiana. The selected analyses shown on the diagram are typical for water from the principally used aquifers. All wells were finished in unconsolidated materials.

Interior–Geological Survey, Reston, Va.—1975

WATER RESOURCES OF THE ST. JOSEPH RIVER BASIN IN INDIANA

By
J. P. Reussow and P. B. Rohne, Jr.

1975